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Report On

FCC and Industry Canada Testing of the
Ericsson RRUS 01 B2 / KRC 118 74/1

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FCC ID: TA8AKRC11874-1
IC: 287AB-AS118741

Document 75926461 Report 01 Issue 2

July 2014



Product Service

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Ericsson RRUS 01 B2 / KRC 118 74/1

Document 75926461 Report 01 Issue 2

July 2014

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DATED

21 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





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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Ericsson RRUS 01 B2 / KRC 118 74/1



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 01 B2 / KRC 118 74/1 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 74/1 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 74/1
IC Model Number	AS118741
Serial Number(s)	CB4J094486, CF80011783
LTE Software Version	CXP102051/19 Rev R30H
PIS Software Version	CXP9017316/1 Rev R25SE
Hardware Version	R1E
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2013 Industry Canada RSS-133 issue 6: 2013
Incoming Release Date	Declaration of Build Status 19 April 2014
Order Number Date	PTP 11 April 2014
Start of Test	22 April 2014
Finish of Test	25 June 2014
Name of Engineer(s)	G Zhao X Zhang
Related Document(s)	ANSI C63.4: 2009 ANSI/TIA-603-C-2004 FCC CFR 47 Part 2: 2013 Industry Canada RSS-GEN Issue 3: 2010 Industry Canada SRSP510 Issue 5: 2009

This report has been up issued to Issue 2 and should be read in place of Issue 1. This report has been up issued to replace the PIS Software Version , which was incorrect.



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 + 1949.3MHz (1.4MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW)		N/A	
				1950.7MHz + 1969.3MHz (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	
				1970.7MHz + 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 + 1949.3MHz (1.4MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW)	0	Pass	
				1950.7MHz + 1969.3MHz (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	
				1970.7MHz + 1989.3MHz (1.4MHz 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					
2.2	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 + 1949.3MHz (1.4MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW)	0	Pass	
				1950.7MHz + 1969.3MHz (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	
				1970.7MHz + 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 + 1949.3MHz (1.4MHz OBW) / 1931.5MHz + 1948.5MHz (3MHz OBW) / 1932.5MHz + 1947.5MHz (5MHz OBW) / 1935.0MHz + 1945.0MHz (10MHz OBW)	0	Pass	
				1970.7MHz + 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	
				1950.7MHz + 1969.3MHz (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 + 1949.3MHz (1.4MHz OBW) / 1947.7MHz + 1966.3MHz (1.4MHz OBW)	0	Pass	
				1950.7MHz + 1969.3MHz (1.4MHz OBW)	0	Pass	
				1970.7MHz + 1989.3MHz (1.4MHz OBW) / 1953.7MHz + 1972.3MHz (1.4MHz 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



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 74/1
IC Model Number	AS118741
SERIAL NUMBER	CB4J094486, CF80011783
HARDWARE VERSION	R1E
LTE SOFTWARE	CXP102051/19 Rev R30H
PIS SOFTWARE	CXP9017316/1 Rev R25SE
TRANSMITTER OPERATING RANGE	TX: 1930MHz - 1990MHz 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 47.8dBm per port (1 x 60W per port) Multi Carrier(x 2): 2 x 44.8dBm per port (2 x 30W per port)
OUTPUT POWER TOLERANCE	± 2.0dB
INSTANTANEOUS BANDWIDTH	20MHz
CHANNEL BANDWIDTH	Single carrier supports 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz Multi carrier supports 1.4MHz, 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 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	TA8AKRC11874-1
IC ID	287AB-AS118741
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of LTE Base Station.

Signature

Date

29 April 2014

D of B S Serial No

75926461/01

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 74/1 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 74/1 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 74/1 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.

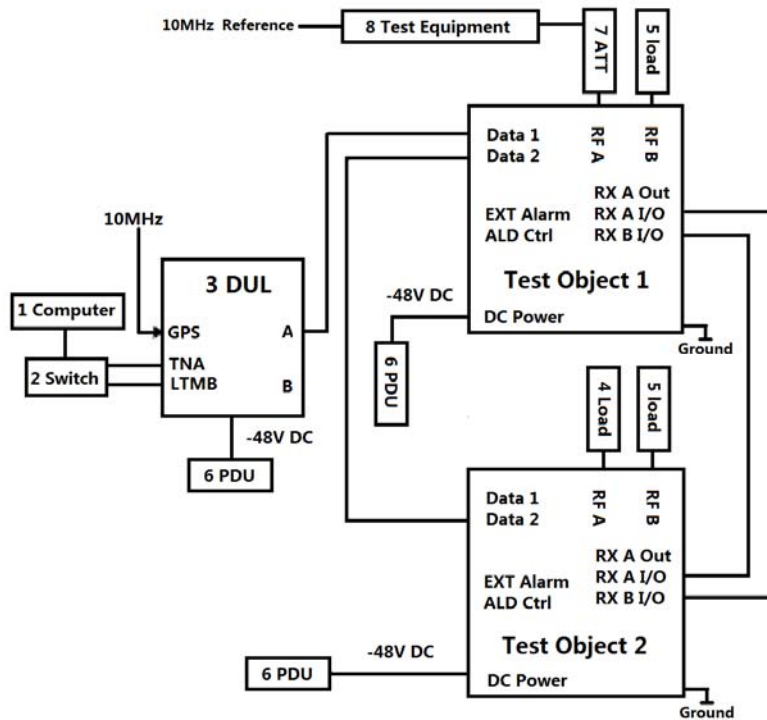
The RF Output Power was tested on both TX/RX output connectors RF A1 and RF A2, all other TX measurements were performed on the combined TX/RX output connector RF A1 of the EUT as the representative port.

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:

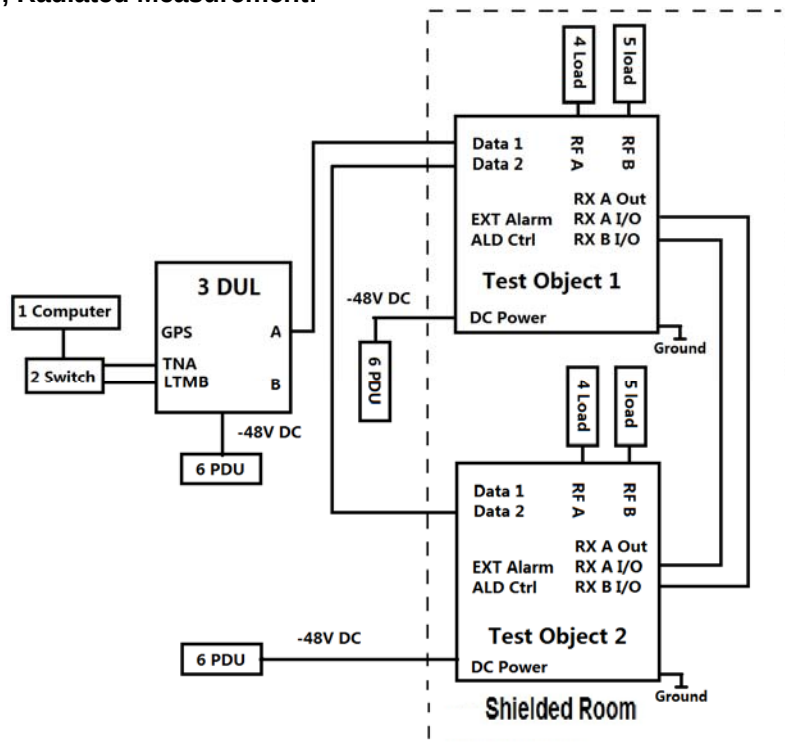
- Single Carrier: Test Model E-TM1.1 in channel bandwidth 1.4MHz.
- Multi Carrier (x2): Test Model E-TM1.1 in channel bandwidth 1.4MHz.

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

**Test Setup, Conducted Measurement:**

Product Name	Product Number	Version	Serial Number
RRUS 01 B2	KRC 118 74/1	R1E	CB4J094486
RRUS 01 B2	KRC 118 74/1	R1E	CF80011783

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 74/1	R1E	CB4J094486
RRUS 01 B2	KRC 118 74/1	R1E	CF80011783

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



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 + 793: 1930.7MHz + 1949.3MHz (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' - 1.4 : EARFCN 777 + 963: 1947.7MHz + 1966.3MHz (1.4MHz Bandwidth)

Middle Channel :

Mode 5 - 1.4 : EARFCN 807 + 993: 1950.7MHz + 1969.3MHz (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 1007 + 1193: 1970.7MHz + 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' - 1.4 : EARFCN 837 + 1023: 1953.7MHz + 1972.3MHz (1.4MHz Bandwidth)

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



Product Service

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 ($\pm 1\text{MHz}$)
- 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 74/1



Product Service

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 74/1, S/N: CB4J094486, CF80011783

2.1.3 Date of Test and Modification State

22 to 29 April 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 spectrum analyzer in accordance with FCC KDB 971168 D01 Power Meas License Digital Systems v02r01 Clause 5.4.

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 (1.4, 3, 5, 10, 15, 20)
- 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



2.1.6 Environmental Conditions

Ambient Temperature 22.0 – 24.5°C

Relative Humidity 48.0 – 58.0%

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

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	47.54	56.75	46.09	47.39	54.83	45.96	50.48	111.58
900 (Middle)	1960.0	47.59	57.41	46.07	47.46	55.72	46.05	50.54	113.13
1193 (Top)	1989.3	47.45	55.59	45.83	47.36	54.45	45.86	50.42	110.04

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	47.58	57.28	35.39	47.55	56.89	35.34	50.58	114.17
900 (Middle)	1960.0	47.58	57.28	35.31	47.57	57.15	35.23	50.59	114.43
1100 (Top)	1980.0	47.52	56.49	35.27	47.51	56.36	35.22	50.53	112.85

**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	47.60	57.54	43.37	47.53	56.62	43.32	50.58	114.16
	5.0	47.59	57.41	41.22	47.56	57.02	41.12	50.59	114.43
	10.0	47.62	57.81	38.24	47.54	56.75	38.19	50.59	114.56
	15.0	47.60	57.54	36.59	47.57	57.15	36.55	50.60	114.69

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	47.51	56.36	46.05	47.43	55.34	46.04	50.48	111.70
	E-TM3.1	47.49	56.10	46.06	47.42	55.21	46.03	50.47	111.31

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	47.58	57.28	35.67	47.52	56.49	35.59	50.56	113.77
	E-TM3.1	47.60	57.54	35.28	47.56	57.02	35.27	50.59	114.56

**Multi Carrier (x2)****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 + 793 (Bottom)	1930.7 + 1949.3	47.42	55.21	47.33	54.08	50.39	109.29
807 + 993 (Middle)	1950.7 + 1969.3	47.52	56.49	47.36	54.45	50.45	110.94
1007 + 1193 (Top)	1970.7 + 1989.3	47.49	56.10	47.36	54.45	50.44	110.55

E-TM1.1: 10.0MHz BandwidthConfiguration 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	47.61	57.68	47.57	57.15	50.60	114.83
850 + 950 (Middle)	1955.0 + 1965.0	47.61	57.68	47.59	57.41	50.61	115.09
1050 + 1150 (Top)	1975.0 + 1985.0	47.55	56.89	47.55	56.89	50.56	113.78

E-TM1.1: 3.0MHz and 5.0MHz BandwidthConfiguration 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	47.60	57.54	47.54	56.75	50.58	114.29
825 + 975 / 1952.5 + 1967.5 (Middle)	5.0	47.57	57.15	47.56	57.02	50.58	114.17

**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		
807 + 993/ 1950.7 + 1969.3 (Middle)	1.4	47.51	56.36	47.39	54.83	50.46	111.19
850 + 950 / 1955.0 + 1965.0 (Middle)	10.0	47.55	56.89	47.55	56.89	50.56	113.78

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		
807 + 993/ 1950.7 + 1969.3 (Middle)	1.4	47.51	56.36	47.37	54.58	50.45	110.94
850 + 950 / 1955.0 + 1965.0 (Middle)	10.0	47.59	57.41	47.57	57.15	50.59	114.56

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: $\leq 1640\text{W/MHz}$ or $\leq +62.15\text{dBm/MHz}$ IC: $\leq 100\text{W}$ or $\leq +50\text{dBm}$
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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 74/1, S/N: CB4J094486, CF80011783

2.2.3 Date of Test and Modification State

22 to 29 April 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 determine 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 representative 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 (1.4, 3, 5, 10, 15, 20)
- 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 – 24.5°C

Relative Humidity 48.0 – 58.0%

2.2.7 Test Results

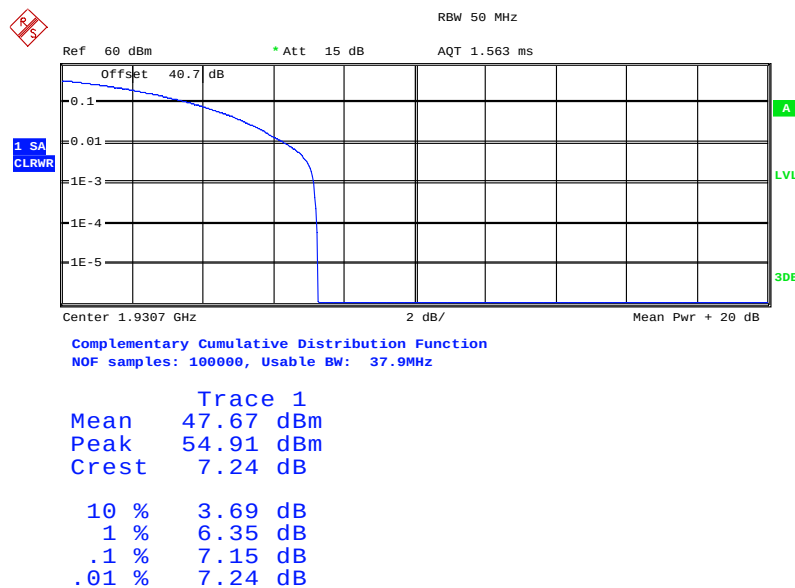
For the period of test the EUT met the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133 for Peak – Average Ratio.

The test results are shown below.

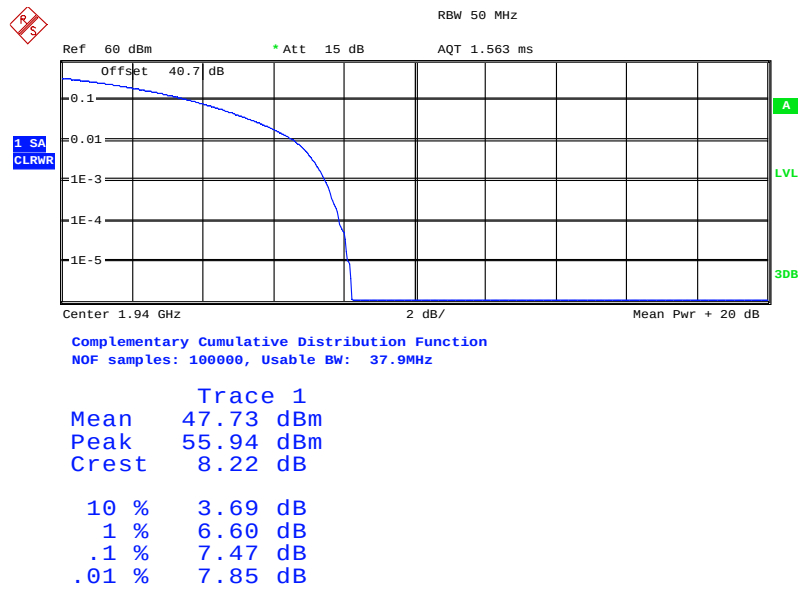
Single Carrier

Configuration 1 - Mode 1 - 1.4

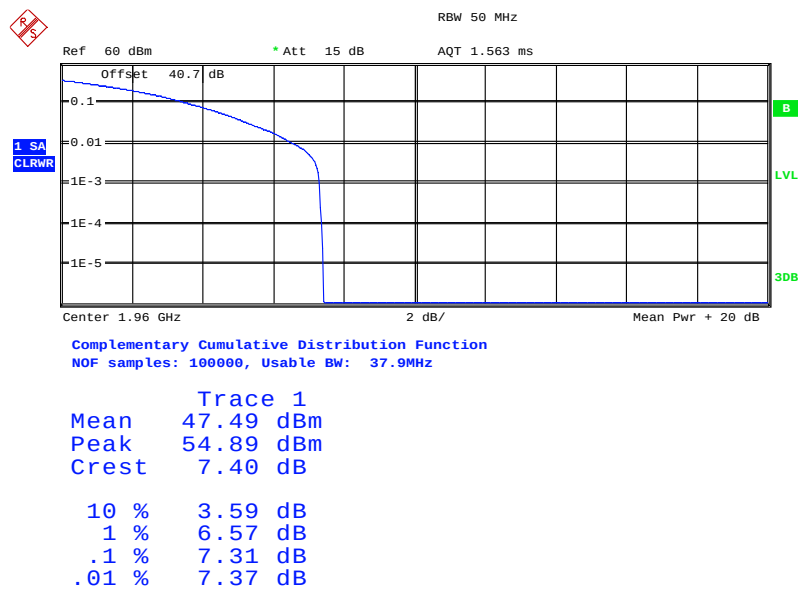
E-TM1.1: 1.4MHz Bandwidth



Date: 28.APR.2014 13:17:24

**Configuration 1 - Mode 1 - 20****E-TM1.1: 20.0MHz Bandwidth**

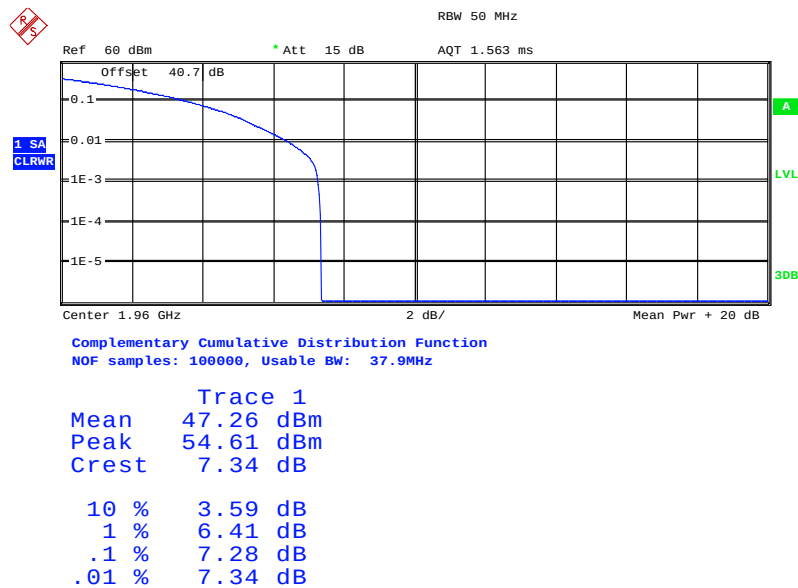
Date: 28.APR.2014 12:14:12

Configuration 1 - Mode 2**E-TM1.1: 1.4MHz Bandwidth**

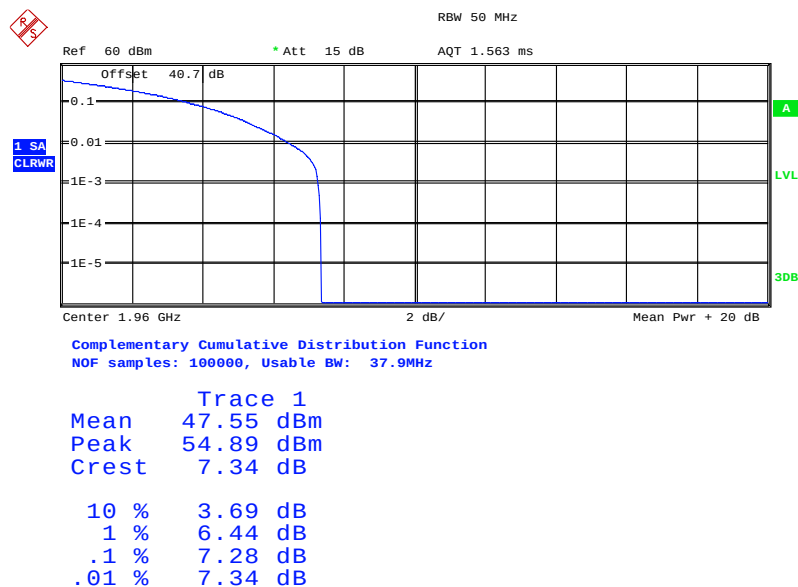
Date: 24.APR.2014 15:29:14



Product Service

E-TM3.2: 1.4MHz Bandwidth

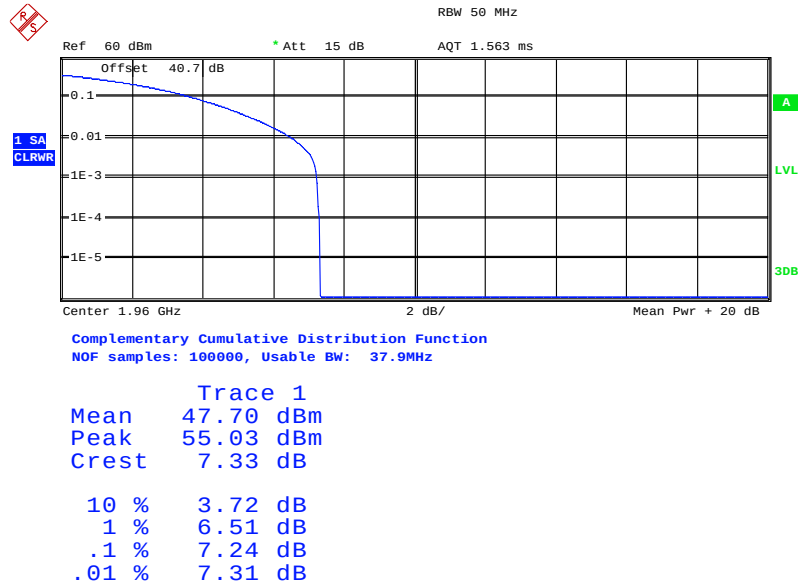
Date: 24.APR.2014 17:36:19

E-TM3.1: 1.4MHz Bandwidth

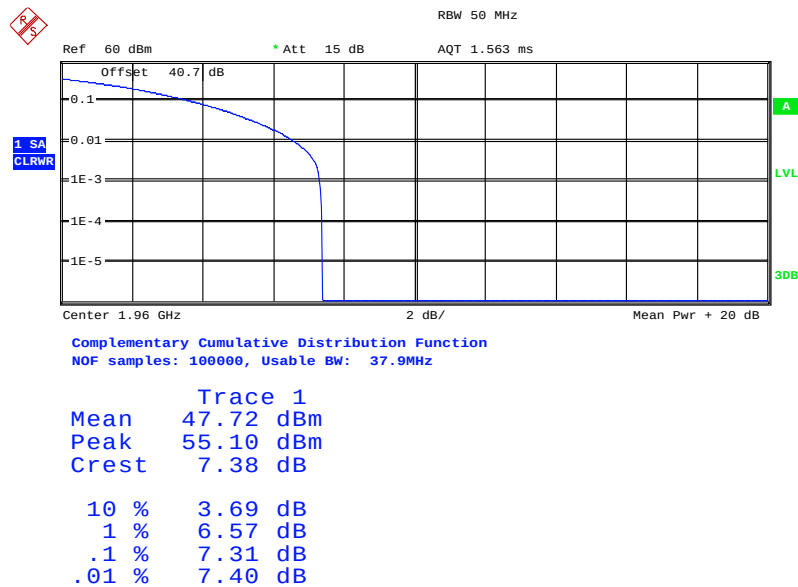
Date: 24.APR.2014 18:01:10



Product Service

E-TM1.1: 3.0MHz Bandwidth

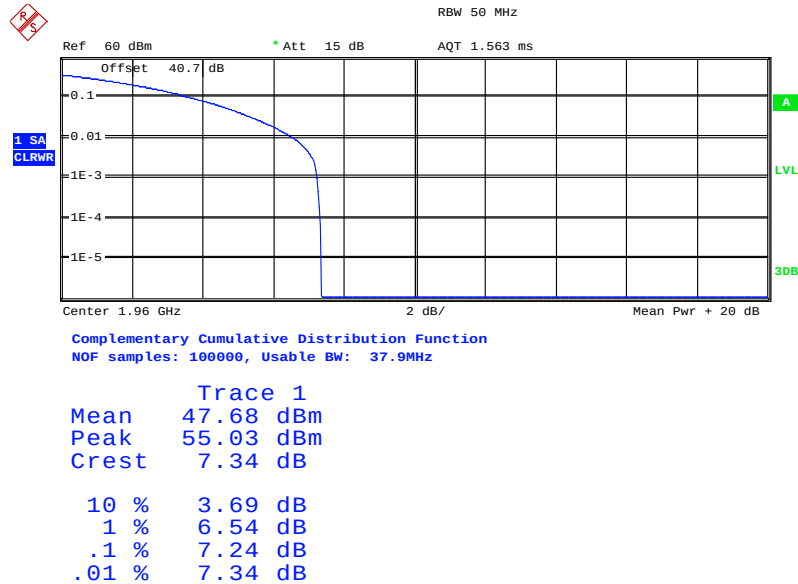
Date: 25.APR.2014 15:41:39

E-TM1.1: 5.0MHz Bandwidth

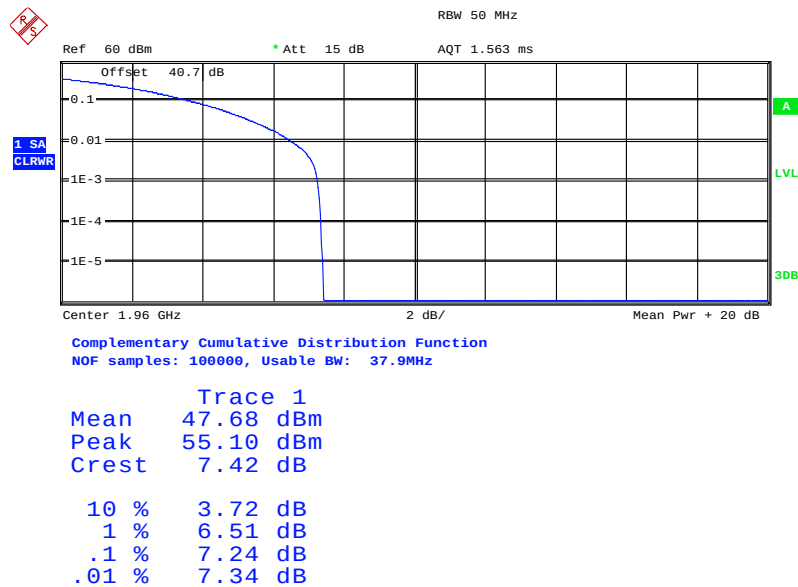
Date: 25.APR.2014 16:20:28



Product Service

E-TM1.1: 10.0MHz Bandwidth

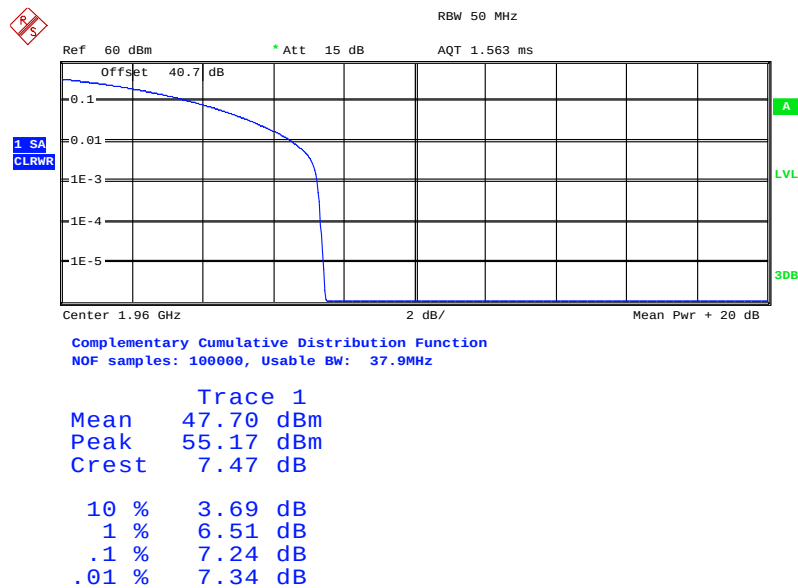
Date: 25.APR.2014 16:40:09

E-TM1.1: 15.0MHz Bandwidth

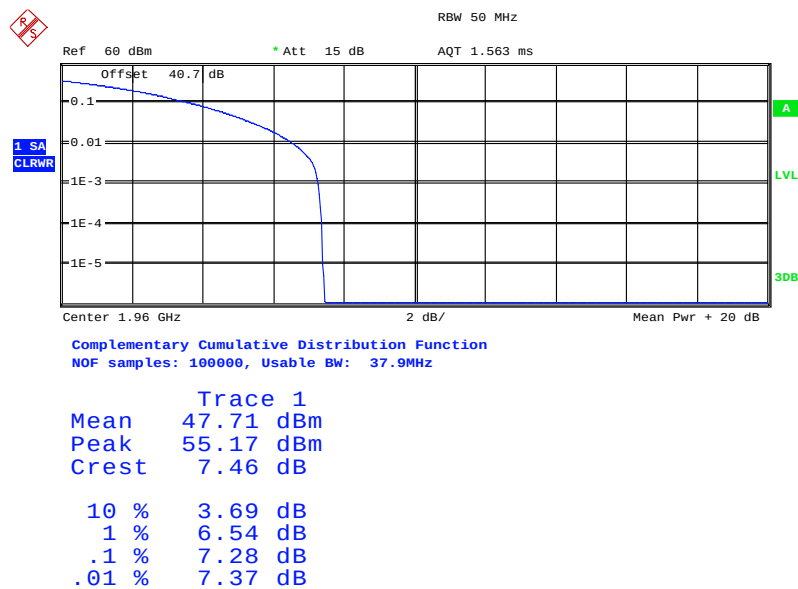
Date: 25.APR.2014 16:48:22



Product Service

E-TM1.1: 20.0MHz Bandwidth

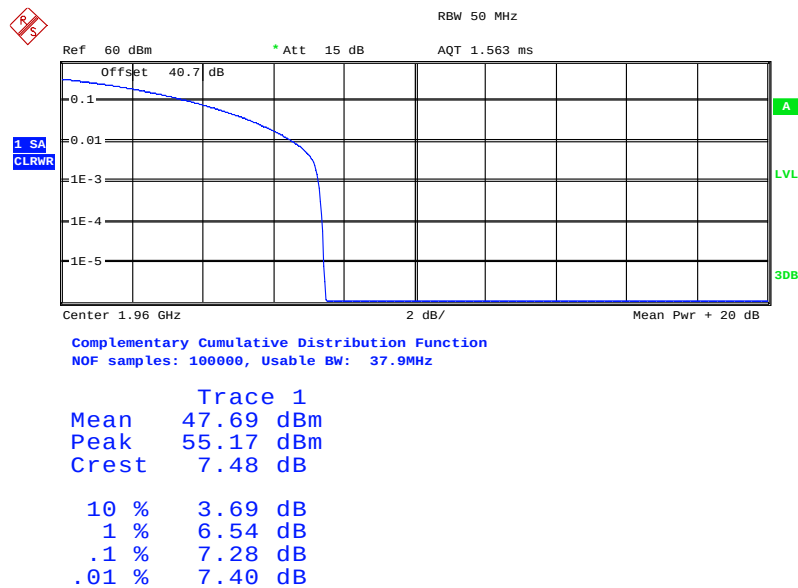
Date: 25.APR.2014 12:14:06

E-TM3.2: 20MHz Bandwidth

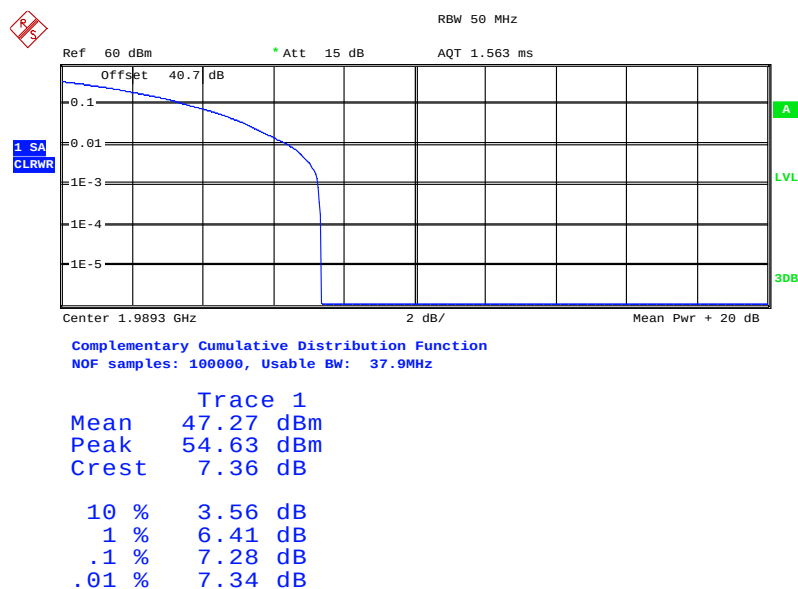
Date: 25.APR.2014 12:33:22



Product Service

E-TM3.1: 20MHz Bandwidth

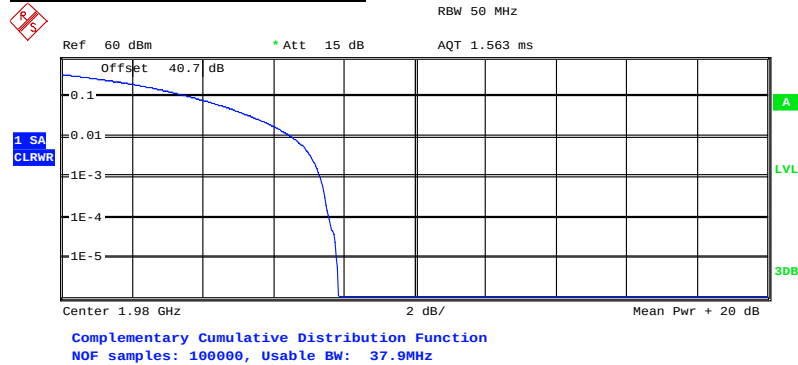
Date: 25.APR.2014 15:28:39

Configuration 1 - Mode 3 - 1.4E-TM1.1: 1.4MHz Bandwidth

Date: 28.APR.2014 13:42:39



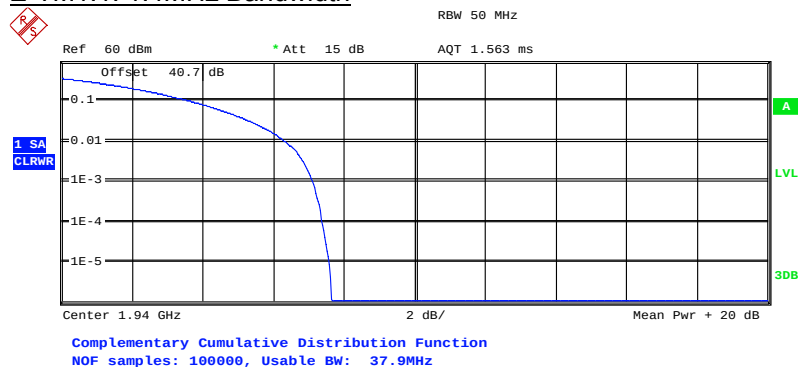
Product Service

Configuration 1 - Mode 3 - 20**E-TM1.1: 20.0MHz Bandwidth**

Trace 1

Mean	47.72 dBm
Peak	55.56 dBm
Crest	7.85 dB
10 %	3.69 dB
1 %	6.51 dB
.1 %	7.34 dB
.01 %	7.56 dB

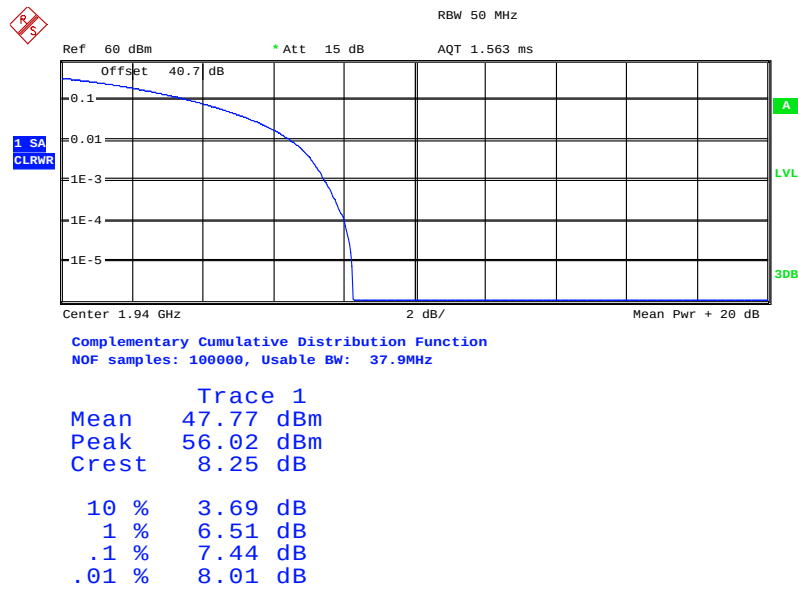
Date: 28.APR.2014 12:03:10

Multi Carrier (x2)**Configuration 1 - Mode 4 - 1.4****E-TM1.1: 1.4MHz Bandwidth**

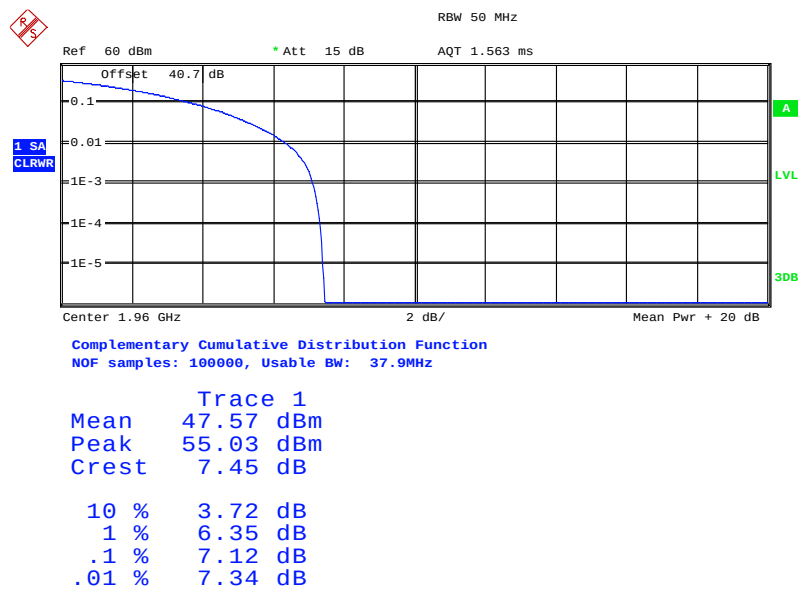
Trace 1

Mean	47.67 dBm
Peak	55.31 dBm
Crest	7.64 dB
10 %	3.69 dB
1 %	6.31 dB
.1 %	7.12 dB
.01 %	7.37 dB

Date: 28.APR.2014 18:01:42

**Configuration 1 - Mode 4 - 10****E-TM1.1: 10MHz Bandwidth**

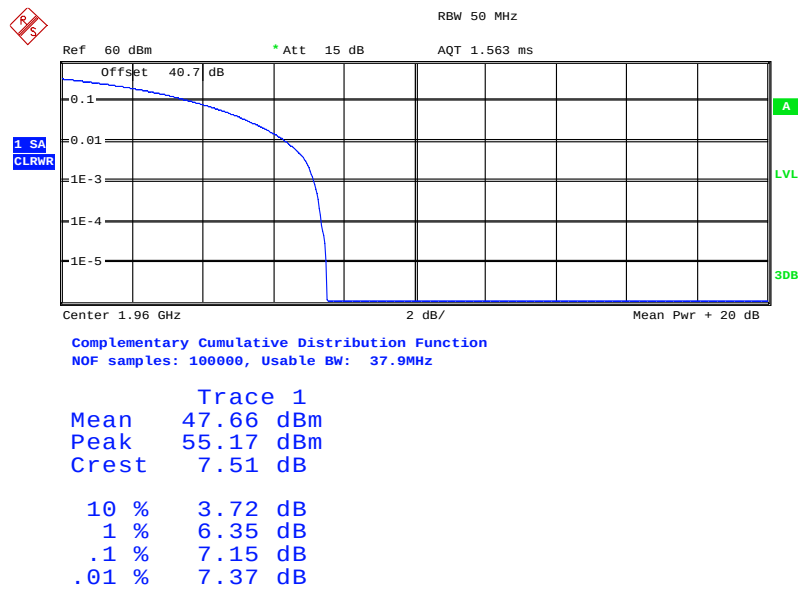
Date: 29.APR.2014 12:14:05

Configuration 1 - Mode 5 - 1.4**E-TM1.1: 1.4MHz Bandwidth**

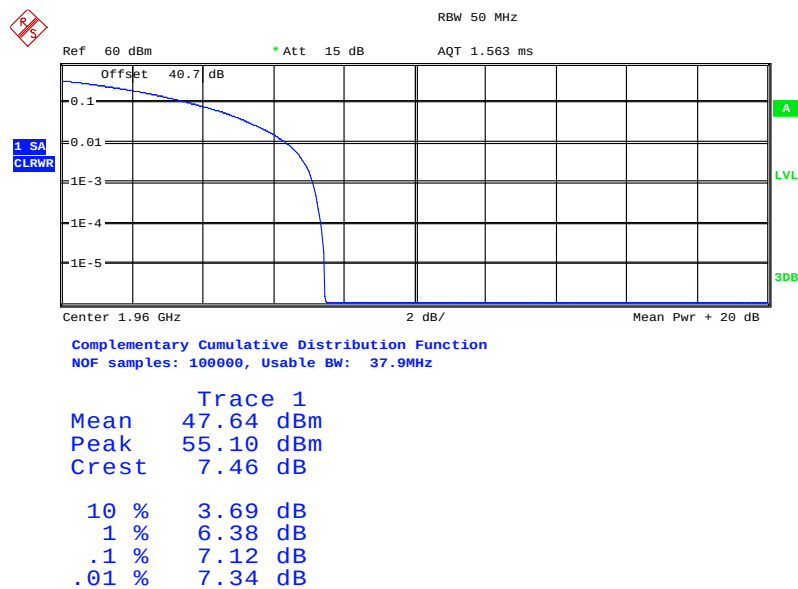
Date: 29.APR.2014 15:42:59



Product Service

E-TM3.2: 1.4MHz Bandwidth

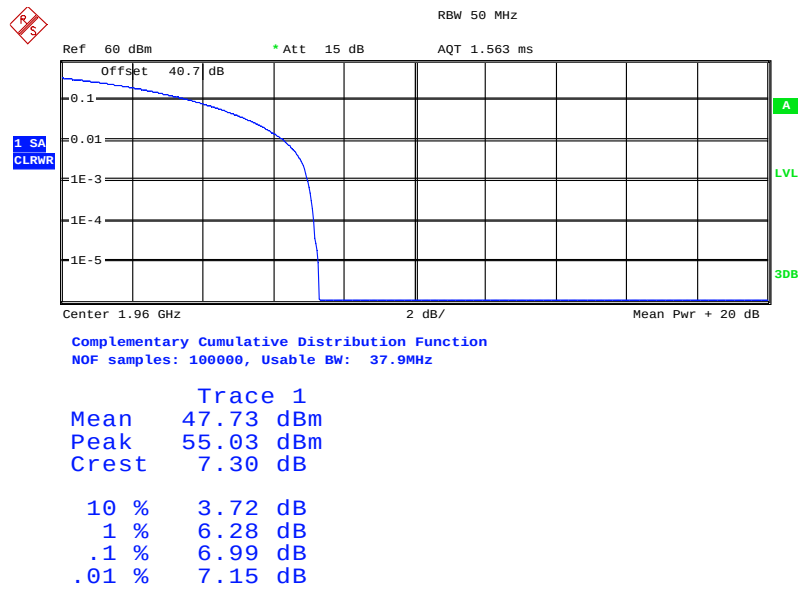
Date: 29.APR.2014 14:09:50

E-TM3.1: 1.4MHz Bandwidth

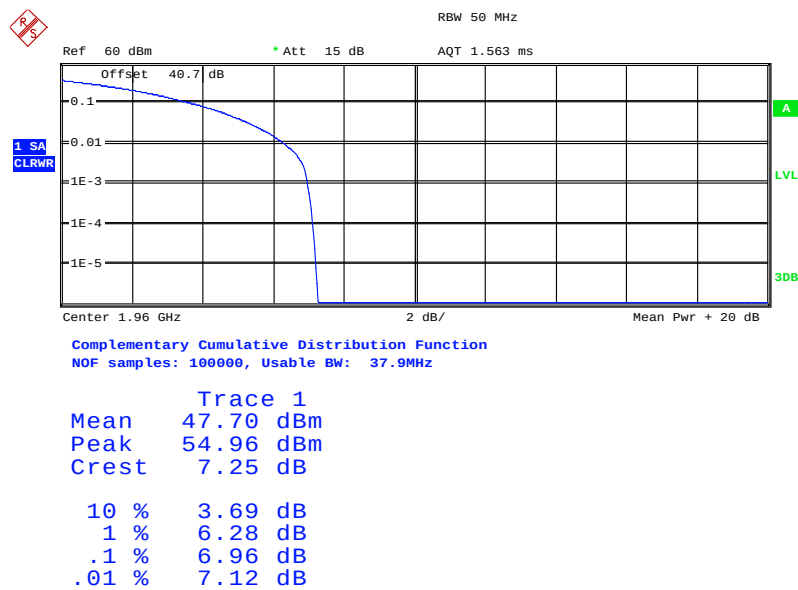
Date: 29.APR.2014 14:00:09



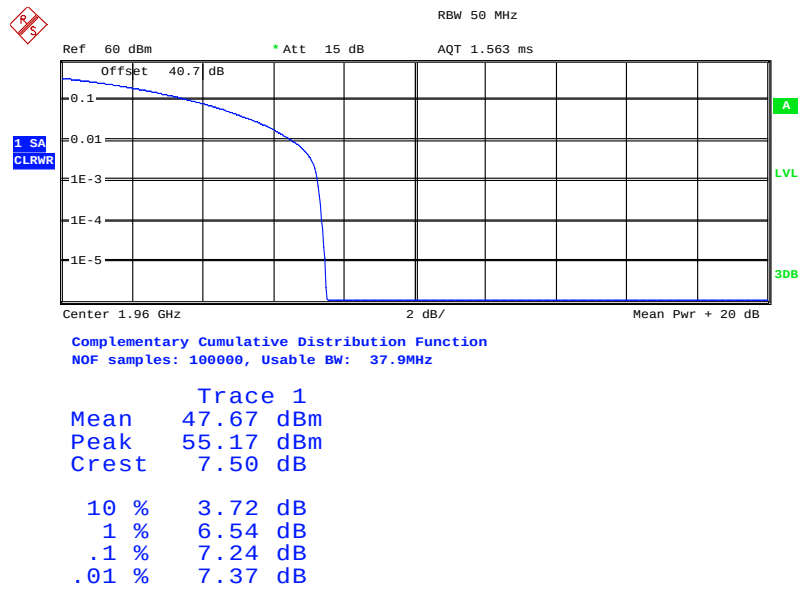
Product Service

Configuration 1 - Mode 5 - 3**E-TM1.1: 3MHz Bandwidth**

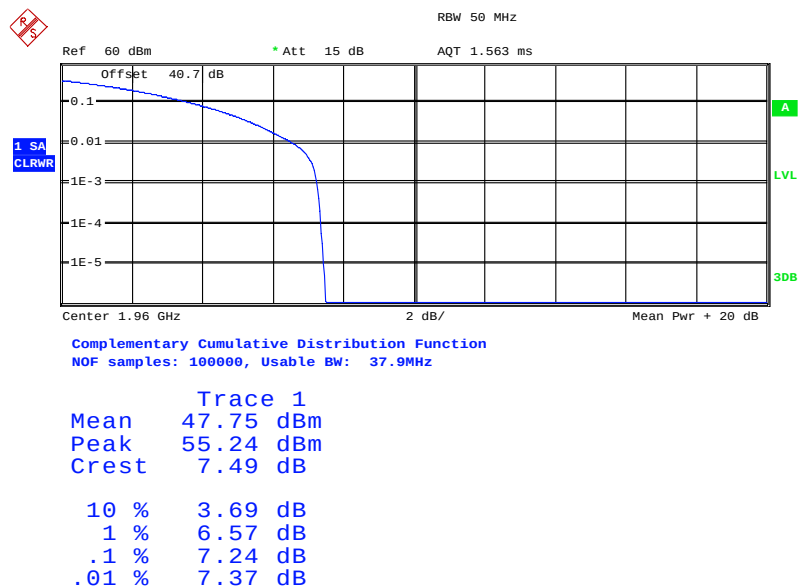
Date: 29.APR.2014 13:32:29

Configuration 1 - Mode 5 - 5**E-TM1.1: 5MHz Bandwidth**

Date: 29.APR.2014 16:28:19

**Configuration 1 - Mode 5 - 10****E-TM1.1: 10MHz Bandwidth**

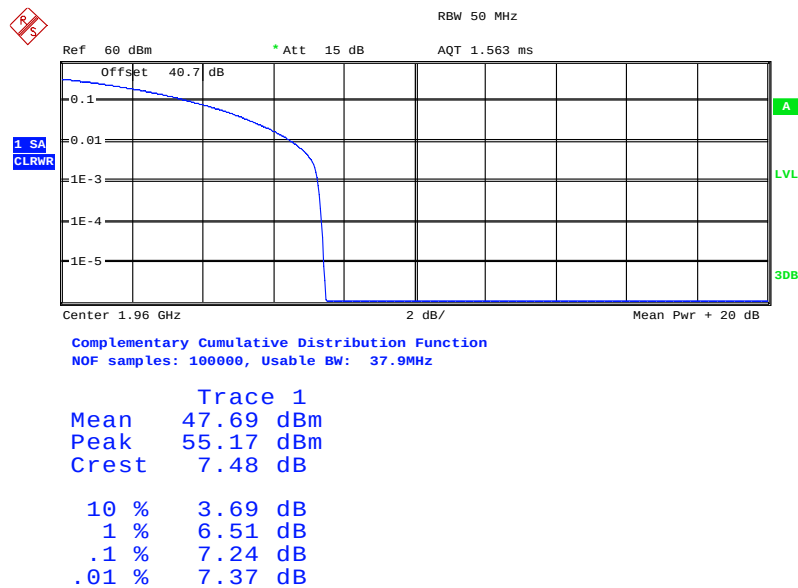
Date: 29.APR.2014 16:00:05

E-TM3.2: 10MHz Bandwidth

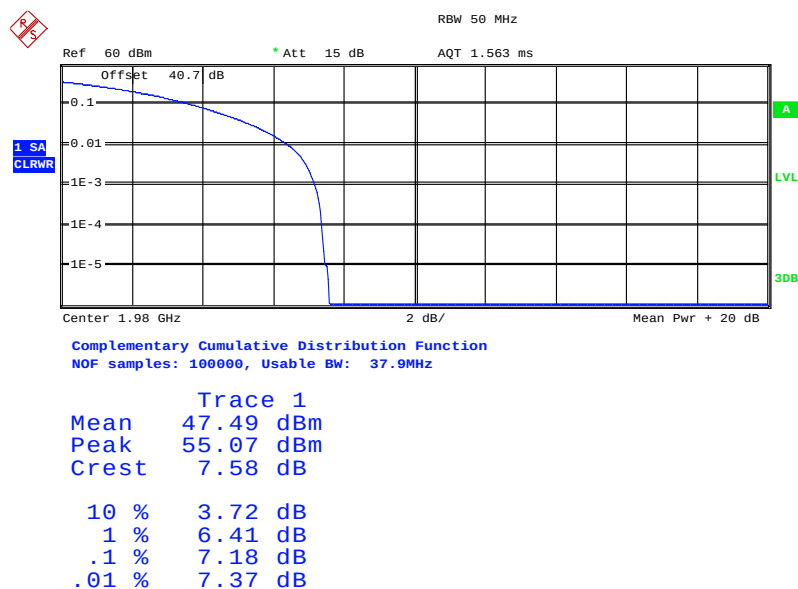
Date: 29.APR.2014 14:20:23



Product Service

E-TM3.1: 10MHz Bandwidth

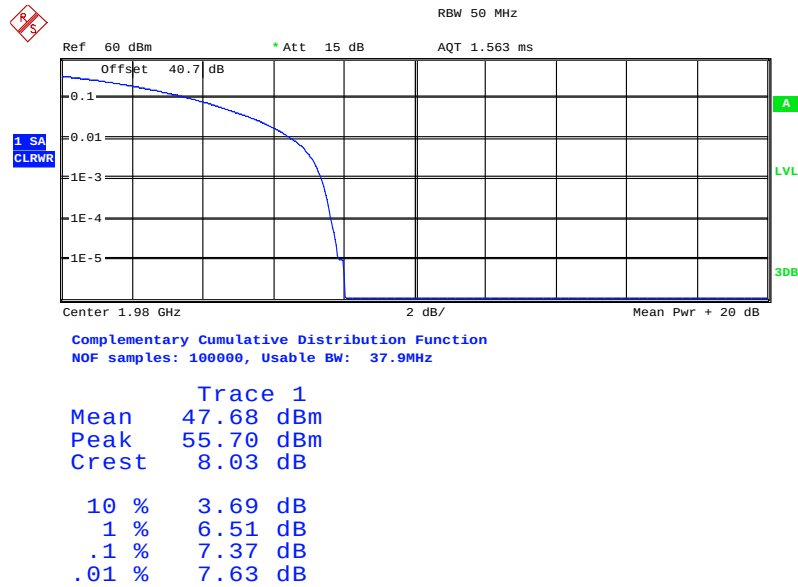
Date: 29.APR.2014 14:18:09

Configuration 1 - Mode 6 - 1.4E-TM1.1: 1.4MHz Bandwidth

Date: 29.APR.2014 15:57:14



Product Service

Configuration 1 - Mode 6 - 10**E-TM1.1: 10MHz Bandwidth**

Date: 29.APR.2014 16:15:25

Limit	13dB
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Remarks

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



Product Service

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 74/1, S/N: CB4J094486, CF80011783

2.3.3 Date of Test and Modification State

13 May 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 Bandwidth.

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

Configuration 1 - Mode 2 (3)

2.3.5 Environmental Conditions

Ambient Temperature 22.0 – 24.5°C

Relative Humidity 48.0 – 58.0%



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.

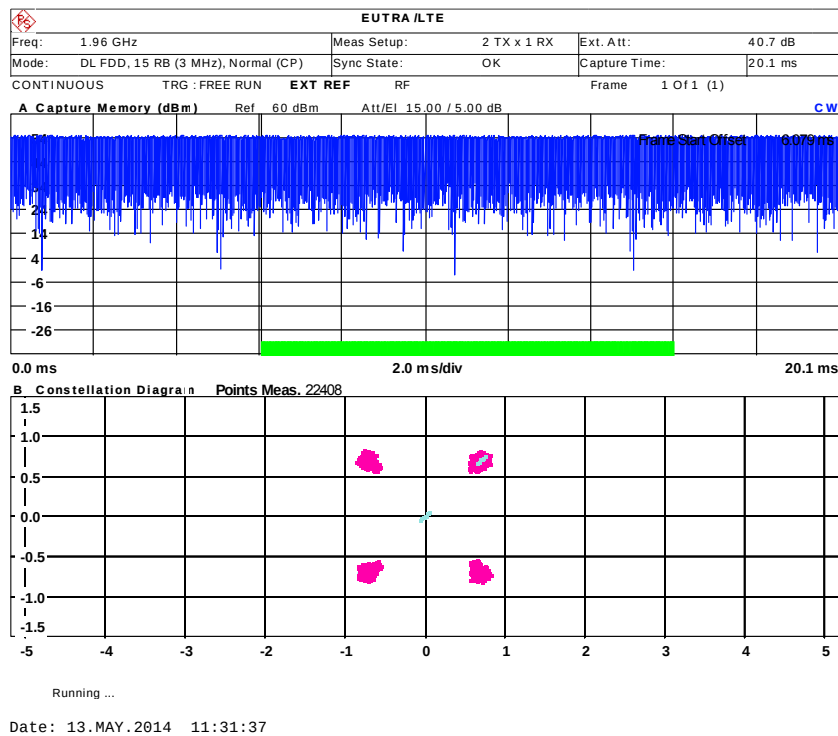
The test results are shown below

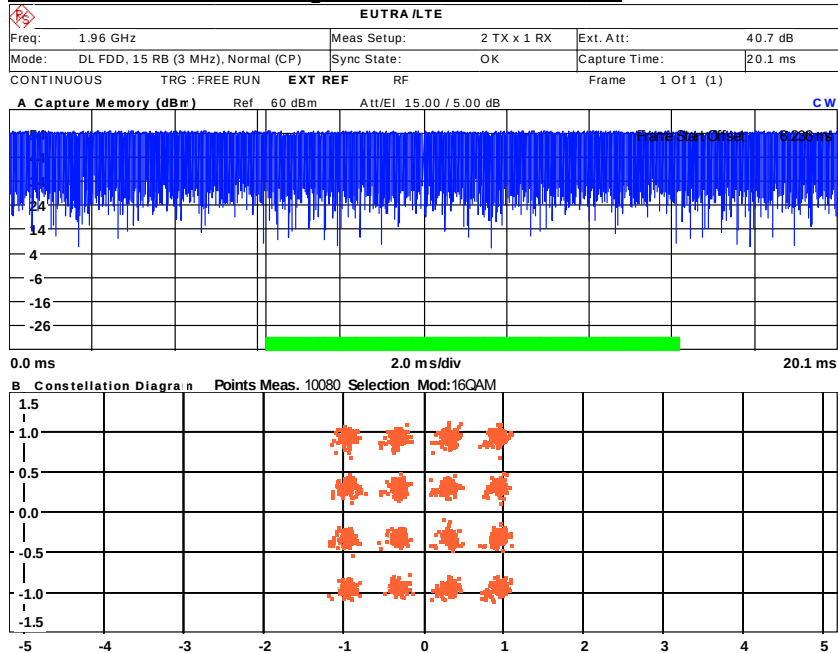
Single Carrier

Configuration 1 - Mode 2

3.0MHz Bandwidth

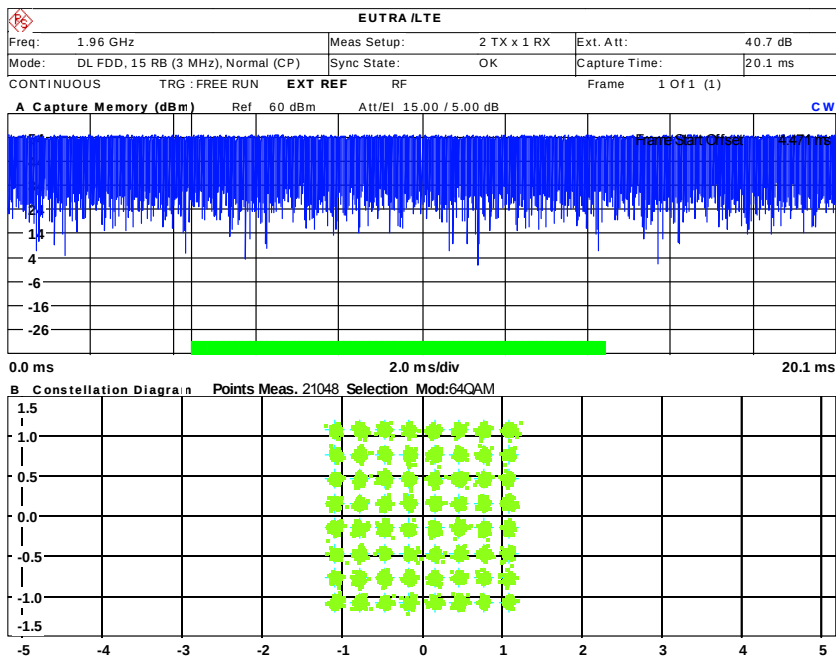
E-TM1.1: EUT transmitting with QPSK modulation:



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

Running ...

Date: 13.MAY.2014 11:30:00

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

Running ...

Date: 13.MAY.2014 11:24:28



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 74/1, S/N: CB4J094486, CF80011783

2.4.3 Date of Test and Modification State

22 to 29 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(1.4, 3, 5, 10, 15, 20)
 - Mode 3 - 1.4, Mode 3 - 20

2.4.6 Environmental Conditions

Ambient Temperature 22.0 – 24.5°C

Relative Humidity 48.0 – 56.0%

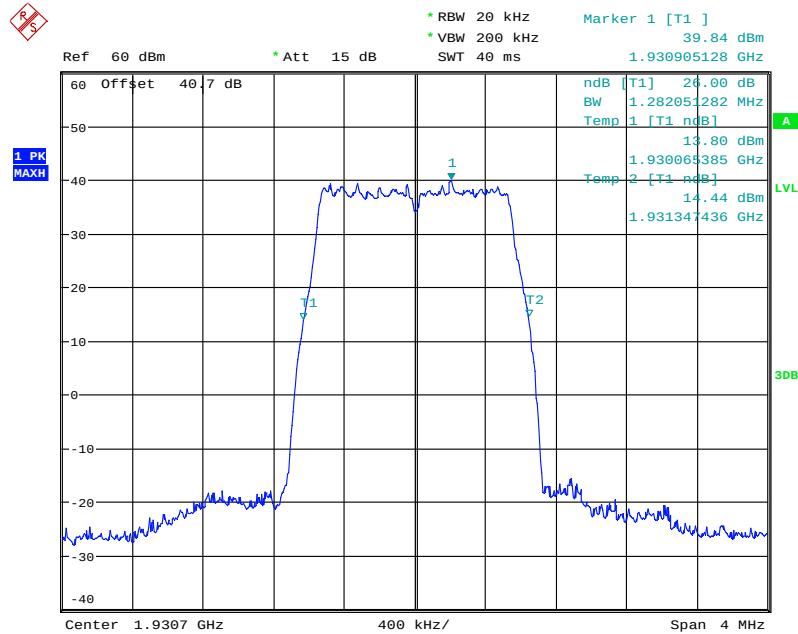


2.4.7 Test Results

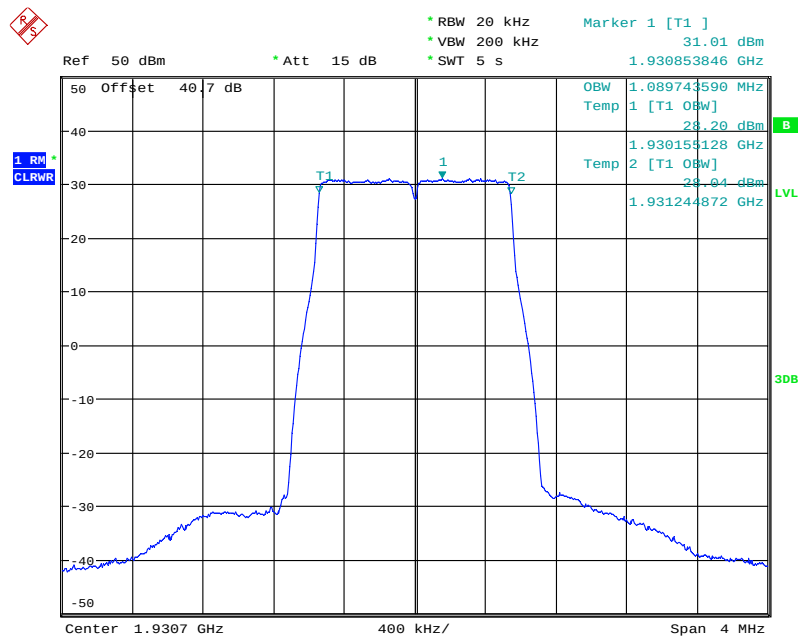
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN for Occupied Bandwidth.

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)	18.75	17.95
	1.4	1960.0 (Middle)	1.28	1.09
	3.0	1960.0 (Middle)	2.91	2.68
	5.0	1960.0 (Middle)	4.86	4.47
	10.0	1960.0 (Middle)	9.42	8.97
	15.0	1960.0 (Middle)	14.23	13.46
	20.0	1960.0 (Middle)	18.75	17.95
	1.4	1989.3 (Top)	1.28	1.09
	20.0	1980.0 (Top)	18.75	17.87
E-TM3.2	1.4	1960.0 (Middle)	1.28	1.09
	20.0	1960.0 (Middle)	18.75	17.87
E-TM3.1	1.4	1960.0 (Middle)	1.28	1.09
	20.0	1960.0 (Middle)	18.75	17.95

**E-TM1.1****Configuration 1 - Mode 1 - 1.4****-26dB Occupied Bandwidth of 1.4MHz Bandwidth**

Date: 25.APR.2014 11:37:11

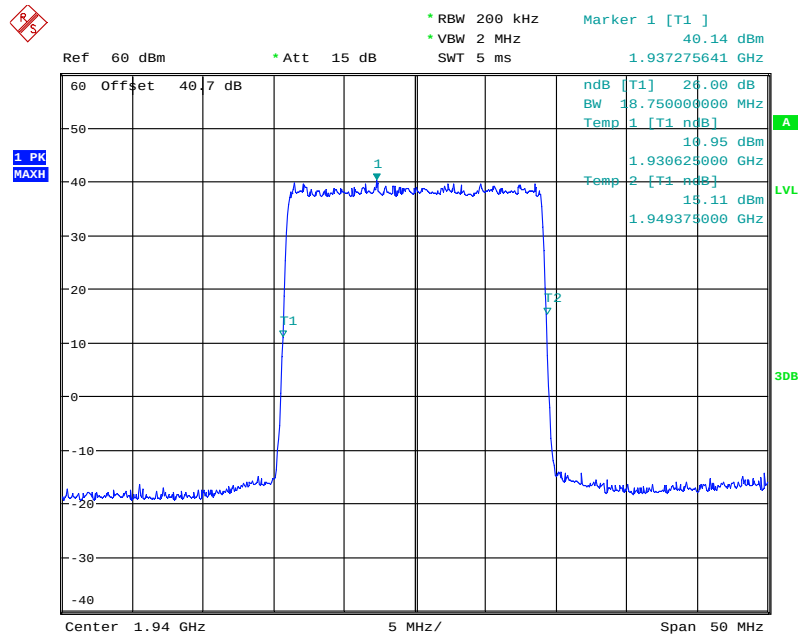
99% Occupied Bandwidth of 1.4MHz Bandwidth

Date: 25.APR.2014 11:36:27



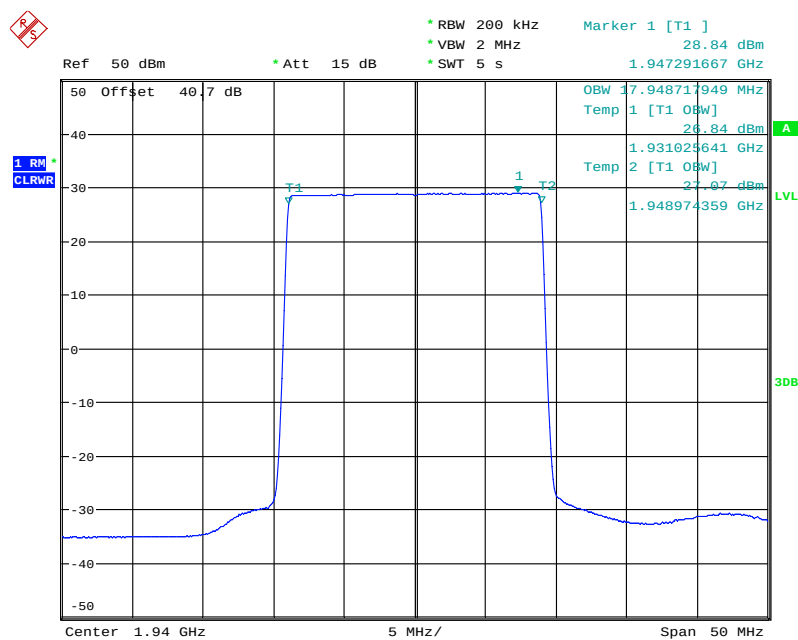
Configuration 1 - Mode 1 - 20

-26dB Occupied Bandwidth of 20.0MHz Bandwidth



Date: 28.APR.2014 12:16:49

99% Occupied Bandwidth of 20.0MHz Bandwidth

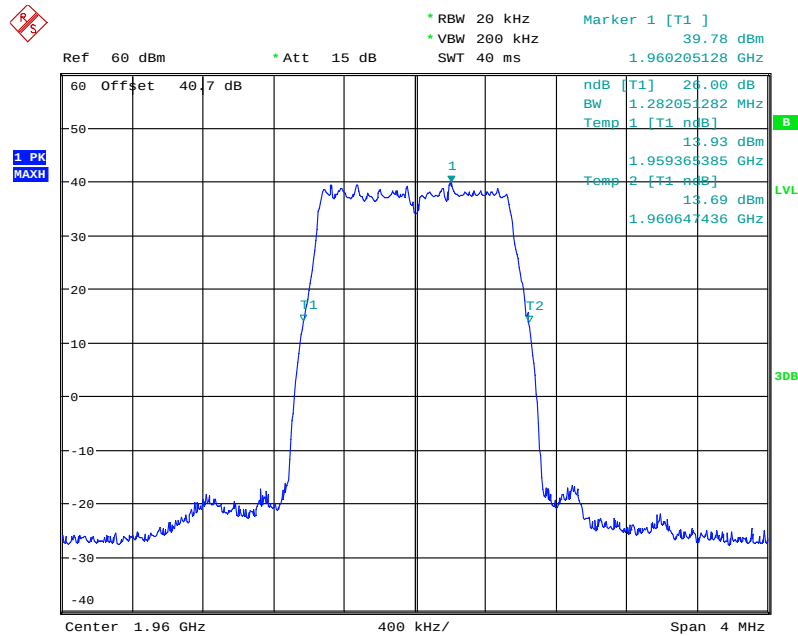


Date: 28.APR.2014 12:15:20



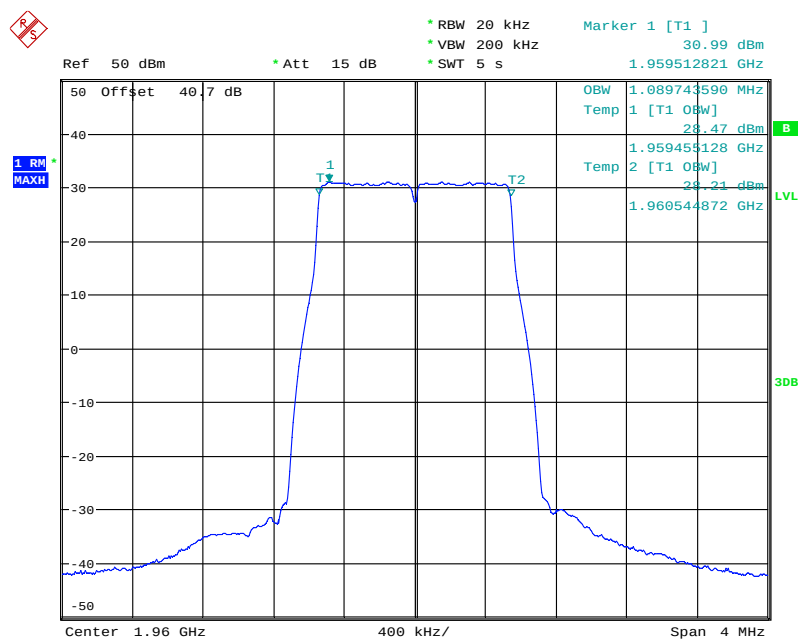
Configuration 1 - Mode 2

-26dB Occupied Bandwidth of 1.4MHz Bandwidth



Date: 24.APR.2014 15:32:38

99% Occupied Bandwidth of 1.4MHz Bandwidth

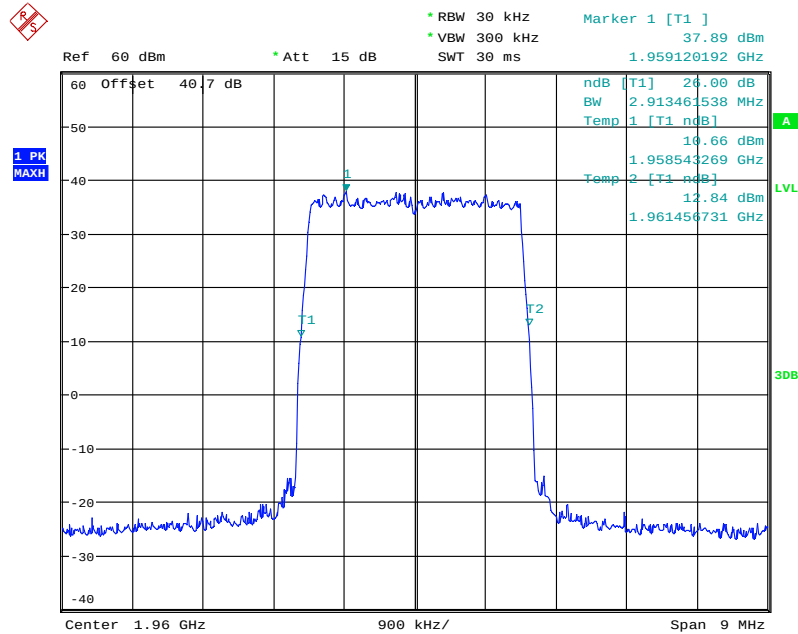


Date: 24.APR.2014 15:38:39



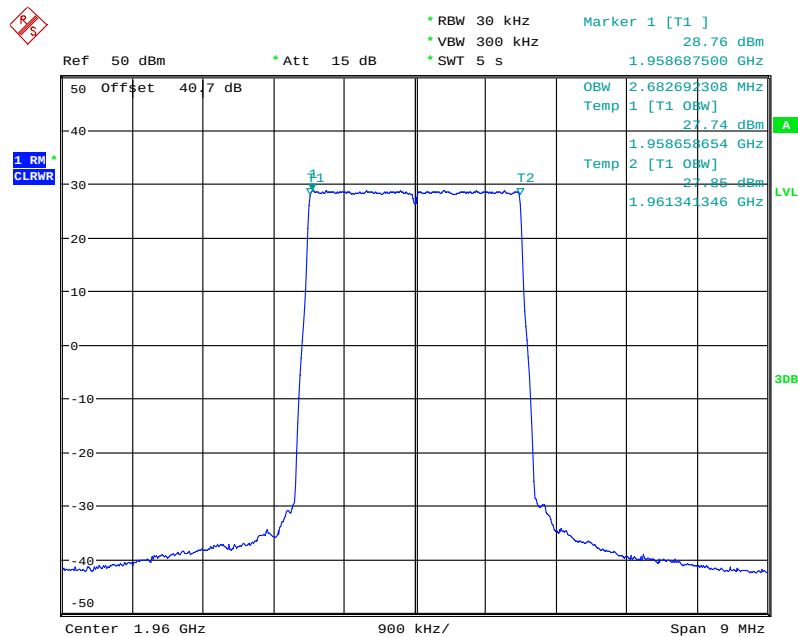
Product Service

-26dB Occupied Bandwidth of 3.0MHz Bandwidth



Date: 25.APR.2014 15:40:41

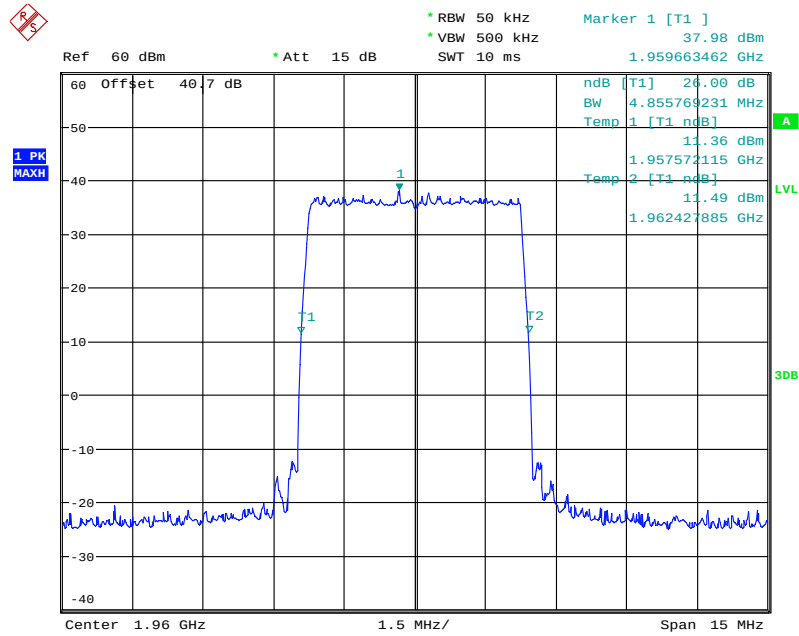
99% Occupied Bandwidth of 3.0MHz Bandwidth



Date: 25.APR.2014 15:38:54

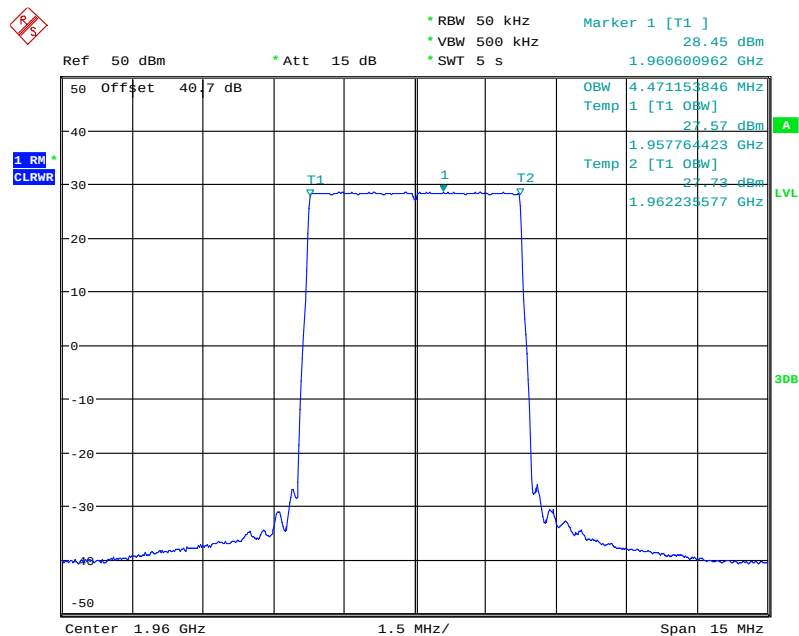


-26dB Occupied Bandwidth of 5.0MHz Bandwidth



Date: 25.APR.2014 16:23:07

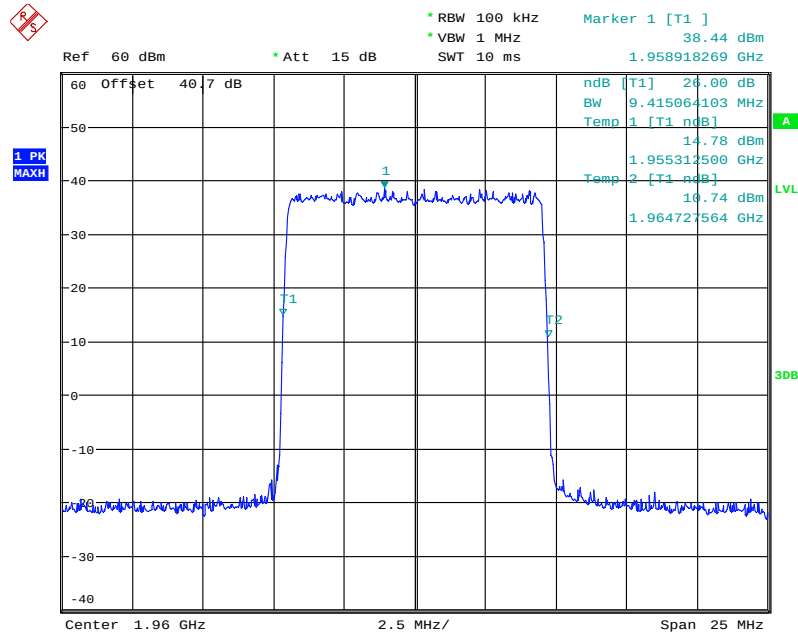
99% Occupied Bandwidth of 5.0MHz Bandwidth



Date: 25.APR.2014 16:24:07

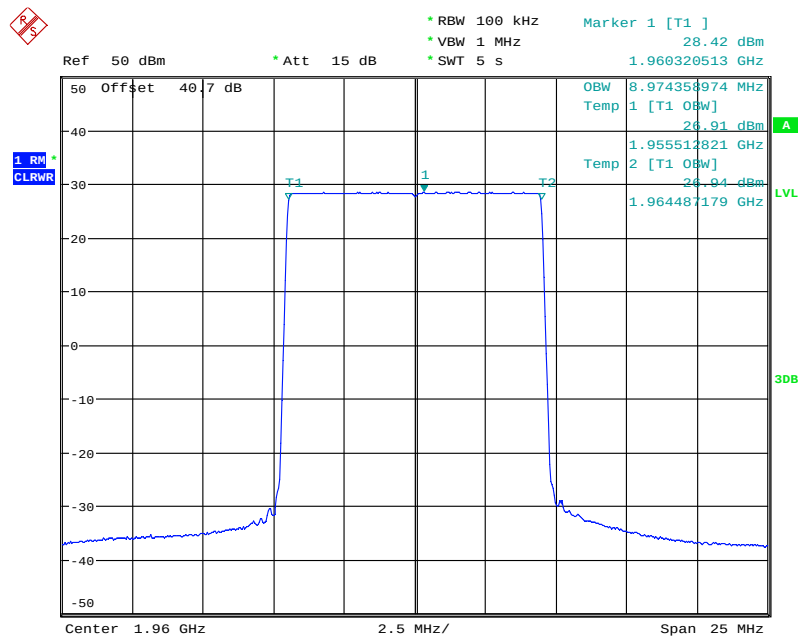


-26dB Occupied Bandwidth of 10.0MHz Bandwidth



Date: 25.APR.2014 16:35:58

99% Occupied Bandwidth of 10.0MHz Bandwidth

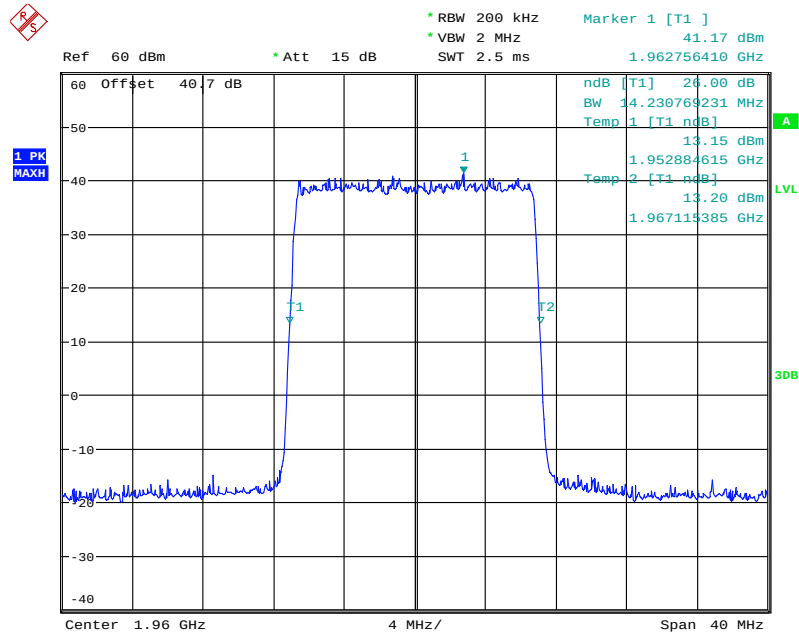


Date: 25.APR.2014 16:34:03



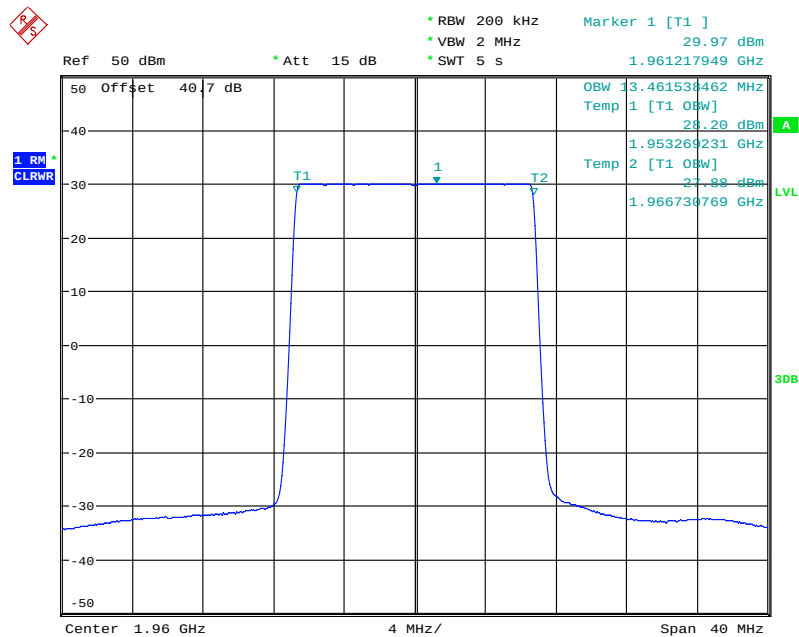
Product Service

-26dB Occupied Bandwidth of 15.0MHz Bandwidth



Date: 25.APR.2014 16:54:08

99% Occupied Bandwidth of 15.0MHz Bandwidth

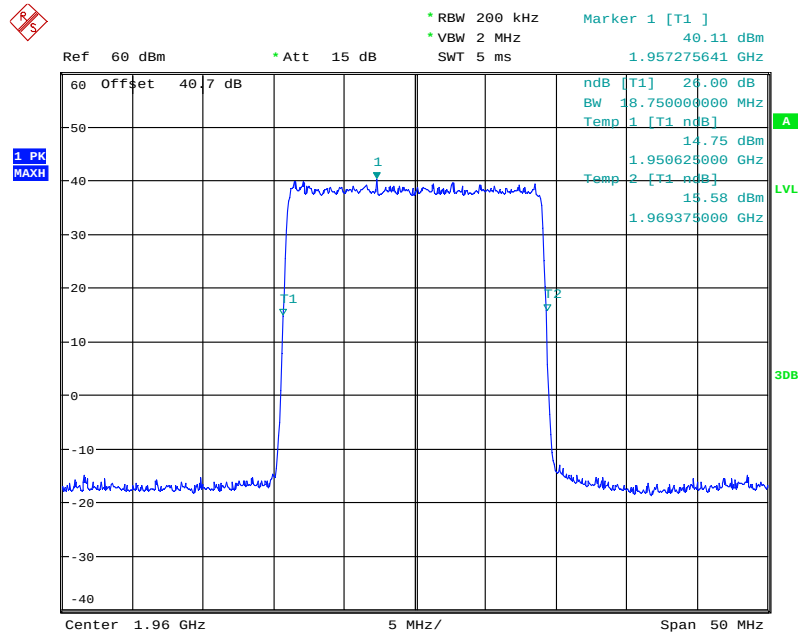


Date: 25.APR.2014 16:55:10



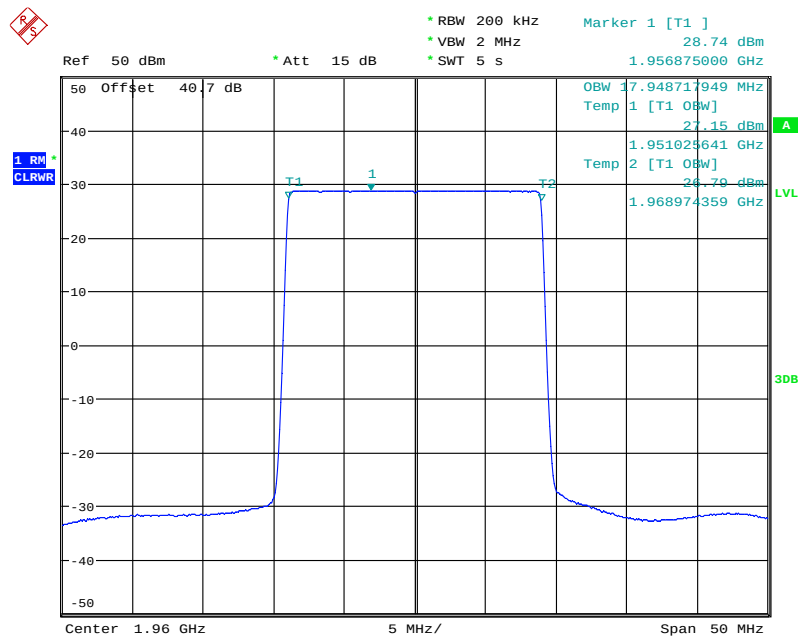
Product Service

-26dB Occupied Bandwidth of 20.0MHz Bandwidth



Date: 25.APR.2014 12:15:52

99% Occupied Bandwidth of 20.0MHz Bandwidth

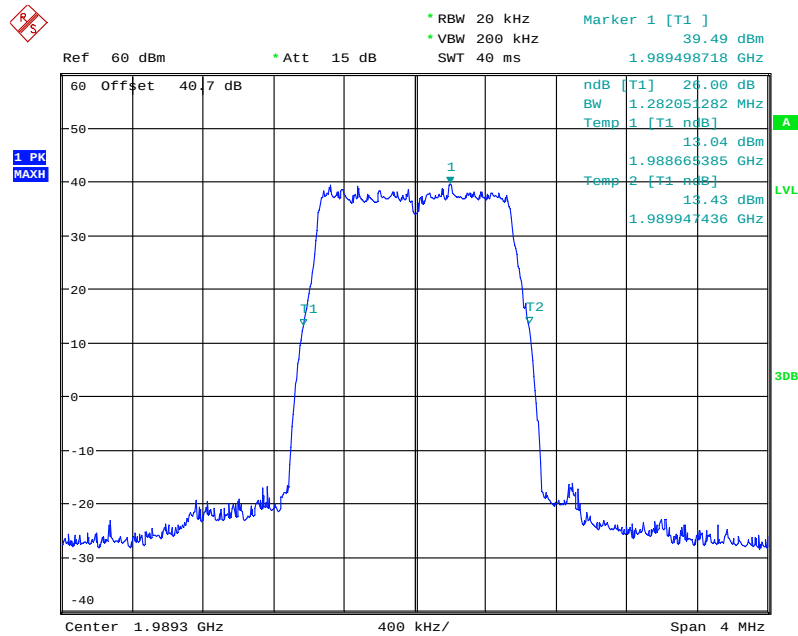


Date: 25.APR.2014 12:16:25



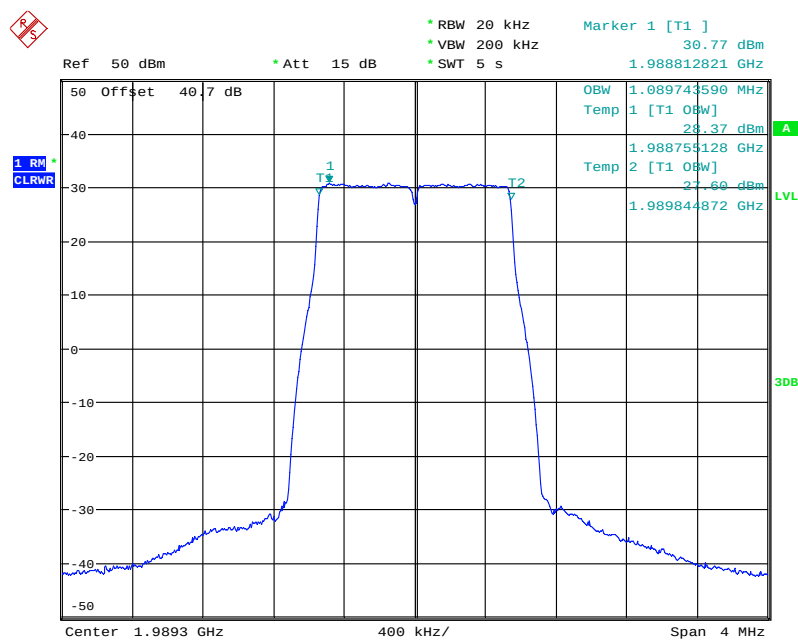
Configuration 1 - Mode 3 - 1.4

-26dB Occupied Bandwidth of 1.4MHz Bandwidth



Date: 28.APR.2014 13:42:12

99% Occupied Bandwidth of 1.4MHz Bandwidth

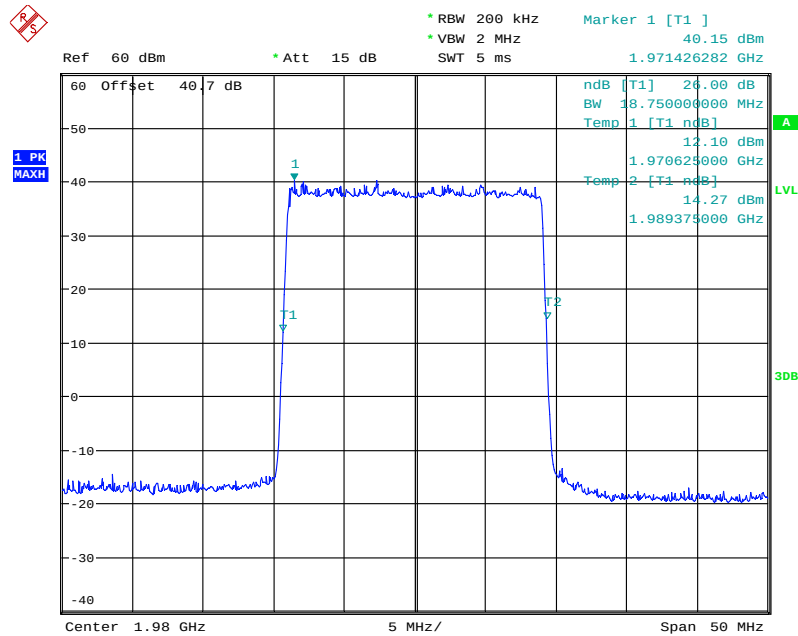


Date: 28.APR.2014 13:41:09



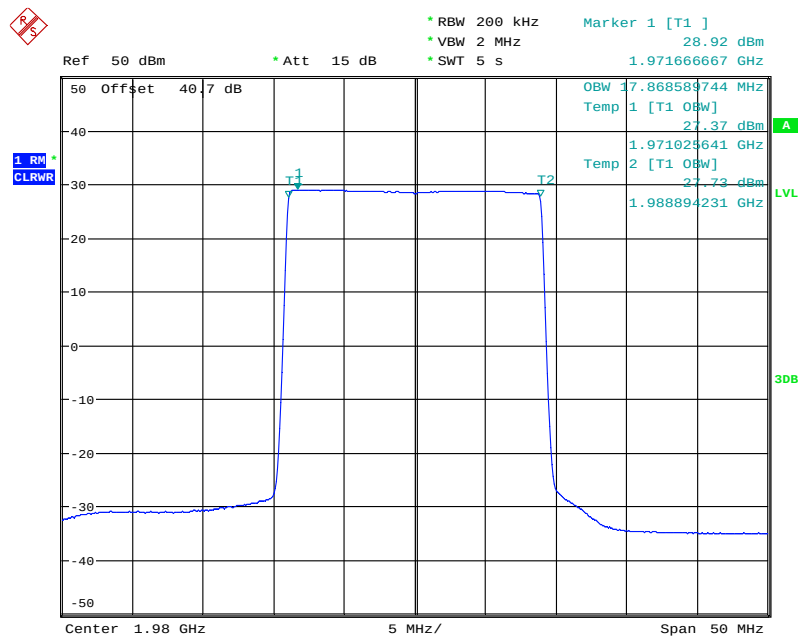
Configuration 1 - Mode 3 - 20

-26dB Occupied Bandwidth of 20.0MHz Bandwidth

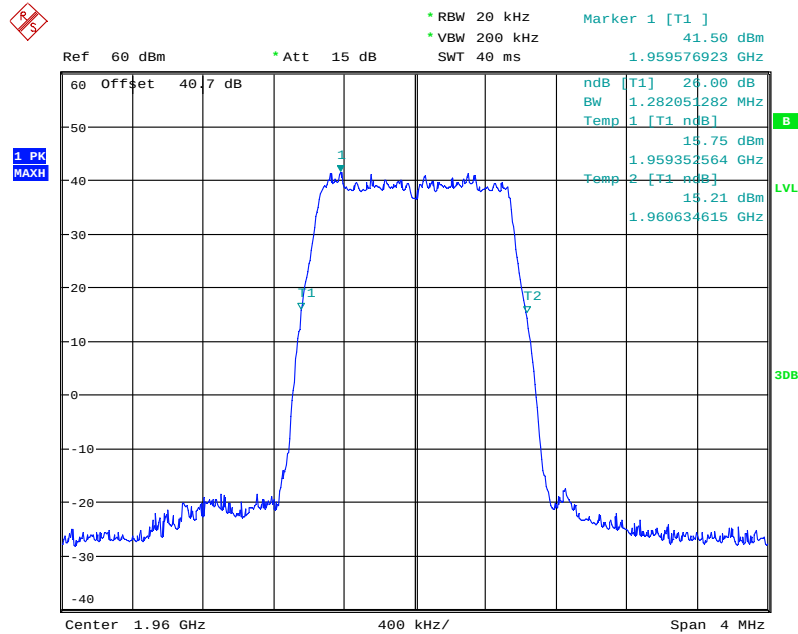


Date: 28.APR.2014 12:05:02

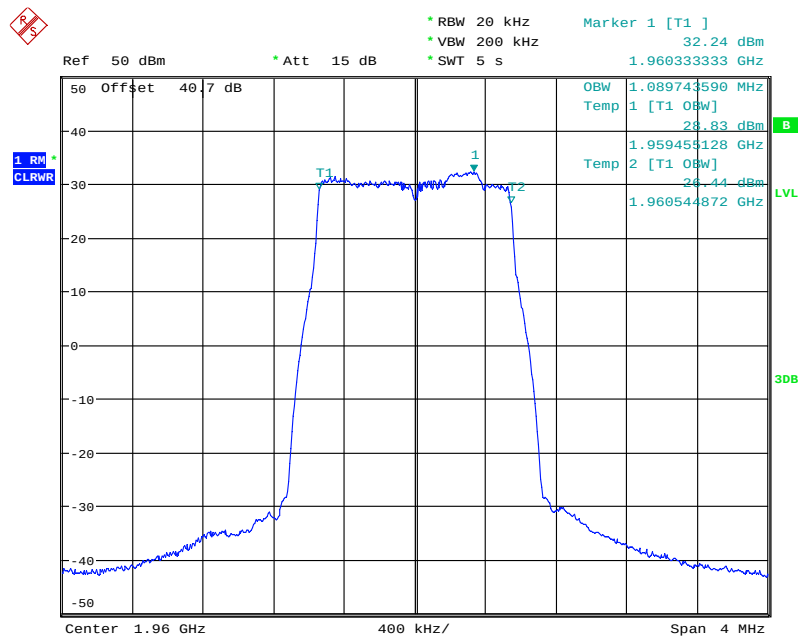
99% Occupied Bandwidth of 20.0MHz Bandwidth



Date: 28.APR.2014 12:06:12

**E-TM3.2****Configuration 1 - Mode 2****-26dB Occupied Bandwidth of 1.4MHz Bandwidth**

Date: 24.APR.2014 17:40:49

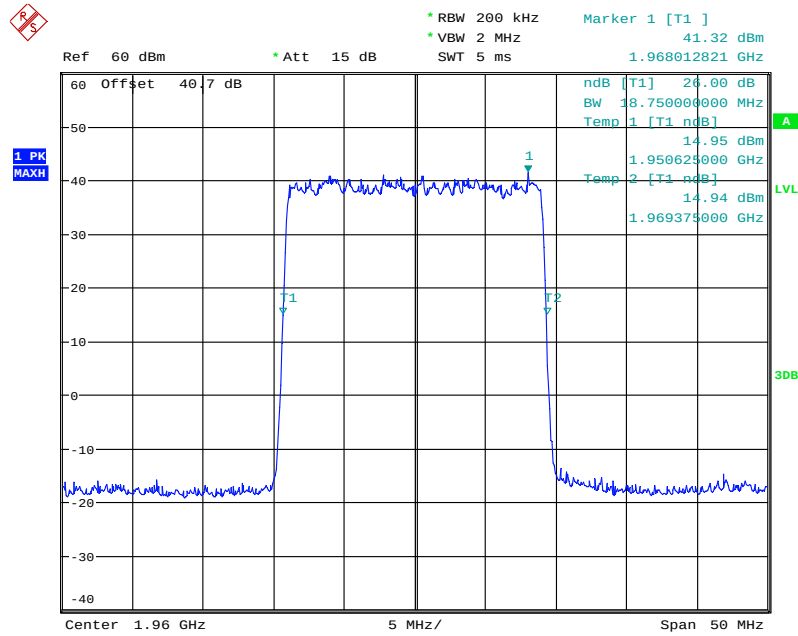
99% Occupied Bandwidth of 1.4MHz Bandwidth

Date: 24.APR.2014 17:41:39



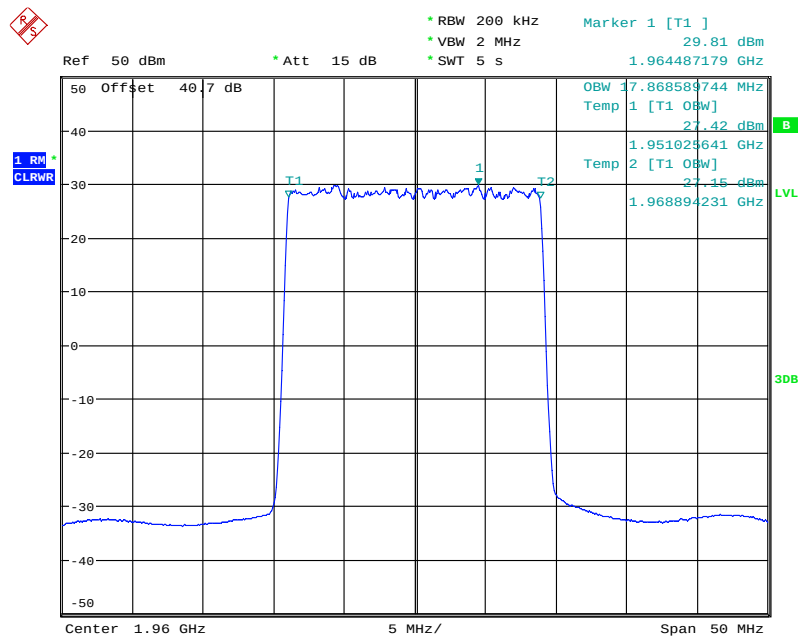
Product Service

-26dB Occupied Bandwidth of 20.0MHz Bandwidth

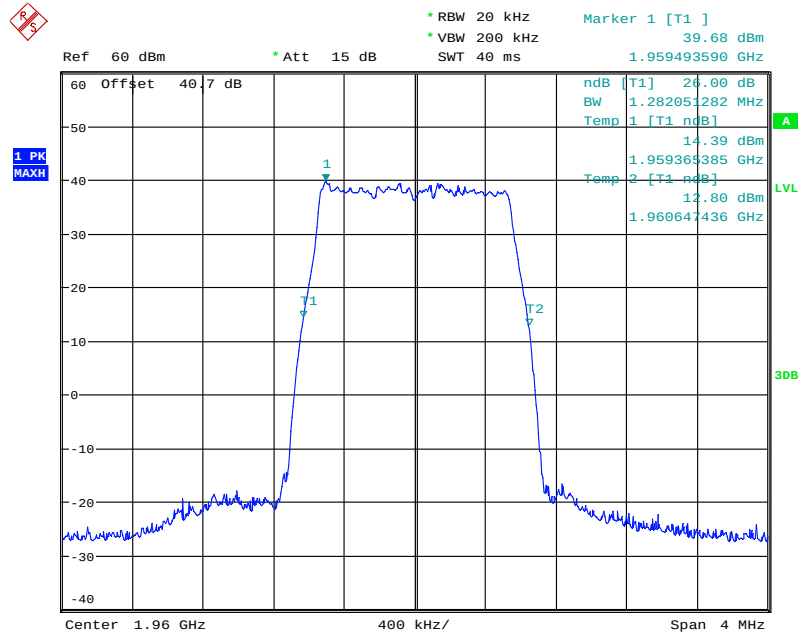


Date: 25.APR.2014 11:29:13

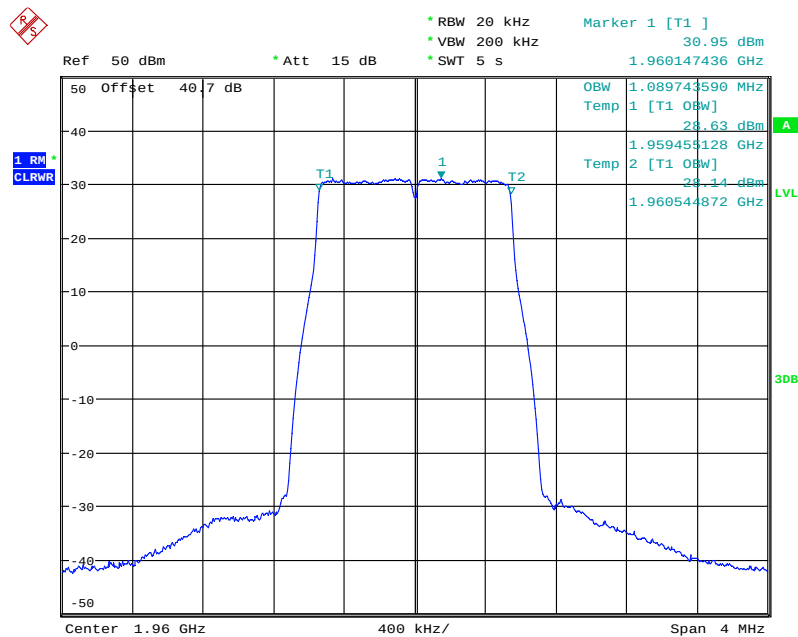
99% Occupied Bandwidth of 20.0MHz Bandwidth



Date: 25.APR.2014 11:27:23

**E-TM3.1****Configuration 1 - Mode 2****-26dB Occupied Bandwidth of 1.4MHz Bandwidth**

Date: 24.APR.2014 18:02:40

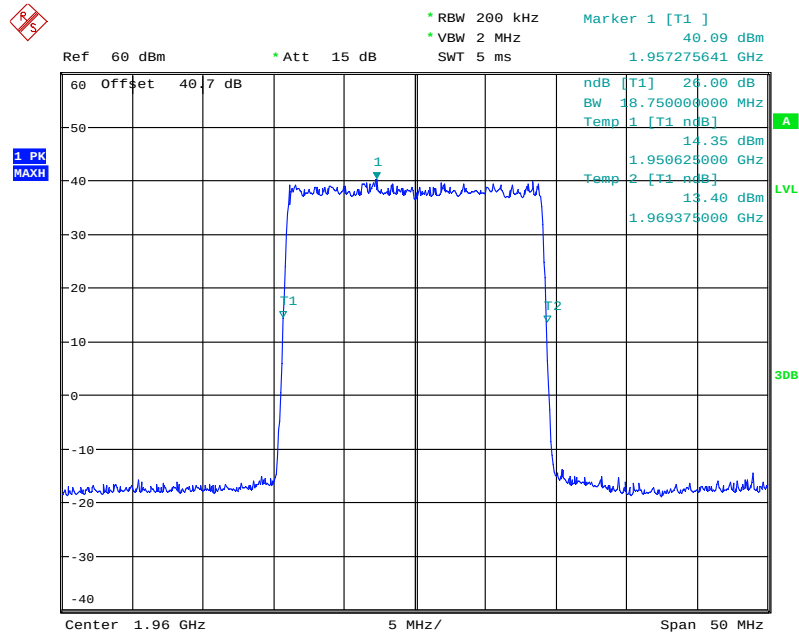
99% Occupied Bandwidth of 1.4MHz Bandwidth

Date: 24.APR.2014 18:03:32



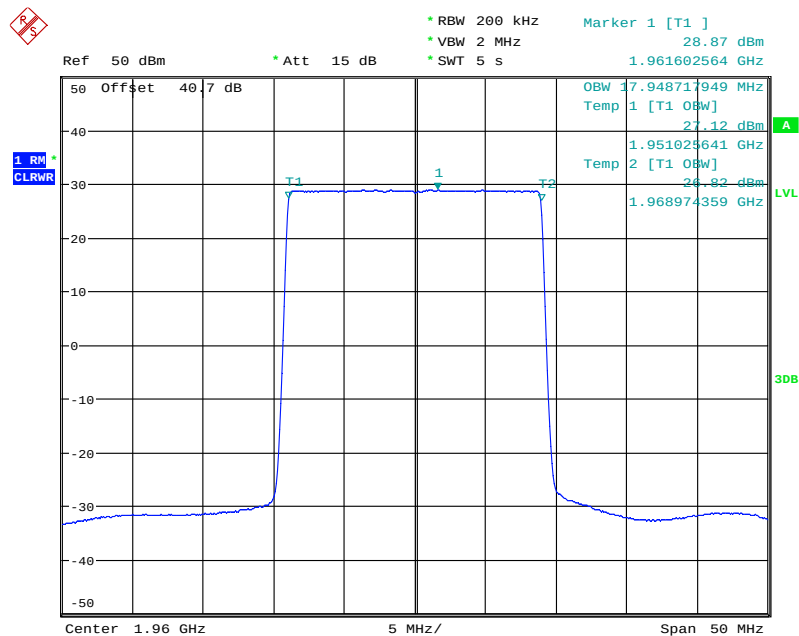
Product Service

-26dB Occupied Bandwidth of 20.0MHz Bandwidth



Date: 25.APR.2014 15:29:29

99% Occupied Bandwidth of 20.0MHz Bandwidth



Date: 25.APR.2014 15:30:26



Product Service

2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (± 1 MHz)

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 74/1, S/N: CB4J094486, CF80011783

2.5.3 Date of Test and Modification State

22 to 29 April 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 bandwidth 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 3MHz OBW of LTE single carrier, a resolution bandwidth of 20kHz was used to the frequencies up to 1MHz away from the block edge, and the resolution bandwidths for all the other bandwidths were shown in section 2.5.7. As 20kHz is <1% of the emission bandwidth (the nominal bandwidth 3MHz was 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 -14.8dBm. 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 representative were shown as below.

The EUT was tested at its 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:



Product Service

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 – 24.5°C

Relative Humidity 48.0 – 56.0%

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 (± 1 MHz).

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 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 1.4MHz Bandwidth Channel No./Frequencies	Channel: 607 Frequency: 1930.7 MHz	Channel: 1193 Frequency: 1989.3 MHz	20k / 200k	-16.0

Bandwidth: 3.0MHz

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

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 3.0MHz Bandwidth Channel No./Frequencies	Channel: 615 Frequency: 1931.5 MHz	Channel: 1185 Frequency: 1988.5MHz	20k / 200k	-17.8

Bandwidth: 5.0MHz

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

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 5.0MHz Bandwidth Channel No./Frequencies	Channel: 625 Frequency: 1932.5 MHz	Channel: 1175 Frequency: 1987.5 MHz	50k / 500k	-16.0

Bandwidth: 10.0MHzConfiguration 1 - Mode 1 - 10 and Mode 3 - 10

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 10.0MHz Bandwidth Channel No./Frequencies	Channel: 650 Frequency: 1935.0 MHz	Channel: 1150 Frequency: 1985.0 MHz	100k / 1M	-16.0

Bandwidth: 15.0MHzConfiguration 1 - Mode 1 - 15 and Mode 3 - 15

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 15.0MHz Bandwidth Channel No./Frequencies	Channel: 675 Frequency: 1937.5 MHz	Channel: 1125 Frequency: 1982.5 MHz	200k / 2M	-16.0

Bandwidth: 20.0MHzConfiguration 1 - Mode 1 - 20 and Mode 3 - 20

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 20.0MHz Bandwidth Channel No./Frequencies	Channel: 700 Frequency: 1940.0 MHz	Channel: 1100 Frequency: 1980.0 MHz	200k / 2M	-16.0

ETM3.2Bandwidth: 1.4MHzConfiguration 1 - Mode 1 -1.4 and Mode 3 - 1.4

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 1.4MHz Bandwidth Channel No./Frequencies	Channel: 607 Frequency: 1930.7 MHz	Channel: 1193 Frequency: 1989.3 MHz	20k / 200k	-16.0

Bandwidth: 3.0MHzConfiguration 1 - Mode 1 - 3 and Mode 3 - 3

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 3.0MHz Bandwidth Channel No./Frequencies	Channel: 615 Frequency: 1931.5 MHz	Channel: 1185 Frequency: 1988.5MHz	20k / 200k	-17.8

**ETM3.1**Bandwidth: 1.4MHzConfiguration 1 - Mode 1 -1.4 and Mode 3 - 1.4

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 1.4MHz Bandwidth Channel No./Frequencies	Channel: 607 Frequency: 1930.7 MHz	Channel: 1193 Frequency: 1989.3 MHz	20k / 200k	-16.0

Bandwidth: 3.0MHzConfiguration 1 - Mode 1 - 3 and Mode 3 - 3

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 3.0MHz Bandwidth Channel No./Frequencies	Channel: 615 Frequency: 1931.5 MHz	Channel: 1185 Frequency: 1988.5MHz	20k / 200k	-17.8

Multi Carrier (x2)**ETM1.1**Bandwidth: 1.4MHzConfiguration 1 - Mode 4 - 1.4 and Mode 6 - 1.4

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 1.4MHz Bandwidth Channel No./Frequencies	Channel: 607 + 793 Frequency: 1930.7MHz + 1949.3 MHz	Channel: 1007 + 1193 Frequency: 1970.7 MHz + 1989.3MHz	20k / 200k	-16.0

Bandwidth: 3.0MHzConfiguration 1 - Mode 4 - 3 and Mode 6 - 3

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

Bandwidth: 5.0MHzConfiguration 1 - Mode 4 - 5 and Mode 6 - 5

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

Bandwidth: 10MHzConfiguration 1 - Mode4 - 10 and Mode 6 - 10

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

ETM3.2Bandwidth: 1.4MHzConfiguration 1 - Mode 4 - 1.4 and Mode 6 - 1.4

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 1.4MHz Bandwidth Channel No./Frequencies	Channel: 607 + 793 Frequency: 1930.7MHz + 1949.3 MHz	Channel: 1007 + 1193 Frequency: 1970.7 MHz + 1989.3MHz	20k / 200k	-16.0

Bandwidth: 3.0MHzConfiguration 1 - Mode 4 - 3 and Mode 6 - 3

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

**ETM3.1****Bandwidth: 1.4MHz****Configuration 1 - Mode 4 - 1.4 and Mode 6 - 1.4**

Band Edge Frequency	Bottom 1930 MHz	Top 1990 MHz	RBW / VBW (Hz)	Limit (dBm)
Edge Test with 1.4MHz Bandwidth Channel No./Frequencies	Channel: 607 + 793 Frequency: 1930.7MHz + 1949.3 MHz	Channel: 1007 + 1193 Frequency: 1970.7 MHz + 1989.3MHz	20k / 200k	-16.0

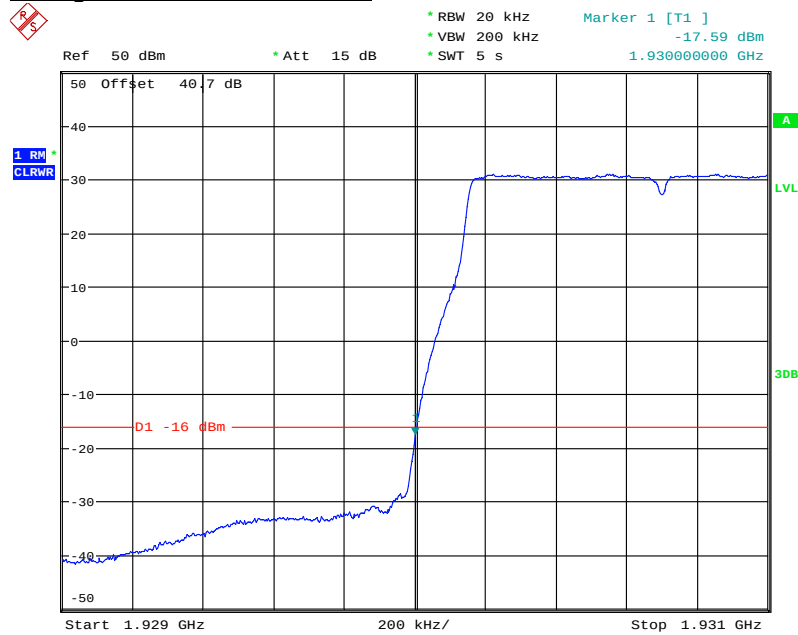
Bandwidth: 3.0MHz**Configuration 1 - Mode 4 - 3 and Mode 6 - 3**

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

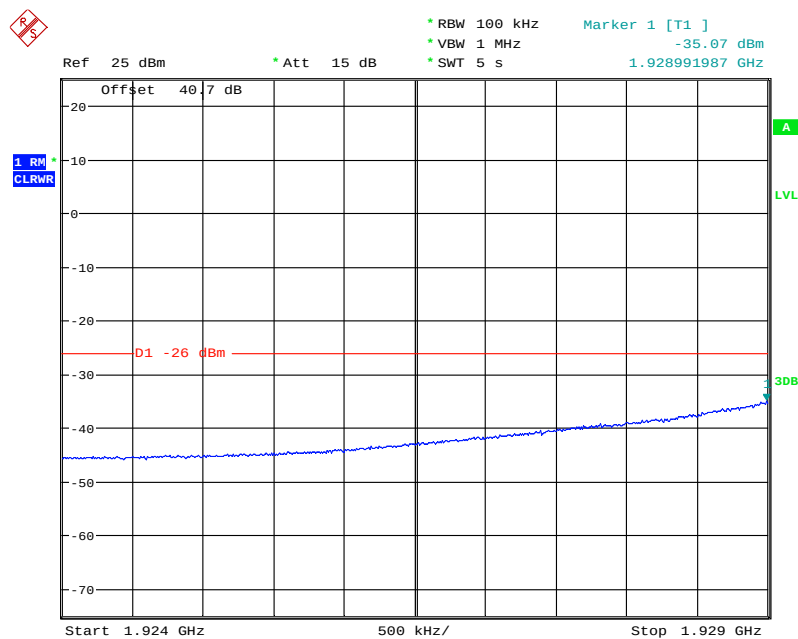
The channels shown in the table above are the minimum and maximum channels that can be used in the authorised frequency ranges to maintain compliance. Channels used outside of those stated and power levels used beyond those stated in the table exceed the specification limits, thus they cannot be used.

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: 28.APR.2014 13:21:28

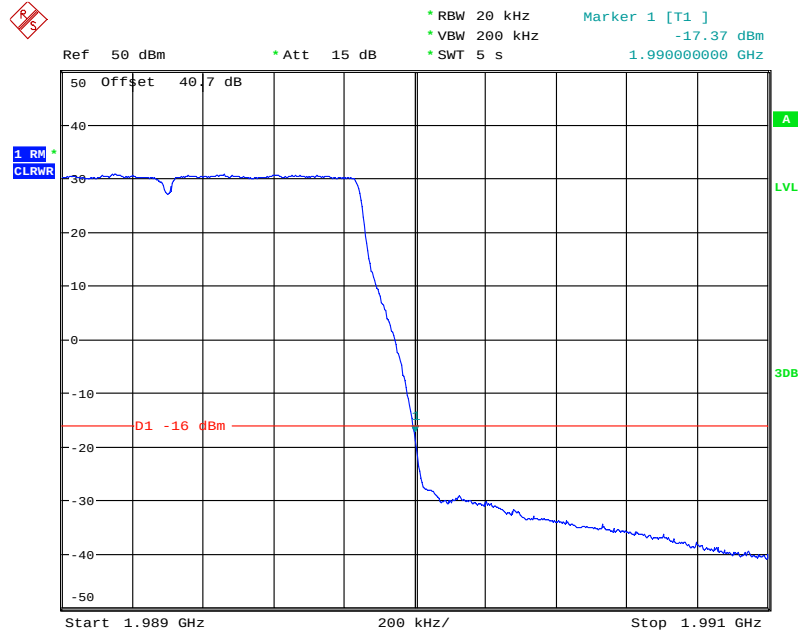


Date: 28.APR.2014 13:22:46

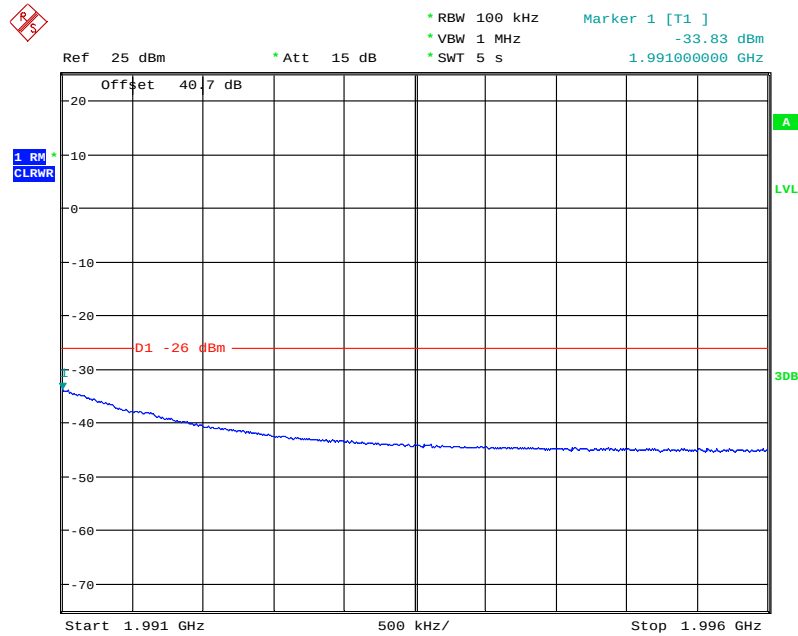


Product Service

Configuration 1 - Mode 3 - 1.4



Date: 28.APR.2014 13:33:35



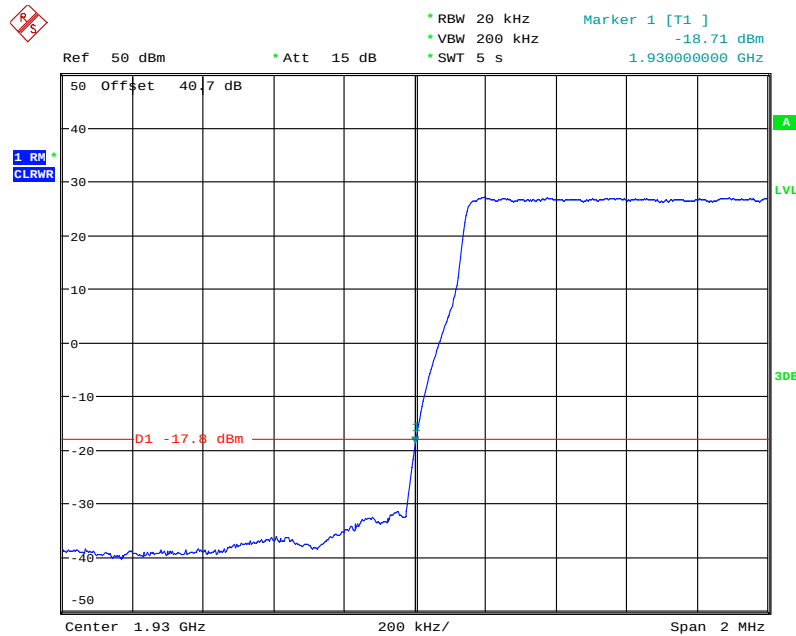
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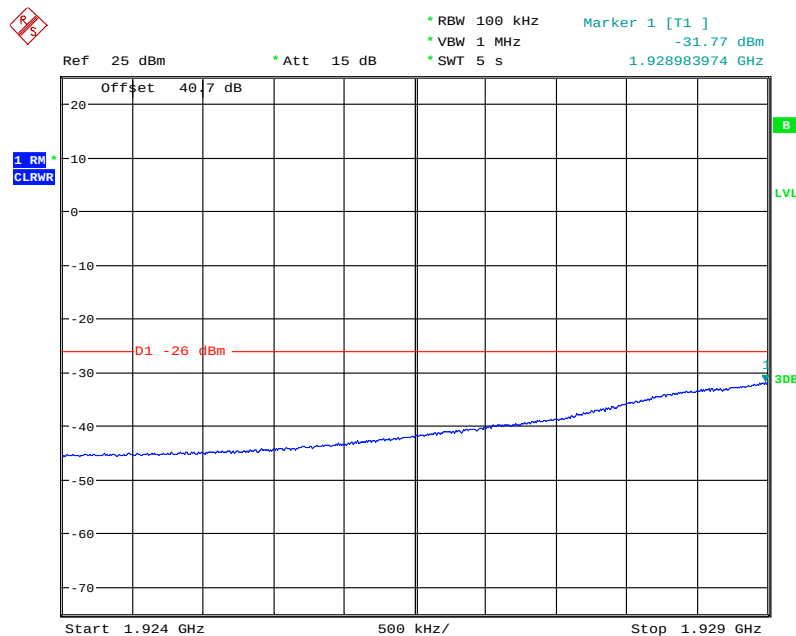
Product Service

3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3



Date: 28.APR.2014 13:57:39

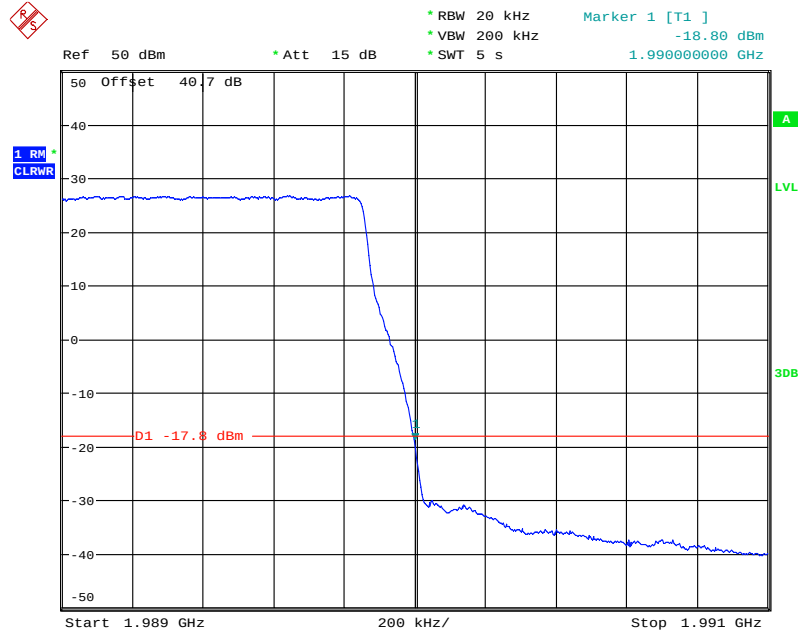


Date: 28.APR.2014 13:58:08

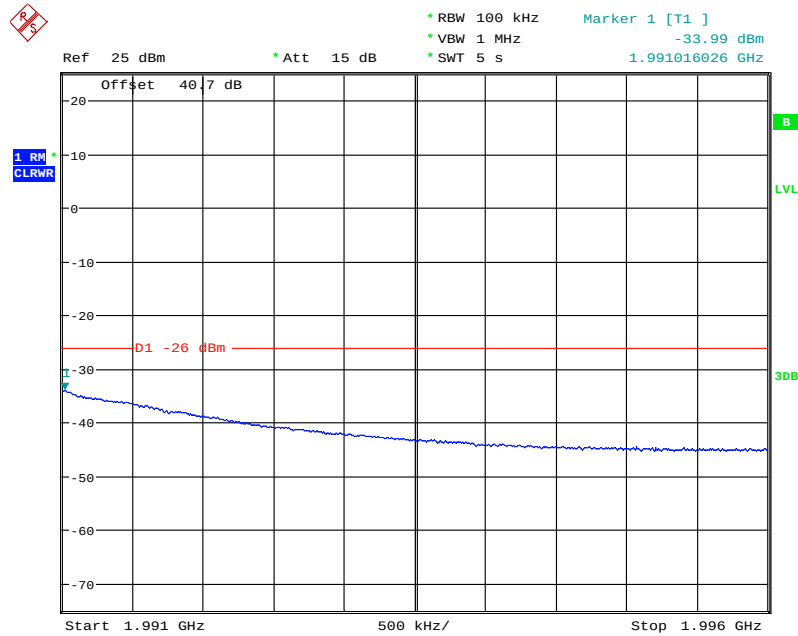


Product Service

Configuration 1 - Mode 3 - 3



Date: 28.APR.2014 14:01:08



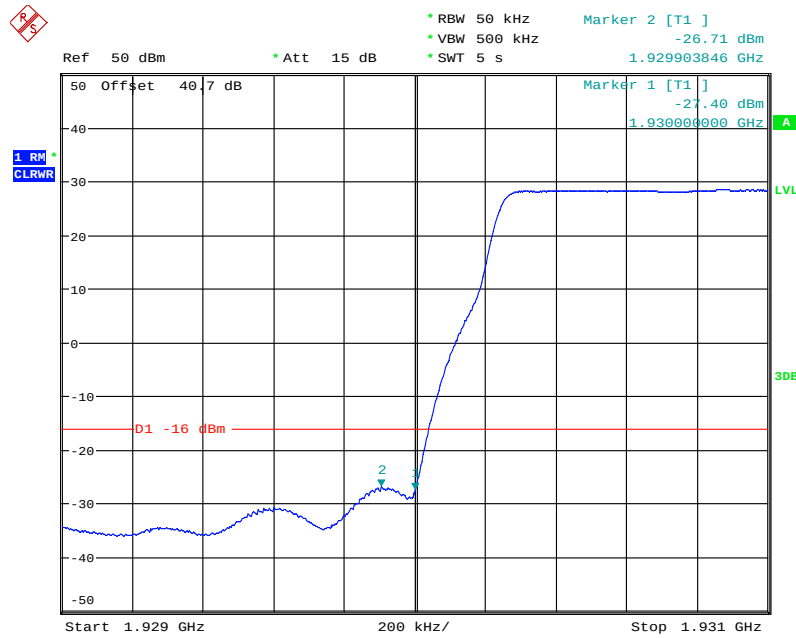
Date: 28.APR.2014 14:01:31



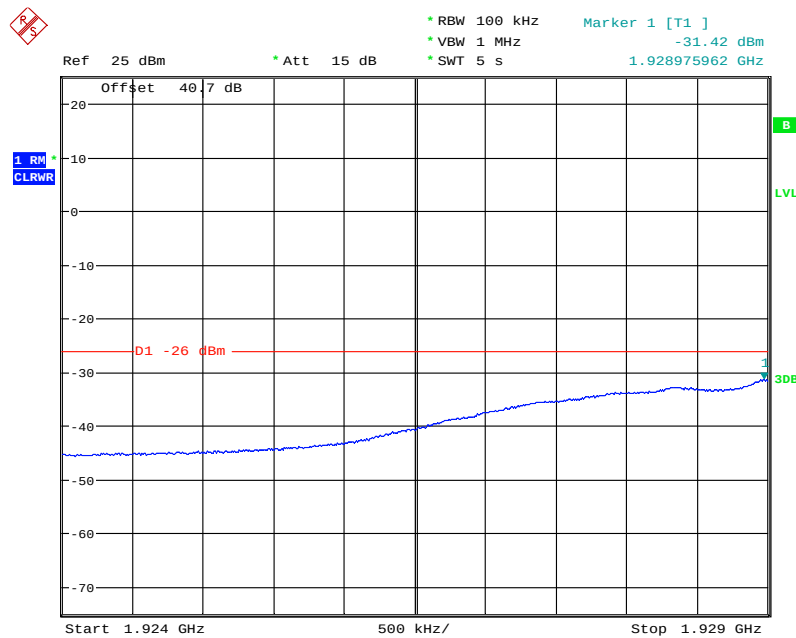
Product Service

5.0MHz Bandwidth

Configuration 1 - Mode 1 - 5



Date: 28.APR.2014 14:08:41

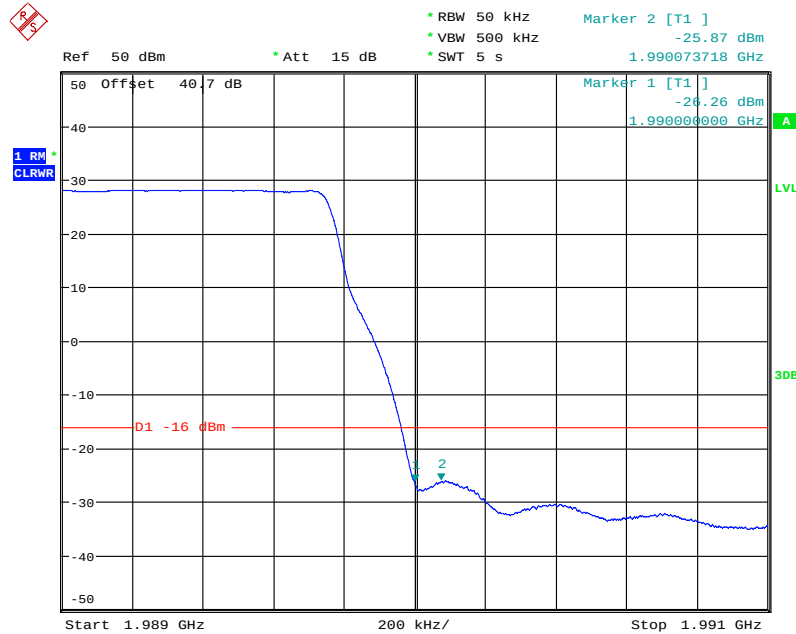


Date: 28.APR.2014 14:08:12

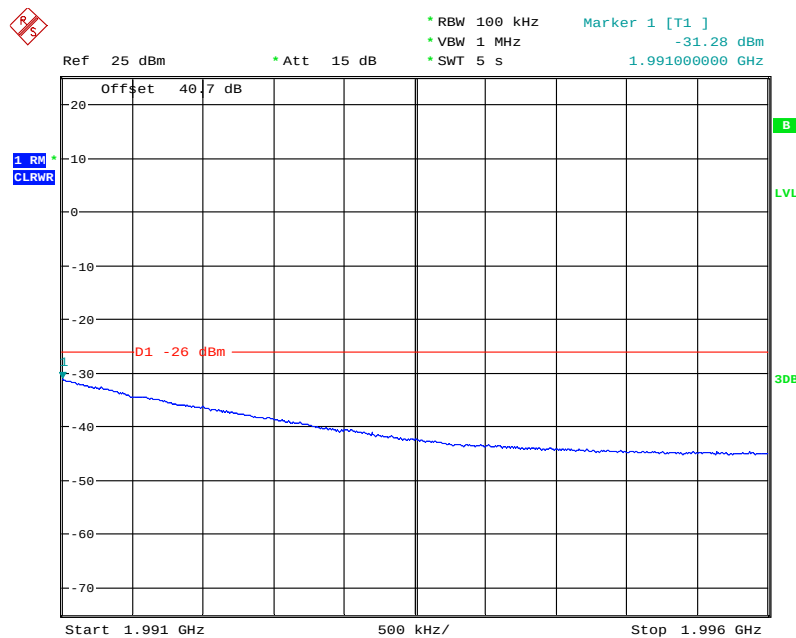


Product Service

Configuration 1 - Mode 3 - 5



Date: 28.APR.2014 14:07:06



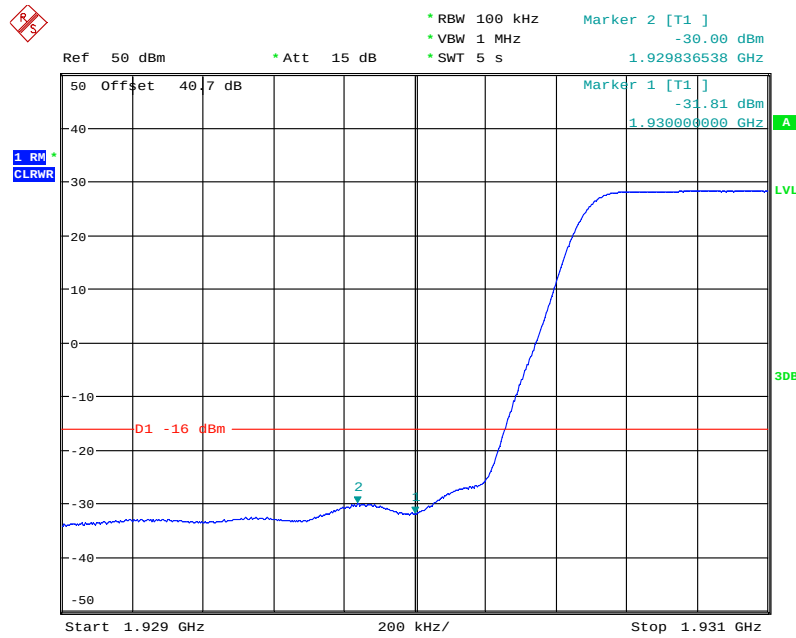
Date: 28.APR.2014 14:05:57



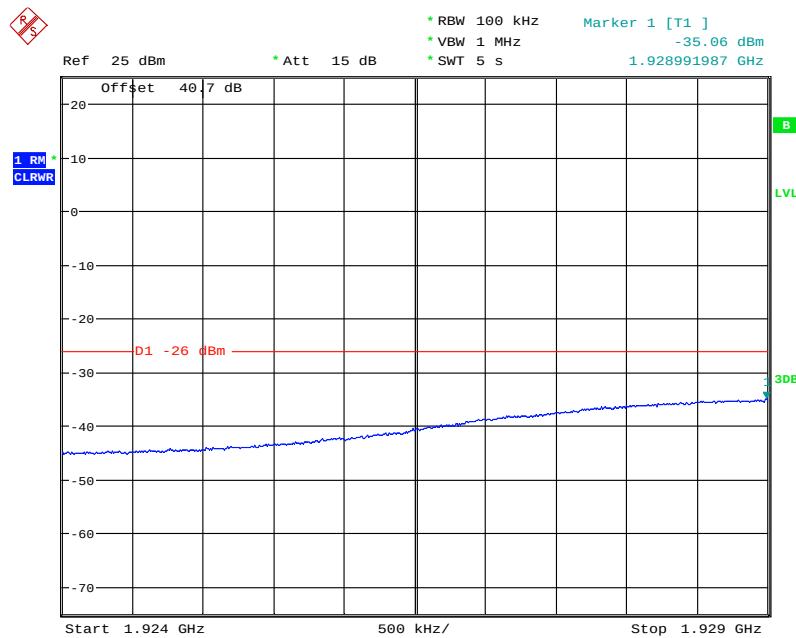
Product Service

10.0MHz Bandwidth

Configuration 1 - Mode 1 - 10



Date: 28.APR.2014 14:12:08

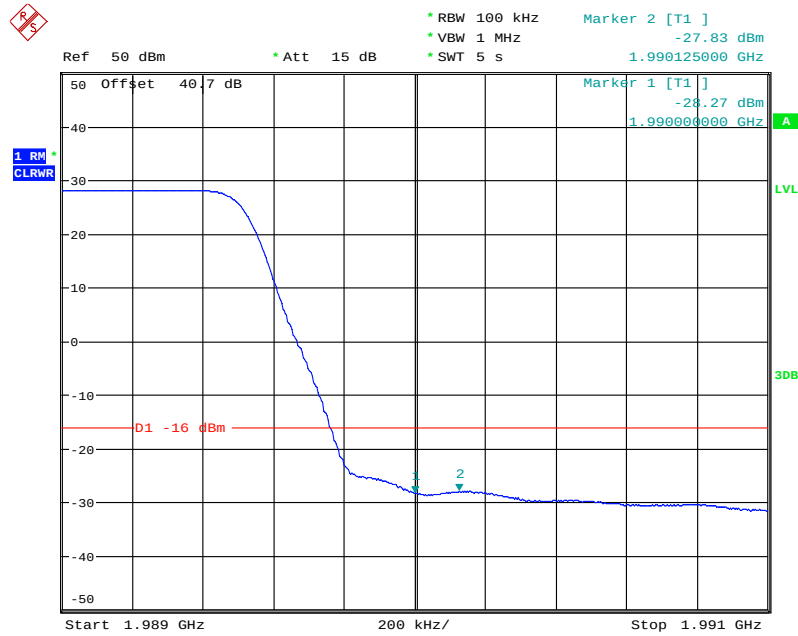


Date: 28.APR.2014 14:12:49

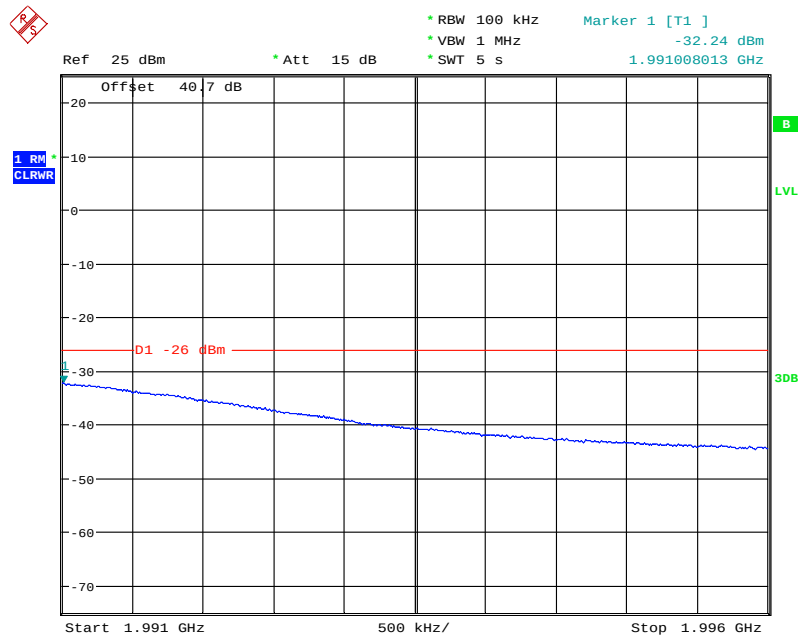


Product Service

Configuration 1 - Mode 3 - 10



Date: 28.APR.2014 14:16:16

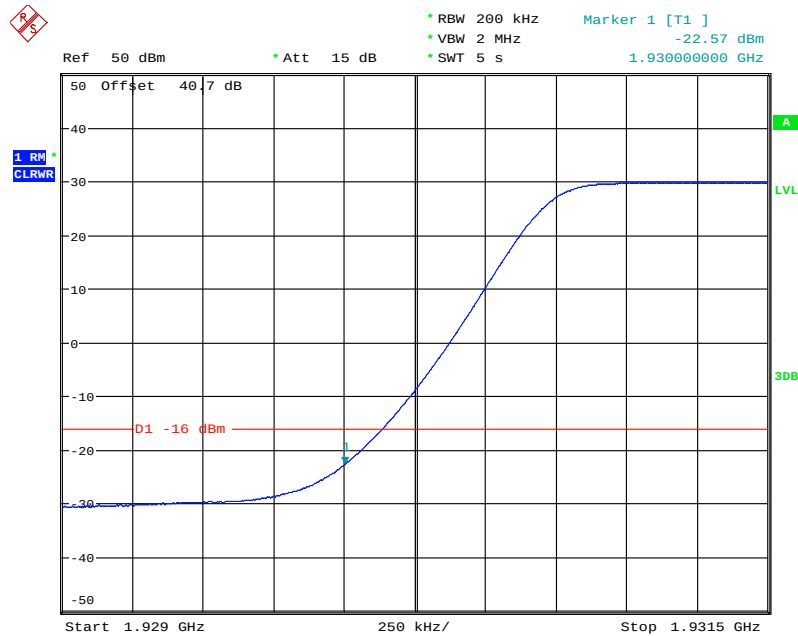


Date: 28.APR.2014 14:16:47

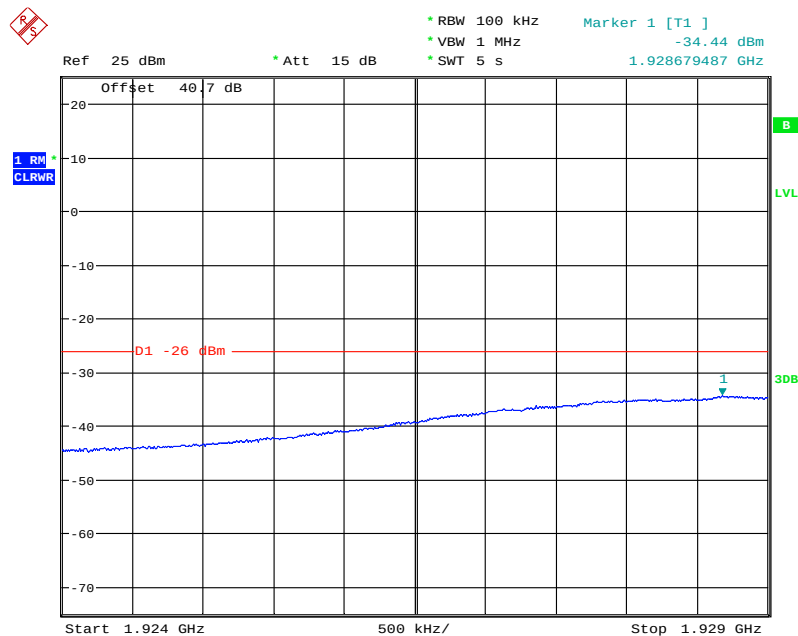


15.0MHz Bandwidth

Configuration 1 - Mode 1 - 15



Date: 28.APR.2014 14:22:41

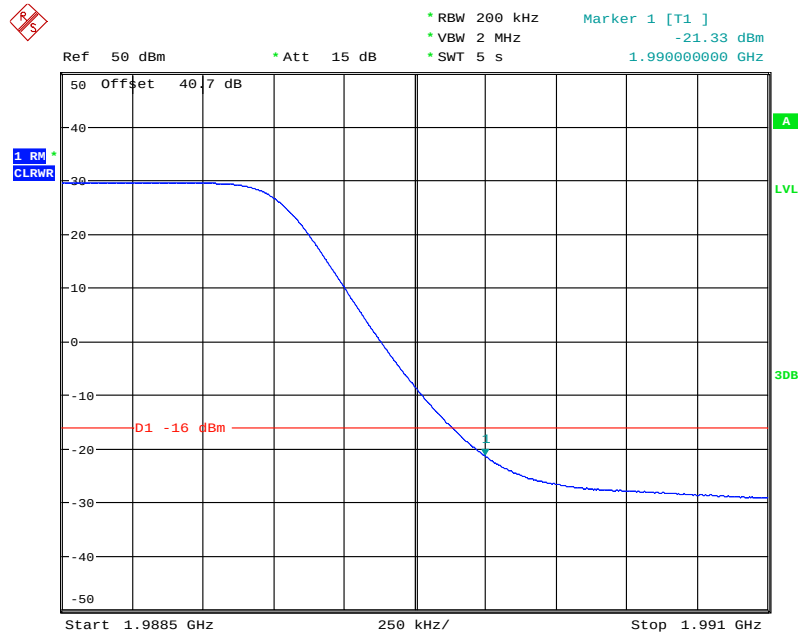


Date: 28.APR.2014 14:23:06

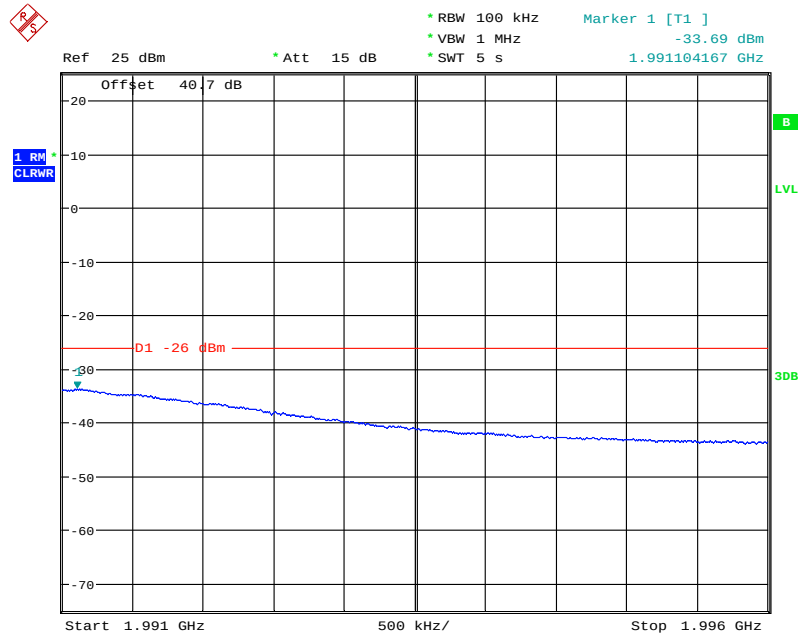


Product Service

Configuration 1 - Mode 3 - 15



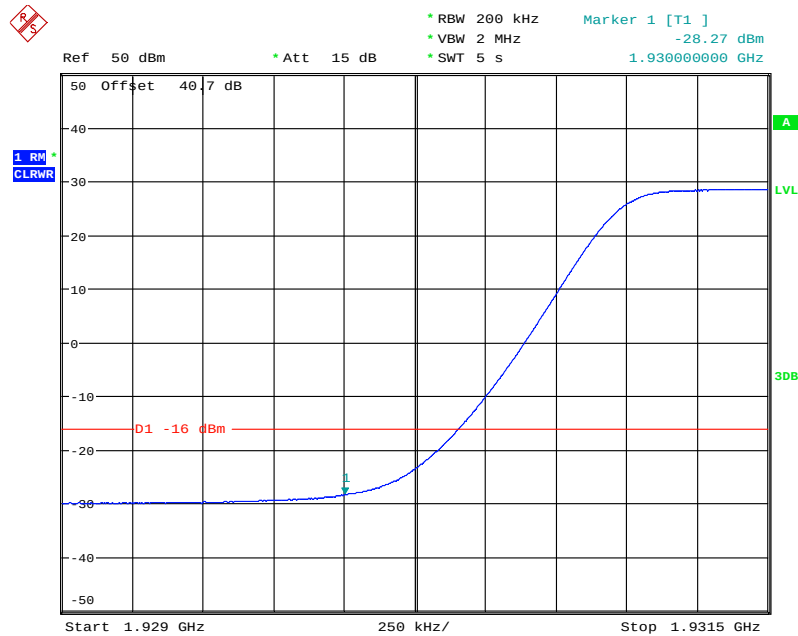
Date: 28.APR.2014 14:21:23



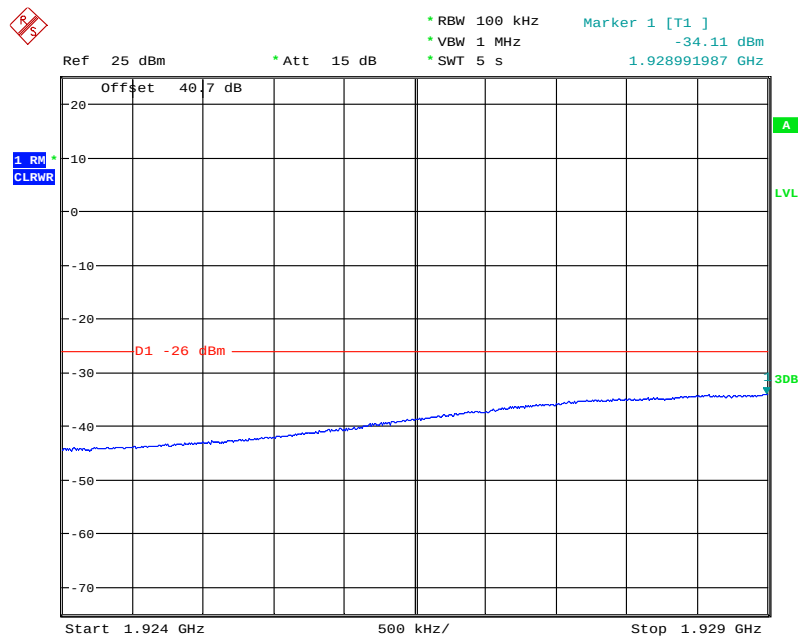
Date: 28.APR.2014 14:21:49



Product Service

20.0MHz Bandwidth**Configuration 1 - Mode 1 - 20**

Date: 28.APR.2014 12:13:16

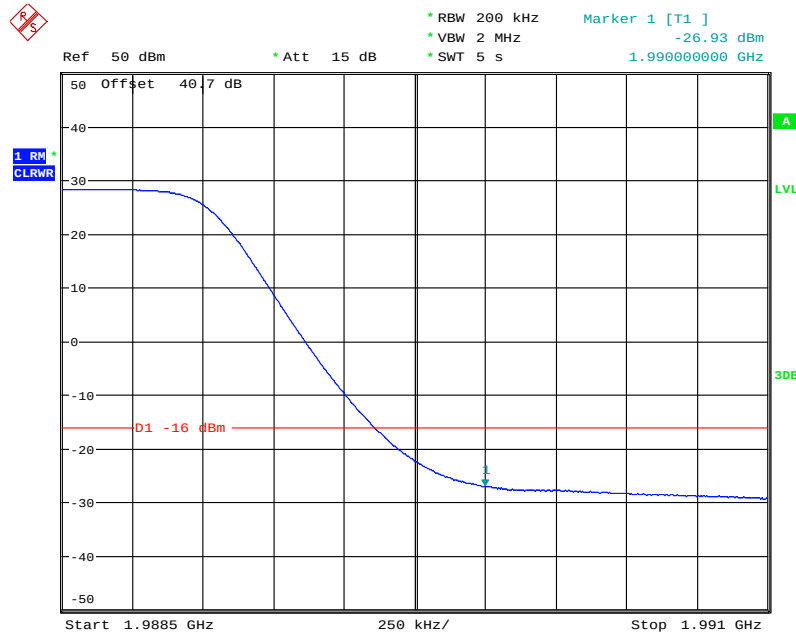


Date: 28.APR.2014 12:12:06

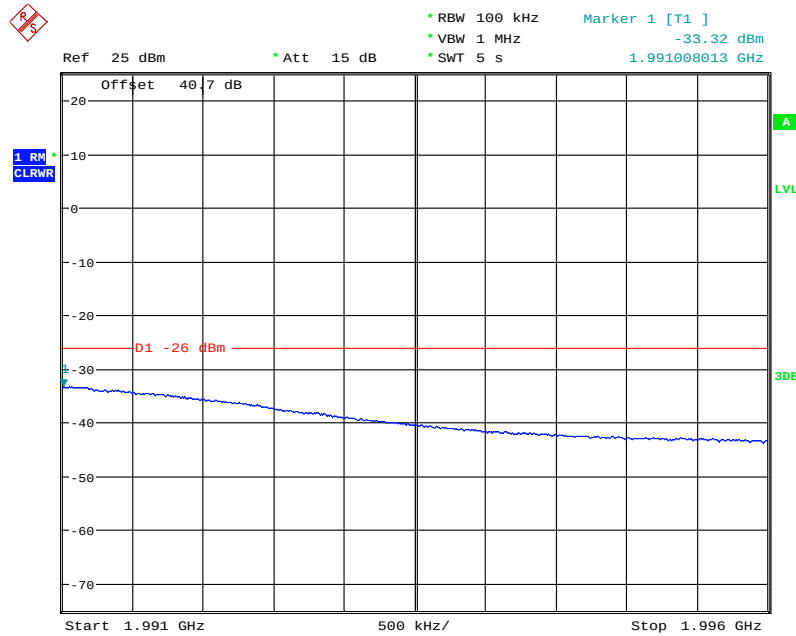


Product Service

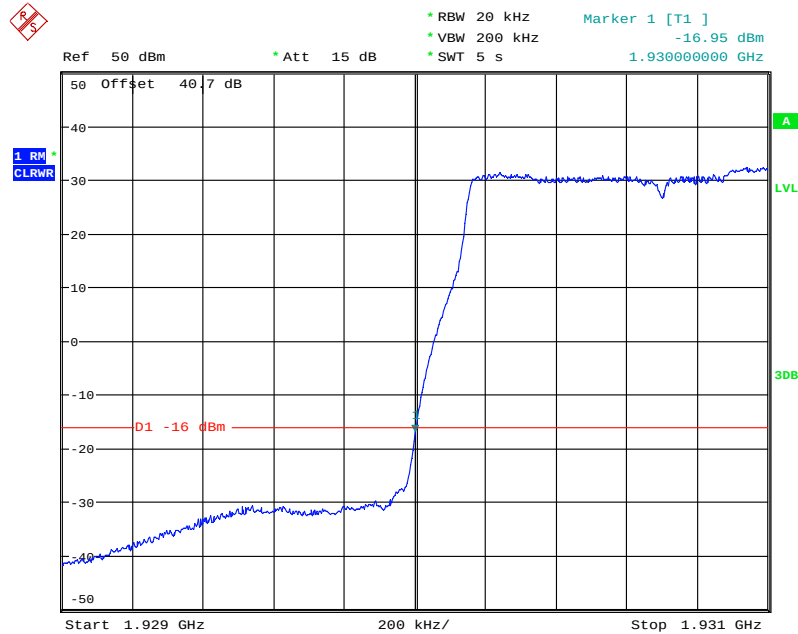
Configuration 1 - Mode 3 - 20



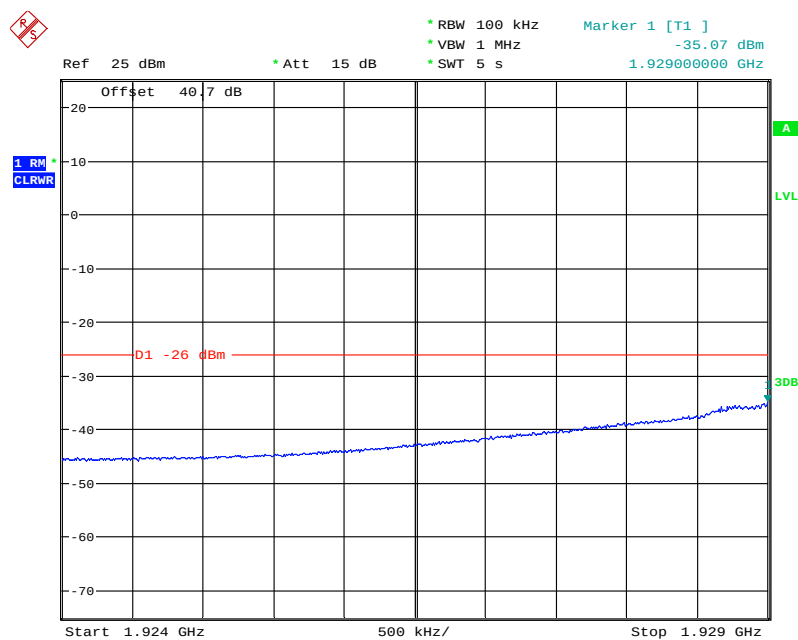
Date: 28.APR.2014 12:09:11



Date: 28.APR.2014 12:10:06

**E-TM3.2****1.4MHz Bandwidth****Configuration 1 - Mode 1 - 1.4**

Date: 28.APR.2014 13:29:17

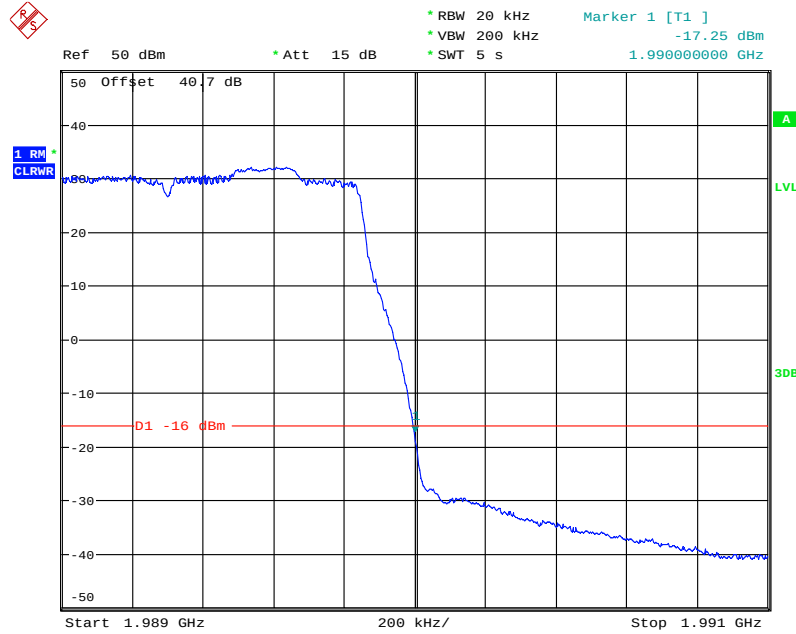


Date: 28.APR.2014 13:30:17

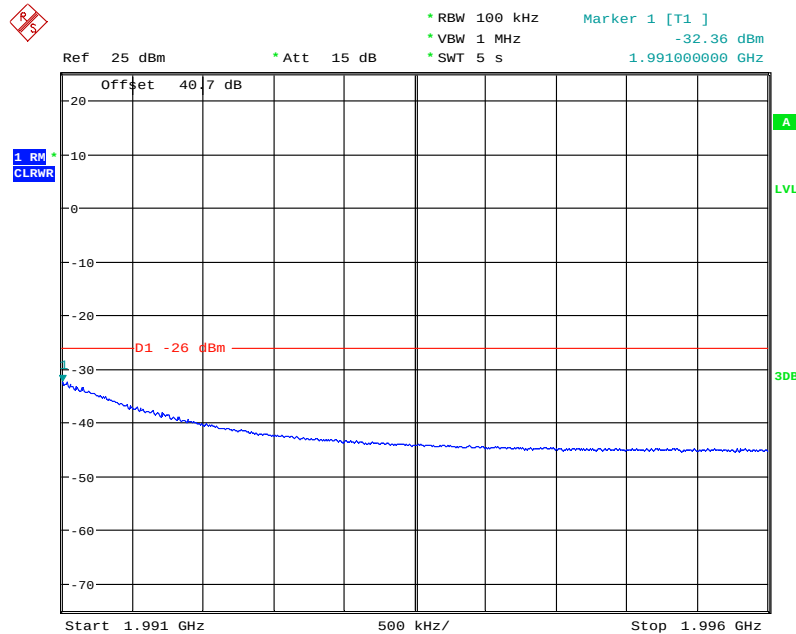


Product Service

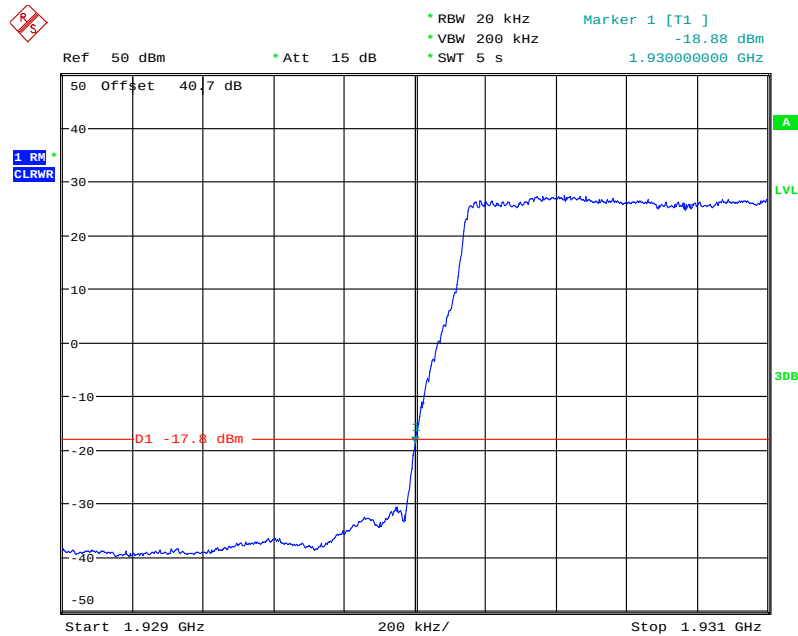
Configuration 1 - Mode 3 - 1.4



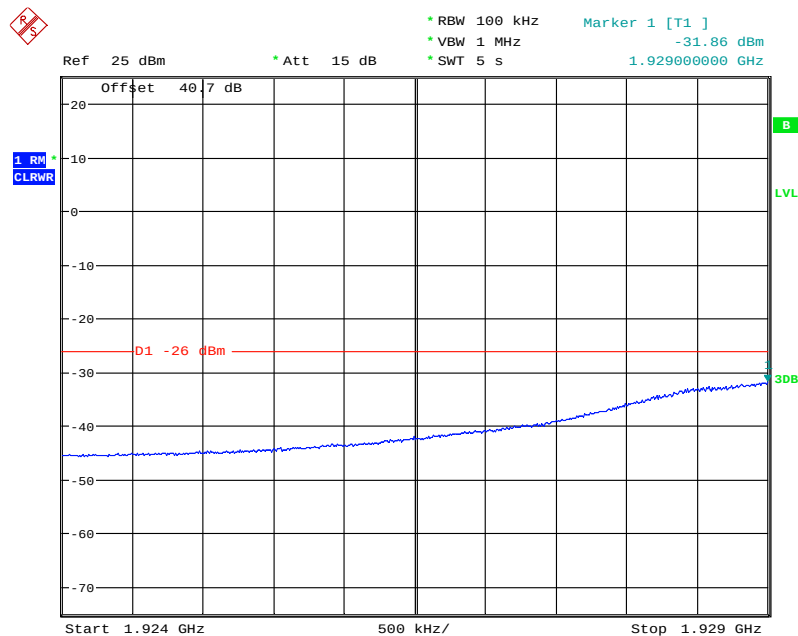
Date: 28.APR.2014 13:37:00



Date: 28.APR.2014 13:36:06

**3.0MHz Bandwidth****Configuration 1 - Mode 1 - 3**

Date: 28.APR.2014 13:51:32

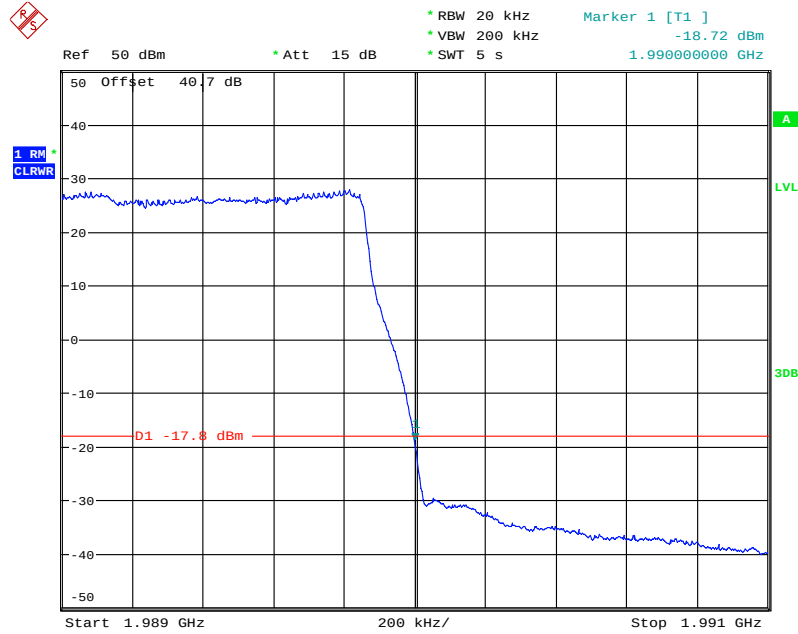


Date: 28.APR.2014 13:51:46

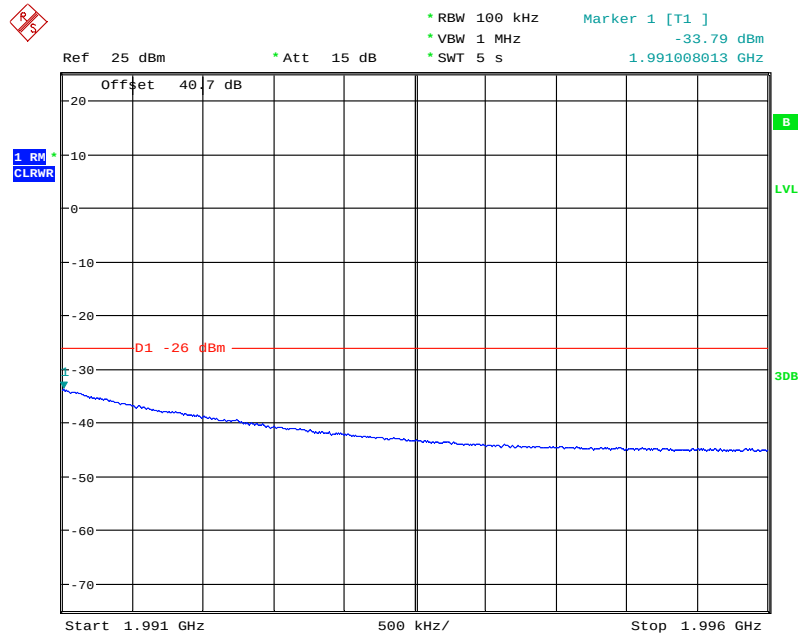


Product Service

Configuration 1 - Mode 3 - 3



Date: 28.APR.2014 14:04:12



Date: 28.APR.2014 14:04:37

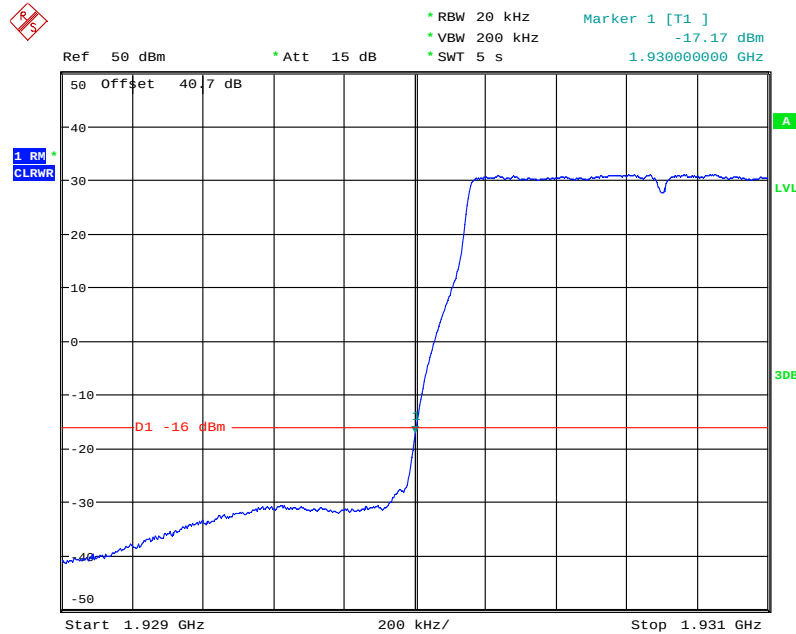


Product Service

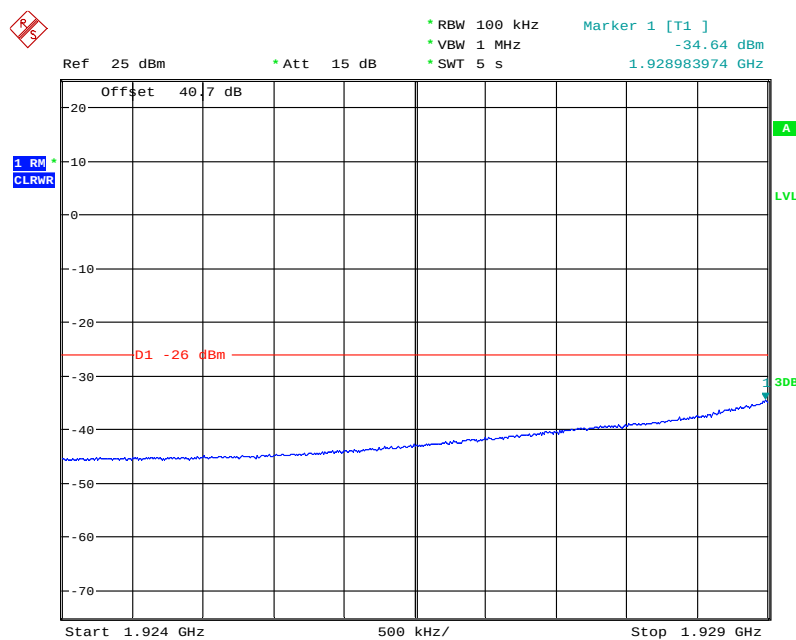
E-TM3.1

1.4MHz Bandwidth

Configuration 1 - Mode 1 - 1.4



Date: 28.APR.2014 13:28:06

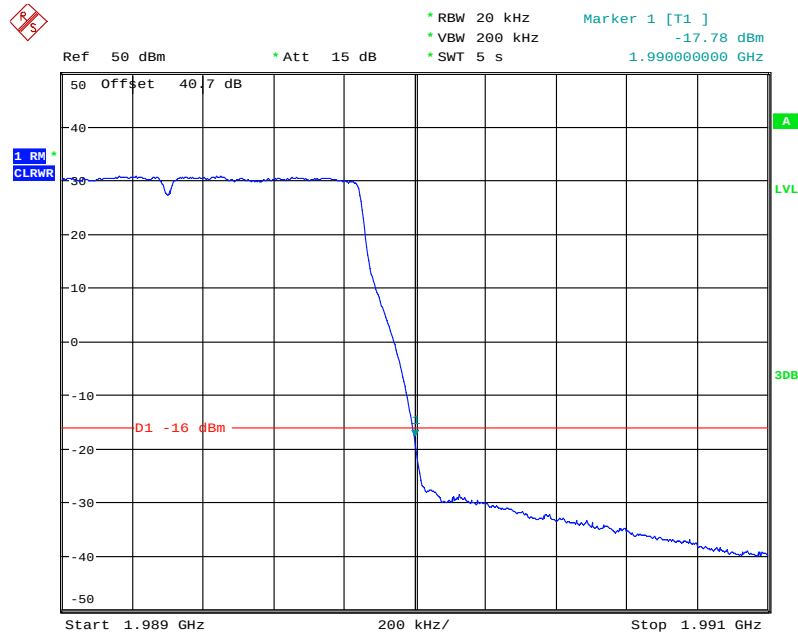


Date: 28.APR.2014 13:27:01

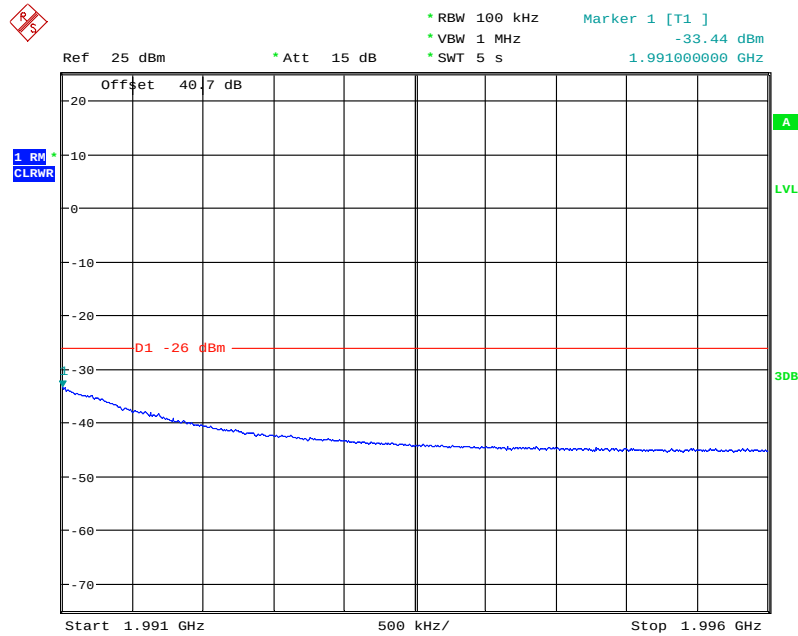


Product Service

Configuration 1 - Mode 3 - 1.4



Date: 28.APR.2014 13:34:54



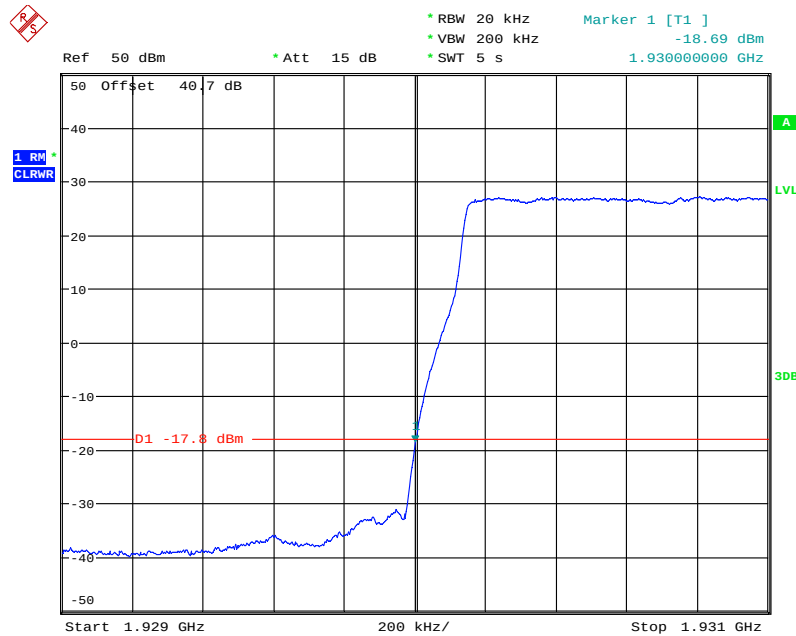
Date: 28.APR.2014 13:35:21



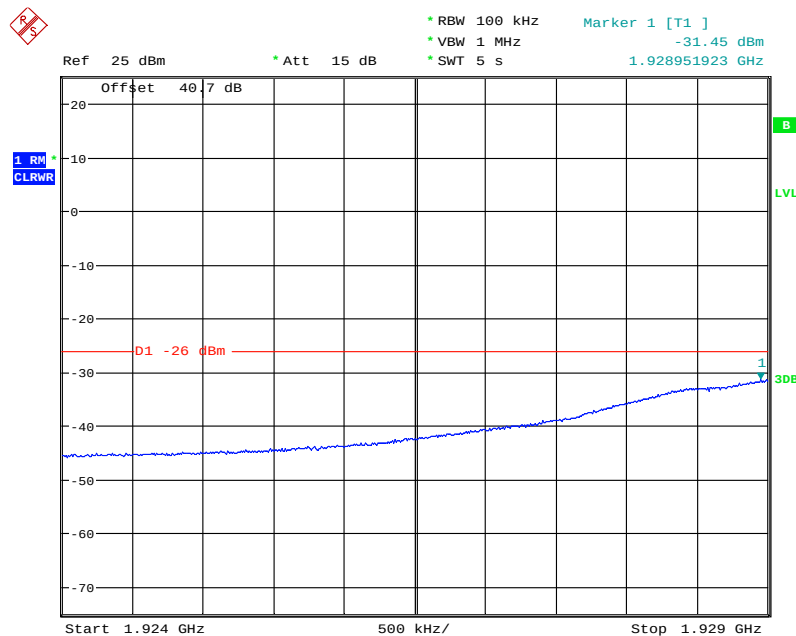
Product Service

3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3



Date: 28.APR.2014 13:49:51

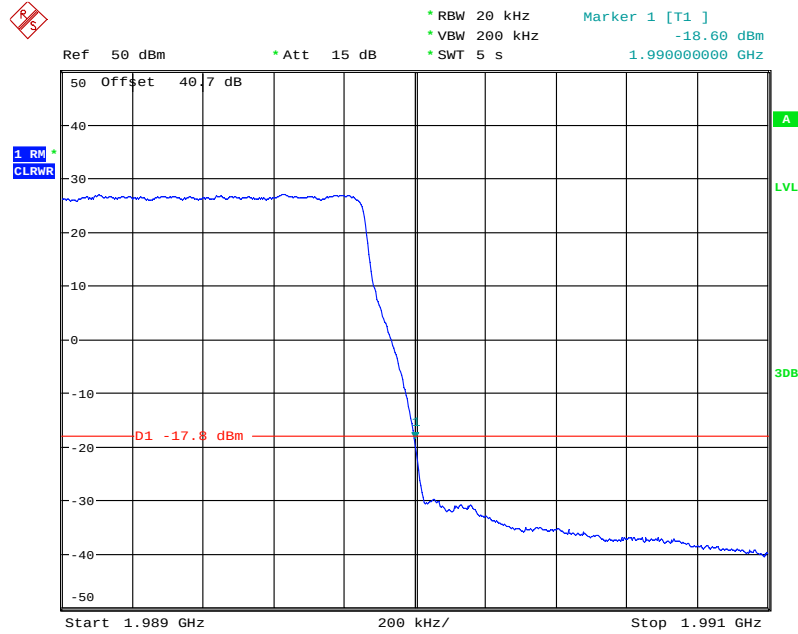


Date: 28.APR.2014 13:48:27

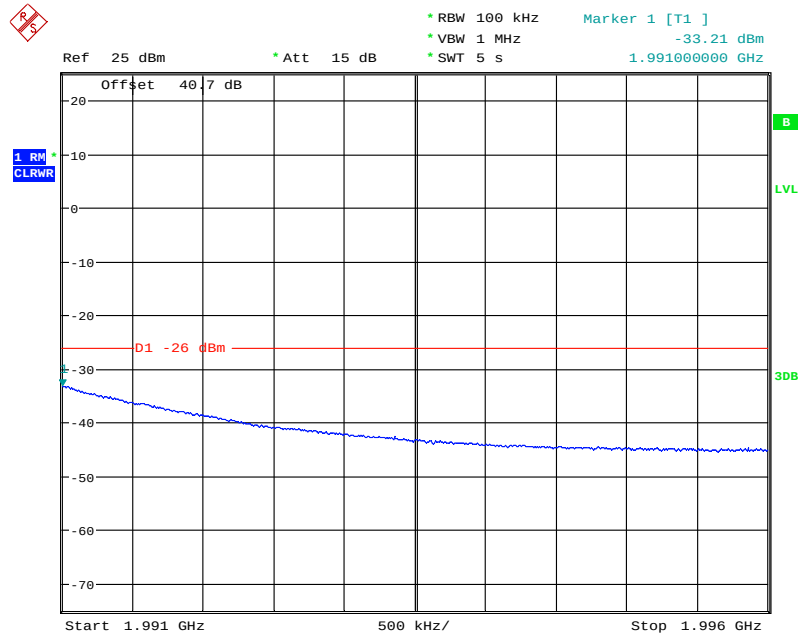


Product Service

Configuration 1 - Mode 3 - 3



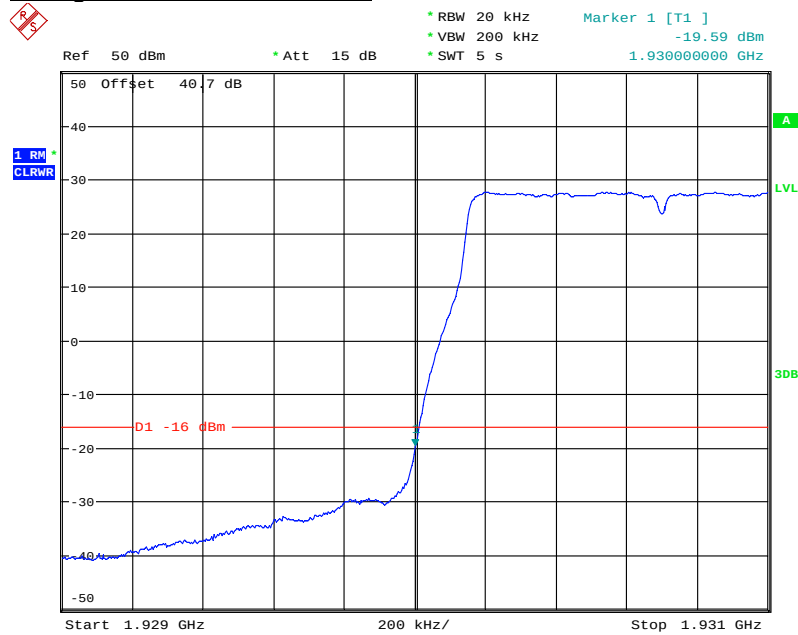
Date: 28.APR.2014 14:02:49



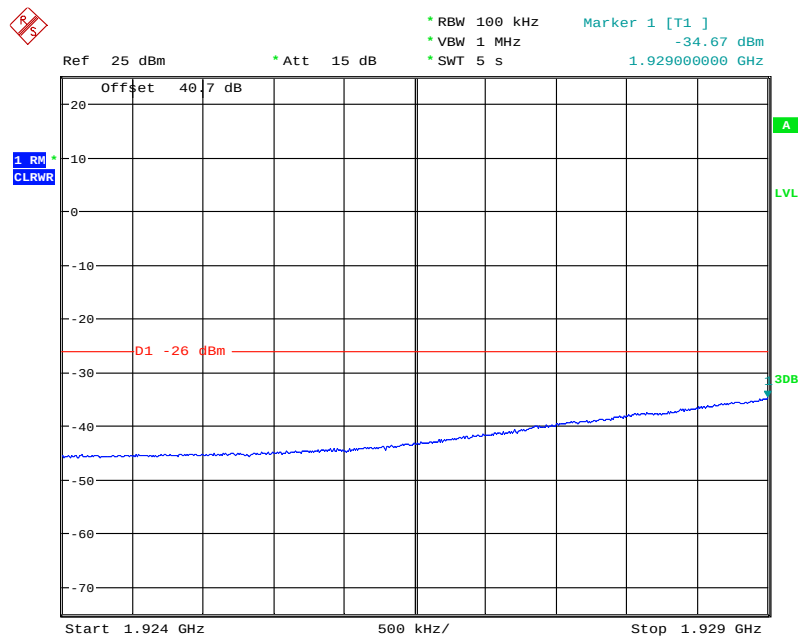
Date: 28.APR.2014 14:02:22



Product Service

Multi Carrier (x2)**E-TM1.1****1.4MHz Bandwidth****Configuration 1 - Mode 4 - 1.4**

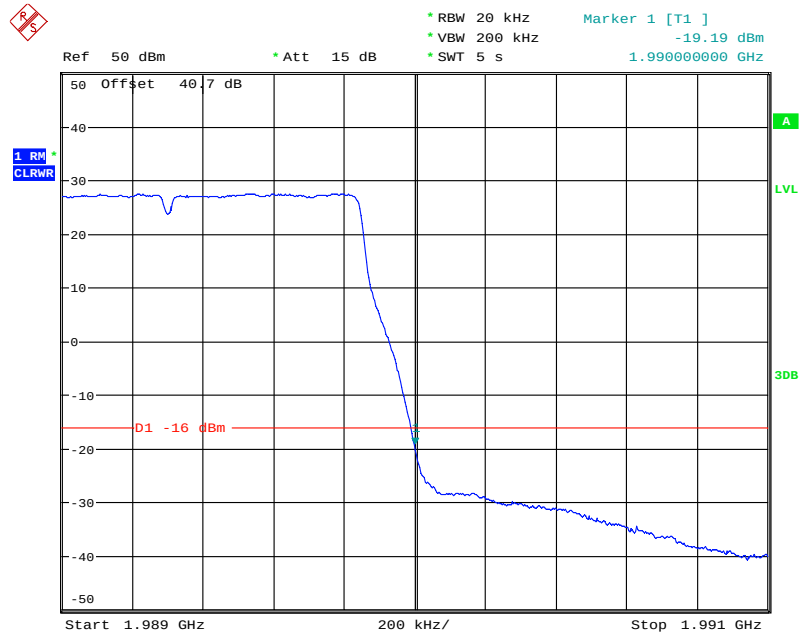
Date: 28.APR.2014 18:05:34



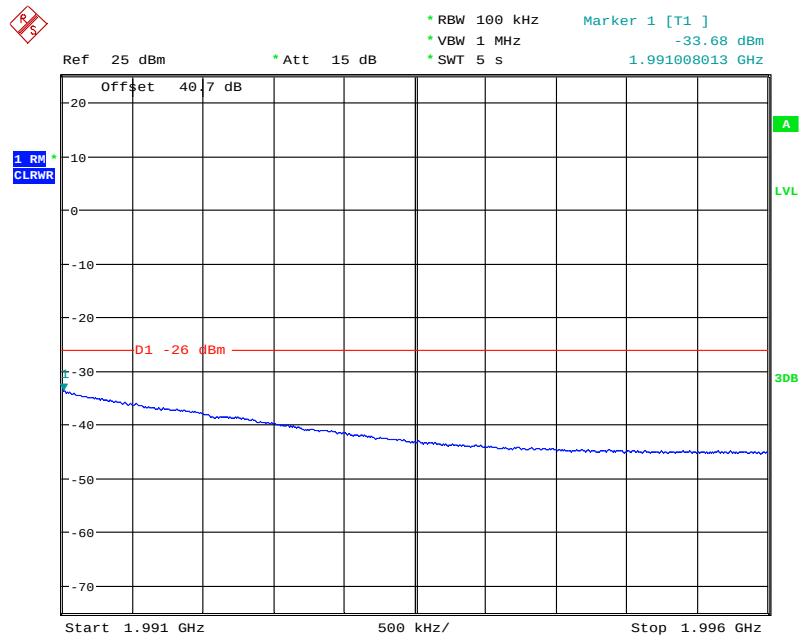
Date: 28.APR.2014 18:06:04



Product Service

Configuration 1 - Mode 6 - 1.4

Date: 29.APR.2014 11:30:46

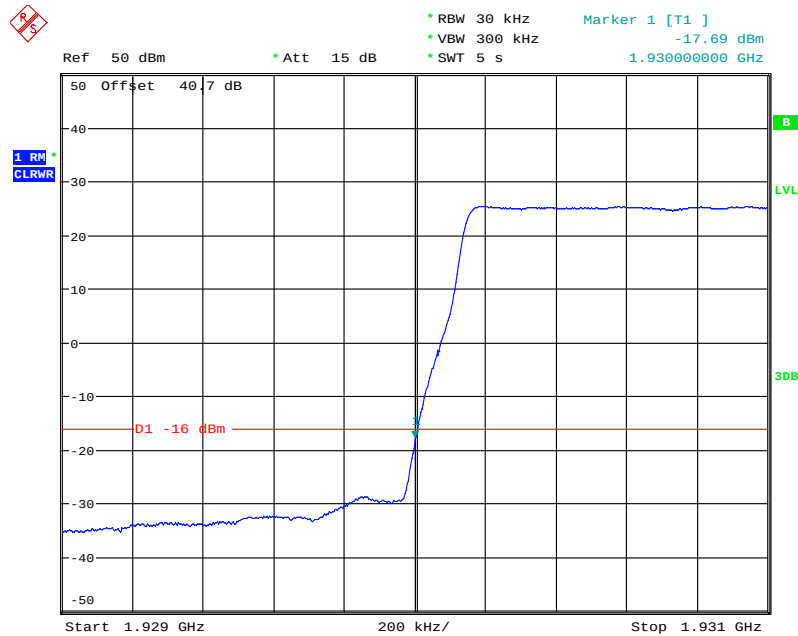


Date: 29.APR.2014 11:29:44

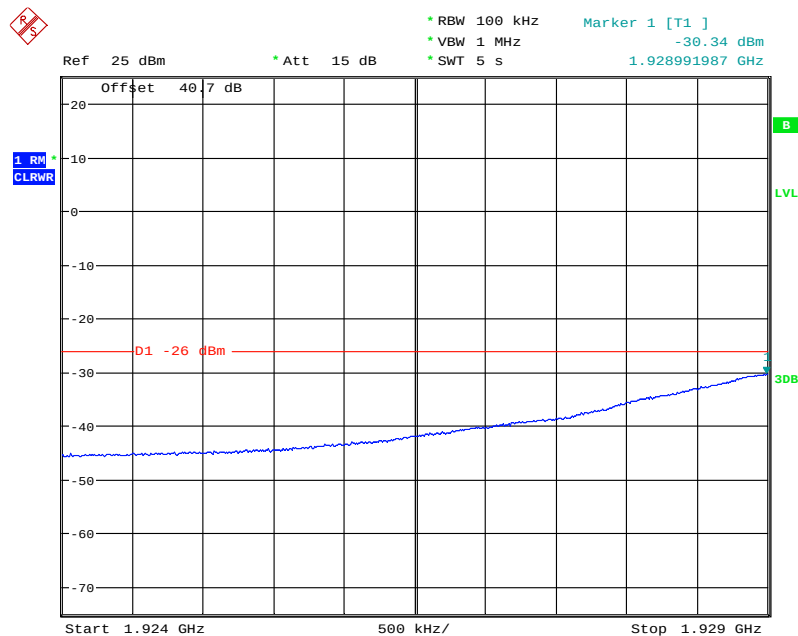


3.0MHz Bandwidth

Configuration 1 - Mode 4 - 3



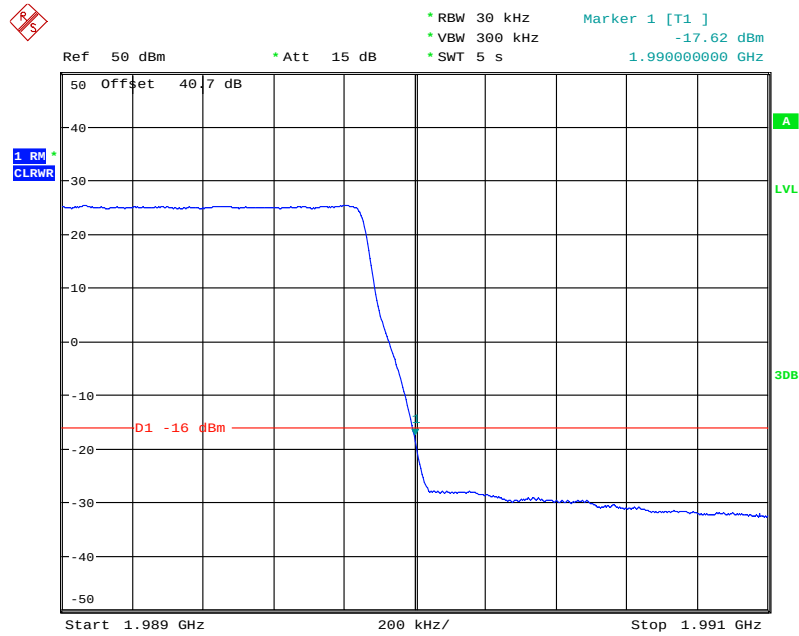
Date: 29.APR.2014 14:29:28



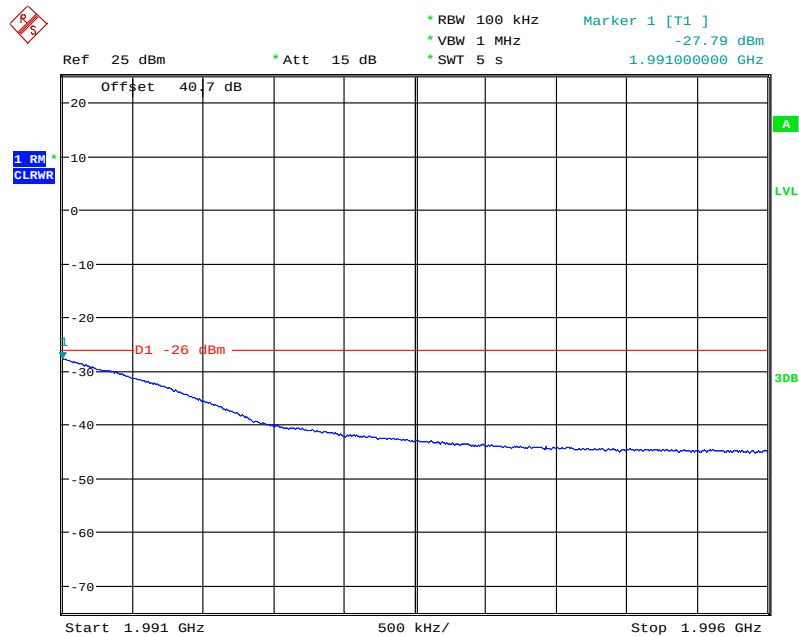
Date: 29.APR.2014 14:30:39



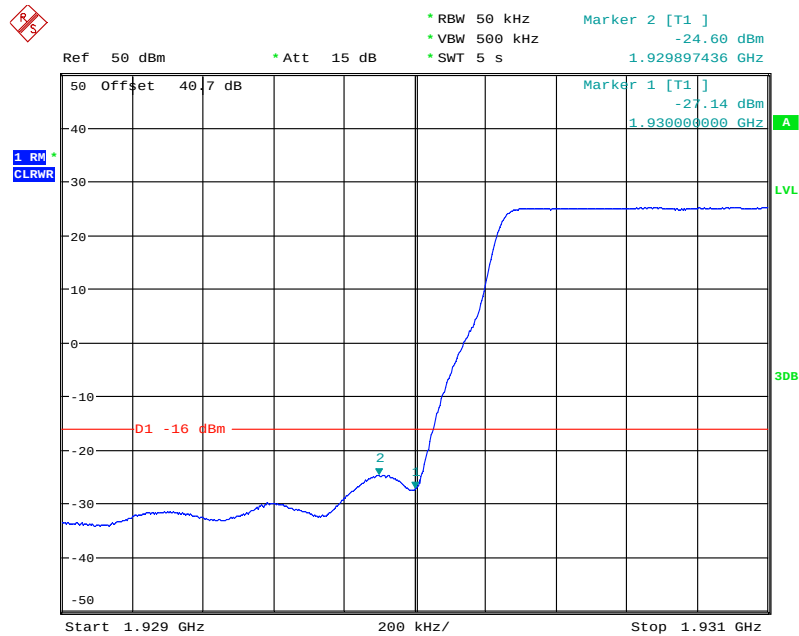
Product Service

Configuration 1 - Mode 6 - 3

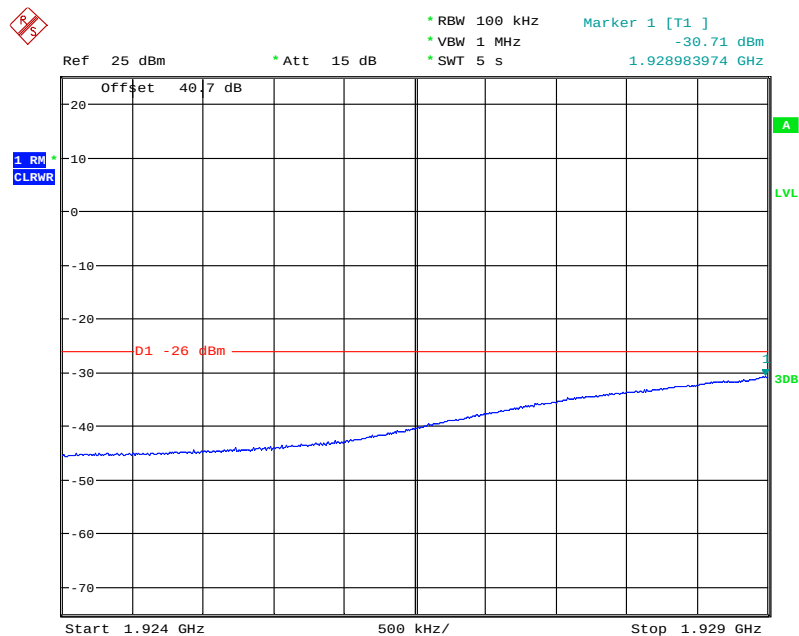
Date: 29.APR.2014 14:52:10



Date: 29.APR.2014 14:50:25

**5.0MHz Bandwidth****Configuration 1 - Mode 4 - 5**

Date: 29.APR.2014 14:56:30

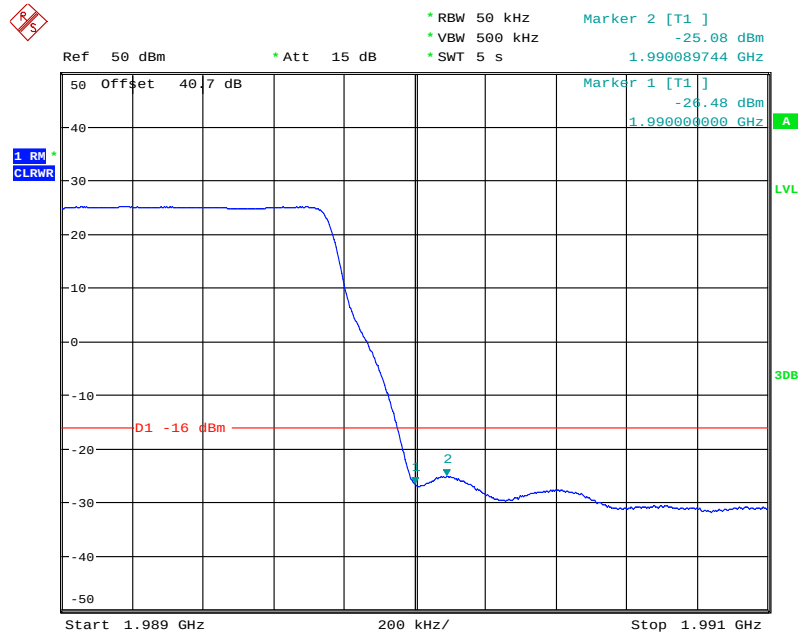


Date: 29.APR.2014 14:57:17

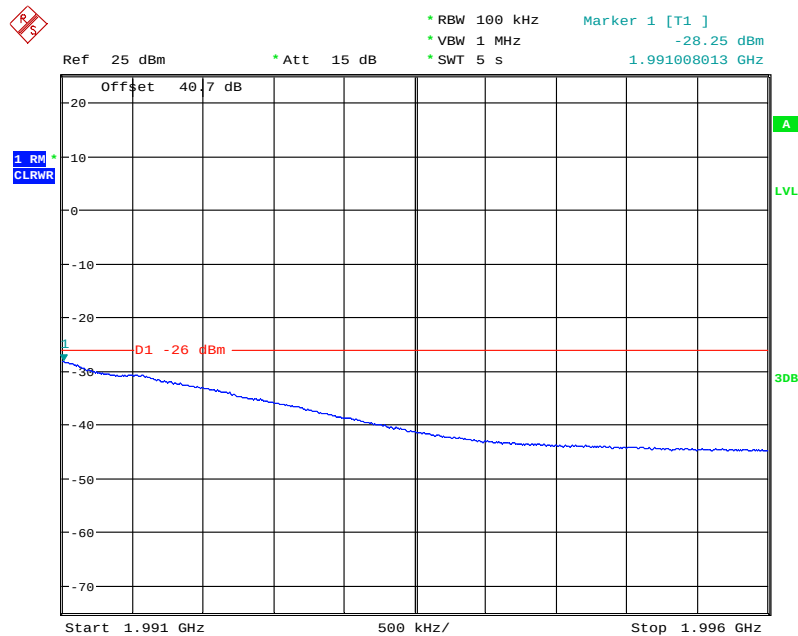


Product Service

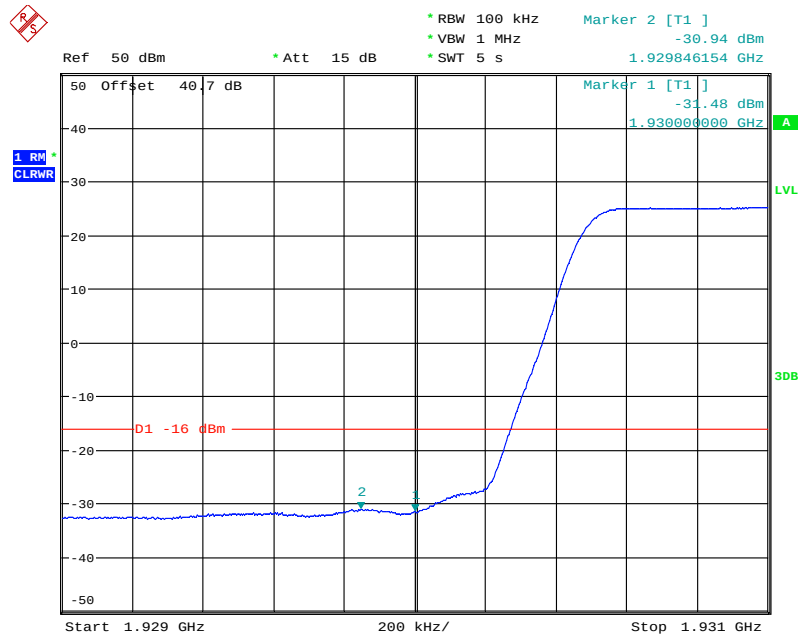
Configuration 1 - Mode 6 - 5



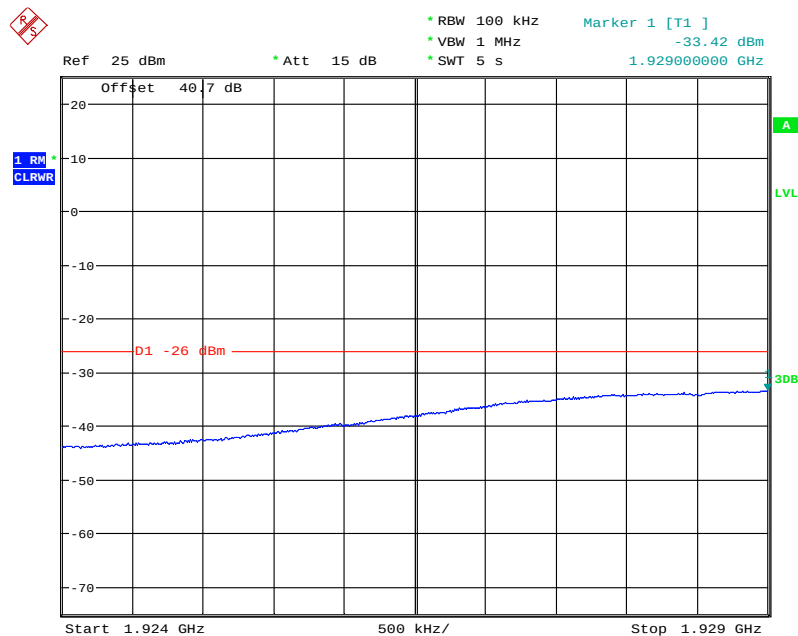
Date: 29.APR.2014 15:04:50



Date: 29.APR.2014 15:03:38

**10.0MHz Bandwidth****Configuration 1 - Mode 4 - 10**

Date: 29.APR.2014 12:17:15

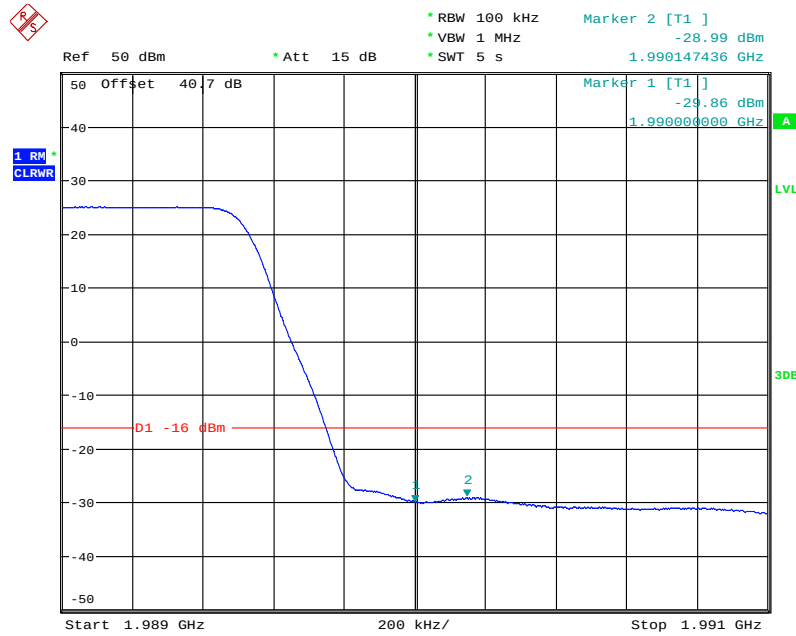


Date: 29.APR.2014 12:15:33

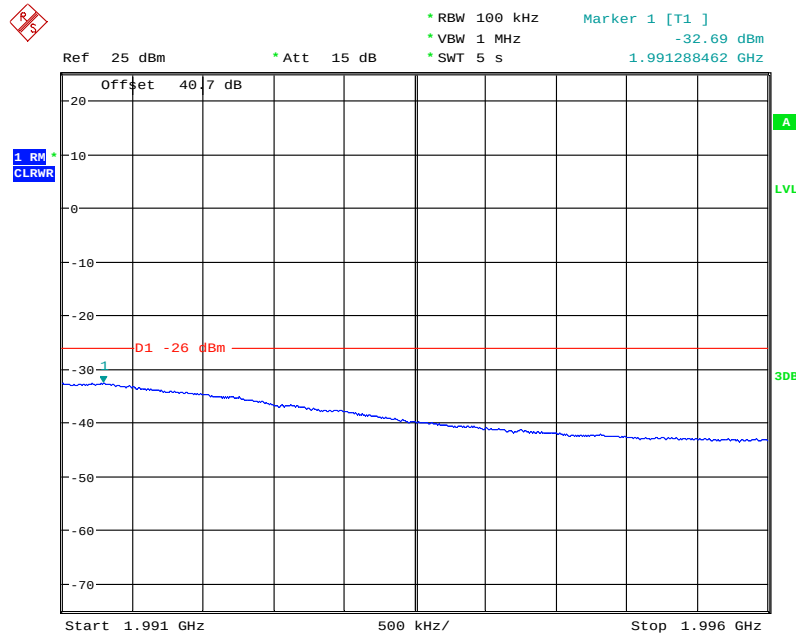


Product Service

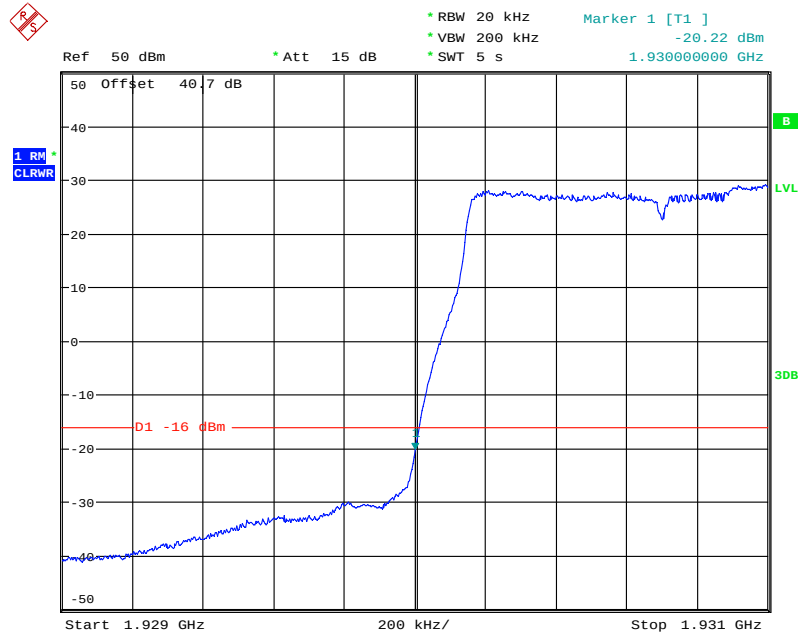
Configuration 1 - Mode 6 - 10



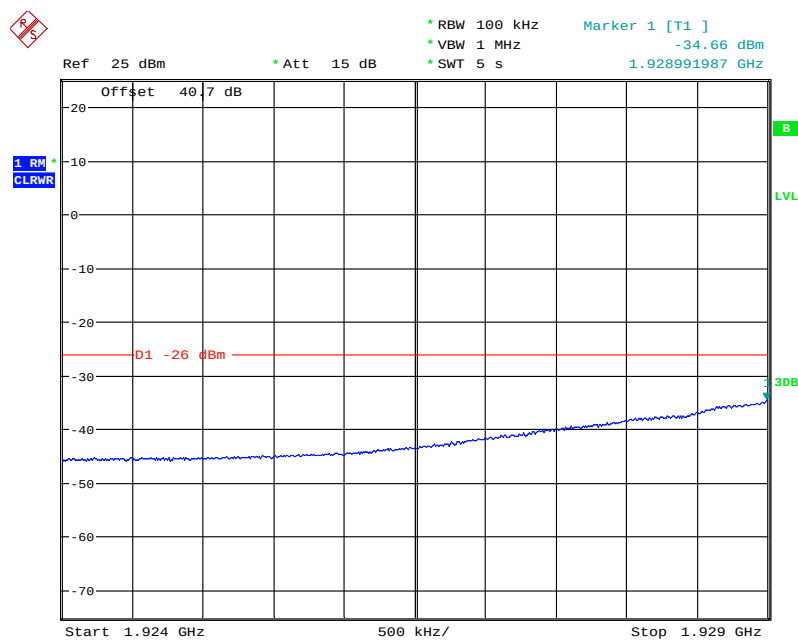
Date: 29.APR.2014 13:27:29



Date: 29.APR.2014 13:26:31

**E-TM3.2****1.4MHz Bandwidth****Configuration 1 - Mode 4 - 1.4**

Date: 29.APR.2014 17:02:50

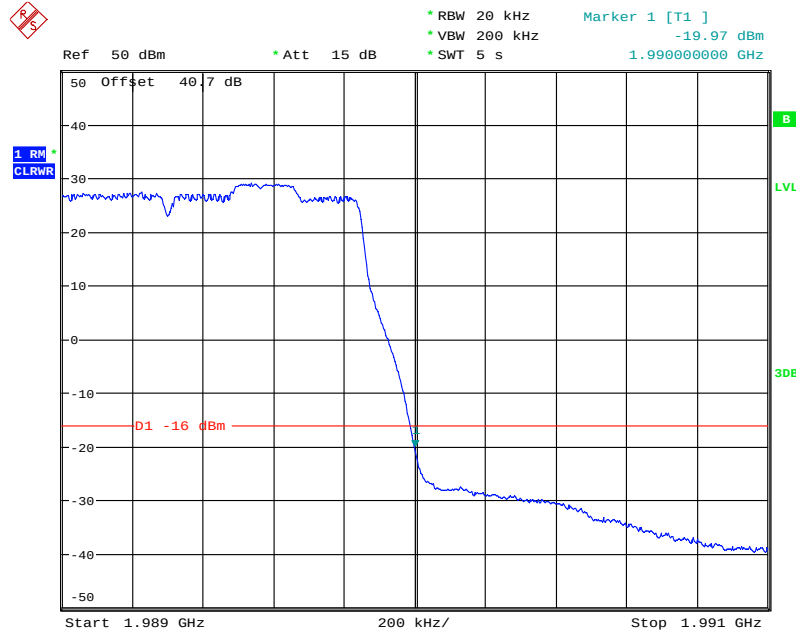


Date: 29.APR.2014 17:01:05

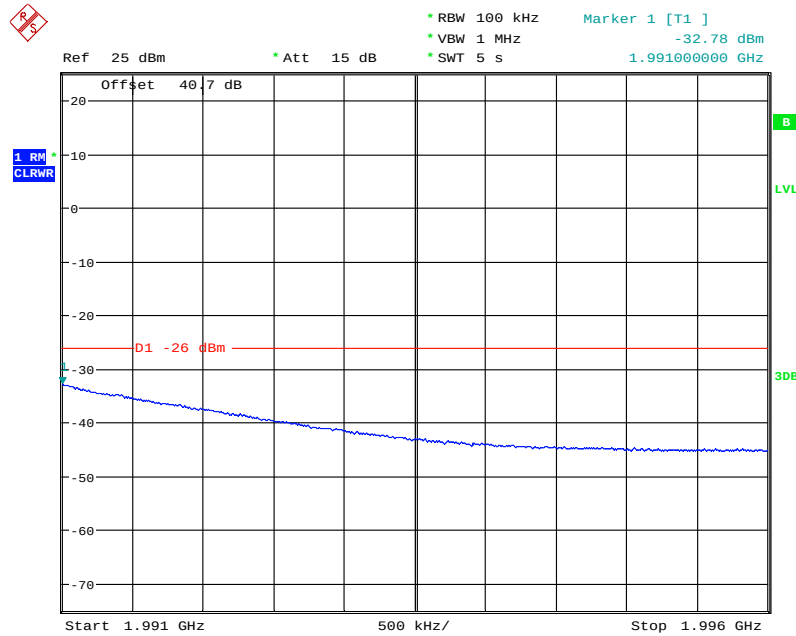


Product Service

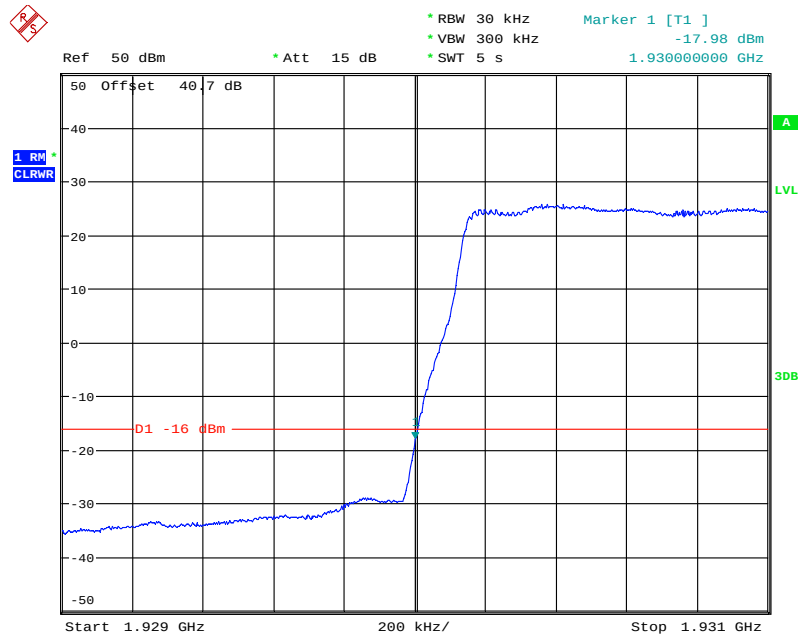
Configuration 1 - Mode 6 - 1.4



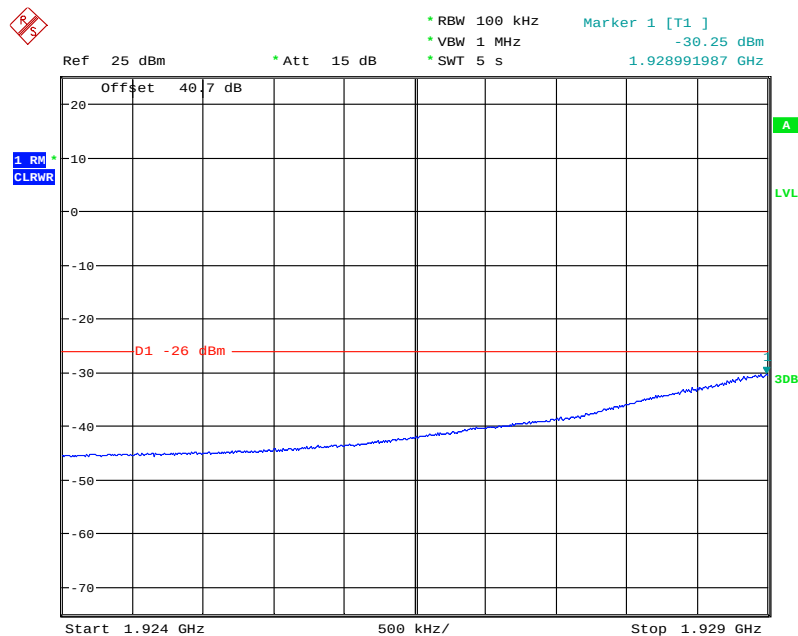
Date: 29.APR.2014 17:16:17



Date: 29.APR.2014 17:15:04

**3.0MHz Bandwidth****Configuration 1 - Mode 4 - 3**

Date: 29.APR.2014 14:42:28

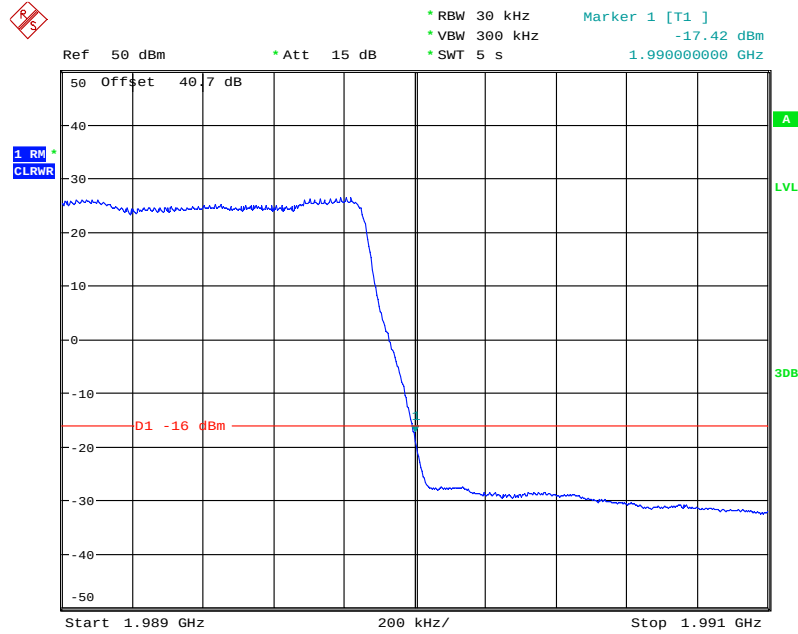


Date: 29.APR.2014 14:43:27

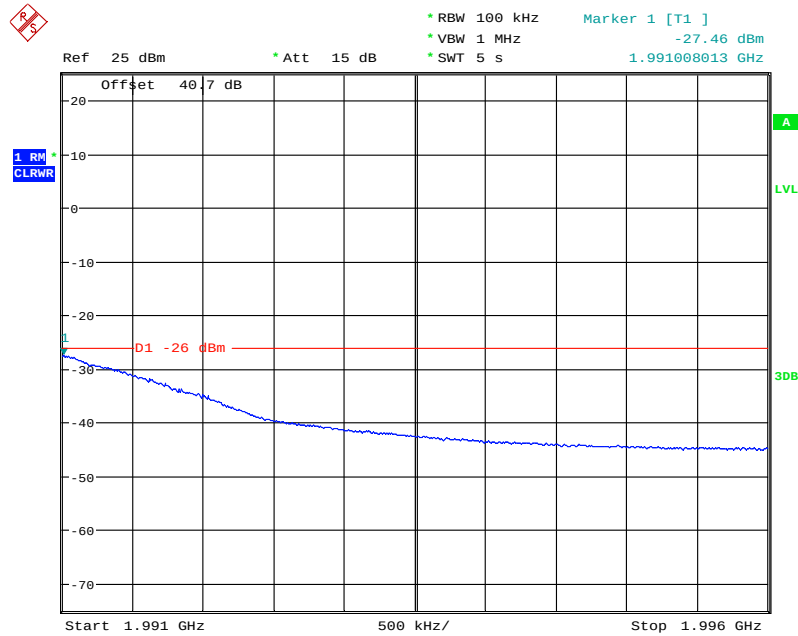


Product Service

Configuration 1 - Mode 6 - 3



Date: 29.APR.2014 14:47:50



Date: 29.APR.2014 14:48:35

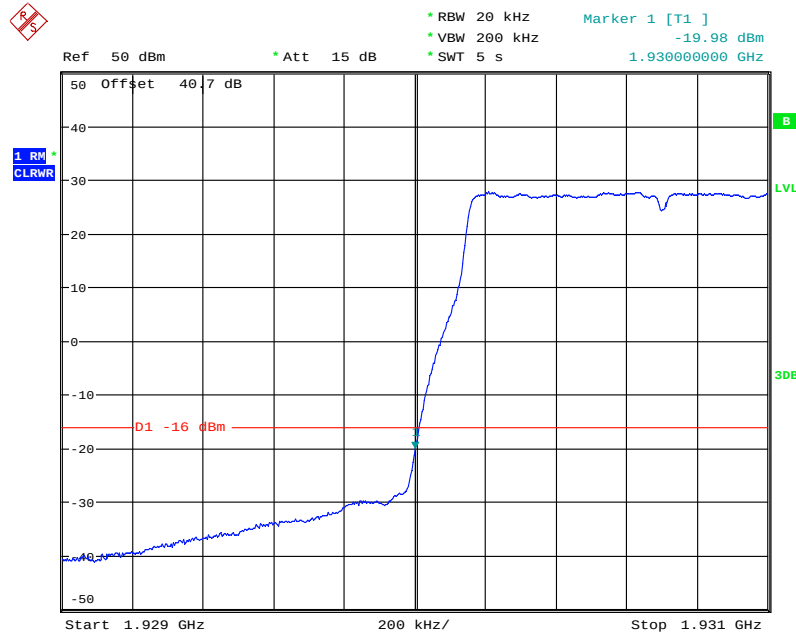


Product Service

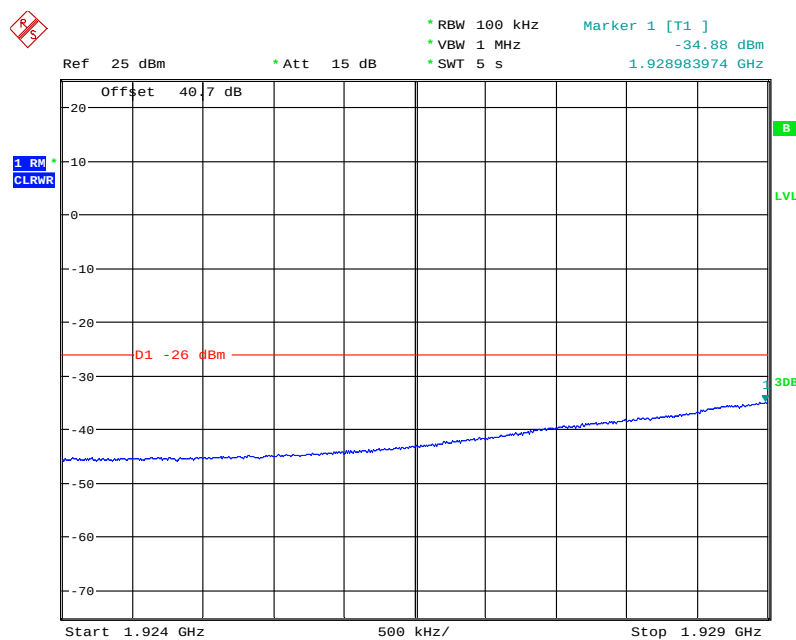
E-TM3.1

1.4MHz Bandwidth

Configuration 1 - Mode 4 - 1.4



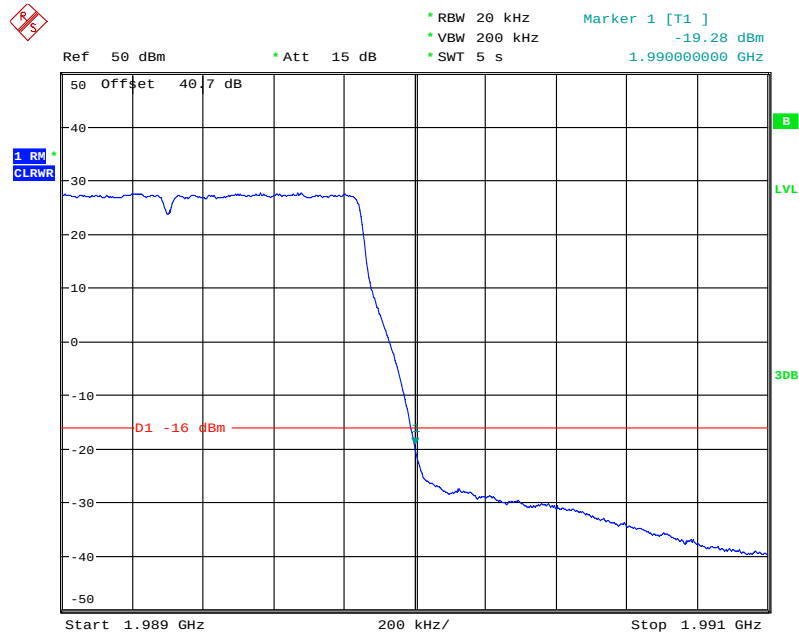
Date: 29.APR.2014 16:58:38



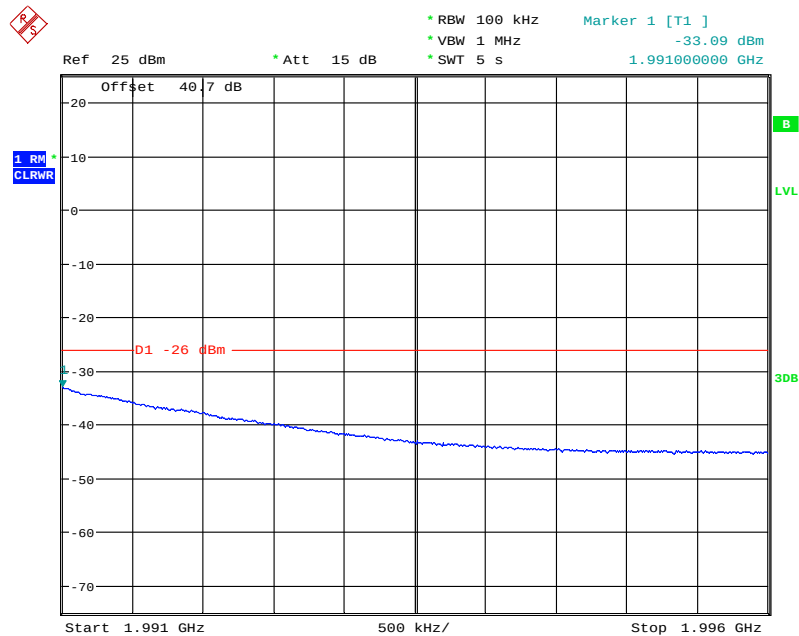
Date: 29.APR.2014 16:59:19



Configuration 1 - Mode 6 - 1.4



Date: 29.APR.2014 17:11:53



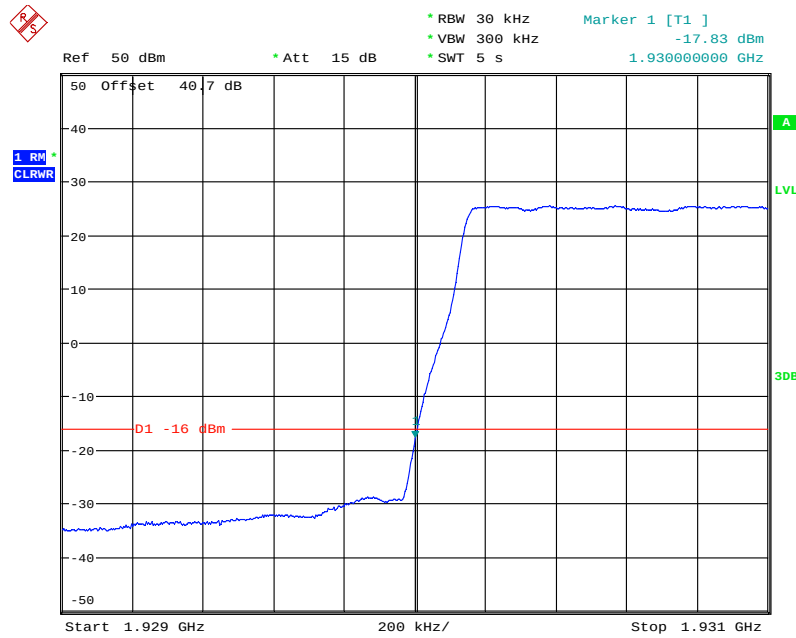
Date: 29.APR.2014 17:13:10



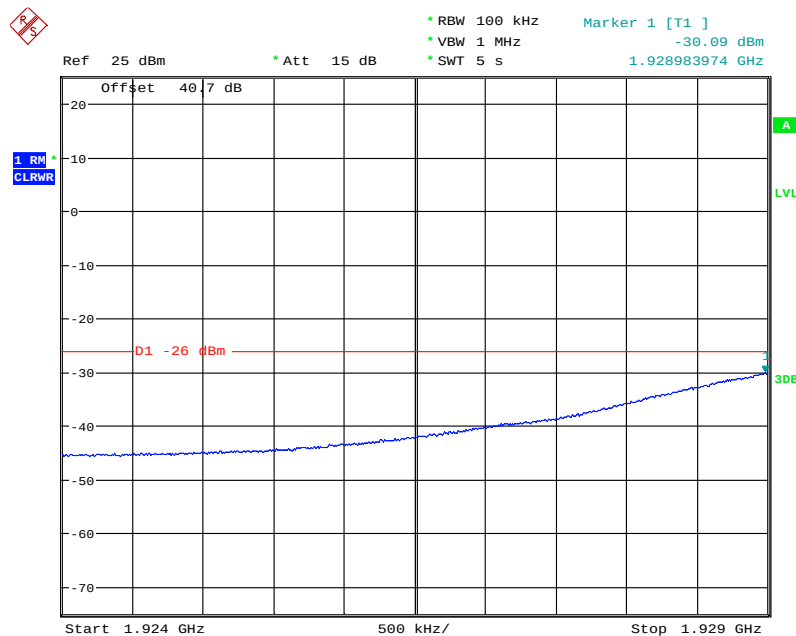
Product Service

3.0MHz Bandwidth

Configuration 1 - Mode 4 - 3



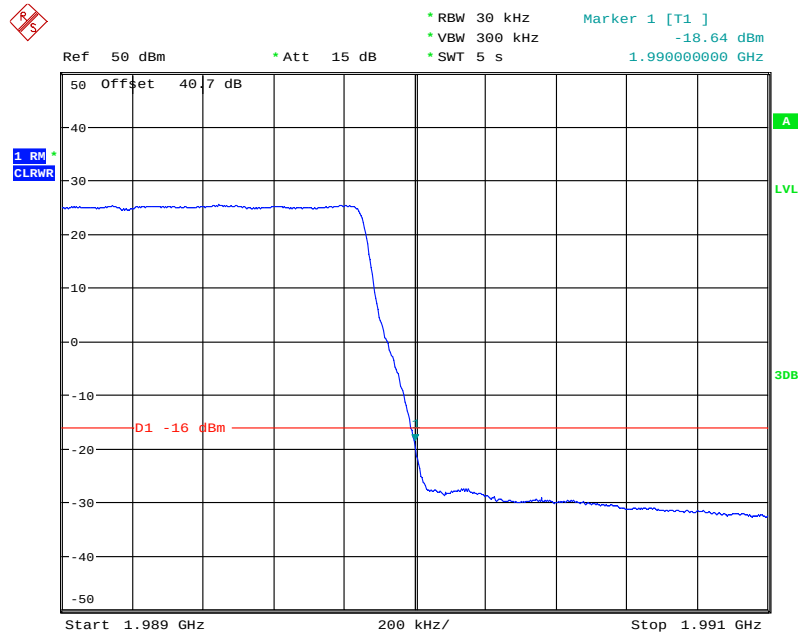
Date: 29.APR.2014 14:39:23



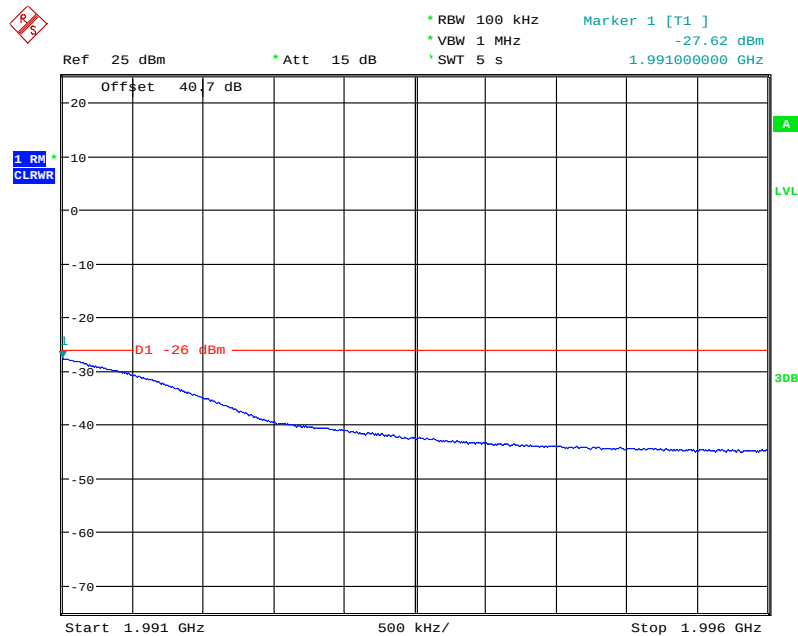
Date: 29.APR.2014 14:38:32



Configuration 1 - Mode 6 - 3



Date: 29.APR.2014 14:46:49



Date: 29.APR.2014 14:45:58

Limit

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



Product Service

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 74/1, S/N: CB4J094486, CF80011783

2.6.3 Date of Test and Modification State

22 and 23 April 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 - $(43 + 10\log(P))$ dB

Where:

Field Strength is measured in dB μ V/m

P is measured Transmitter Power in Watts



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:

$$E_{(v/m)} = (30 \times 1.64 \times 110.04)^{0.5} / 3 = 24.53V/m = 147.79dB\mu V/m$$

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

$$43 + 10\log(110.04) = 63.42dB$$

Therefore the limit at 3m measurement distance is:

$$147.79 - 63.42 = 84.4 \text{ dB}\mu V/m$$

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 (1.4, 3, 5, 10, 15, 20)
 - Mode 3 - 1.4
 - Mode 5 - 1.4

2.6.6 Environmental Conditions

Ambient Temperature 22.0 – 24.5°C

Relative Humidity 48.0 – 56.0%

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**

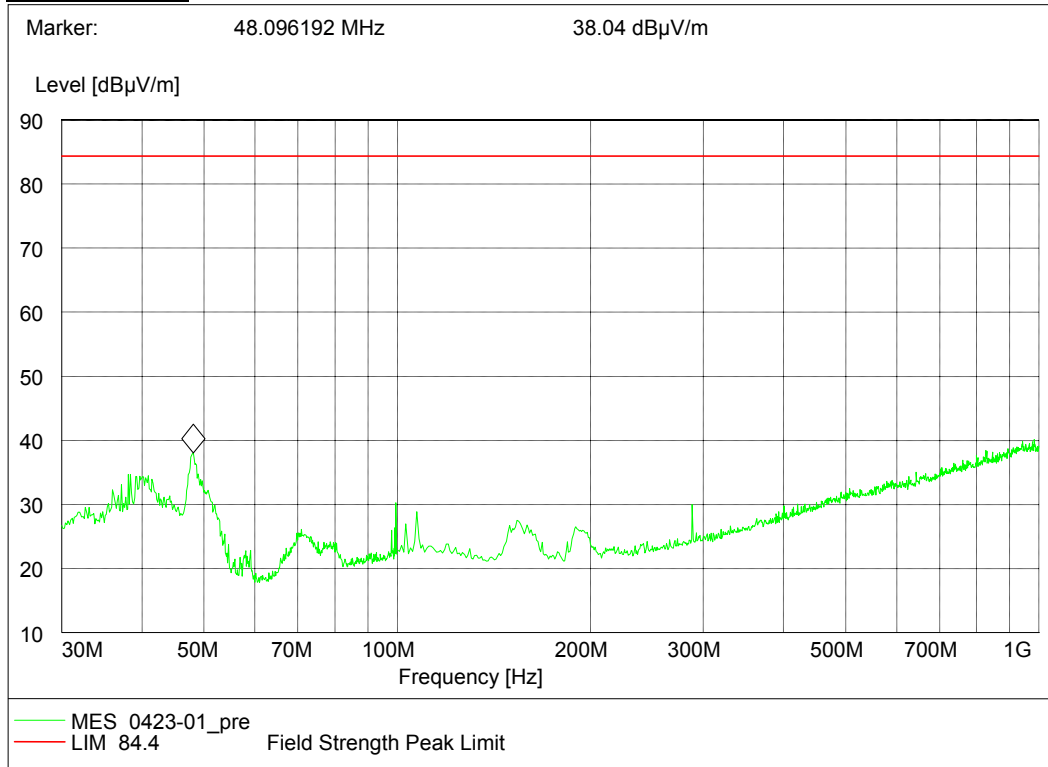
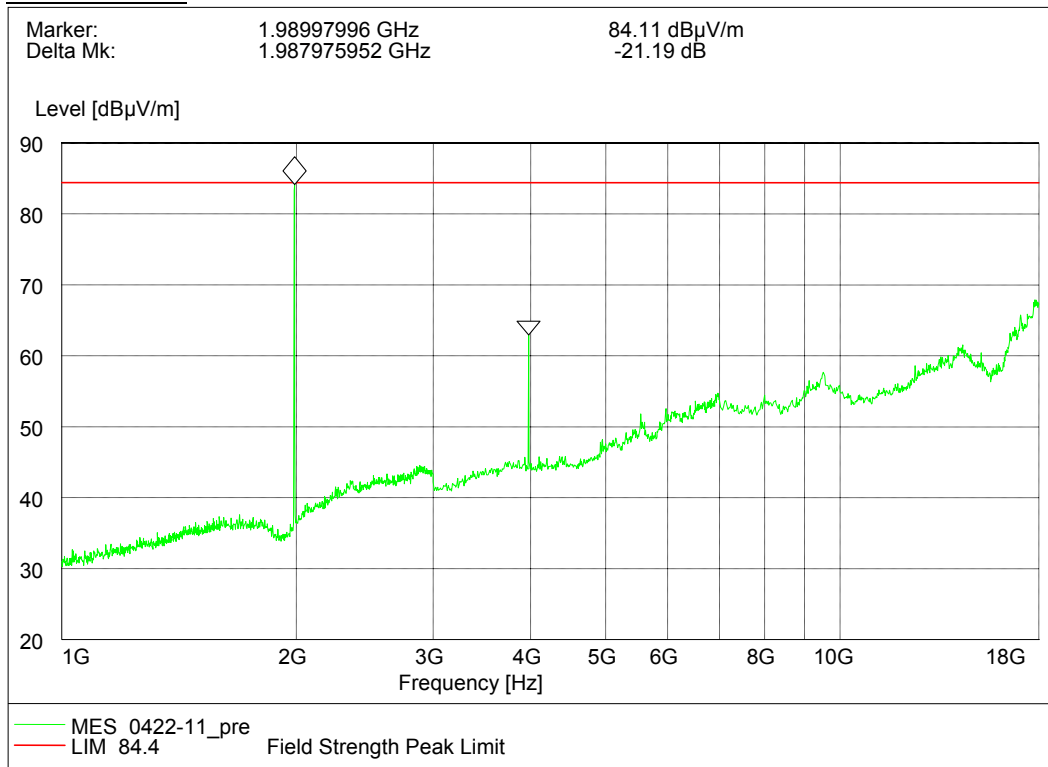
No emissions were detected within 20dB of the limit.

E-TM3.2**1.4MHz Bandwidth****Configuration 1 - Mode 1**

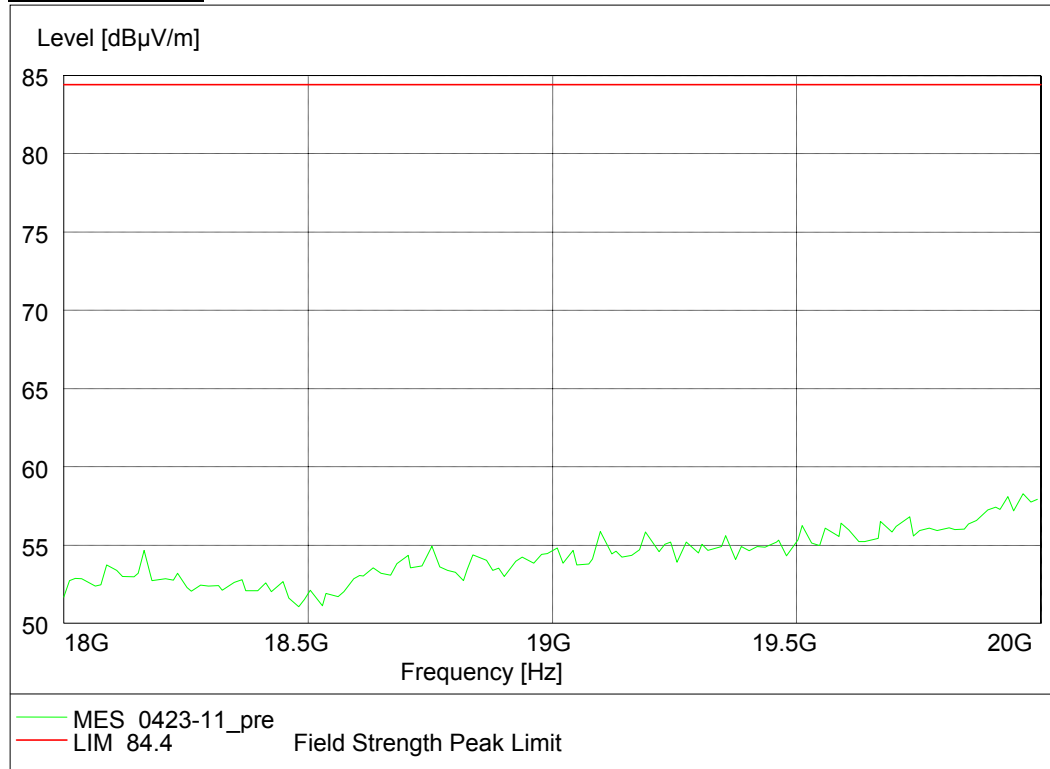
No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 330MHz – 1GHz1GHz – 18GHz

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

**18GHz – 20GHz****E-TM3.1****1.4MHz Bandwidth****Configuration 1 - Mode 2**

No emissions were detected within 20dB of the limit.

Multi Carrier (x2)**E-TM1.1****1.4MHz Bandwidth****Configuration 1 - Mode 5**

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4dBμV/m
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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 74/1, S/N: CB4J094486, CF80011783

2.7.3 Date of Test and Modification State

22 to 29 April and 25 June 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 for E-TM1.1 test model, just 1.4MHz bandwidth for single carrier and multi carrier configurations were 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 [$10\log(2)$] by using the Measure and Add $10\log(N)$ 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 10th harmonic of the highest carrier frequency at least.



Product Service

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

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

2.7.6 Environmental Conditions

Ambient Temperature 22.0 – 24.5°C

Relative Humidity 48.0 – 56.0%

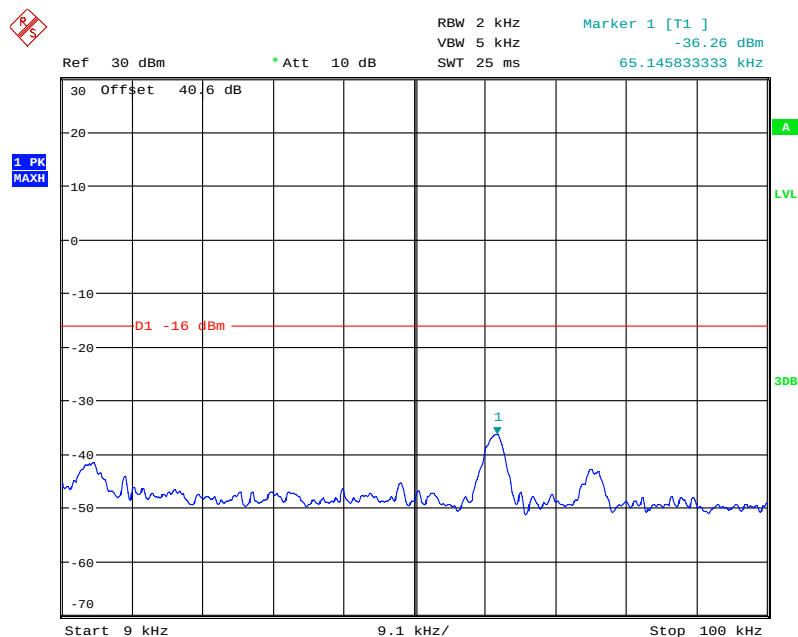
2.7.7 Test Results

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.



Date: 24.APR.2014 15:55:47

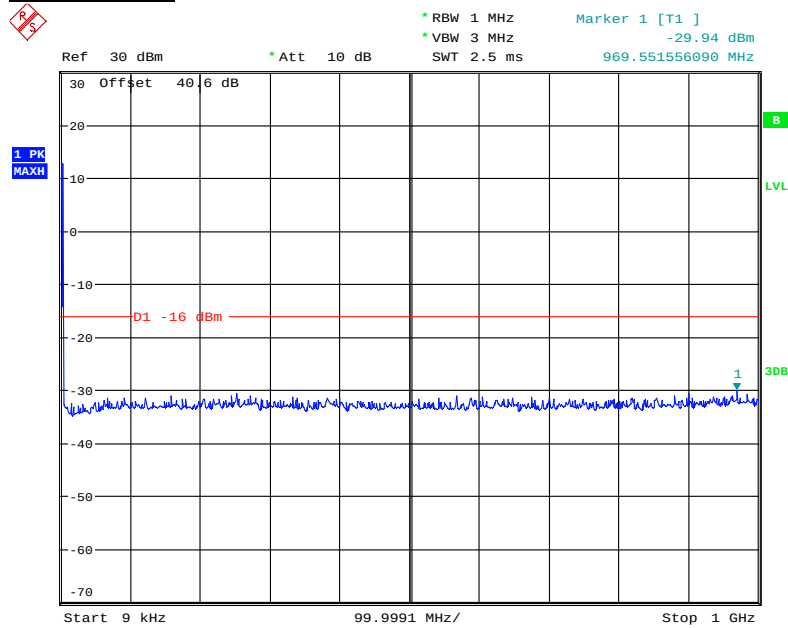


Single Carrier

E-TM1.1 - 1.4MHz Bandwidth

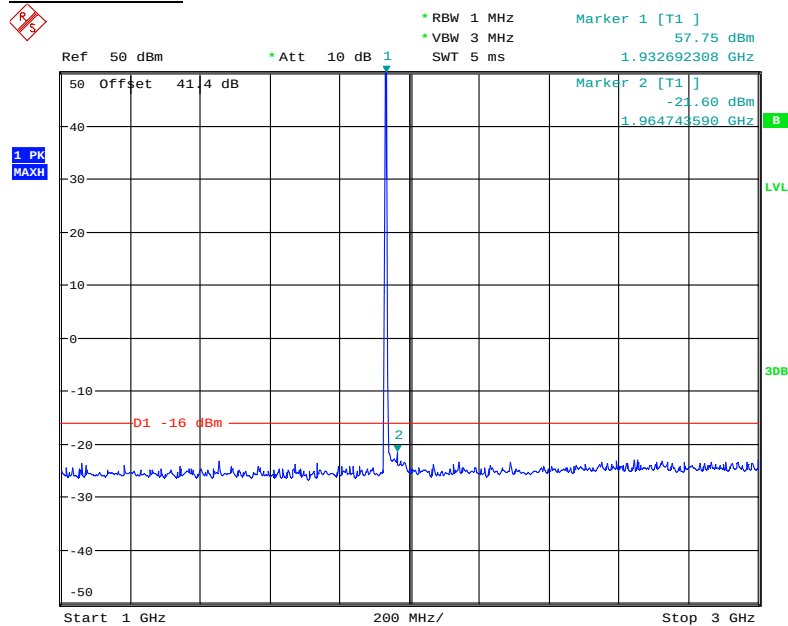
Configuration 1 - Mode 1 - 1.4

9kHz to 1GHz



Date: 28.APR.2014 13:45:31

1GHz to 3GHz

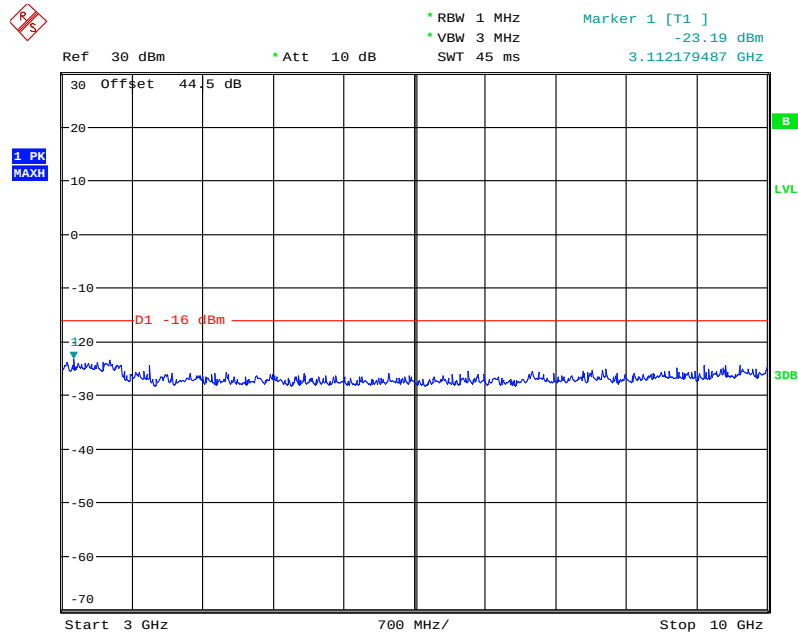


Date: 28.APR.2014 13:23:52

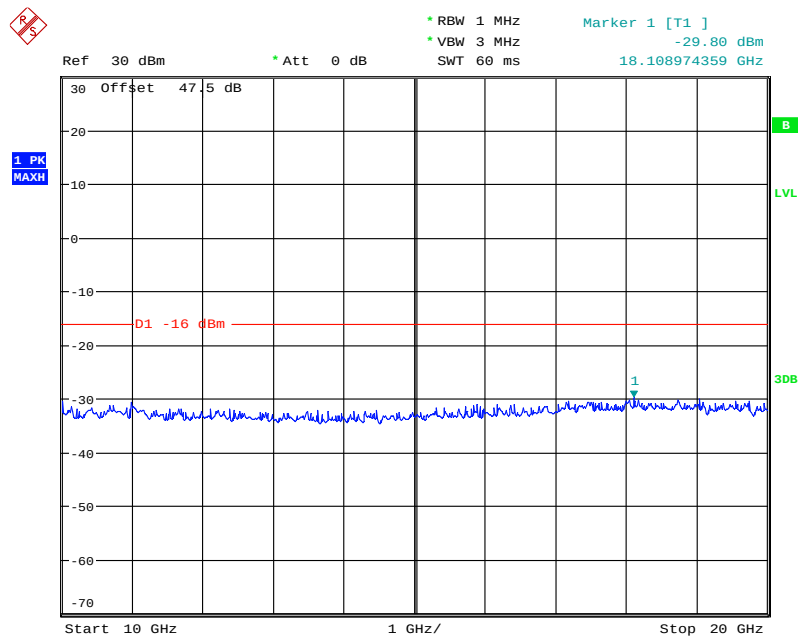
Note: The emission beyond the limit is the operating frequency.



Product Service

3GHz to 10GHz

Date: 28.APR.2014 13:25:06

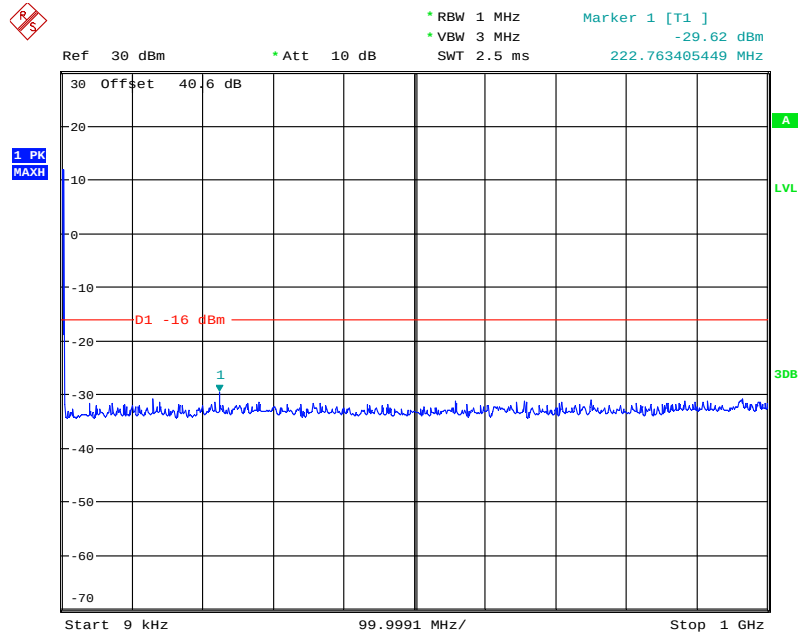
10GHz to 20GHz

Date: 28.APR.2014 13:25:43



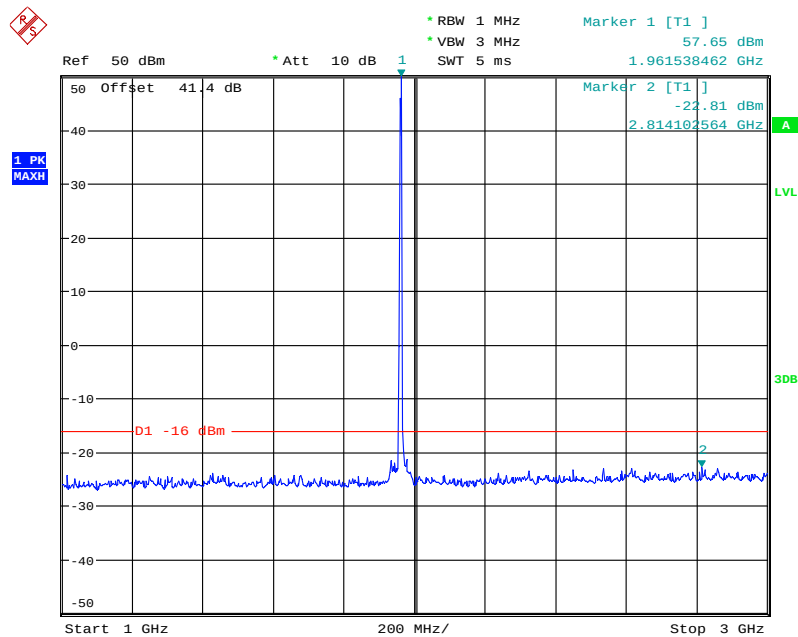
Configuration 1 - Mode 2 - 1.4

9kHz to 1GHz



Date: 24.APR.2014 15:55:04

1GHz to 3GHz



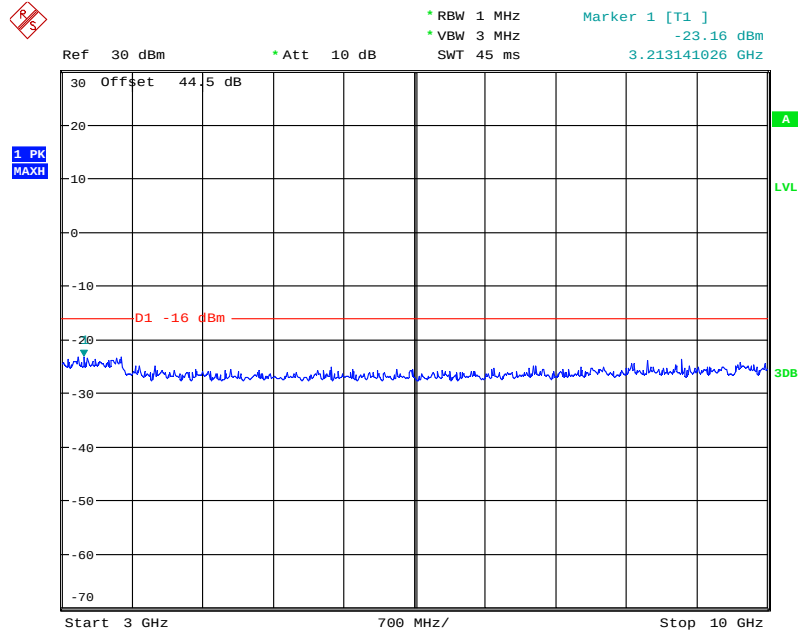
Date: 24.APR.2014 15:50:46

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



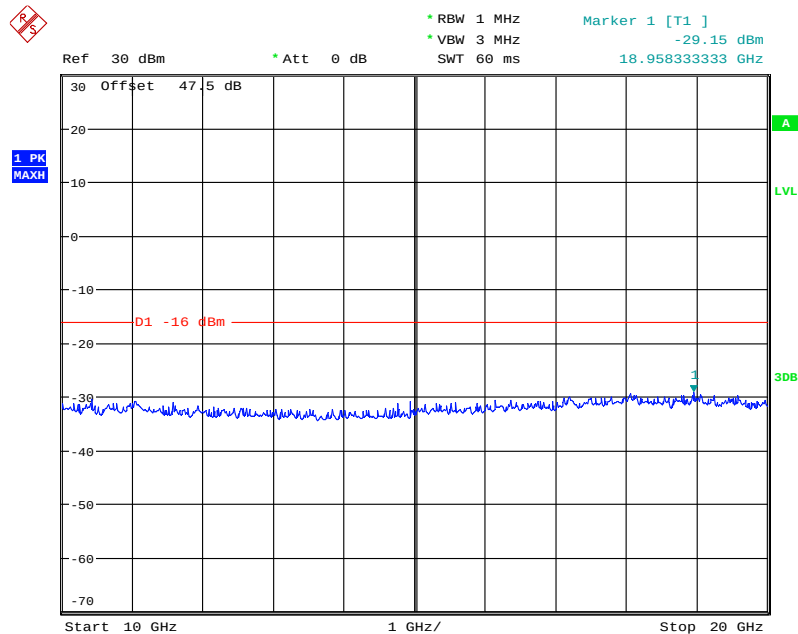
Product Service

3GHz to 10GHz



Date: 24.APR.2014 15:52:43

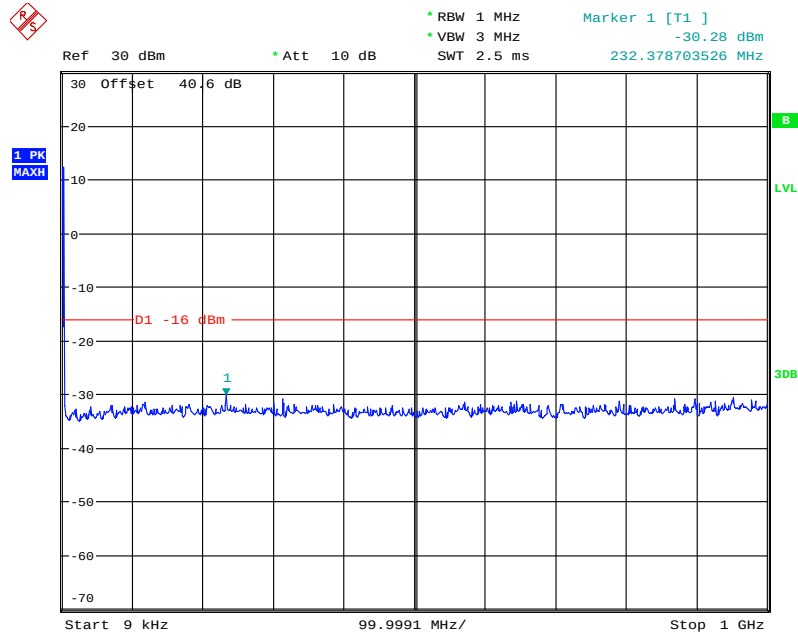
10GHz to 20GHz



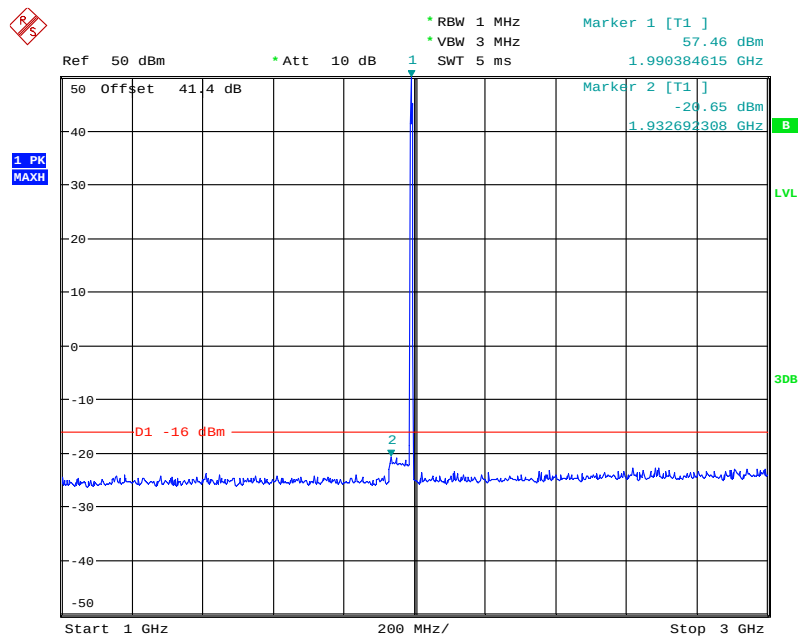
Date: 24.APR.2014 15:53:31



Product Service

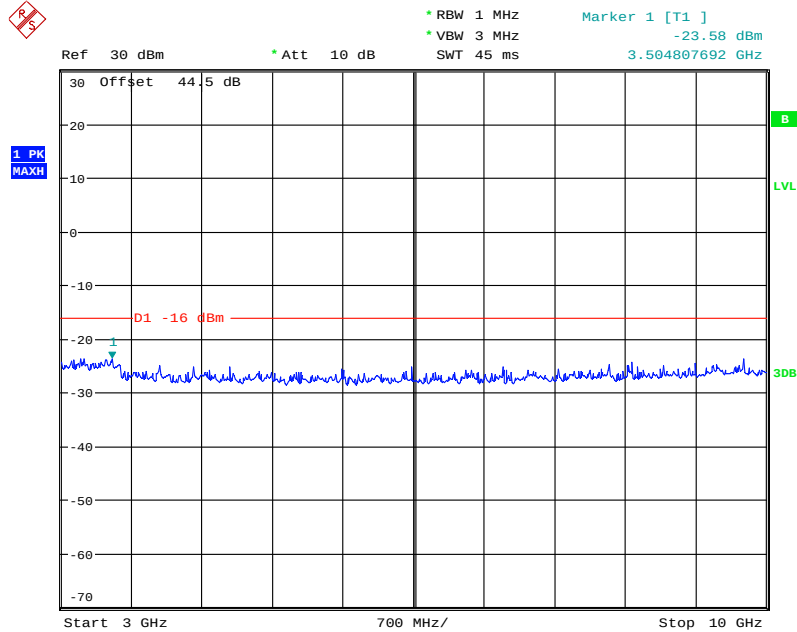
Configuration 1 - Mode 3 - 1.49kHz to 1GHz

Date: 28.APR.2014 13:46:11

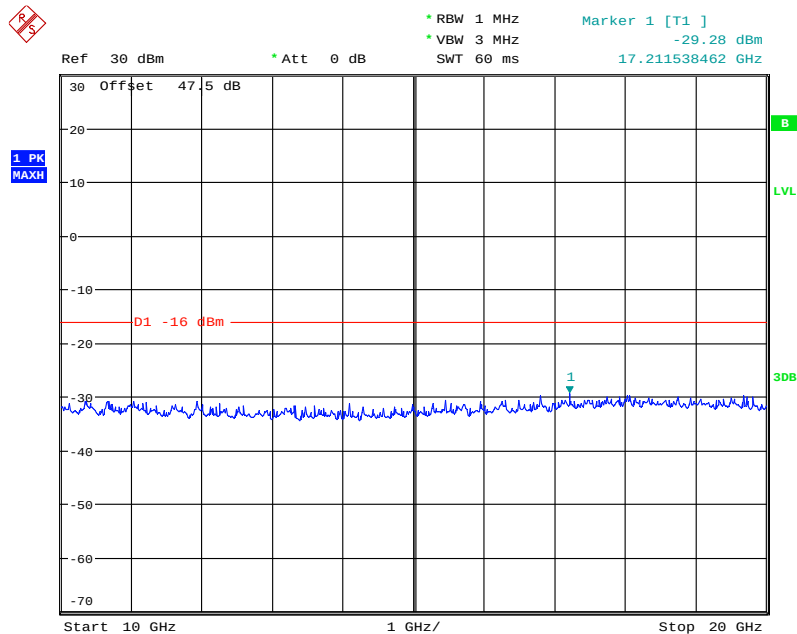
1GHz to 3GHz

Date: 28.APR.2014 13:40:18

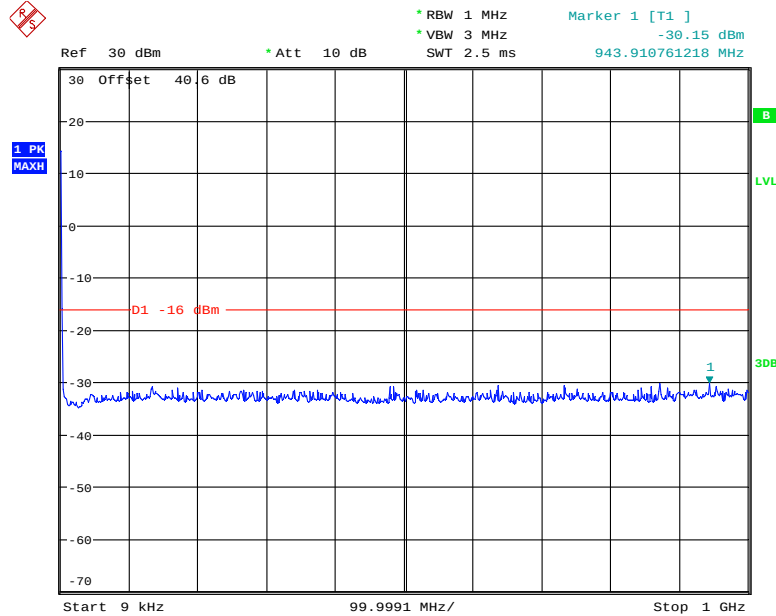
Note: The emission beyond the limit is the operating frequency.

3GHz to 10GHz

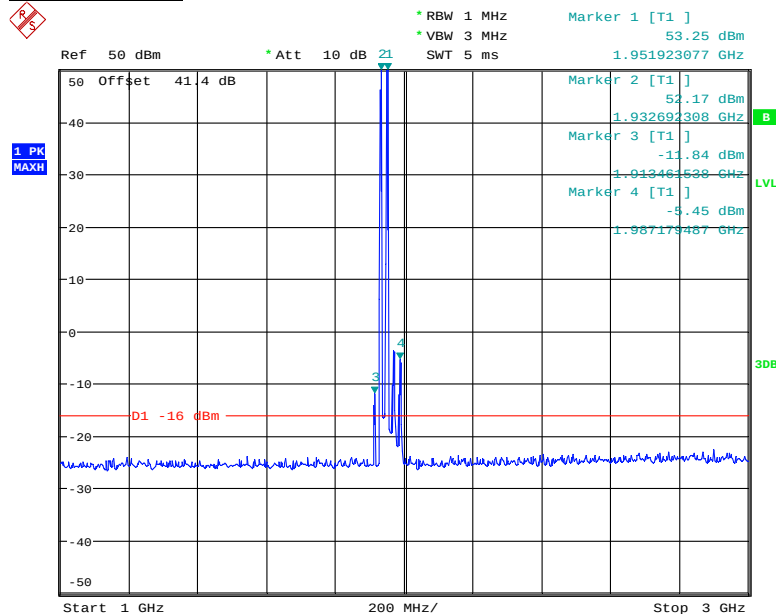
Date: 28.APR.2014 13:38:32

10GHz to 20GHz

Date: 28.APR.2014 13:37:43

**Multi Carrier (x2)****E-TM1.1 - 1.4MHz Bandwidth****Configuration 1 - Mode 4 - 1.4****9kHz to 1GHz**

Date: 28.APR.2014 18:17:23

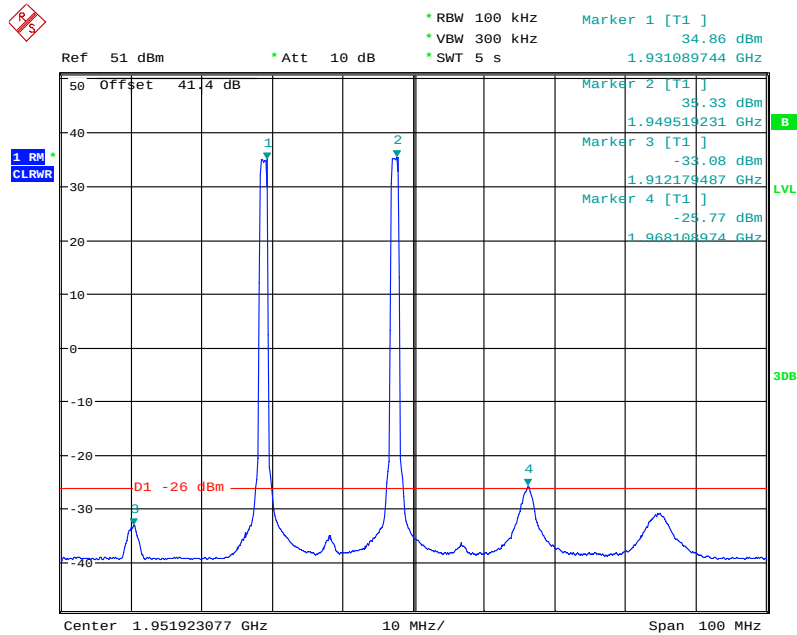
1GHz to 3GHz

Date: 28.APR.2014 18:07:39

Note: The emissions exceeding the limit at markers 1 and 2 are operating frequencies. The emissions exceeding the limit at markers 3 and 4 were re-measured with an RMS detector with a smaller bandwidth, see the plot on page 112 of 135.



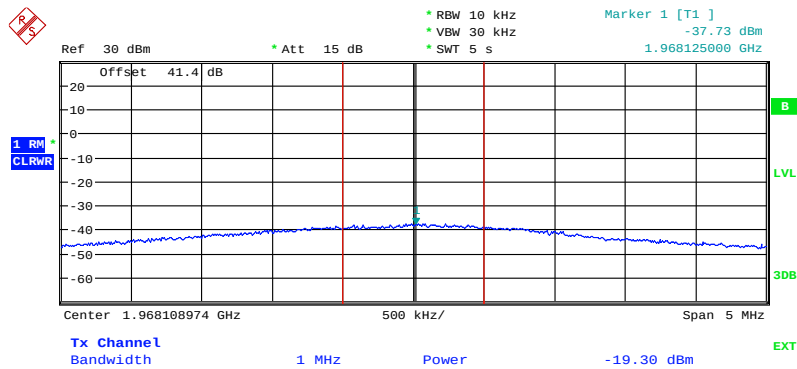
Product Service



Date: 28.APR.2014 18:10:09

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

The channel power for 1968.11MHz is -19.30dBm.

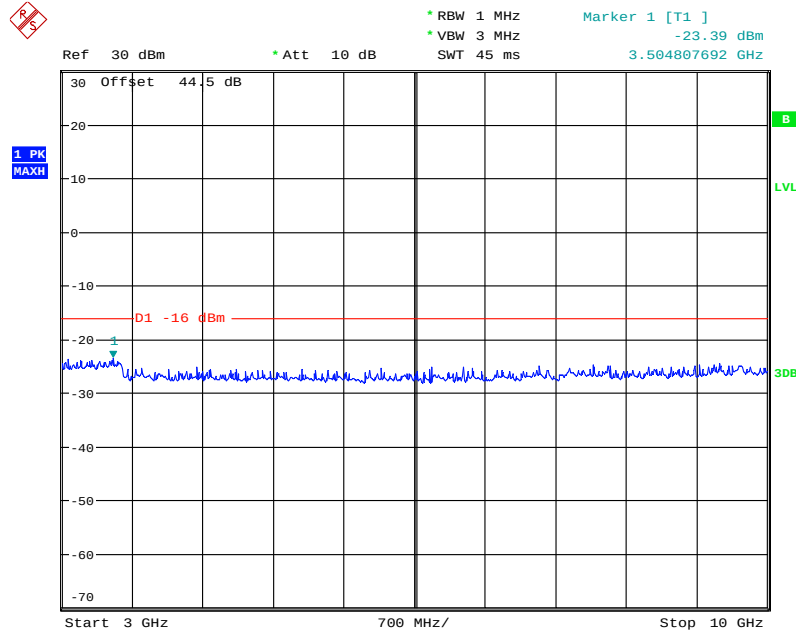


Date: 25.JUN.2014 11:07:06



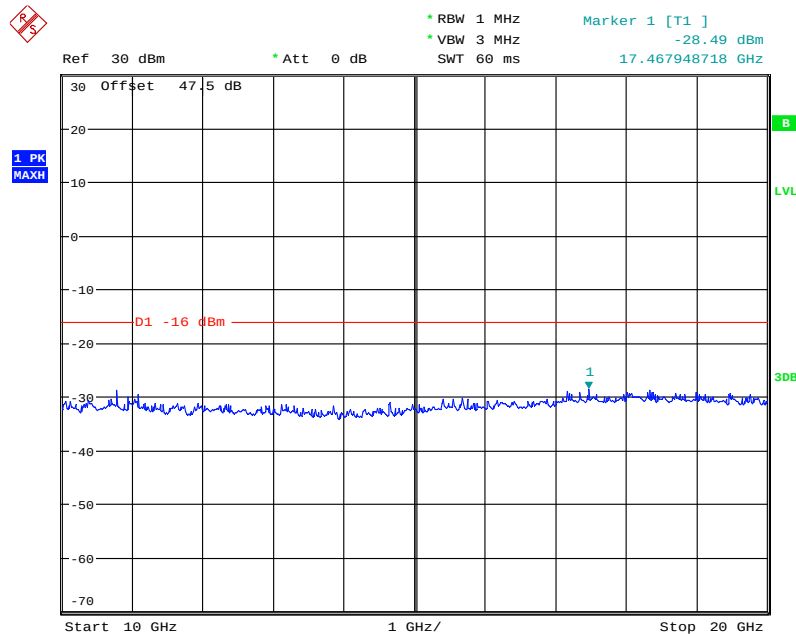
Product Service

3GHz to 10GHz



Date: 28.APR.2014 18:14:48

10GHz to 20GHz

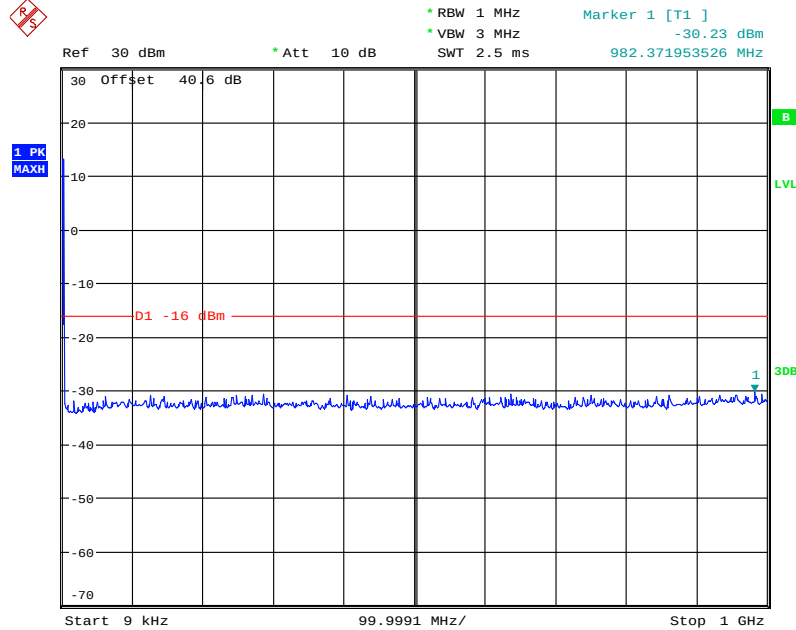


Date: 28.APR.2014 18:15:52



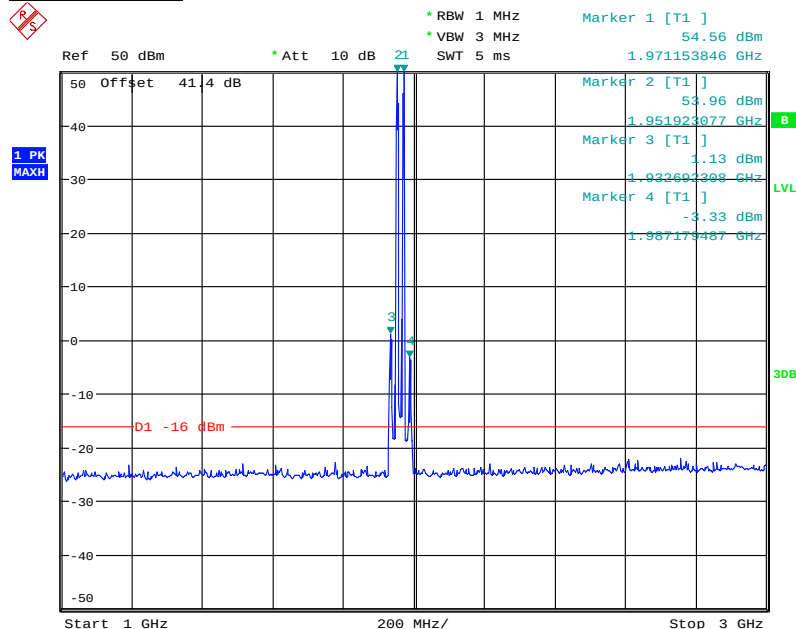
Configuration 1 - Mode 5 - 1.4

9kHz to 1GHz



Date: 29.APR.2014 10:59:01

1GHz to 3GHz

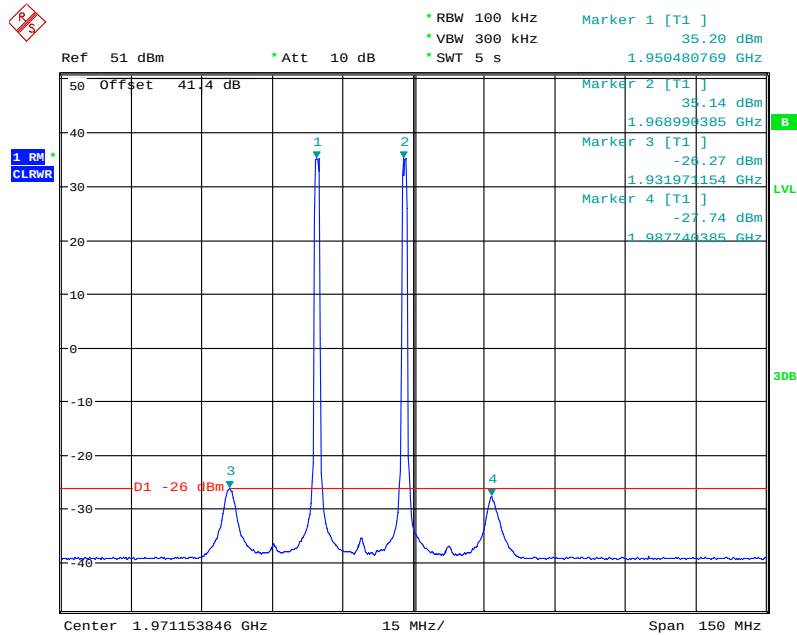


Date: 29.APR.2014 11:15:43

Note: Note: The emissions exceeding the limit at markers 1 and 2 are operating frequencies. The emissions exceeding the limit at markers 3 and 4 were re-measured with an RMS detector with a smaller bandwidth, see the plot on page 115 of 135.



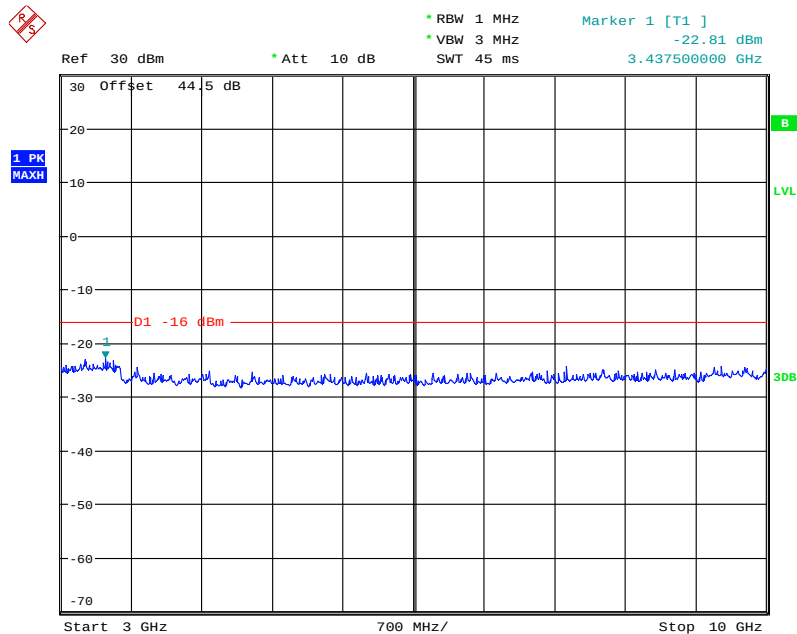
Product Service



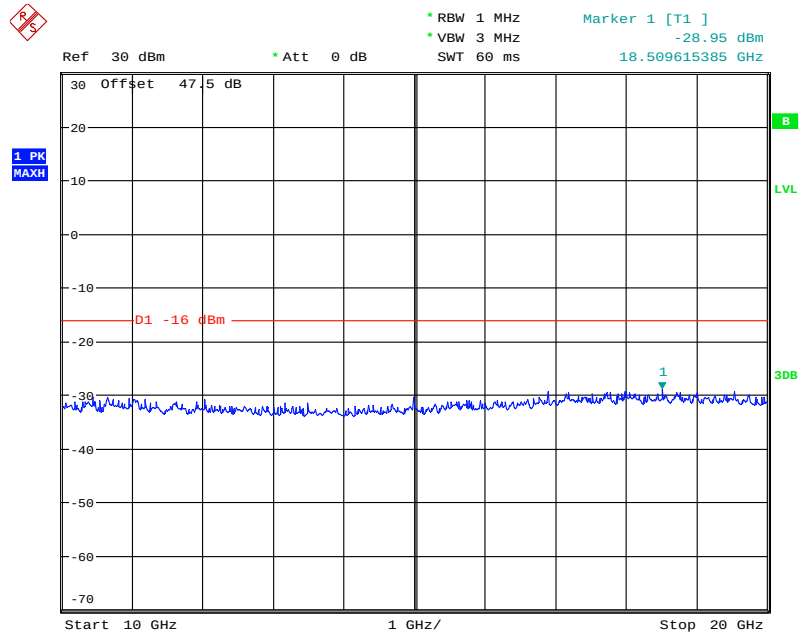
Date: 29.APR.2014 11:18:33

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

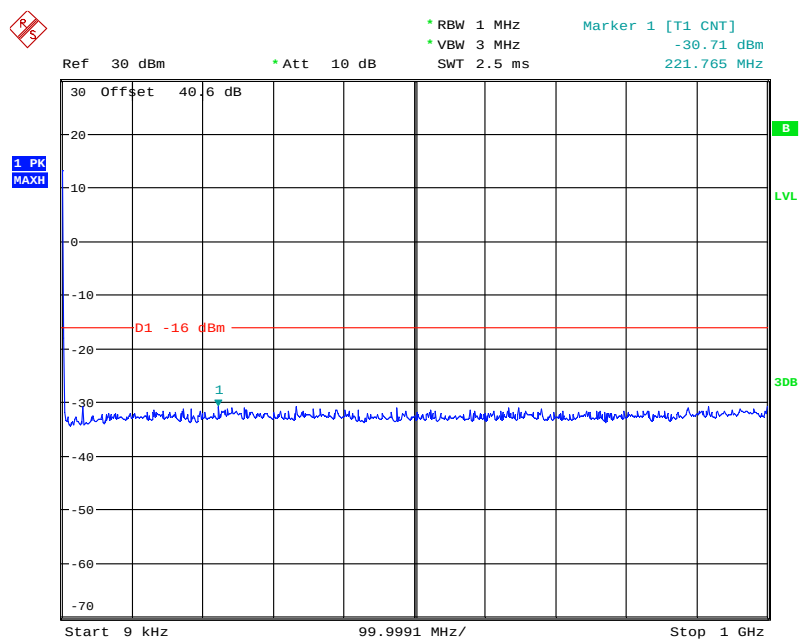
3GHz to 10GHz



Date: 29.APR.2014 11:13:14

10GHz to 20GHz

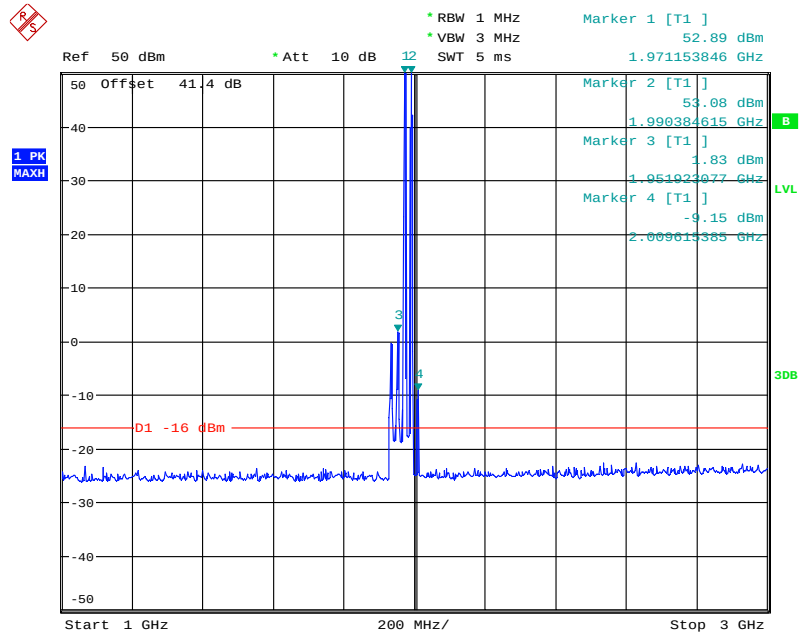
Date: 29.APR.2014 11:12:28

Configuration 1 - Mode 6 - 1.49kHz to 1GHz

Date: 29.APR.2014 12:01:00

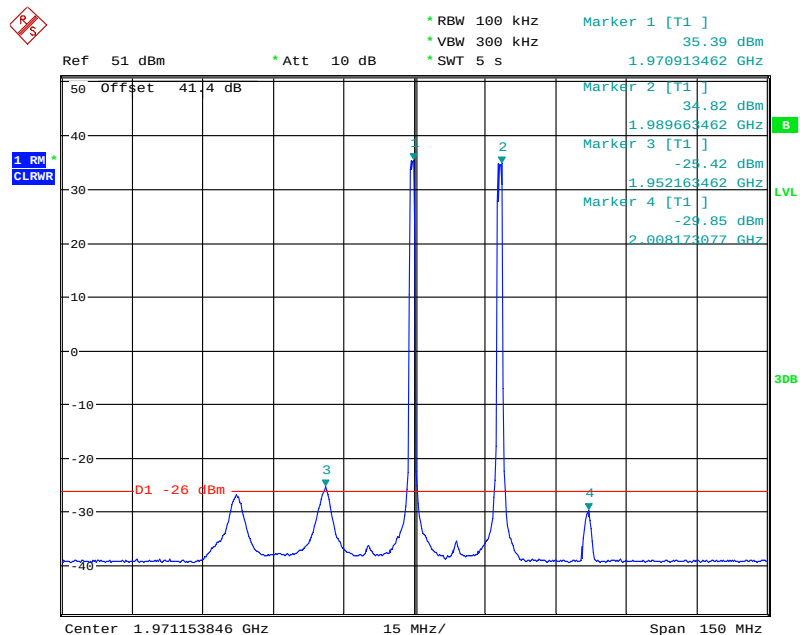


1GHz to 3GHz



Date: 29.APR.2014 11:32:40

Note: The emissions exceeding the limit at markers 1 and 2 are operating frequencies. The emissions exceeding the limit at markers 3 and 4 were re-measured with an RMS detector with a smaller bandwidth, see the plot below.

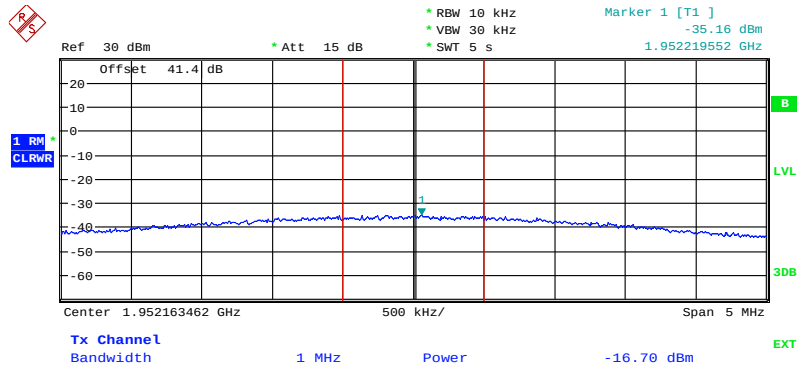


Date: 29.APR.2014 11:34:39

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

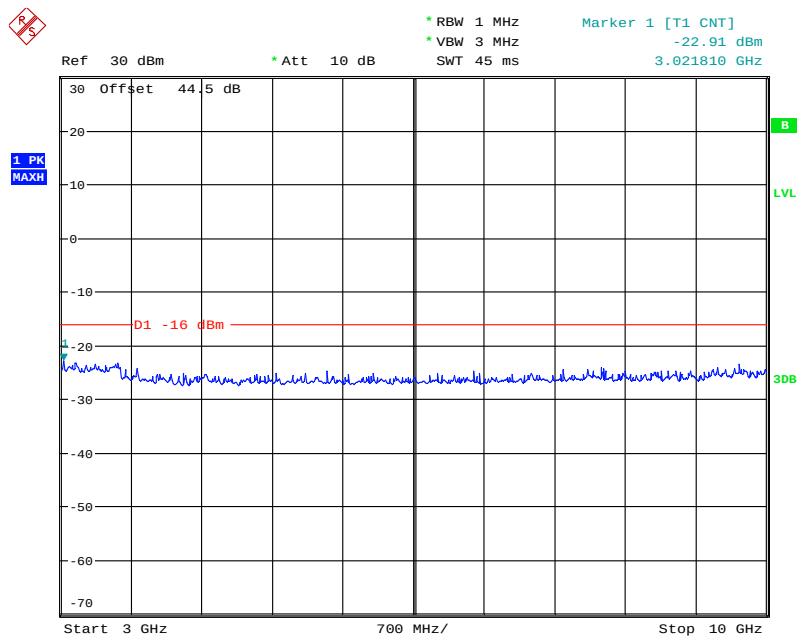


The channel power for 1952.16MHz is -16.70dBm.



Date: 25.JUN.2014 11:01:58

3GHz to 10GHz

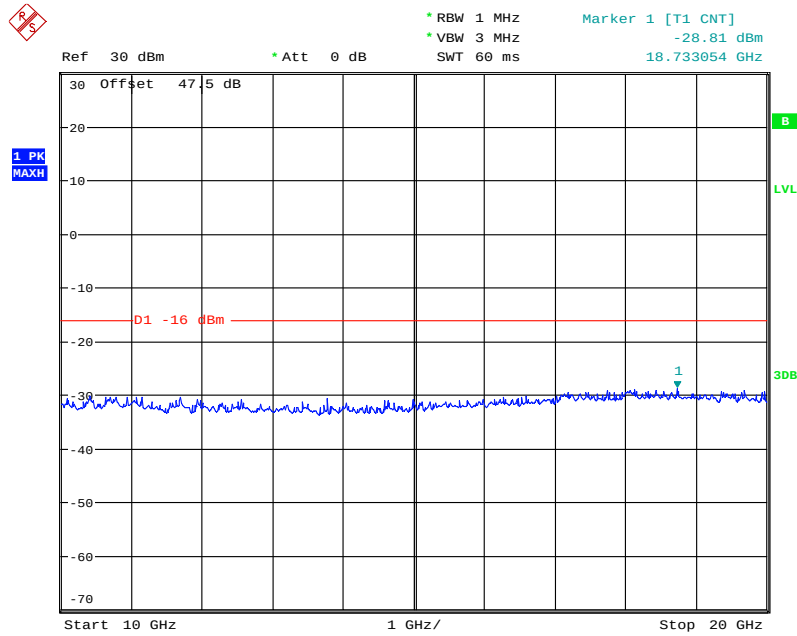


Date: 29.APR.2014 11:45:10



Product Service

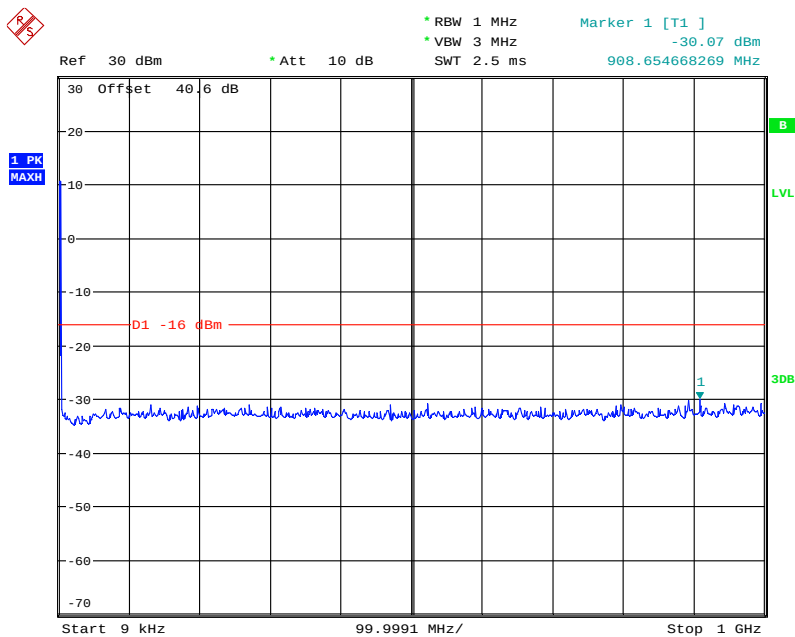
10GHz to 20GHz



Date: 29.APR.2014 11:46:23

Configuration 1 - Mode 4' - 1.4

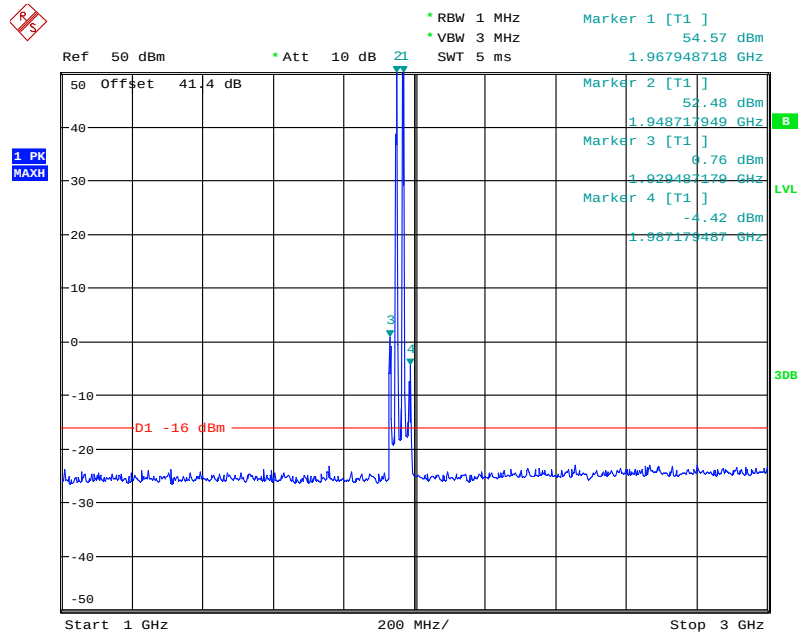
9kHz to 1GHz



Date: 29.APR.2014 10:30:26

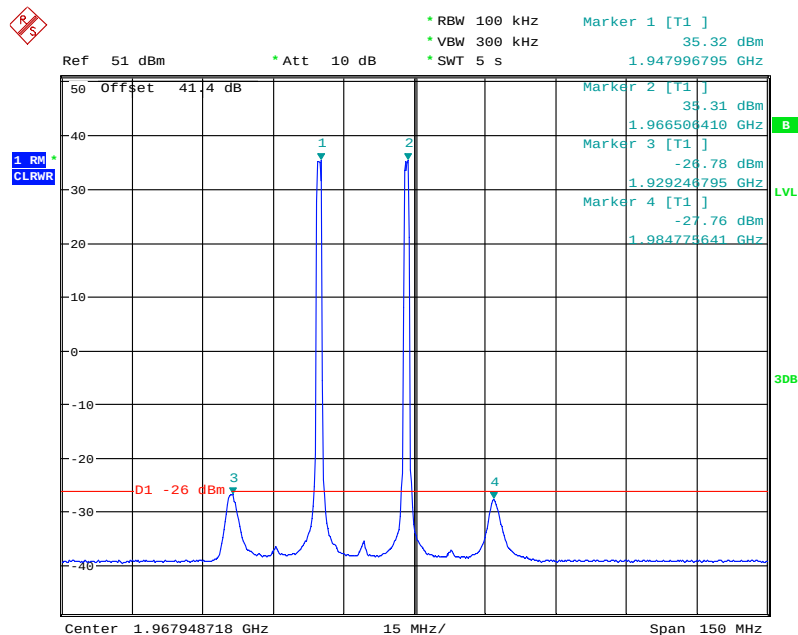


1GHz to 3GHz



Date: 29.APR.2014 10:38:18

Note: The emissions exceeding the limit at markers 1 and 2 are operating frequencies. The emissions exceeding the limit at markers 3 and 4 were re-measured with an RMS detector with a smaller bandwidth, see the plot below.



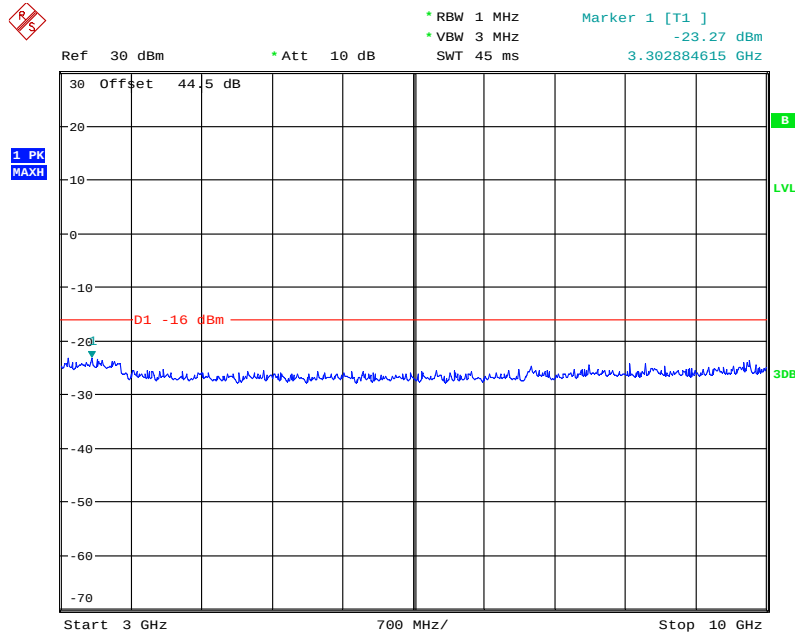
Date: 29.APR.2014 10:39:23

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



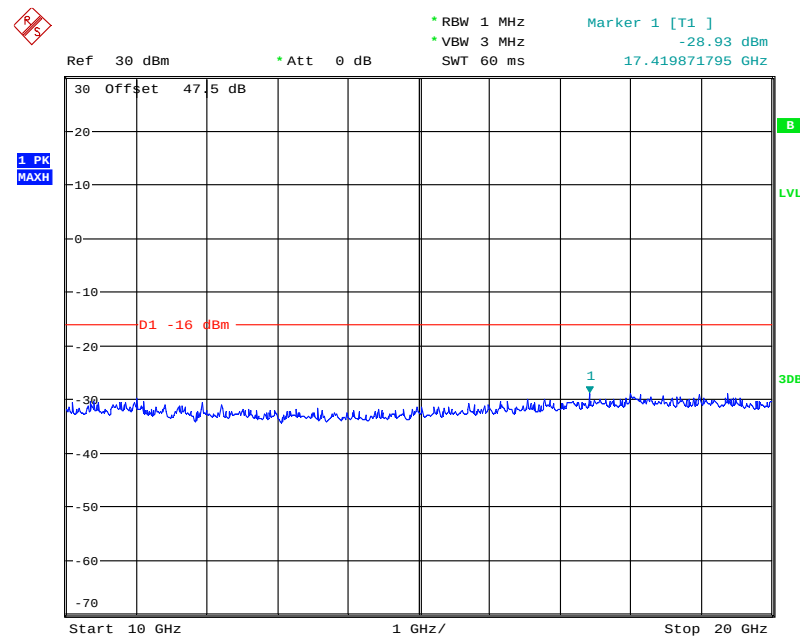
Product Service

3GHz to 10GHz



Date: 29.APR.2014 10:41:47

10GHz to 20GHz

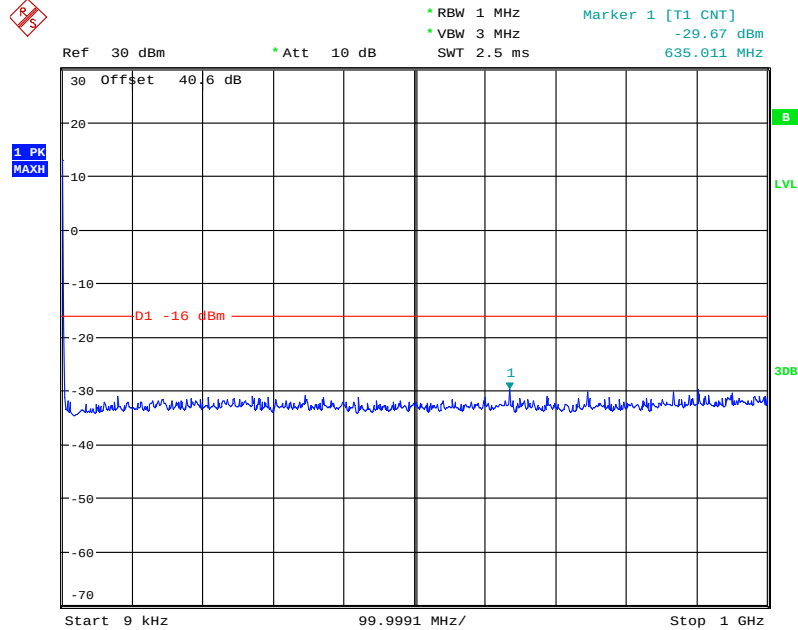


Date: 29.APR.2014 10:42:49



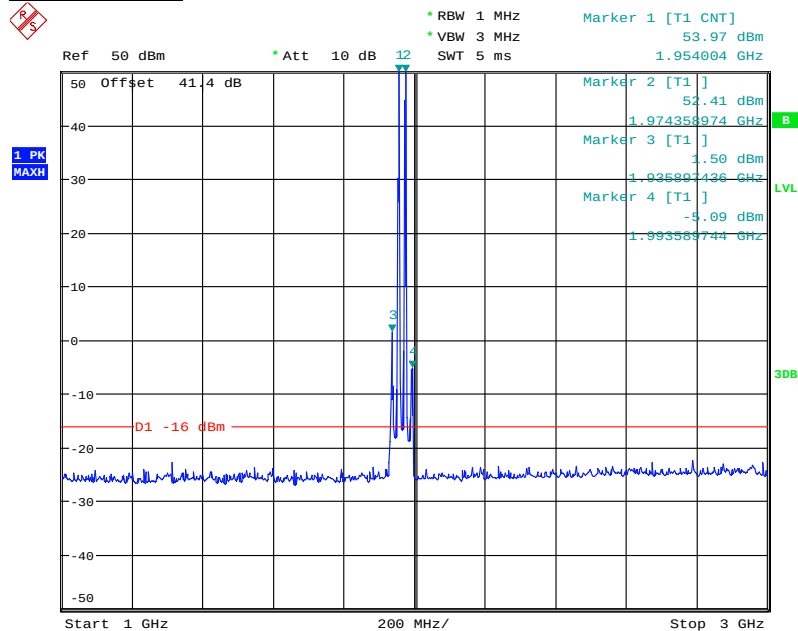
Configuration 1 - Mode 6' - 1.4

9kHz to 1GHz



Date: 29.APR.2014 12:01:38

1GHz to 3GHz

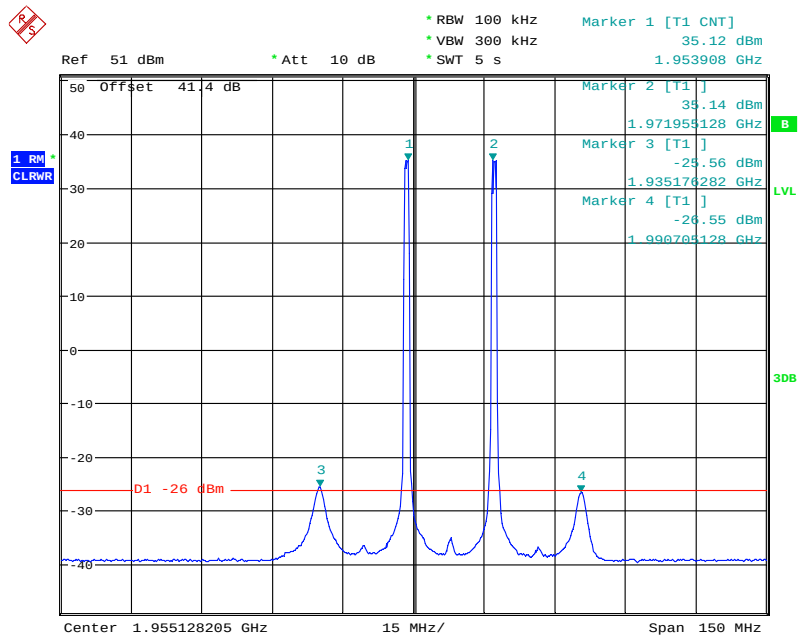


Date: 29.APR.2014 12:03:50

Note: The emissions exceeding the limit at markers 1 and 2 are operating frequencies. The emissions exceeding the limit at markers 3 and 4 were re-measured with an RMS detector with a smaller bandwidth, see the plot on page 123 of 135.



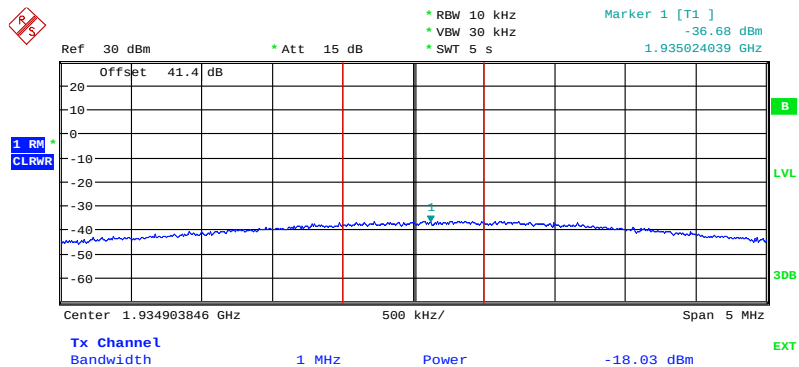
Product Service



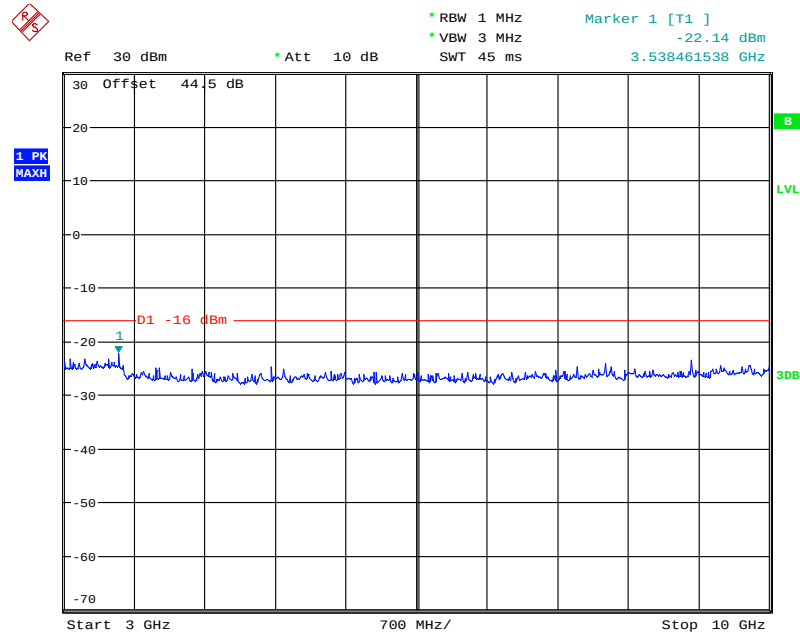
Date: 29.APR.2014 12:04:50

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

The channel power for 1934.90MHz is -18.03dBm.

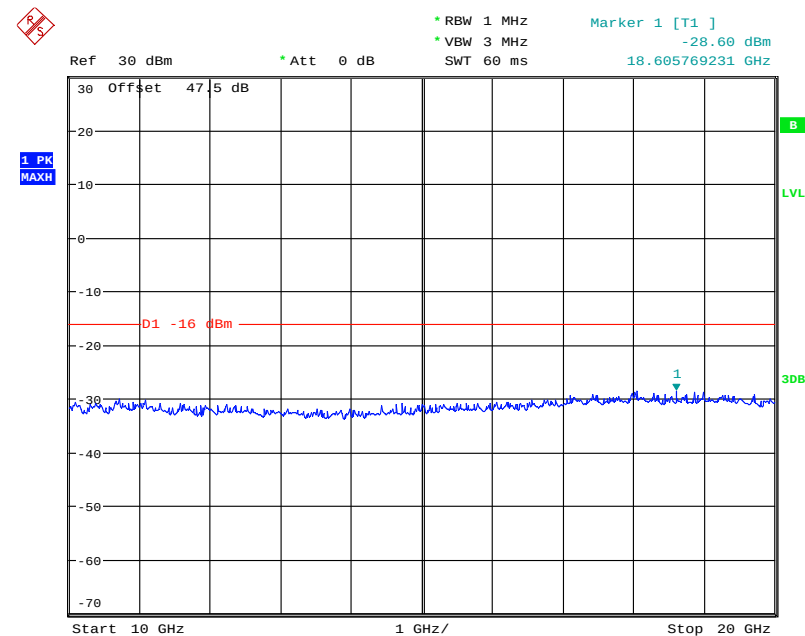


Date: 25.JUN.2014 11:15:00

3GHz to 10GHz

Date: 29.APR.2014 12:08:33

10GHz to 20GHz



Date: 29.APR.2014 12:09:45



Product Service

Limit

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

Remarks

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



Product Service

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 74/1, S/N: CB4J094486, CF80011783

2.8.3 Date of Test and Modification State

12 and 13 May 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 -30°C and +50°C in 10° 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)

2.8.6 Environmental Conditions

Ambient Temperature 22.0 – 24.5°C

Relative Humidity 48.0 – 56.0%



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 (°C)	Deviation (Hz)
-30	-12.28
-20	-12.86
-10	-13.27
0	-13.36
+10	-12.57
+20	-12.25
+30	-12.94
+40	-11.71
+50	-12.43

Limit	$\pm (0.05 \text{ ppm} + 12 \text{ Hz})$ or $\pm 110 \text{ Hz}^*$
-------	--

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.



Product Service

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 74/1, S/N: CB4J094486, CF80011783

2.9.3 Date of Test and Modification State

13 May 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)

2.9.6 Environmental Conditions

Ambient Temperature 22.0 – 24.5°C

Relative Humidity 48.0 – 56.0%



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	-12.48
-48.0	-12.25
-55.2	-11.81

Limit	$\pm (0.05 \text{ ppm} + 12 \text{ Hz})$ or $\pm 110 \text{ Hz}^*$
-------	--

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



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



Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
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

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



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		$<1 \times 10^{-7}$
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



Product Service

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).

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TÜV SÜD Product Service

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