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Report On

FCC Testing of the
Ericsson AB
RRUS 11 B26A / KRC 161 287/2

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FCC ID: TA8AKRC161287-2

Document 75918305 Report 01 Issue 1

August 2012



Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC Testing of the
Ericsson RRUS 11 B26A / KRC 161 287/2

Document 75918305 Report 01 Issue 1

August 2012

PREPARED FOR

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Test Engineer

APPROVED BY

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DATED

16 August 2012

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 90. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

X Zhang

C Zhang





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Ericsson AB
RRUS 11 B26A / KRC 161 287/2



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 11 B26A / KRC 161 287/2 to the requirements of FCC CFR 47 Part 90.

Testing was carried out in support of a C2PC application for Grant of RRUS 11 B26A / KRC 161 287/2 to include LTE wireless network.

Objective	To perform FCC 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 11 B26A
Product Number	KRC 161 287/2
Serial Number(s)	C826062821, C826062822
RBS Software Version	CXP102051/14_R20T
PIS Software Version	CXP 901 7316/1, R44GS
Hardware Version	R1C
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 90: 2011
Incoming Release Date	Declaration of Build Status 4 June 2012
Order Number Date	PTP 30 May 2012
Start of Test	4 June 2012
Finish of Test	29 June 2012
Name of Engineer(s)	X Zhang C Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2011



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 2 and 90, is shown below.

Configuration 1 – Radio Equipment						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 90					
	90.635	Effective Radiated Power	863.7MHz (3MHz OBW) / 864.5MHz (5MHz OBW)		N/A	No integral antenna.
			865.5MHz (3MHz, 5MHz OBW)		N/A	
			867.3MHz (3MHz OBW) / 866.5MHz (5MHz OBW)		N/A	
2.1	2.1046, 90.635	Maximum Output Power - Conducted	863.7MHz (3MHz OBW) / 864.5MHz (5MHz OBW)	0	Pass	-
			865.5MHz (3MHz, 5MHz OBW)	0	Pass	
			867.3MHz (3MHz OBW) / 866.5MHz (5MHz OBW)	0	Pass	
2.2	2.1047 (d)	Modulation Characteristics	863.7MHz (3MHz OBW)		N/A	-
			865.5MHz (3MHz OBW)	0	Pass	
			867.3MHz (3MHz OBW)		N/A	
2.3	2.1049 (h)	Occupied Bandwidth ¹	863.7MHz (3MHz OBW) / 864.5MHz (5MHz OBW)		N/A	-
			865.5MHz (3MHz, 5MHz OBW)	0	Pass	
			867.3MHz (3MHz OBW) / 866.5MHz (5MHz OBW)		N/A	
2.4	2.1051, 90.210 (g), 90.691	Emission Masks	863.7MHz (3MHz OBW) / 864.5MHz (5MHz OBW)	0	Pass	-
			865.5MHz (3MHz, 5MHz OBW)		N/A	
			867.3MHz (3MHz OBW) / 866.5MHz (5MHz OBW)	0	Pass	
2.5	2.1053, 90.691	Radiated Spurious Emissions	863.7MHz (3MHz OBW)	0	Pass	-
			865.5MHz (3MHz, 5MHz OBW)	0	Pass	
			867.3MHz (3MHz OBW)	0	Pass	
2.6	2.1051, 90.691	Conducted Spurious Emissions	863.7MHz (3MHz OBW) / 864.5MHz (5MHz OBW)	0	Pass	-
			865.5MHz (3MHz, 5MHz OBW)	0	Pass	
			867.3MHz (3MHz OBW) / 866.5MHz (5MHz OBW)	0	Pass	
2.7	2.1055, 90.213	Frequency Stability Under Temperature Variations	863.7MHz (3MHz OBW)		N/A	-
			865.5MHz (3MHzOBW)	0	Pass	
			867.3MHz (3MHz OBW)		N/A	
2.8	2.1055, 90.213	Frequency Stability Under Voltage Variations	863.7MHz (3MHz OBW)			
			865.5MHz (3MHzOBW)	0	Pass	
			867.3MHz (3MHz OBW)		N/A	

N/A – Not Applicable

Note1: See FCC 12-25.



1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NUMBER	RRUS 11 B26A
PART NUMBER	KRC 161 287/2
SERIAL NUMBER	C826062821, C826062822
HARDWARE VERSION	R1C
RBS SOFTWARE VERSION	CXP102051/14_R20T
PIS SOFTWARE VERSION	CXP 901 7316/1, R44GS
TRANSMITTER OPERATING RANGE	TX: 862MHz - 869MHz RX: 817MHz - 824MHz
MODULATIONS	QPSK, 16QAM, 64QAM
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	3M00F9W 5M00F9W
CHANNEL BANDWIDTH	3MHz, 5MHz according to 3GPP TS 36.141
OUTPUT POWER (RMS) (W or dBm)	2 x 46.0dBm (2 x 40W)
OUTPUT POWER TOLERANCE	± 1.0dB
NUMBER OF ANTENNA PORTS	2 TX/ RX ports
SUPPORTED CONFIGURATION	Dual Single Carrier: TX Diversity. Both RF chains are identical
FCC ID	TA8AKRC161287-2
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of LTE Base Station.

Signature

Date

7 July 2012

D of B S Serial No

75918305/01

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 11 B26A / KRC 161 287/2 is an Ericsson Radio Equipment working in the public mobile service 800MHz band which operates in LTE mode. The RRUS 11 B26A / KRC 161 287/2 operates from a - 48V DC supply.

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



Equipment Under Test



1.4.2 Test Configuration

Configuration 1: Radio Equipment

The EUT was configured in accordance with FCC CFR 47 Part 90.

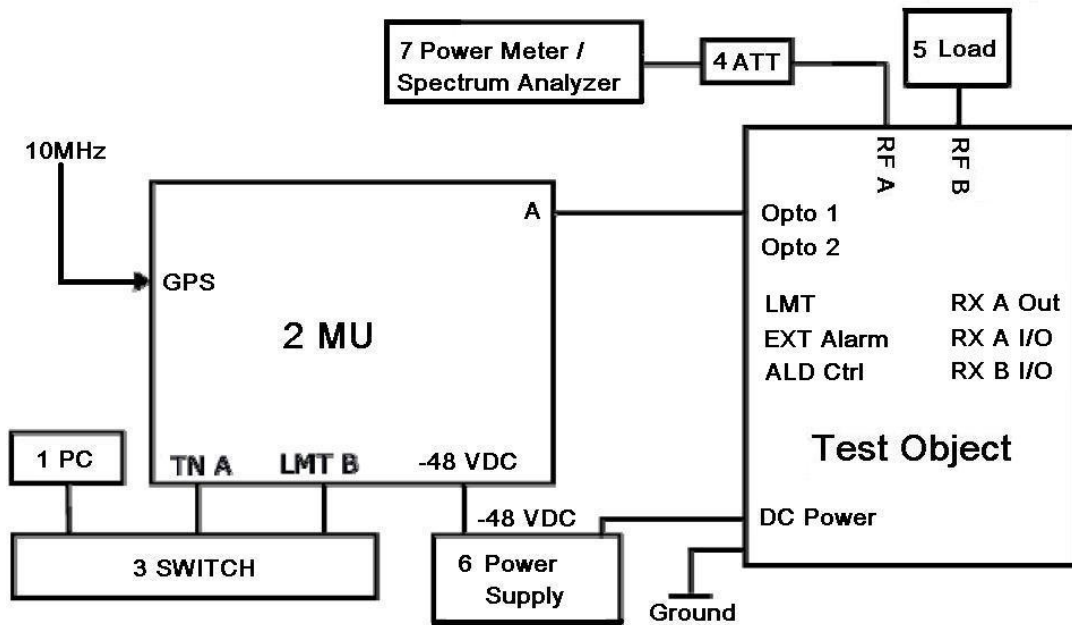
The RRUS 11 B26A / KRC 161 287/2 supports both single mode and TX Diversity mode. Both modes have been included when several settings were tested to find worst case setting, and TX Diversity was used for the TX measurements.

The RRUS 11 B26A / KRC 161 287/2 supports Test Models E-TM1.1, E-TM3.2 and E-TM3.1 at 800MHz defined in 3GPP TS 36.141. Test Model E-TM1.1 was used to represent QPSK modulation only, Test Model E-TM3.2 was used to represent 16QAM modulation, and Test Model E-TM3.1 was used to represent 64QAM modulation.

The EUT has two TX/RX ports and it can be configured to transmit in 800MHz with both TX are active.

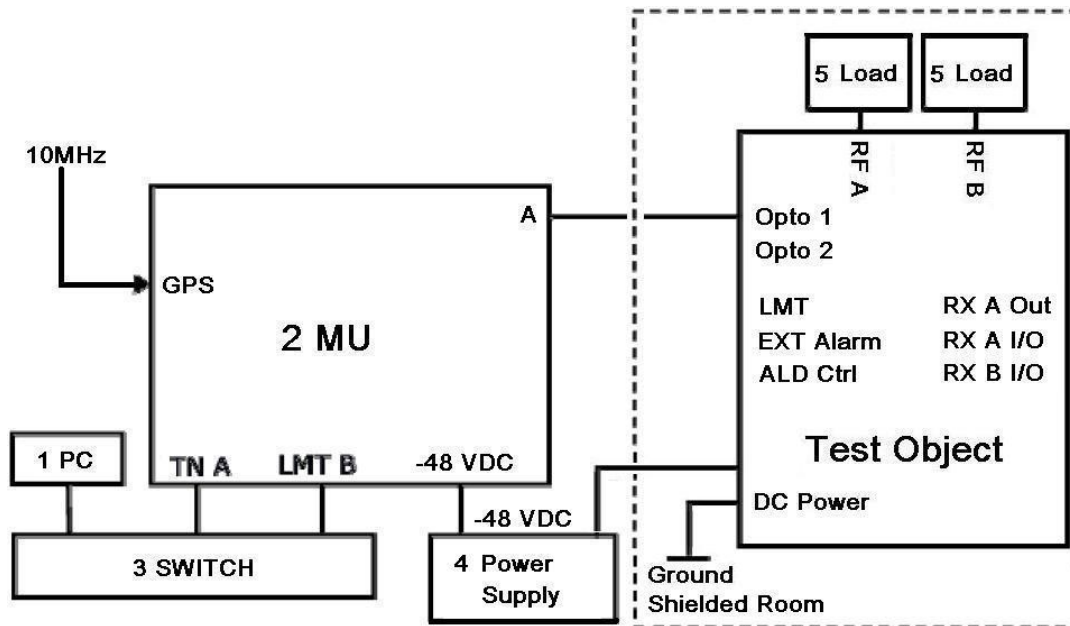
For TX test cases Maximum Output Power, Emission Masks and Conducted Spurious Emissions, measurements were performed on both combined TX/RX output connectors RF A and RF B of the EUT. For all other TX test cases, measurements were performed on the combined TX/TX output connector RF A. The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

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

**Test Setup, Conducted Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 11 B26A / KRC 161 287/2	R1C	C826062821

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	IPC-610H	--	ATBB094173
2	RBS 6601	BFL 901 009/1	--	--
	DUL 20 01	KDU 137 533/4	R1C	CB4H274963
	SUP 6601	1/ BFL 901 009/1	R3B	BR81262575
3.	Switch	TL-SF1008+	--	11328413316
4.	Attenuator	48-40-43-LIM	--	BR5020
5.	Load	TF100	--	09121616
6	Power Supply	DH1716A-14	--	ETD/L041
7	Power Meter	NRP	--	101310
	Thermal Power Sensor	NRP-Z51	--	102116
	Spectrum Analyzer	FSQ26	--	201124

**Test Setup, Radiated Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 11 B26A / KRC 161 287/2	R1C	C826062822

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	IPC-610H	--	ATBB094173
2	RBS 6601	BFL 901 009/1	--	--
	DUL 20 01	KDU 137 533/4	R1C	CB4H274963
	SUP 6601	1/ BFL 901 009/1	R3B	BR81262575
3.	Switch	TL-SF1008+	--	11328413316
4	Power Supply	DH1716A-14	--	ETD/L041
5	Load	TF100	--	09121616
	Load	TF100	--	08011709



Product Service

1.4.3 Modes of Operation

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

Bottom Channel :

Mode 1 - 3 : EARFCN 8737 : 863.7MHz (3MHz Bandwidth)

Mode 1 - 5 : EARFCN 8745 : 864.5MHz (5MHz Bandwidth)

Middle Channel :

Mode 2 : EARFCN 8755 : 865.5MHz

Top Channel :

Mode 3 - 3 : EARFCN 8773: 867.3MHz (3MHz Bandwidth)

Mode 3 - 5 : EARFCN 8765: 866.5MHz (5MHz 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

No modifications were made to the EUT during testing.

1.8 ALTERNATIVE TEST SITE

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

FCC Accreditation 910917:

The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.



Product Service

SECTION 2

TEST DETAILS

FCC Testing of the
Ericsson AB
RRUS 11 B26A / KRC 161 287/2



Product Service

2.1 MAXIMUM OUTPUT POWER - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2 Clause 2.1046
FCC CFR 47 Part 90, Clause 90.635

2.1.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.1.3 Date of Test and Modification State

11 and 21 July 2012 – Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above 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 90.

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.

Since the EUT transmits on two antennas simultaneously in the same frequency range, i.e, TX Diversity, using the Measure-and-Sum approach, the output power at both antennas were tested, and the total output power were then summed mathematically in linear power units.

The path loss was measured and 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 - 3, Mode 1 - 5
- Mode 2 (3MHz, 5MHz OBW)
- Mode 3 - 3, Mode 1 - 5

2.1.6 Environmental Conditions

	11 June 2012	21 June 2012
Ambient Temperature	26.0°C	26.5°C
Relative Humidity	43.0%	56.4%



2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 90 for Maximum Output Power.

The test results are shown below

Antenna A and B

E-TM1.1

3MHz Bandwidth

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

EARFCN	Frequency (MHz)	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
8737	863.7	45.43	34.91	45.35	34.28	48.40	69.19
8755	865.5	45.53	35.73	45.62	36.48	48.59	72.21
8773	867.3	45.84	38.37	45.83	38.28	48.85	76.65

5MHz Bandwidth

Configuration 1 - Mode 1 - 5, Mode 2 and Mode 3 - 5

EARFCN	Frequency (MHz)	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
8745	864.5	45.07	32.14	45.48	35.32	48.29	67.46
8755	865.5	45.60	36.31	45.63	36.56	48.63	72.87
8765	866.5	45.72	37.33	45.74	37.50	48.74	74.83

**E-TM3.2****3MHz Bandwidth****Configuration 1 - Mode 1 - 3, Mode 2 and Mode 3 - 3**

EARFCN	Frequency (MHz)	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
8737	863.7	45.38	34.51	45.33	34.12	48.37	68.63
8755	865.5	45.52	35.65	45.60	36.31	48.57	71.96
8773	867.3	45.78	37.84	45.79	37.93	48.79	75.77

5MHz Bandwidth**Configuration 1 - Mode 1 - 5, Mode 2 and Mode 3 - 5**

EARFCN	Frequency (MHz)	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
8745	864.5	45.44	34.99	45.48	35.32	48.47	70.31
8755	865.5	45.48	35.32	45.52	35.65	48.51	70.97
8765	866.5	45.94	39.26	45.95	39.36	48.96	78.62

**E-TM3.1****3MHz Bandwidth****Configuration 1 - Mode 1 - 3, Mode 2 and Mode 3 - 3**

EARFCN	Frequency (MHz)	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
8737	863.7	45.40	34.67	45.35	34.28	48.39	68.95
8755	865.5	45.51	35.56	45.61	36.39	48.57	71.95
8773	867.3	45.81	38.11	45.81	38.11	48.82	76.22

5MHz Bandwidth**Configuration 1 - Mode 1 - 5, Mode 2 and Mode 3 - 5**

EARFCN	Frequency (MHz)	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
8745	864.5	45.47	35.24	45.53	35.73	48.51	70.97
8755	865.5	45.51	35.56	45.57	36.06	48.55	71.62
8765	866.5	45.71	37.24	45.77	37.76	48.75	75.0

Limit	≤1000W or ≤+60dBm
-------	-------------------

Remarks

The EUT does not exceed 1000W or 60dBm at the measured frequencies.



Product Service

2.2 MODULATION CHARACTERISTICS

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047 (d)

2.2.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.2.3 Date of Test and Modification State

11 and 12 June 2012 – Modification State 0

2.2.4 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2.

Connect the TX output connector RF A to a spectrum analyzer with an attenuator. The other connector RF B 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 modulation.

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

Configuration 1 - Mode 2 (3MHz OBW)

2.2.5 Environmental Conditions

	11 June 2012	12 June 2012
Ambient Temperature	26.0°C	26.5°C
Relative Humidity	43.0%	49.0%



2.2.6 Test Results

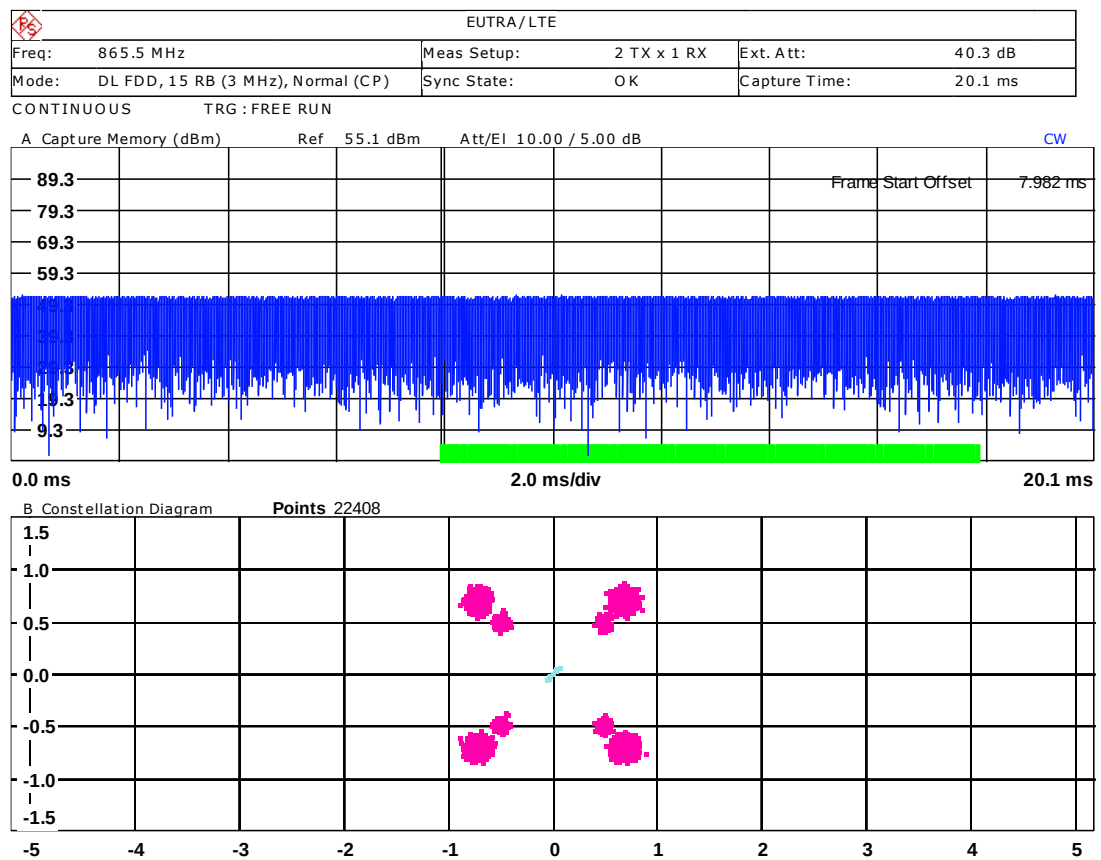
Plots are listed on the following showing the EUT transmitting with all of the modulations:

The test results are shown below

Configuration 1 - Mode 2

3MHz Bandwidth

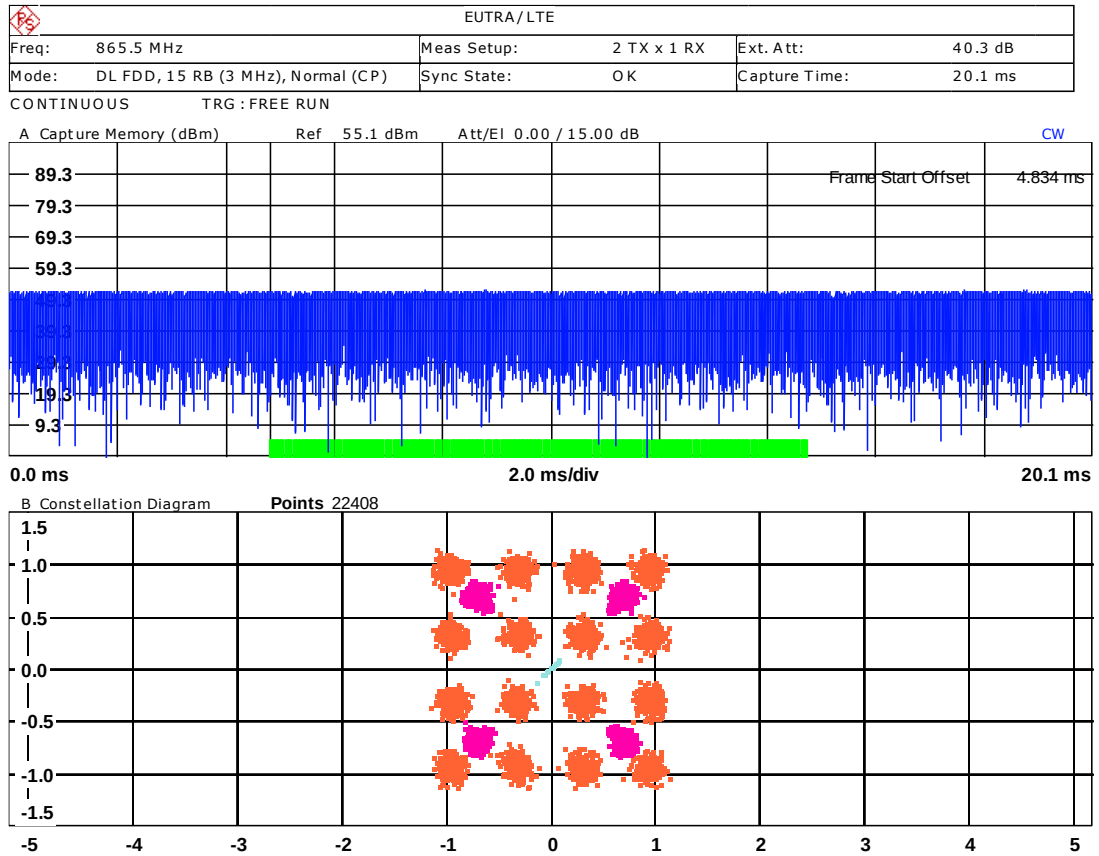
E-TM1.1: EUT transmitting with QPSK modulation:



Date: 11.JUN.2012 09:50:32



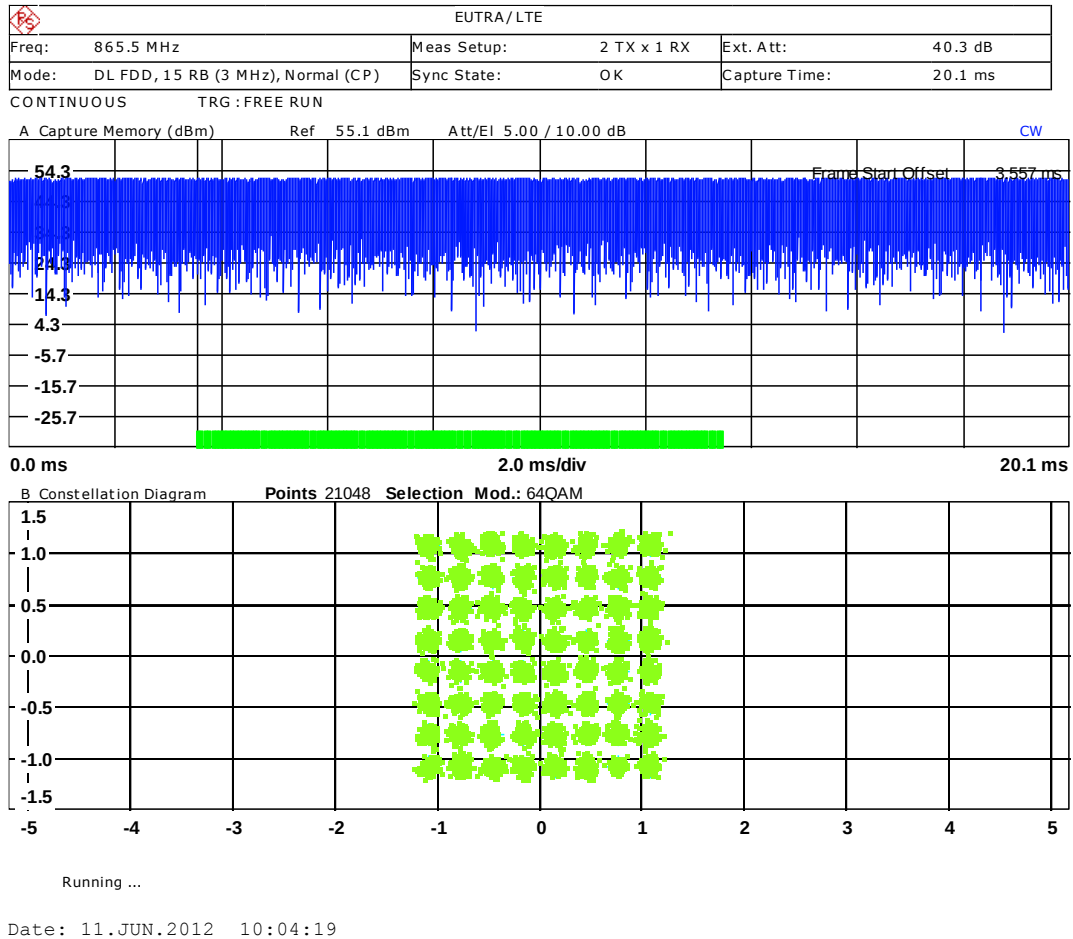
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E-TM3.2: EUT transmitting with 16QAM modulation:

Date: 12.JUN.2012 04:46:44



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





Product Service

2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049 (h)
FCC 12-25

2.3.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.3.3 Date of Test and Modification State

11, 12 and 21 June 2012 – Modification State 0

2.3.4 Test Equipment Used

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

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and FCC 12-25.

The EUT was transmitting at maximum power, E-TM1.1, E-TM3.2 and E-TM3.1 were tested sing middle channel as the representative channel. The EUT was tested in the supported 3MHz and 5MHz bandwidths. At least 1% of the bandwidth were used for the resolution bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

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

Configuration 1 - Mode 2 (3MHz, 5MHz OBW)

2.3.6 Environmental Conditions

	11 June 2012	12 June 2012	21 June 2012
Ambient Temperature	26.0°C	26.5°C	26.5°C
Relative Humidity	43.0%	49.0%	56.4%



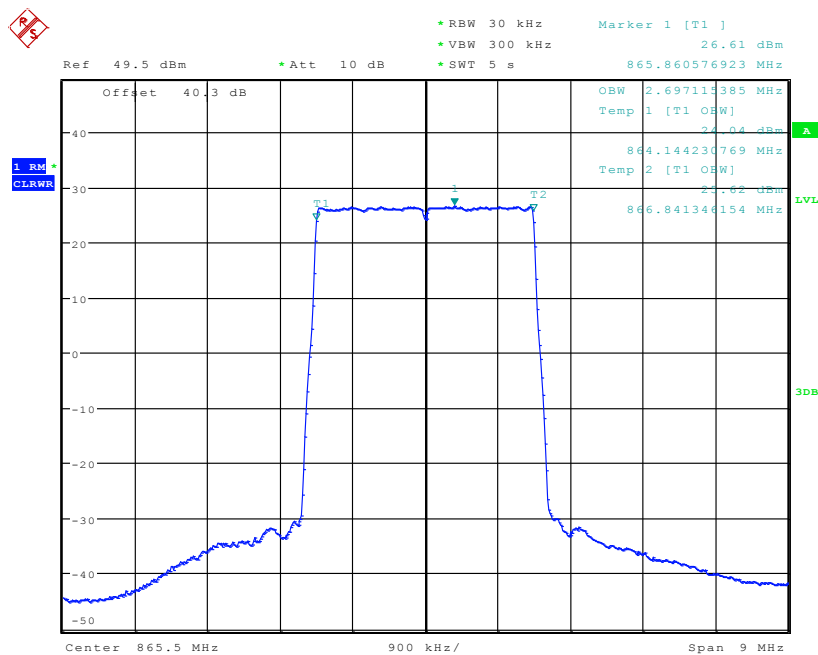
2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and FCC 12-25 for Occupied Bandwidth.

The test results are shown below

Configuration 1 - Mode 2 : 3MHz Bandwidth

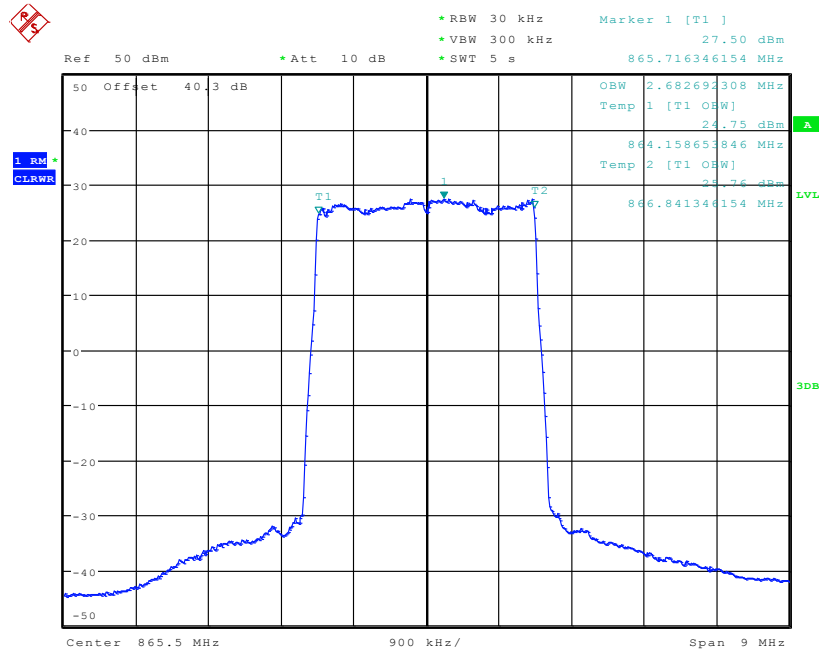
E-TM1.1



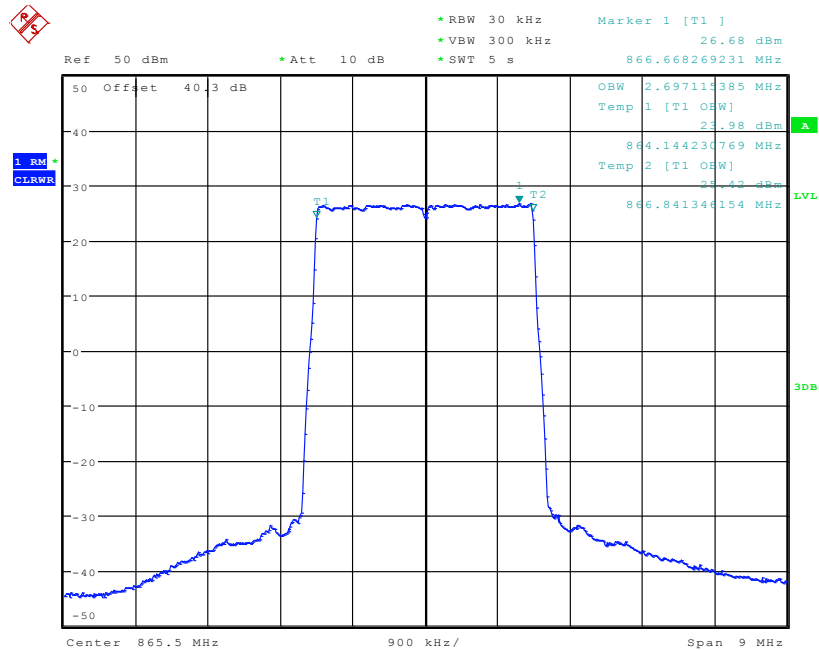
Date: 11.JUN.2012 09:40:33



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E-TM3.2

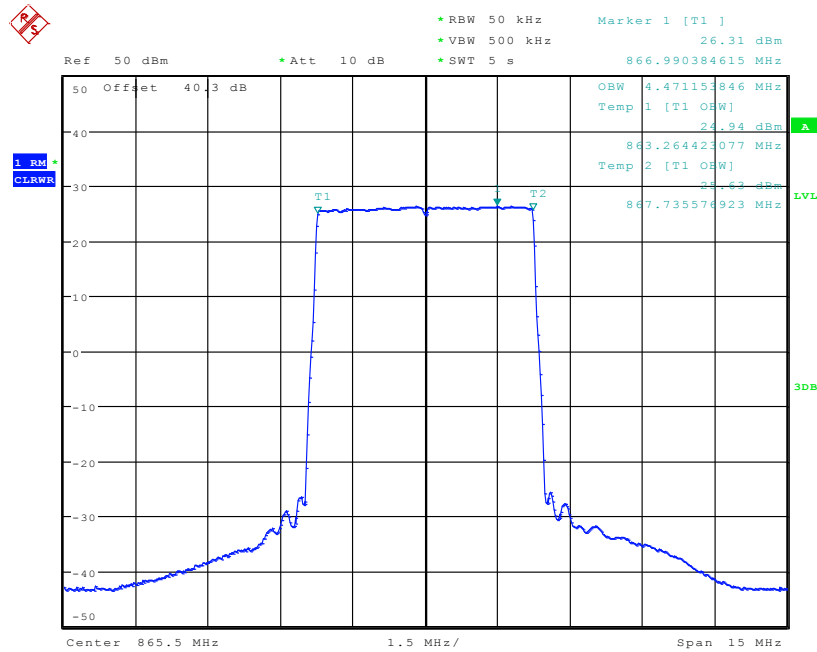
Date: 12.JUN.2012 04:56:54

E-TM3.1

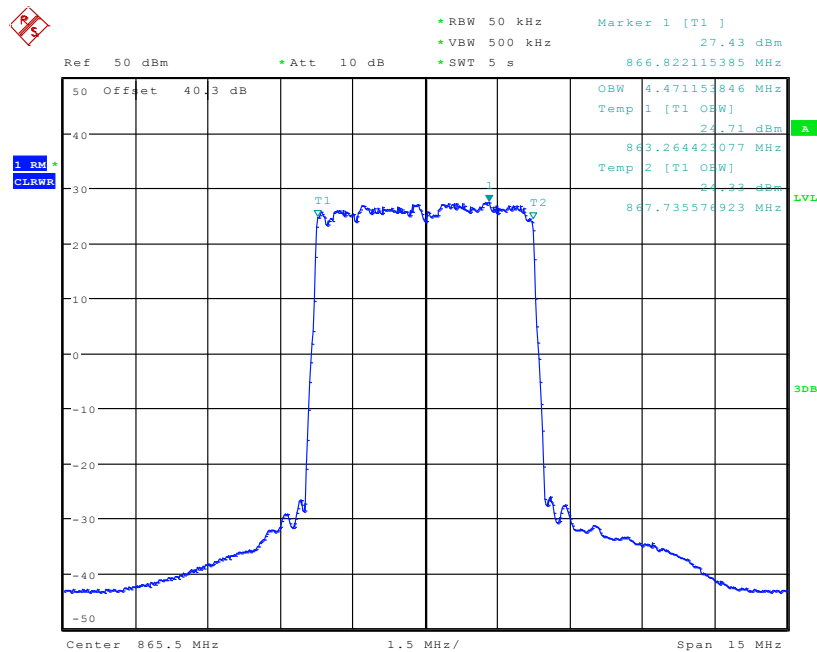
Date: 11.JUN.2012 10:08:08



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Configuration 1 - Mode 2 : 5MHz Bandwidth**E-TM1.1**

Date: 21.JUN.2012 11:25:29

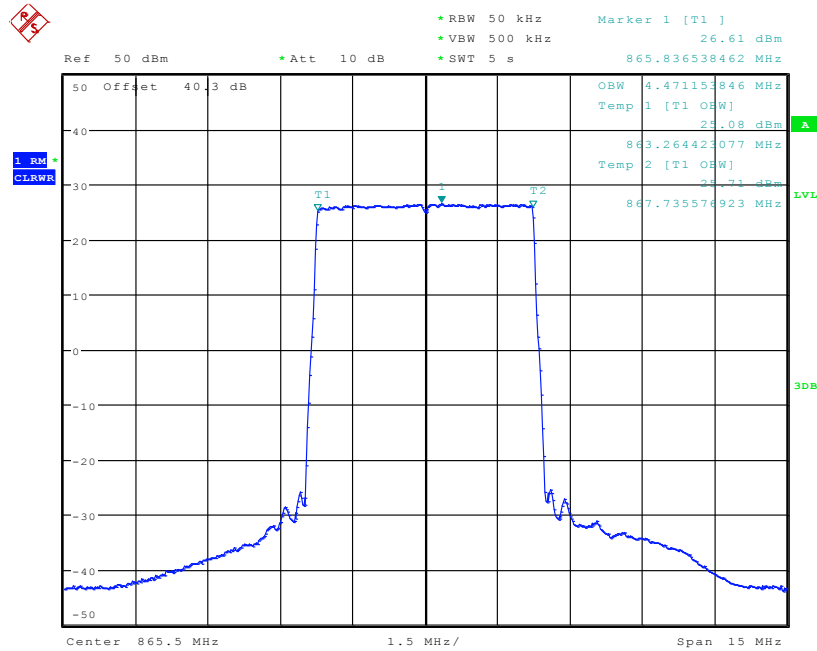
E-TM 3.2

Date: 12.JUN.2012 04:18:15



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E-TM 3.1



Date: 11.JUN.2012 08:14:10



Product Service

2.4 EMISSION MASKS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 90, Clause 90.210 (g)
FCC CFR 47 Part 90, Clause 90.691

2.4.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.4.3 Date of Test and Modification State

13 and 21 June 2012 – Modification State 0

2.4.4 Test Equipment Used

The major items of test equipment used for the above 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 90.

Since the EUT transmits on two antennas simultaneously in the same frequency range, i.e, TX Diversity, using the Measure and Add $10\log(N)$ dB technique, the limits for Spectrum Masks should be adjusted with a correction of $10\log 2$.

Reference is made to FCC 12-25 where an allowance is made for equipment where the bandwidth is greater than that defined in 90.209(b)(5). As the EUT bandwidth is 3 or 5MHz wide, the emission masks defined in 90.210 and 90.691 are not applicable. Therefore, to demonstrate compliance considering the proposed rule change in FCC 12-25 to clause 90.209(b)(7), a band edge measurement has been performed. The EUT has been set to the lowest and highest channels within the 862 – 869 MHz band and the conducted spurious emission limit of $43+10\log(P)$ in conjunction with a reduction of 3 dB to account for simultaneous transmission from antenna port A and B. The plots shown in the test report show a tighter limit of $50+10\log(P)$ with a reduction of 3 dB to account for simultaneous transmission from both antenna ports.

The EUT was tested at it's maximum power level. At least 1% of the emission bandwidth was used for the resolution bandwidth. The limit -20dBm was adjusted with a correction of $10\log 2$ to -23dBm. Spectrum analyser detector was set as RMS.

The path loss measured and entered as a reference level offset.

The EUT was tested at it's maximum power level. Both Antennas were tested and the tests performed on Antenna A were selected as representative.

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

Configuration 1 - Mode 1 - 3, Mode 1 - 5
 - Mode 2 (3MHz, 5MHz OBW)
 - Mode 3 - 3, Mode 3 - 5



Product Service

2.4.6 Environmental Conditions

	13 June 2012	21 June 2012
Ambient Temperature	26.0°C	26.5°C
Relative Humidity	55.0%	56.4%

2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 90 for Emission Masks.

The test results are shown below

The EUT shall only be used on the channels and bandwidths described in the table below and those in between. Any channels outside of those described below shall not be made available to the end user.

Maximum Lower and Upper Channels Usage		
Channel Number	Channel Frequency (MHz)	Bandwidth (MHz)
8737	863.7	3
8775	867.3	3
8743	864.5	5
8765	866.5	5

Antenna A

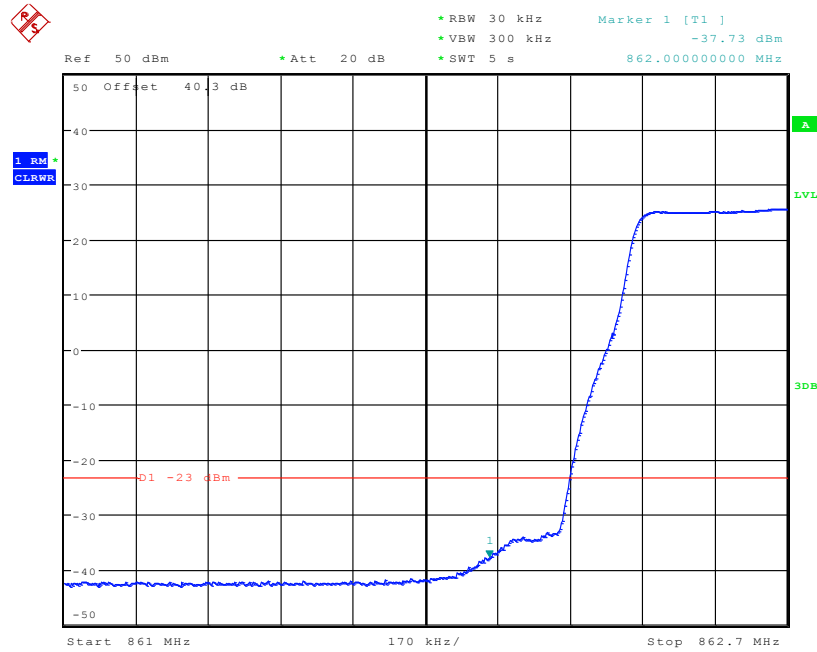


Product Service

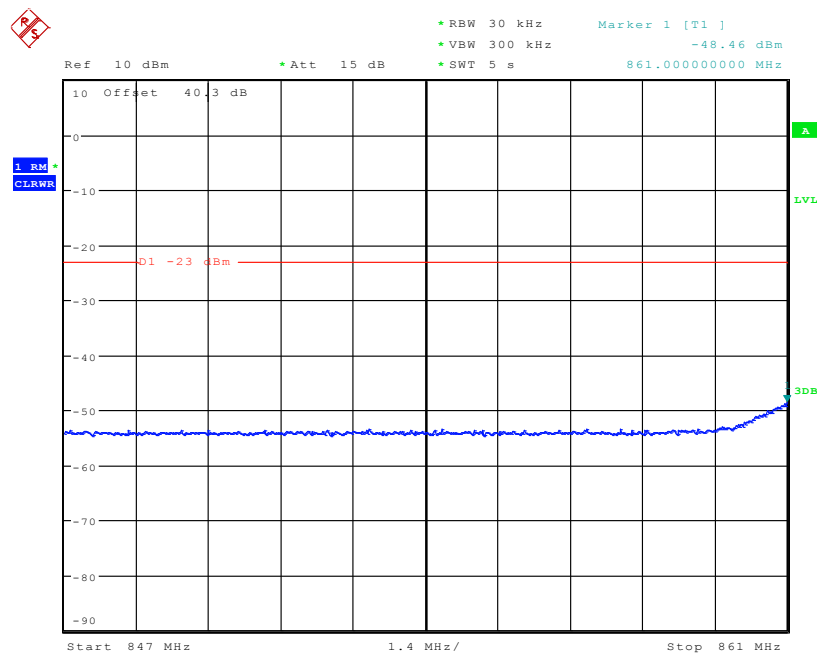
ETM1.1

3MHz Bandwidth

Configuration 1 - Mode 1 - 3



Date: 21.JUN.2012 07:01:41

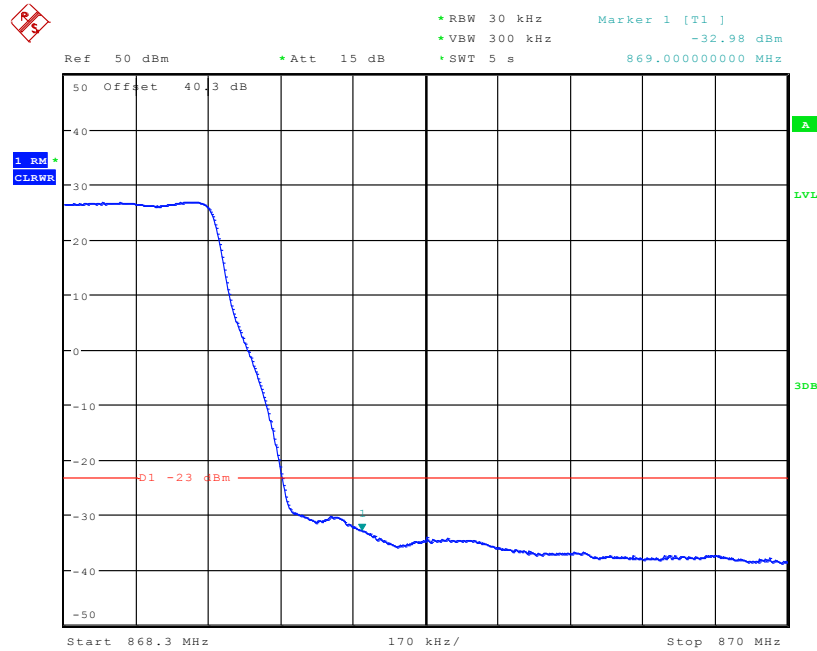


Date: 21.JUN.2012 07:51:44

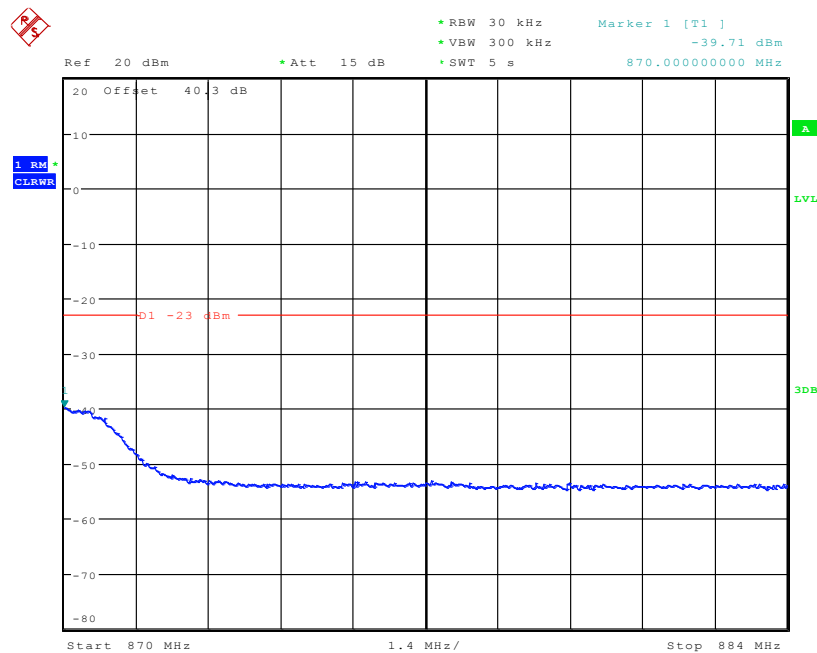


Product Service

Configuration 1 - Mode 3 - 3



Date: 21.JUN.2012 09:37:30



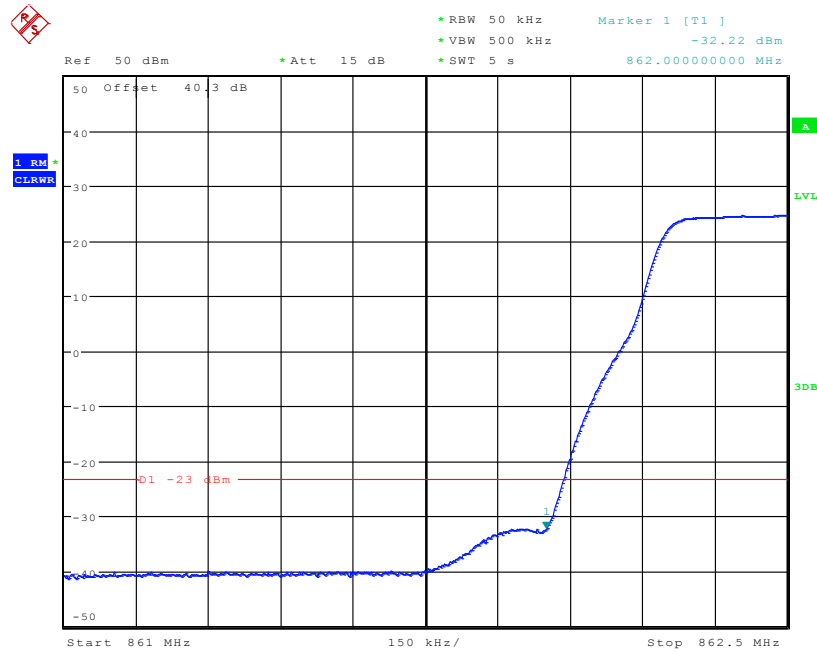
Date: 21.JUN.2012 09:38:43



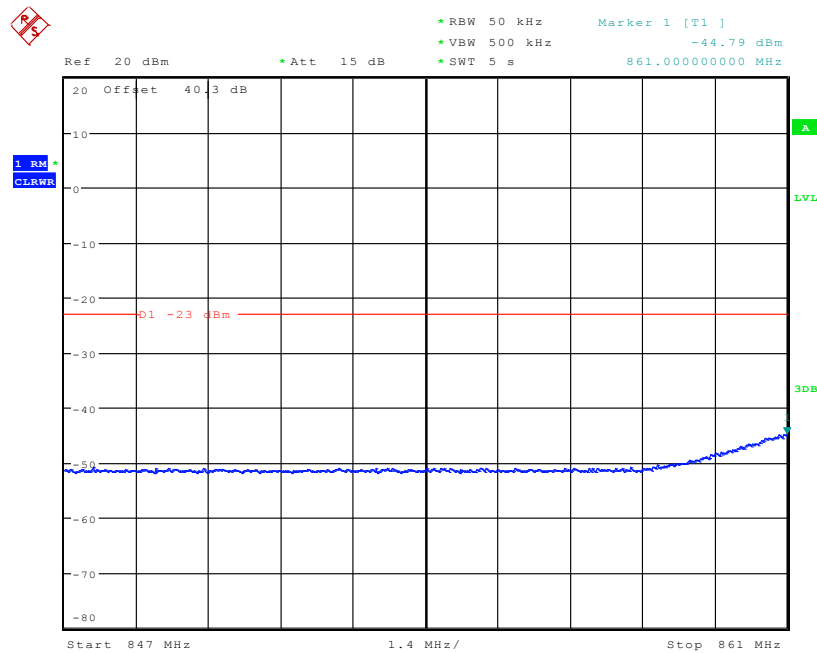
Product Service

5MHz Bandwidth

Configuration 1 - Mode 1 - 5

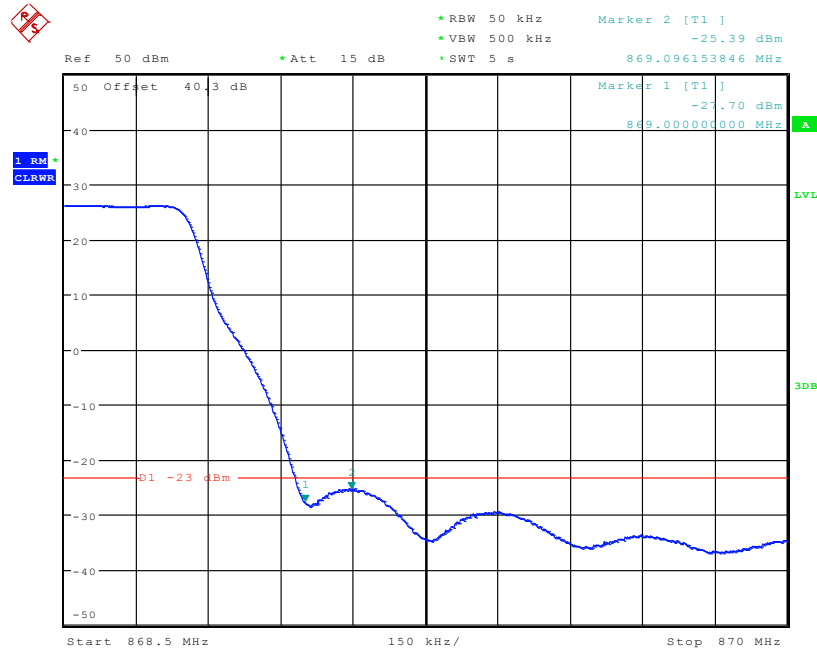


Date: 13.JUN.2012 08:08:42

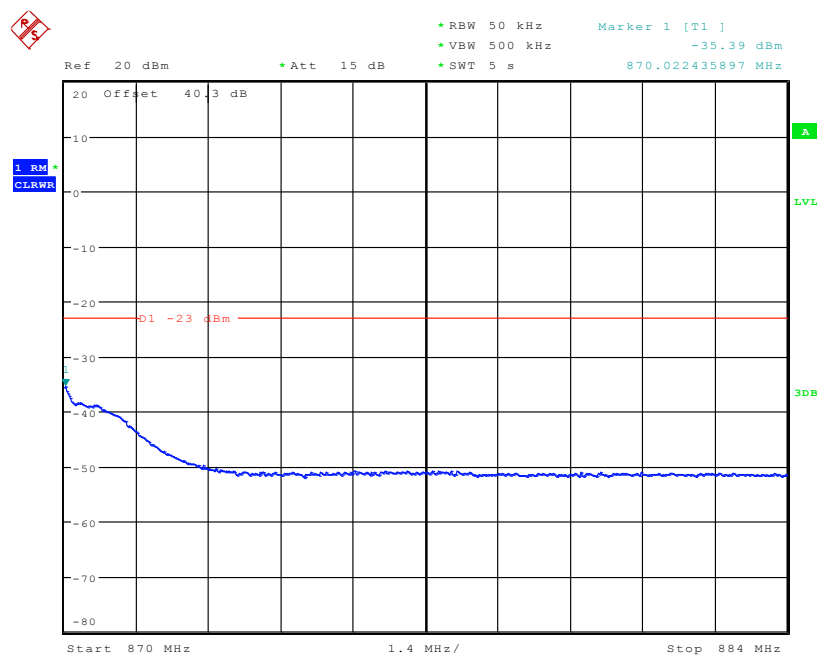


Date: 13.JUN.2012 08:10:10

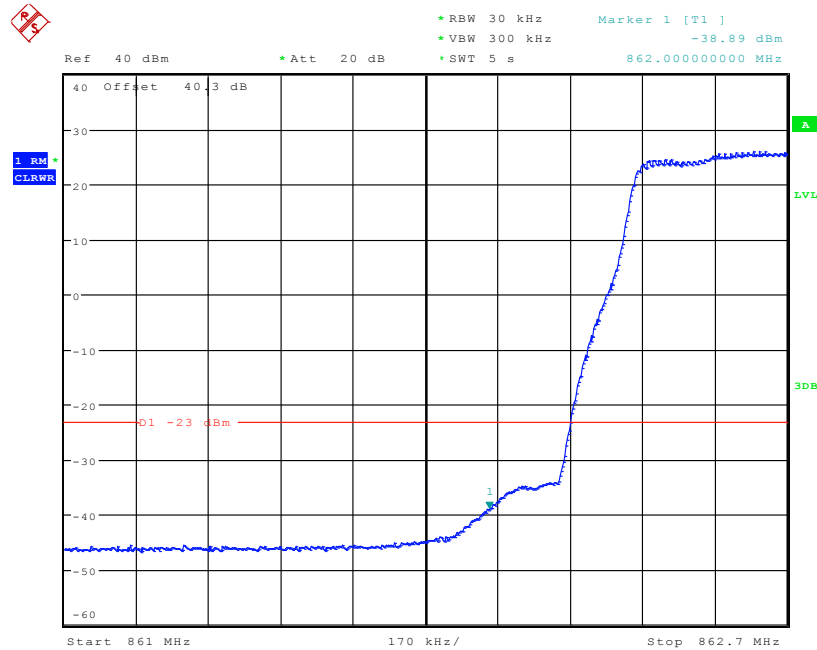
Configuration 1 - Mode 3 - 5



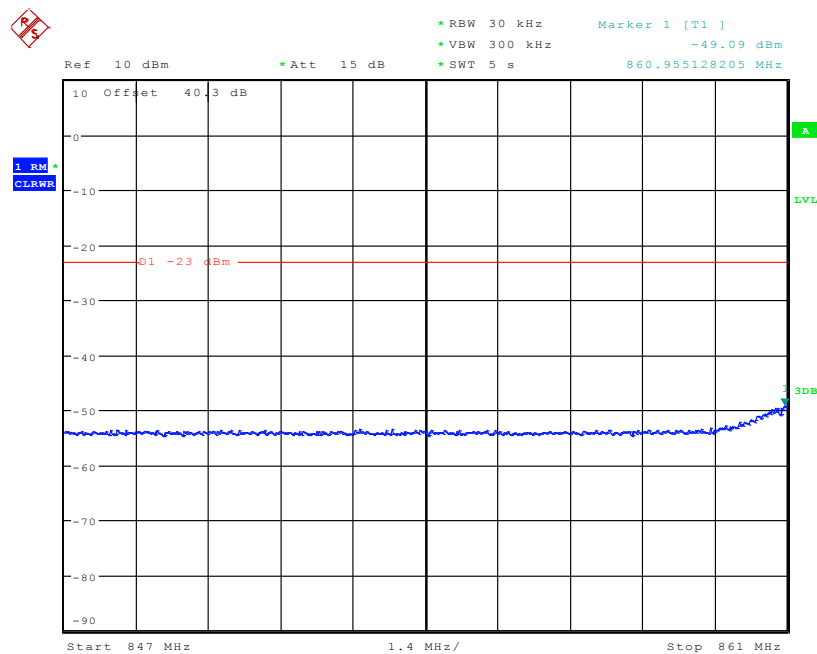
Date: 13.JUN.2012 07:57:20



Date: 13.JUN.2012 07:58:16

**ETM3.2****3MHz Bandwidth****Configuration 1 - Mode 1 - 3**

Date: 21.JUN.2012 08:06:12

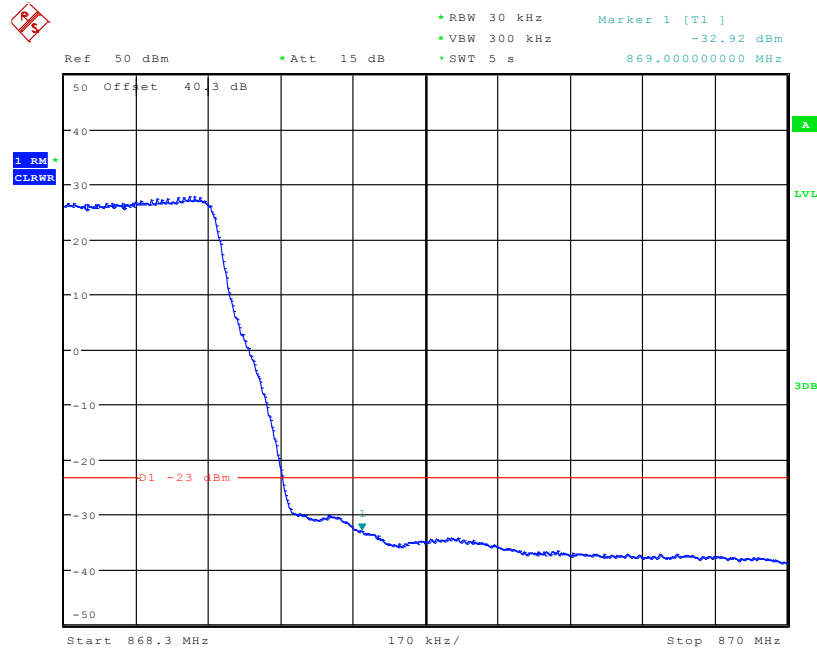


Date: 21.JUN.2012 08:04:19

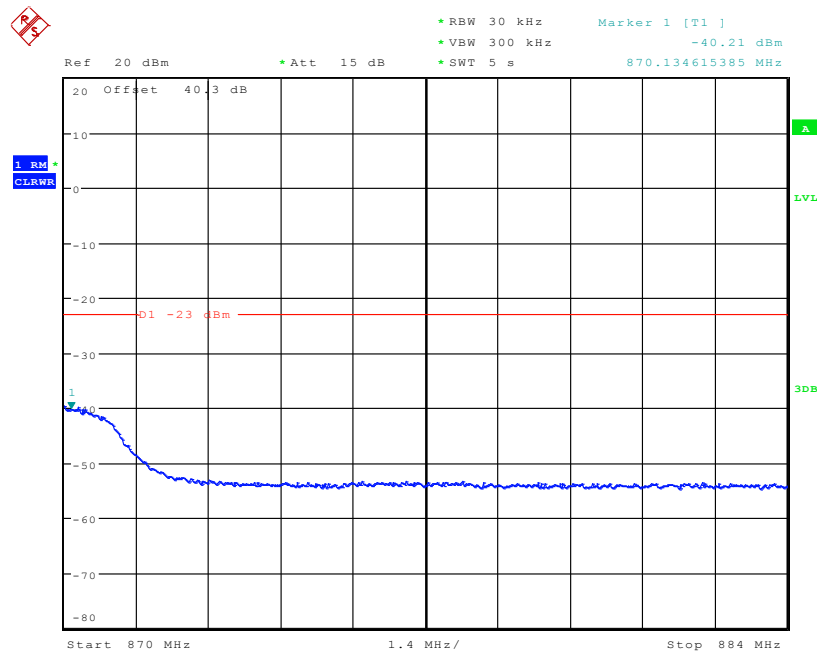


Product Service

Configuration 1 - Mode 3 - 3



Date: 21.JUN.2012 09:20:16



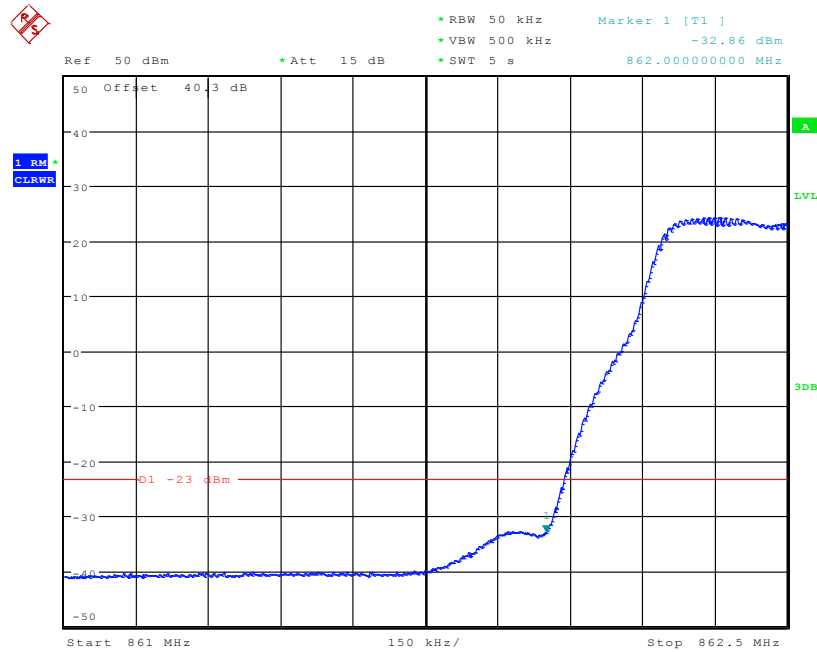
Date: 21.JUN.2012 09:21:10



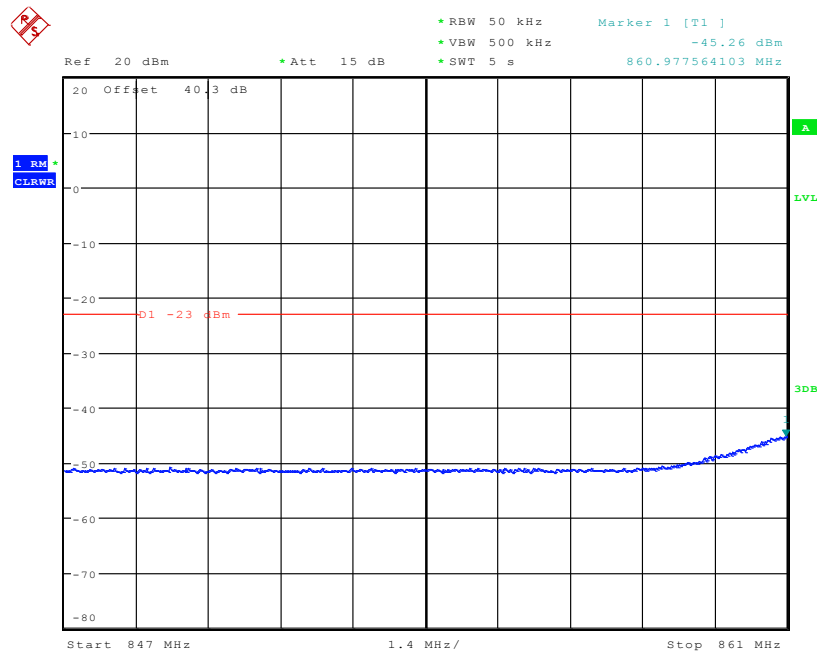
Product Service

5MHz Bandwidth

Configuration 1 - Mode 1 - 5

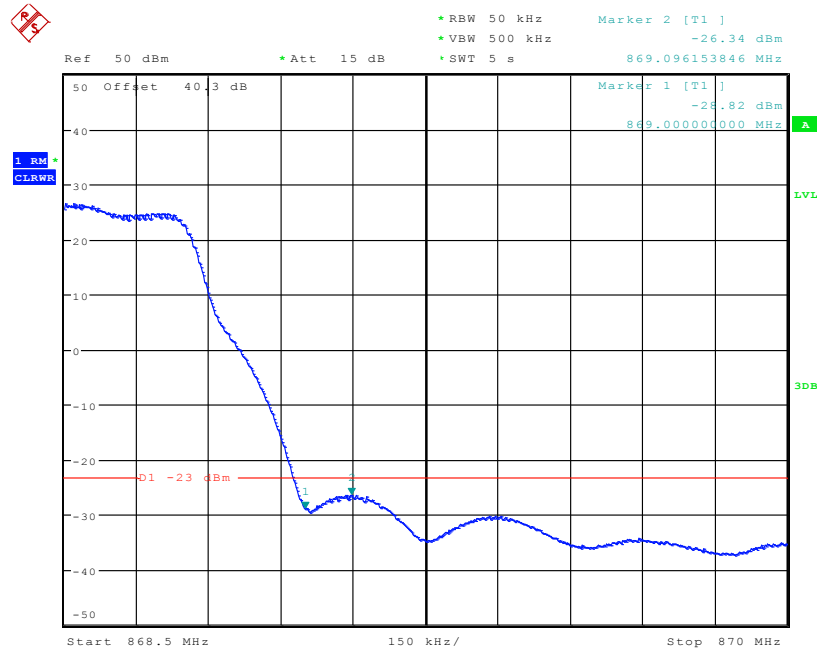


Date: 13.JUN.2012 08:23:40

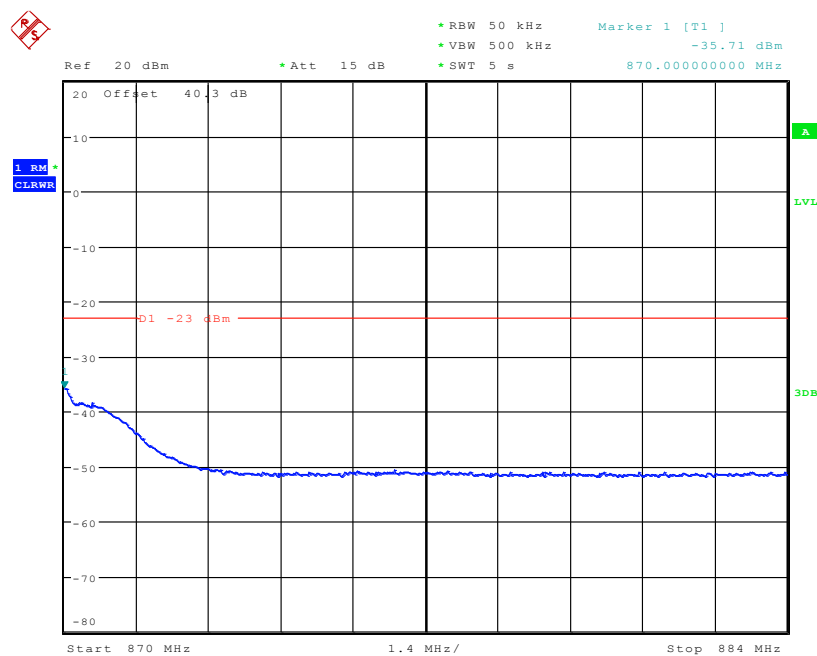


Date: 13.JUN.2012 08:22:33

Configuration 1 - Mode 3 - 5



Date: 13.JUN.2012 07:50:01



Date: 13.JUN.2012 07:47:54

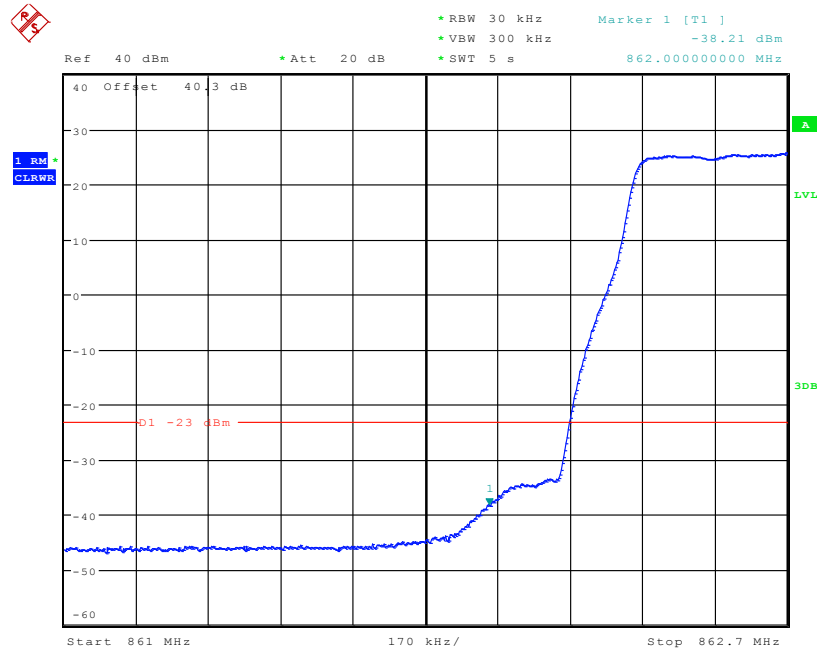


Product Service

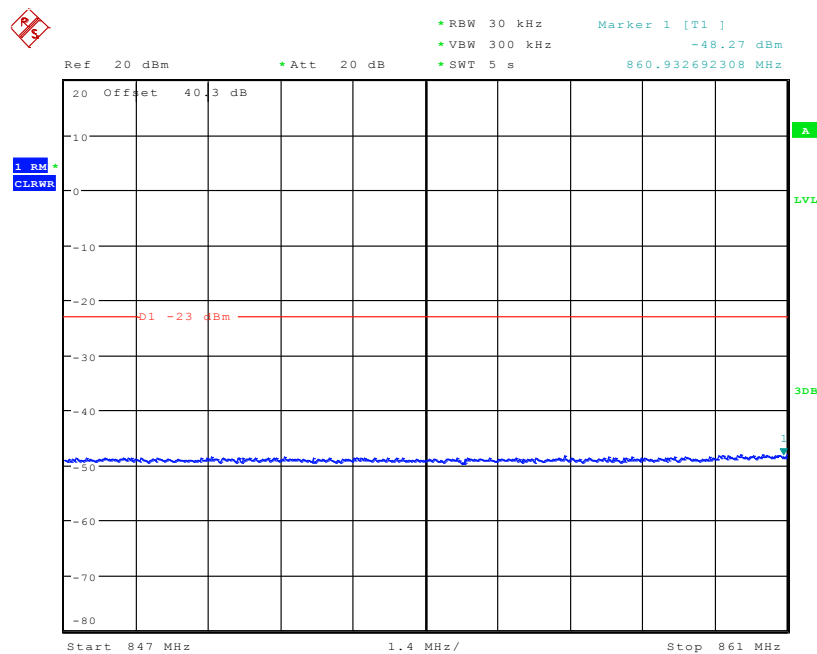
ETM3.1

3MHz Bandwidth

Configuration 1 - Mode 1 - 3



Date: 21.JUN.2012 08:39:49

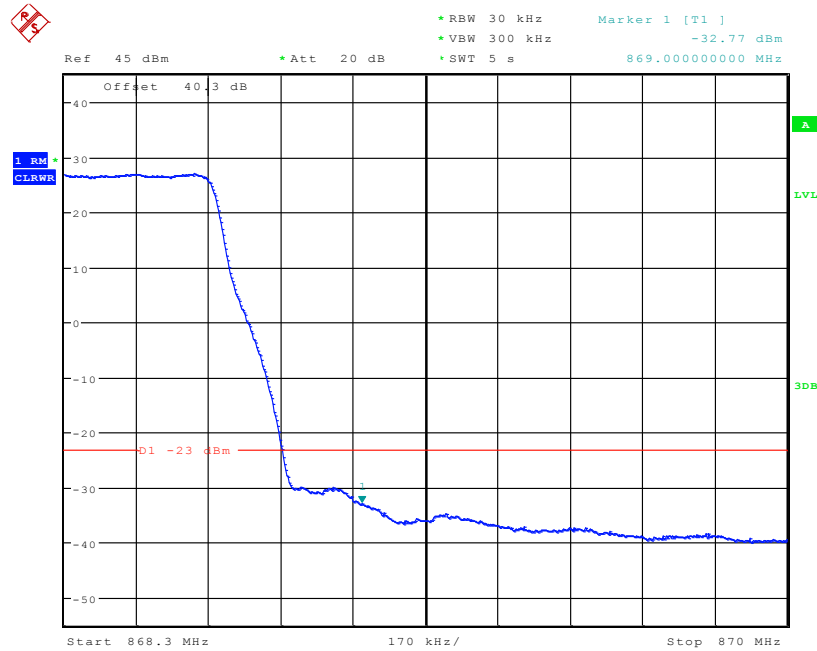


Date: 21.JUN.2012 08:37:26

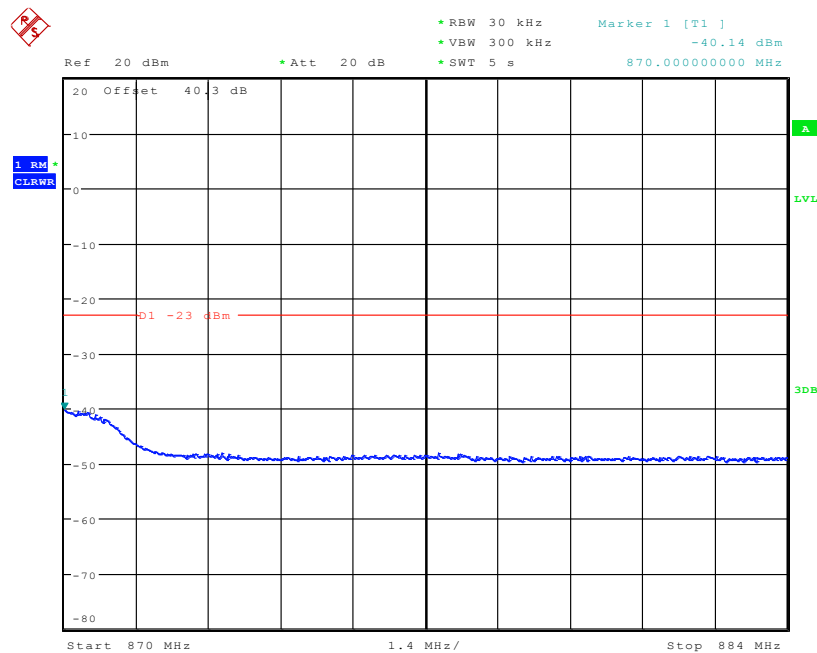


Product Service

Configuration 1 - Mode 3 - 3



Date: 21.JUN.2012 08:52:12



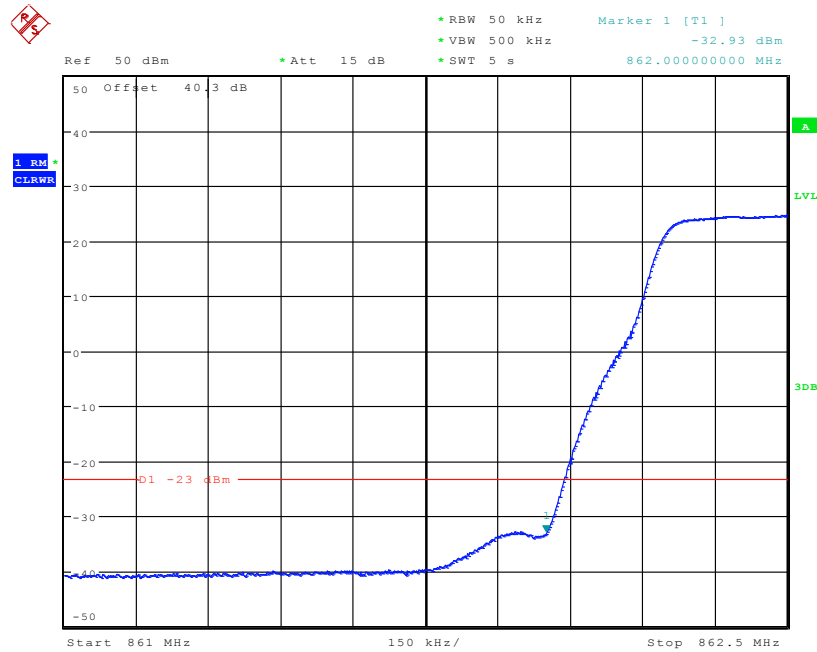
Date: 21.JUN.2012 08:53:04



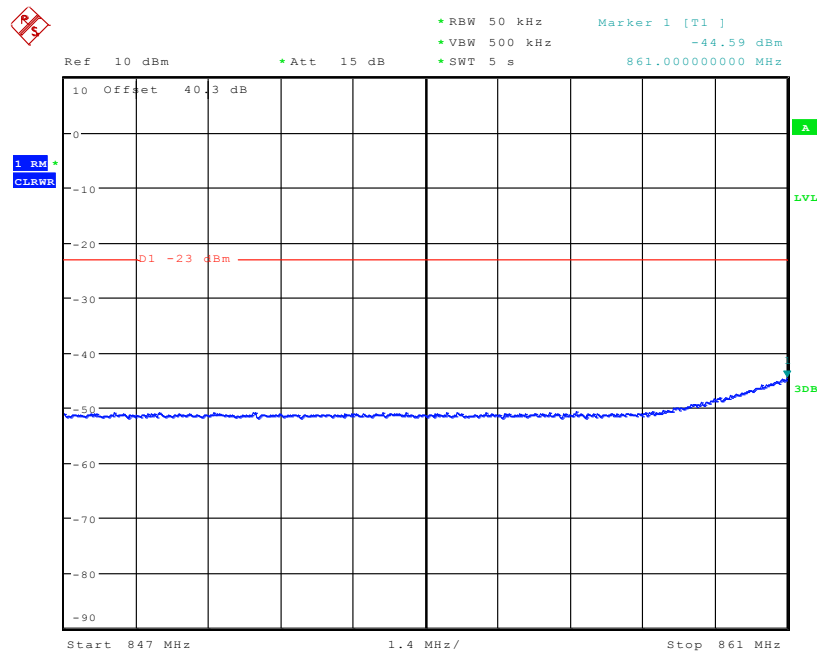
Product Service

5MHz Bandwidth

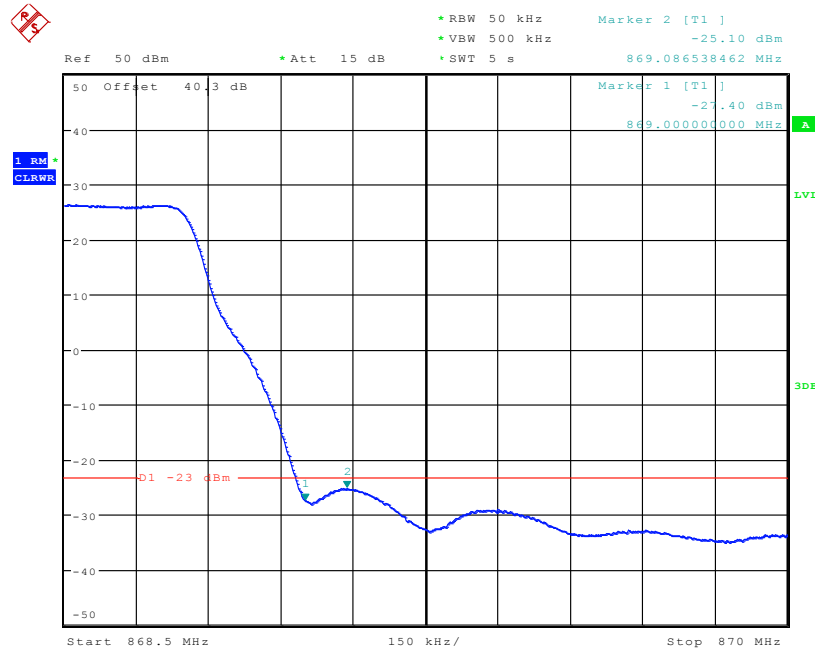
Configuration 1 - Mode 1 - 5



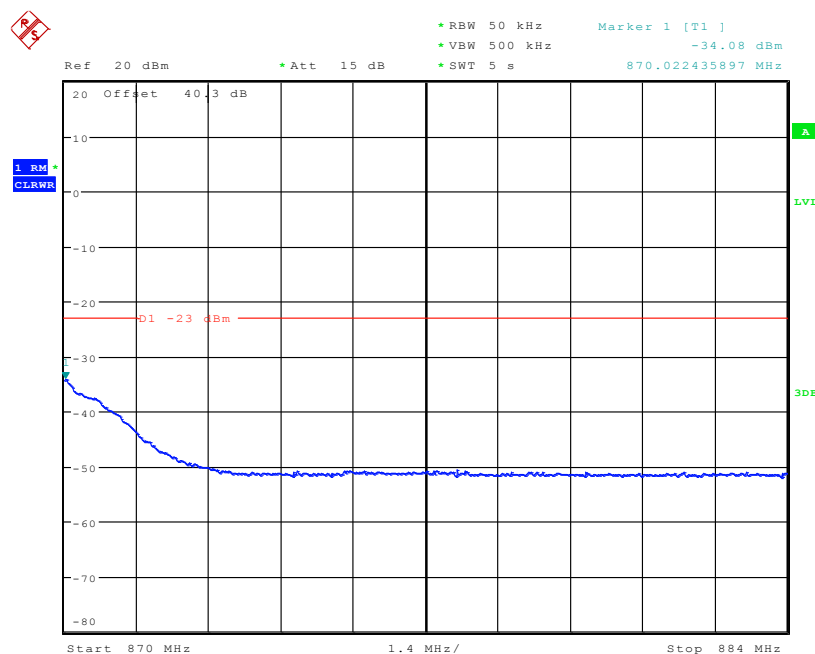
Date: 13.JUN.2012 08:30:37



Date: 13.JUN.2012 08:29:56

Configuration 1 - Mode 3 - 5

Date: 13.JUN.2012 05:49:40



Date: 13.JUN.2012 05:46:46

Limit

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by $50 + 10\log P$ dB.



Product Service

2.5 RADIATED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 90, Clause 90.691

2.5.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.5.3 Date of Test and Modification State

28 and 29 June 2012 – Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above 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 90.

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.

Emissions identified within the range 30MHz – 25GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 25GHz, the measurement was performed with a resolution bandwidth of 1MHz.

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 dipoles 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 meter.

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

$$E_{(v/m)} = (30 \times 1.64 \times 67.46)^{0.5} / 3 = 19.20V/m = 145.67dB\mu V/m$$

As per 90.691, the spurious emission must be attenuated by $43 + 10\log(P_o)$ dB this gives:

$$43 + 10\log(67.46) = 61.29dB$$

Therefore the limit at 3m measurement distance is:

$$145.67 - 61.29 = 84.4 \text{ dB}\mu V/m$$

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 in the following configurations and modes of operation as the worst cases:

Configuration 1 - Mode 1 - 3
 - Mode 2 (3MHz, 5MHz OBW)
 - Mode 3 - 3

2.5.6 Environmental Conditions

	28 June 2012	29 June 2012
Ambient Temperature	26.5°C	26.0°C
Relative Humidity	52.0%	53.0%



2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 90 for Radiated Spurious Emissions.

The test results are shown below

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

E-TM1.1

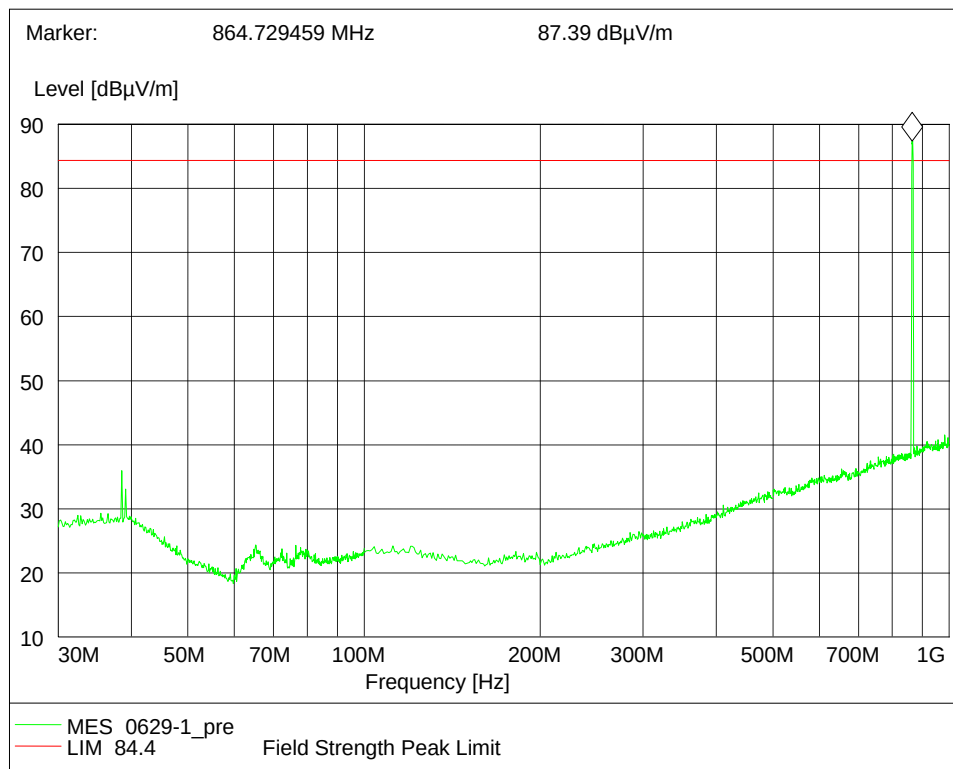
3MHz Bandwidth

Configuration 1 - Mode 1 - 3

No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 2

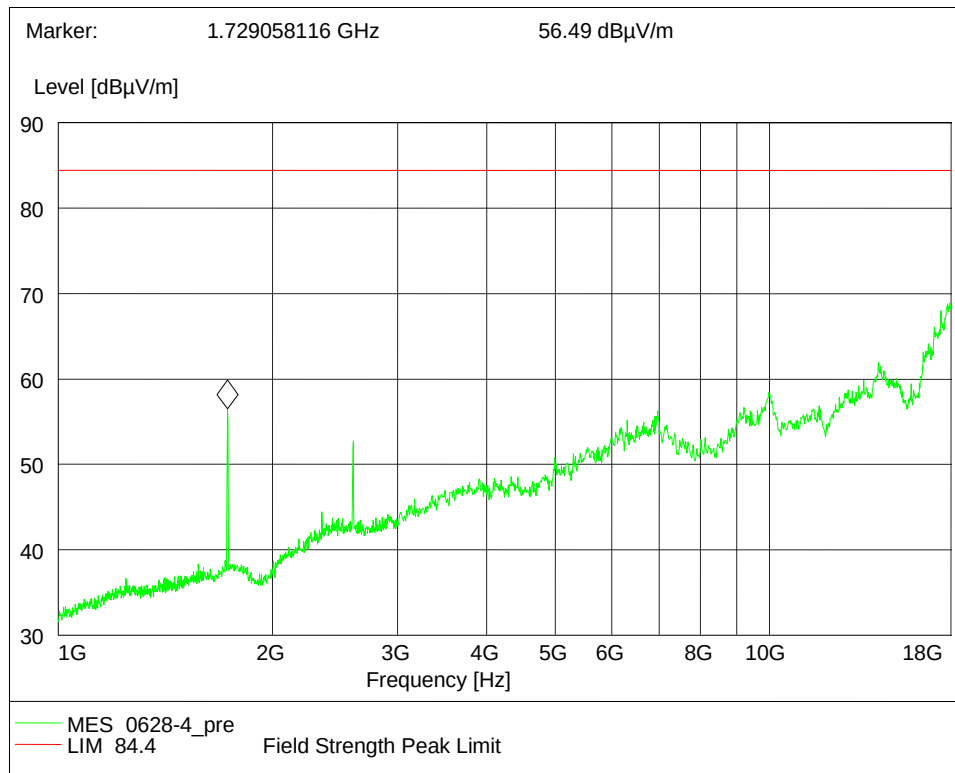
30MHz to 1GHz



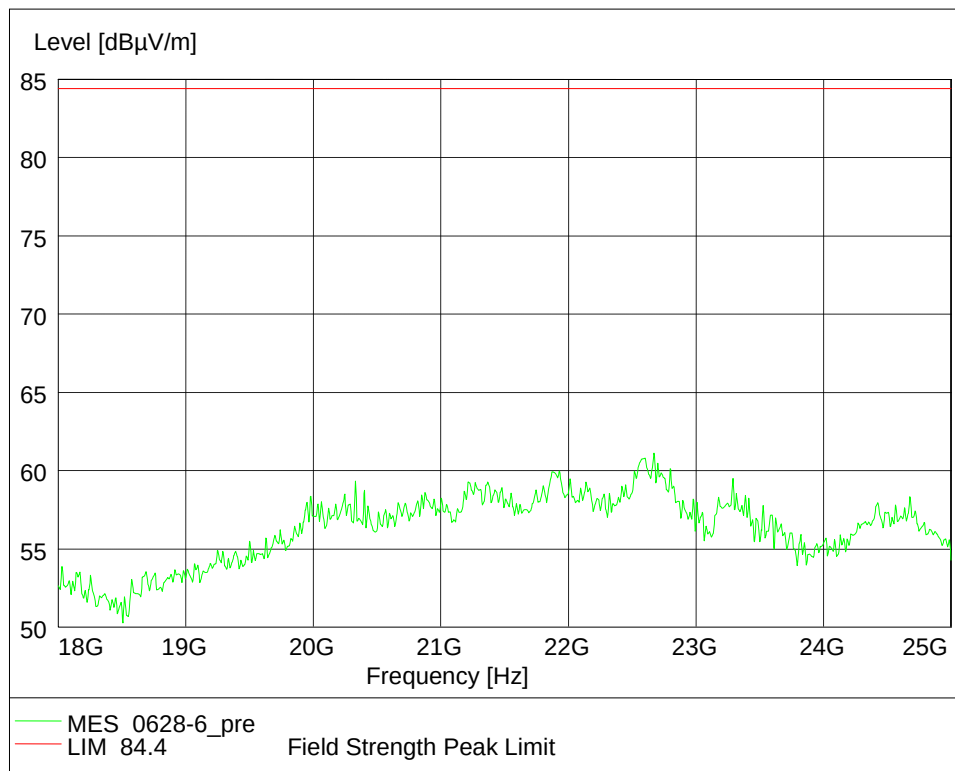
Note: The marked emission is the operating frequency.



1GHz – 18GHz



18GHz – 25GHz





Product Service

Configuration 1 - Mode 3 - 3

No emissions were detected within 20dB of the limit.

5MHz Bandwidth**Configuration 1 - Mode 2**

No emissions were detected within 20dB of the limit.

E-TM3.2**3MHz Bandwidth****Configuration 1 - Mode 2**

No emissions were detected within 20dB of the limit.

5MHz Bandwidth**Configuration 1 - Mode 2**

No emissions were detected within 20dB of the limit

E-TM3.1**3MHz Bandwidth****Configuration 1 - Mode 2**

No emissions were detected within 20dB of the limit.

5MHz Bandwidth**Configuration 1 - Mode 2**

No emissions were detected within 20dB of the limit

Limit	-13dBm / 84.4 dB μ V/m
-------	----------------------------

Remarks

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



2.6 CONDUCTED SPURIOUS EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 90, Clause 90.691

2.6.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.6.3 Date of Test and Modification State

11, 12, 13 and 21 June 2012 – Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above 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 90.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 25GHz. The EUT was set to transmit on maximum power. The EUT was tested on both Antennas on Bottom, Middle and Top channels for all test models in 3MHz and 5MHz bandwidths. The tests performed on Antenna A were selected as representative.

The resolution was set to 1MHz for 9kHz to 25GHz. The spectrum analyzer detector was set to peak and trace was kept on Max Hold as worst case.

Since the EUT transmits on two antennas simultaneously in the same frequency range, i.e, TX Diversity, using the Measure and Add 10Log(N) dB technique, the limit for Conducted Spurious Emission was adjusted with a correction of 10Log2 to -16dBm.

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

In addition, measurements were made up to the 10th harmonic of the highest internal frequency.

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

Configuration 1 - Mode 1 - 3, Mode 1 - 5
 - Mode 2 (3MHz, 5MHz)
 - Mode 3 - 3, Mode 3 - 5



Product Service

2.6.6 Environmental Conditions

	11 June 2012	12 June 2012	13 June 2012	21 June 2012
Ambient Temperature	26.0°C	26.5°C	26.0°C	26.5°C
Relative Humidity	43.0%	49.0%	55.0%	56.4%

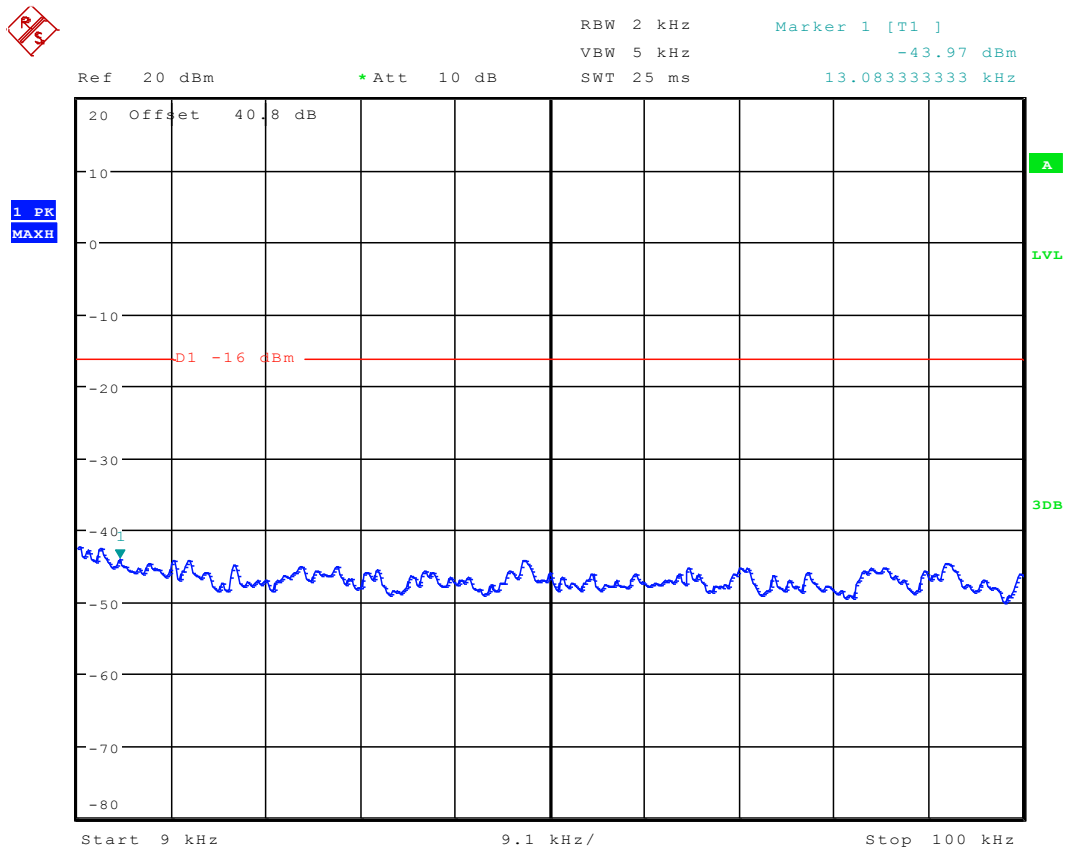
2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 90 for Conducted Spurious Emissions.

The test results are shown below

Remark:

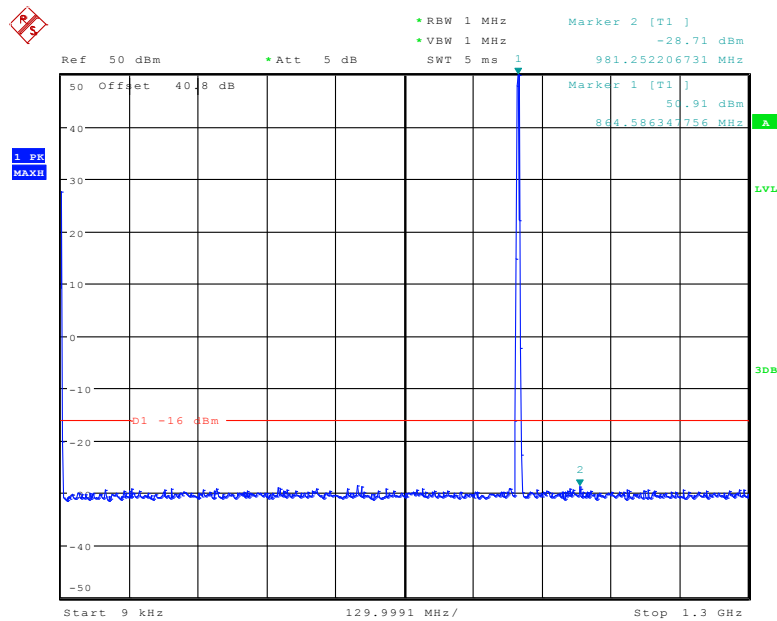
The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller Span showed that it was related to the LO feedthrough.



Date: 11.JUN.2012 10:31:05



Product Service

Antenna A**E-TM1.1****3MHz Bandwidth****Configuration 1 - Mode 1 - 3****9kHz to 1.3GHz**

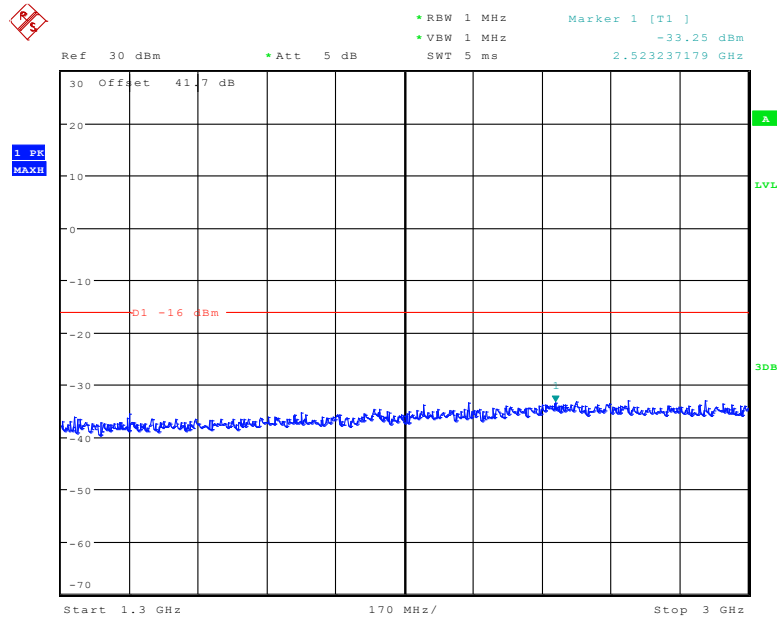
Date: 21.JUN.2012 07:41:12

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



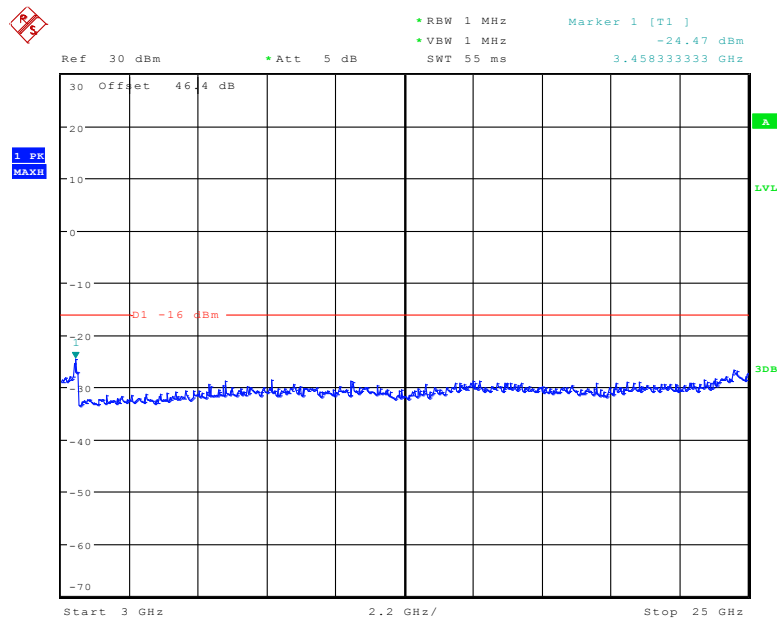
Product Service

1.3GHz to 3GHz



Date: 21.JUN.2012 10:27:05

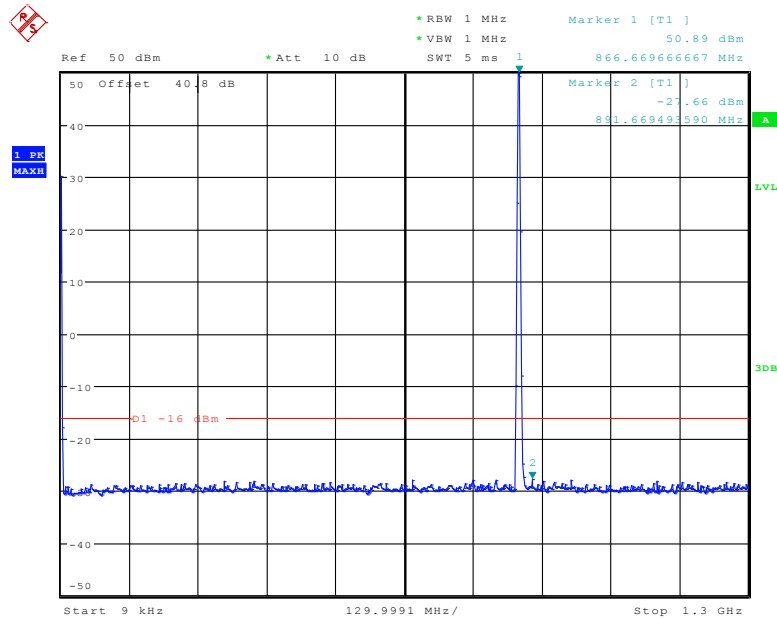
3GHz to 25GHz



Date: 21.JUN.2012 07:08:43

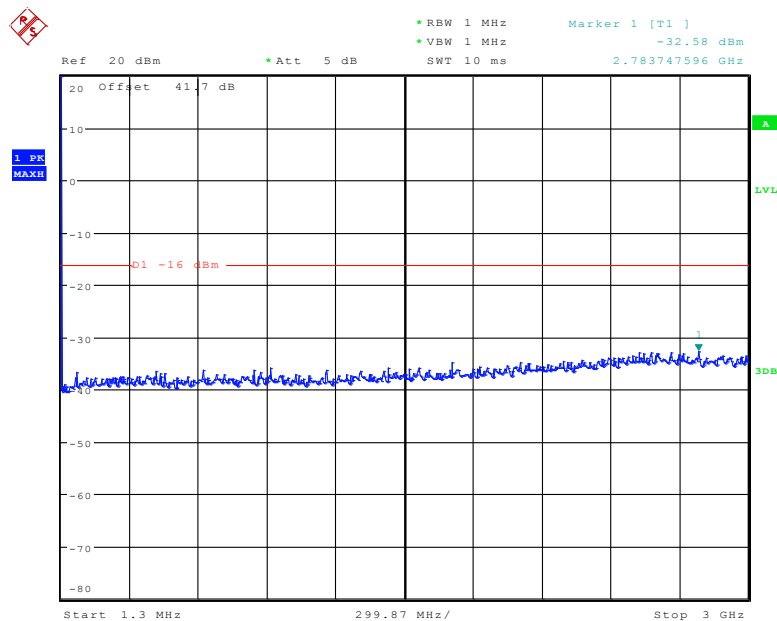


Product Service

Configuration 1 - Mode 29kHz to 1.3GHz

Date: 11.JUN.2012 09:38:06

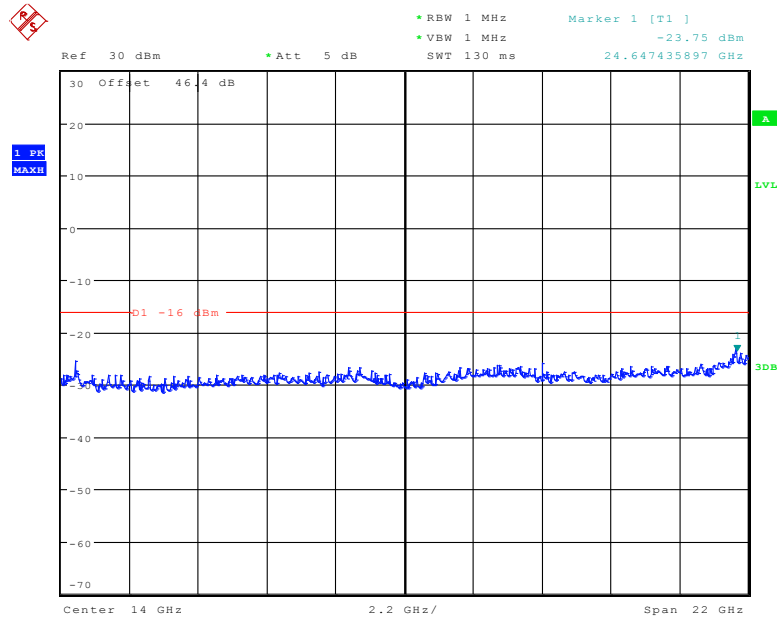
Note: The emission beyond the limit is the operating frequency.

1.3GHz to 3GHz

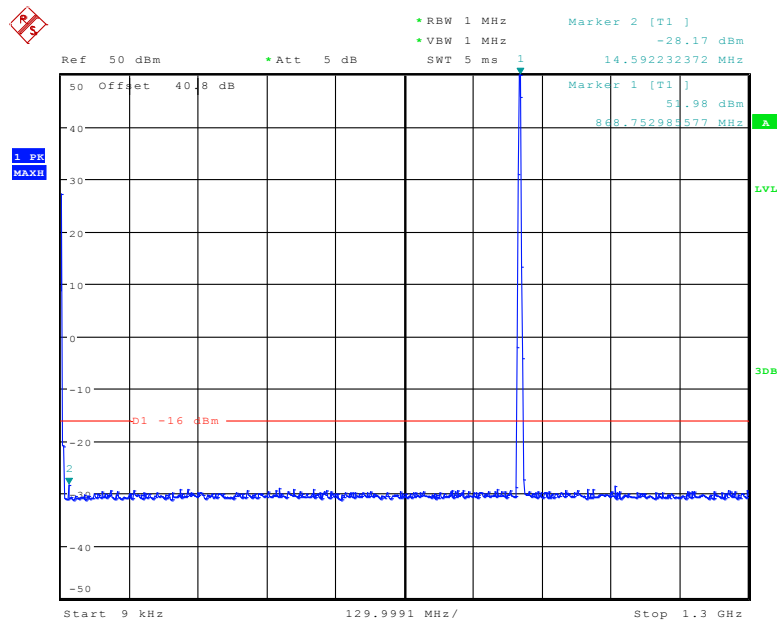
Date: 13.JUN.2012 04:15:23



Product Service

3GHz to 25GHz

Date: 11.JUN.2012 09:36:25

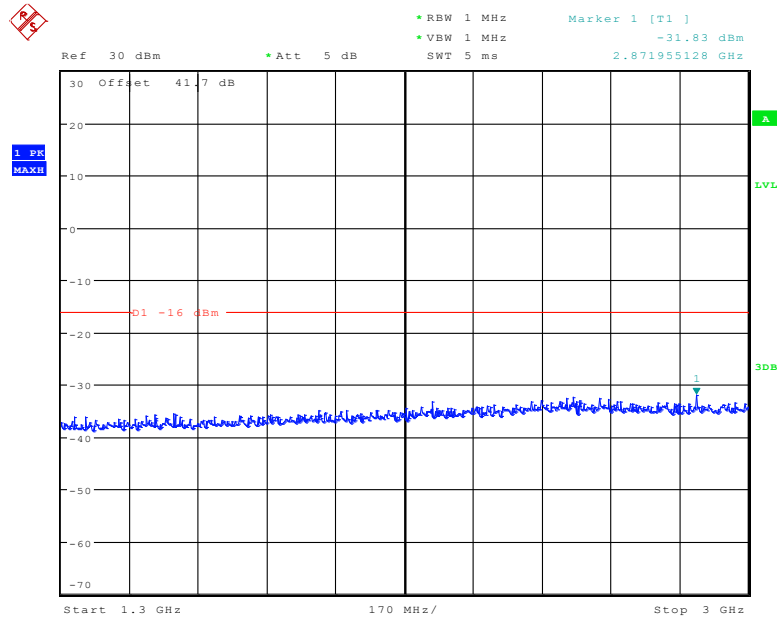
Configuration 1 – Mode 3 - 39kHz – 1.3GHz

Date: 21.JUN.2012 09:41:34

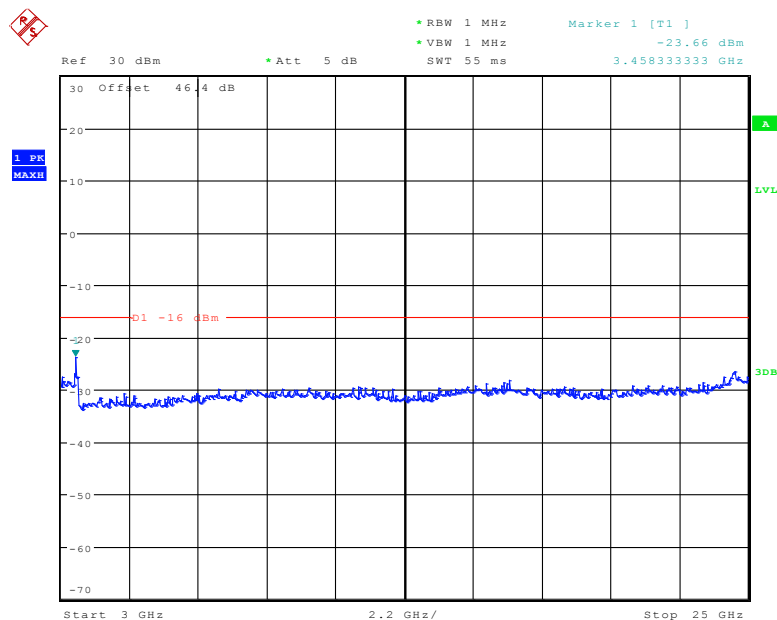
Note: The emission beyond the limit is the operating frequency.



Product Service

1.3GHz – 3GHz

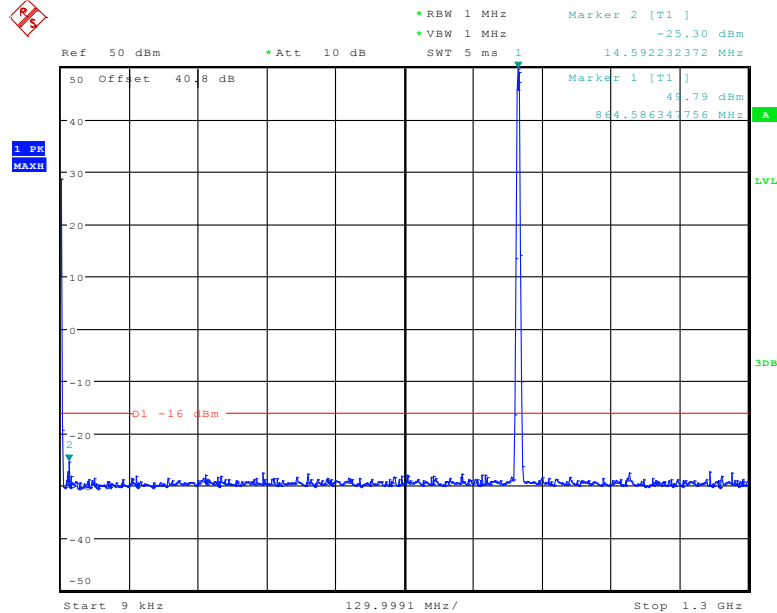
Date: 21.JUN.2012 10:10:07

3GHz – 25GHz

Date: 21.JUN.2012 09:16:45

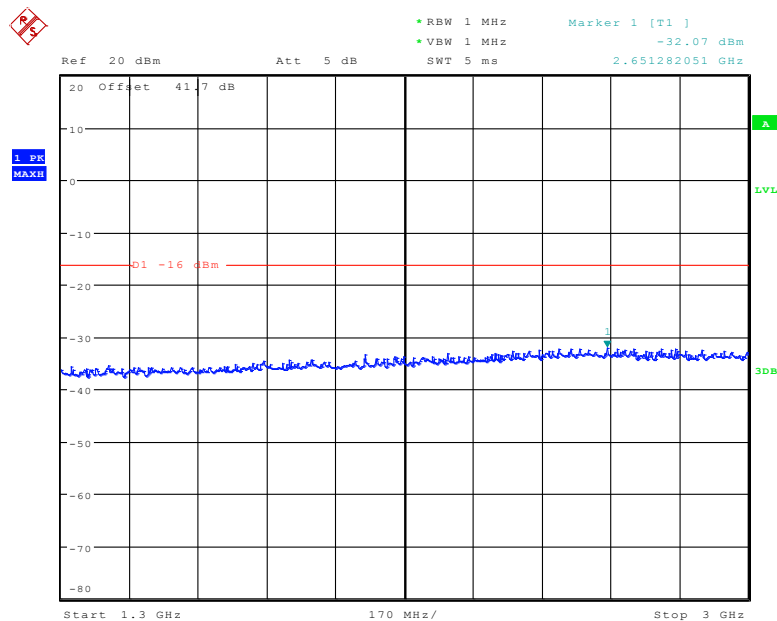


Product Service

5MHz Bandwidth**Configuration 1 - Mode 1 - 5****9kHz to 1.3GHz**

Date: 12.JUN.2012 10:30:20

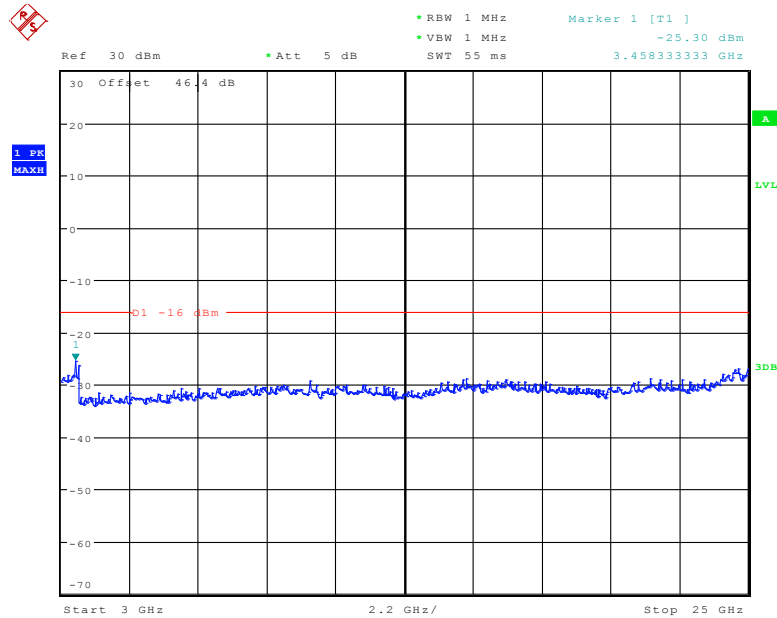
Note: The emission beyond the limit is the operating frequency.

1.3GHz to 3GHz

Date: 21.JUN.2012 10:53:35



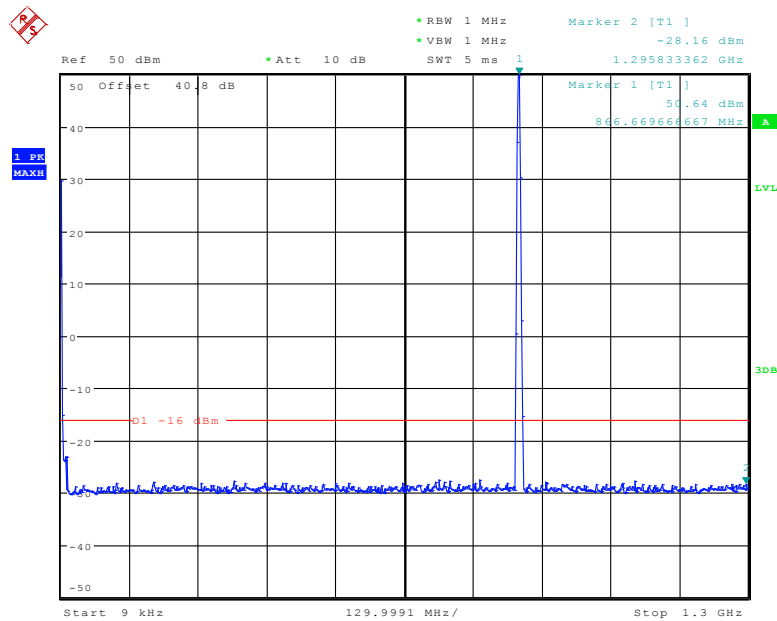
3GHz to 25GHz



Date: 12.JUN.2012 10:31:46

Configuration 1 - Mode 2

9kHz to 1.3GHz

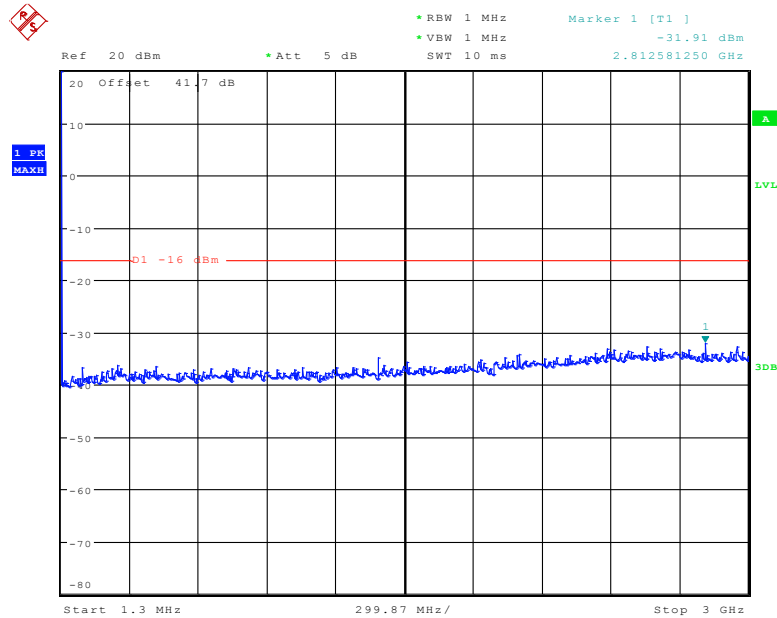


Date: 11.JUN.2012 07:43:14

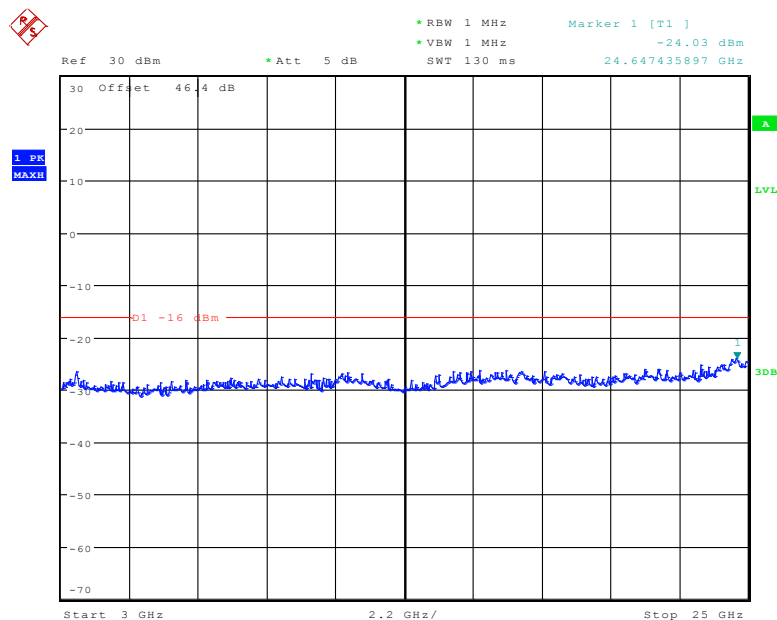
Note: The emission beyond the limit is the operating frequency.



Product Service

1.3GHz to 3GHz

Date: 13.JUN.2012 04:55:26

3GHz to 25GHz

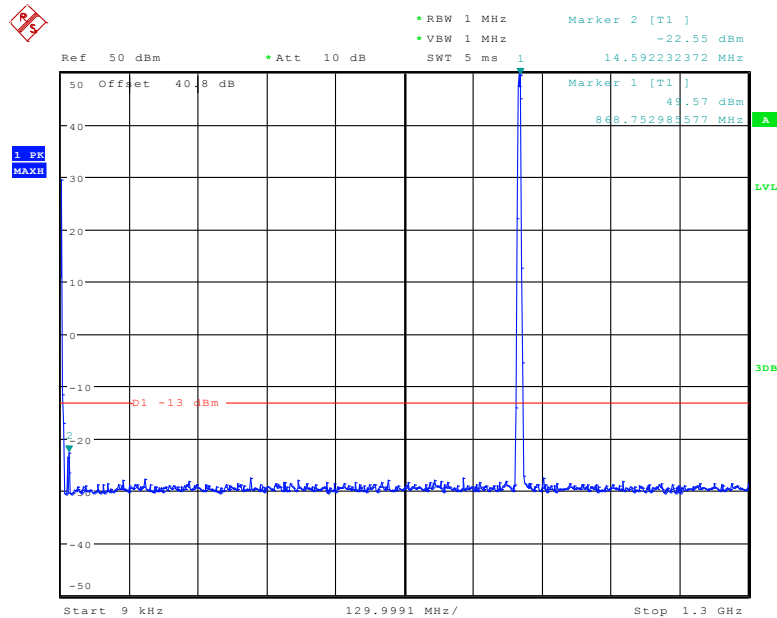
Date: 11.JUN.2012 07:40:21



Product Service

Configuration 1 - Mode 3 - 5

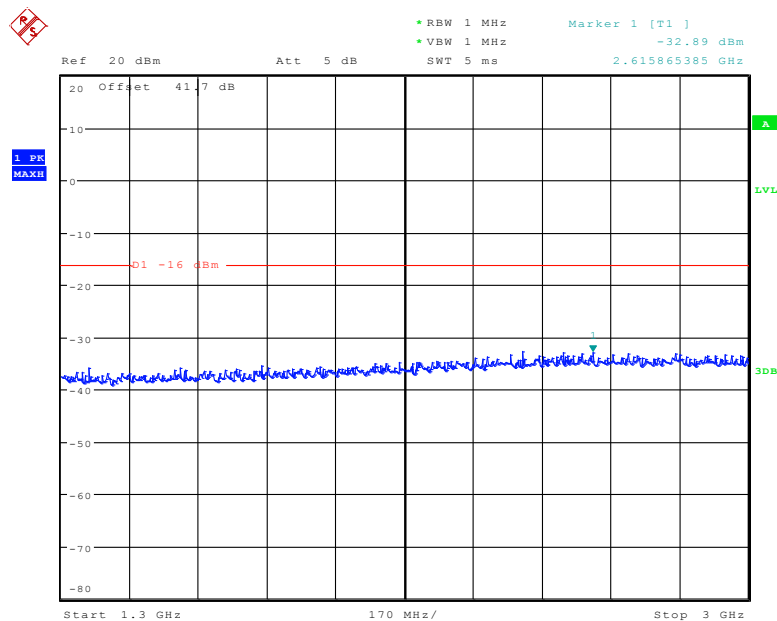
9kHz to 1.3GHz



Date: 12.JUN.2012 10:11:20

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

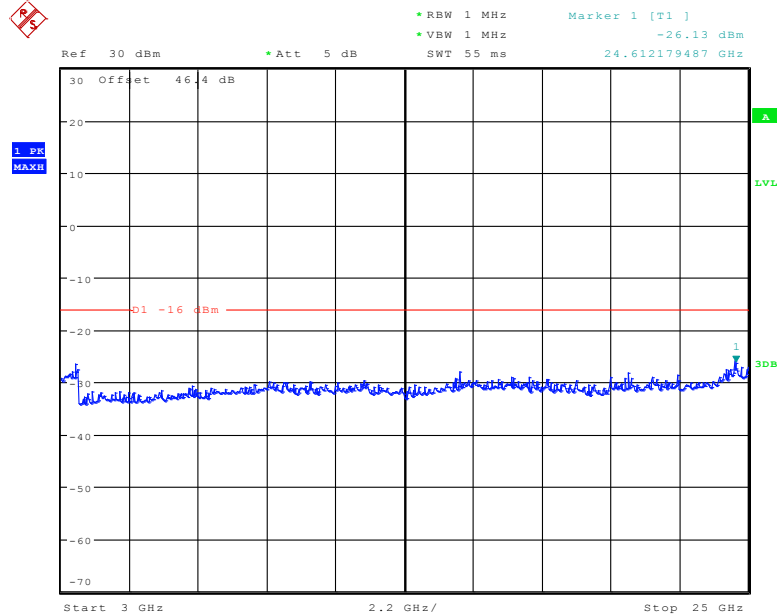
1.3GHz to 3GHz



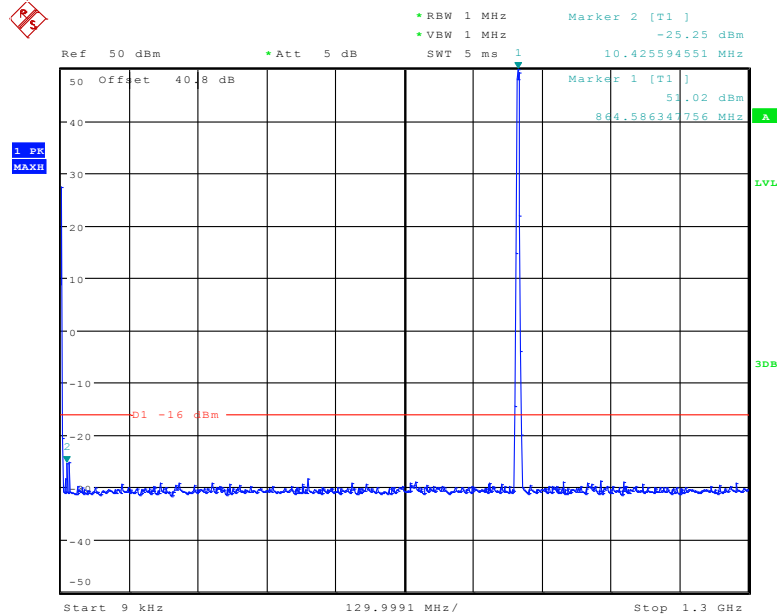
Date: 21.JUN.2012 11:15:20



Product Service

3GHz to 25GHz

Date: 12.JUN.2012 10:09:48

E-TM3.2**3MHz Bandwidth****Configuration 1 - Mode 1 - 3****9kHz to 1.3GHz**

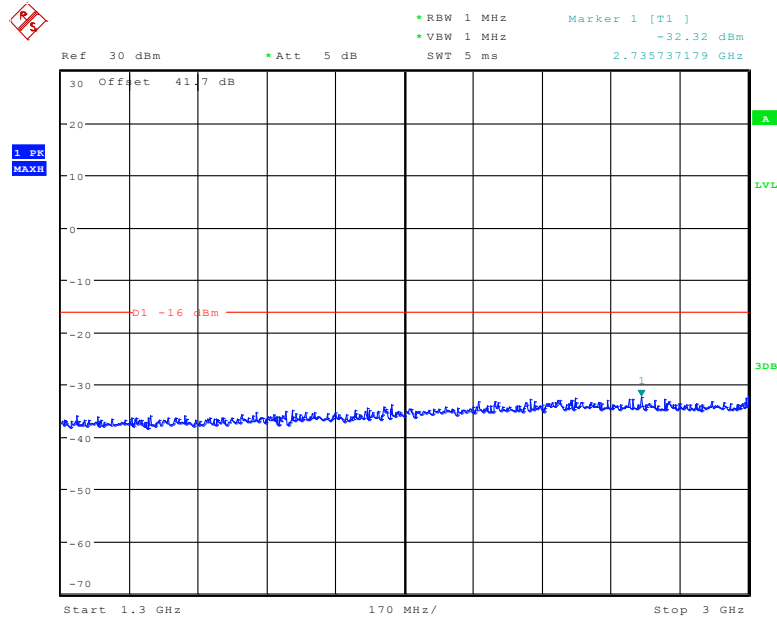
Date: 21.JUN.2012 08:11:35

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



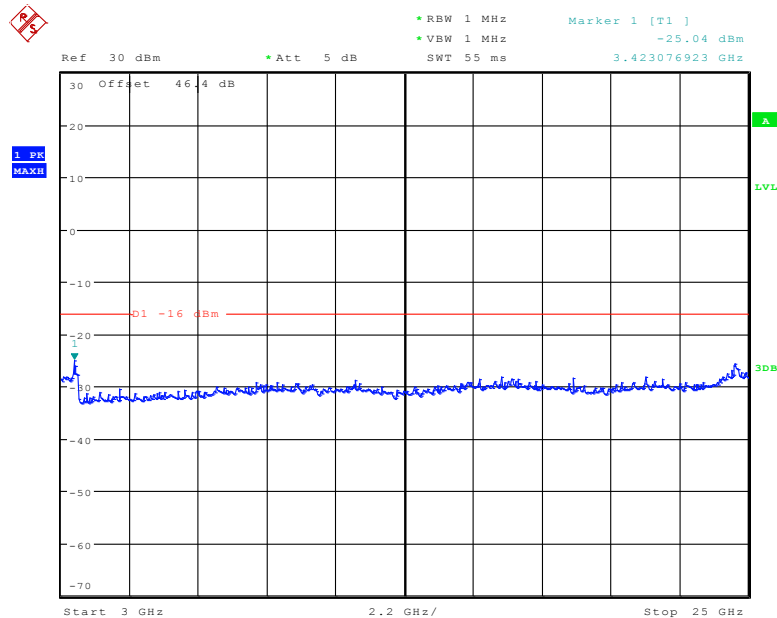
Product Service

1.3GHz to 3GHz



Date: 21.JUN.2012 10:25:24

3GHz to 25GHz

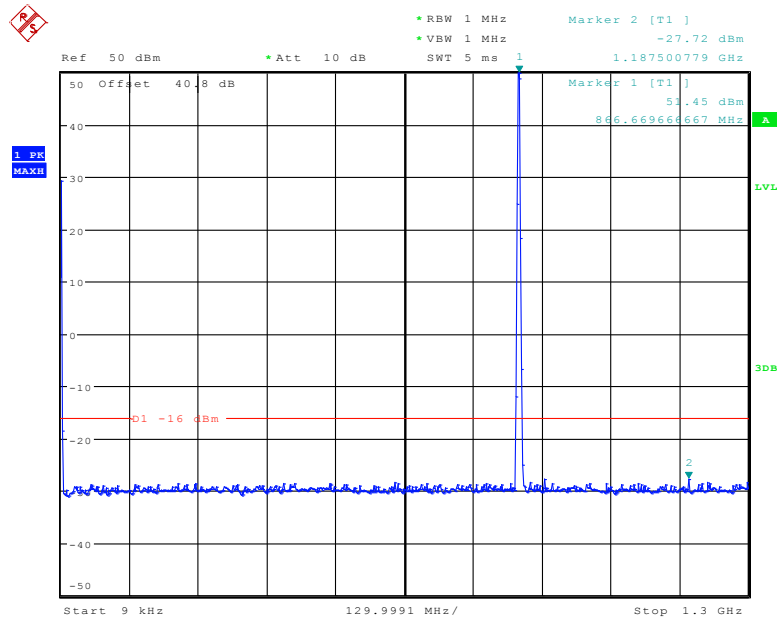


Date: 21.JUN.2012 08:10:56



Configuration 1 - Mode 2

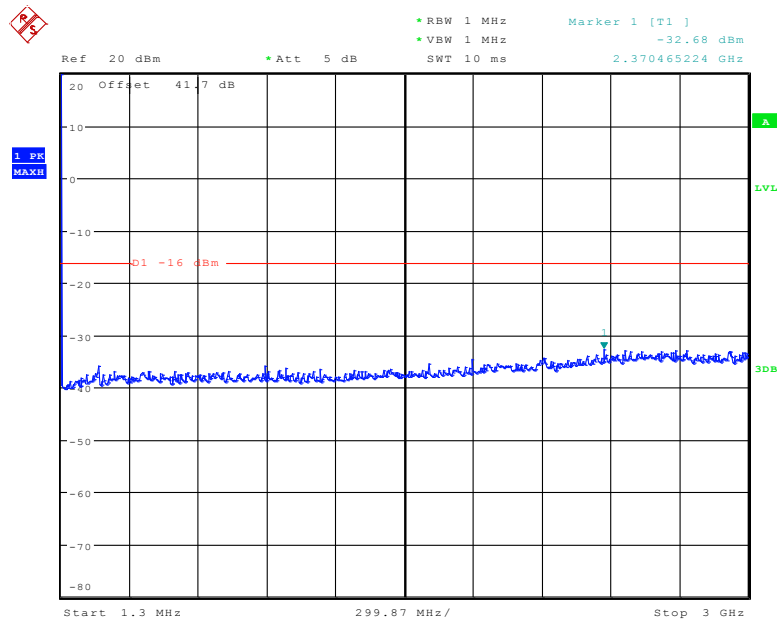
9kHz to 1.3GHz



Date: 12.JUN.2012 04:48:53

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

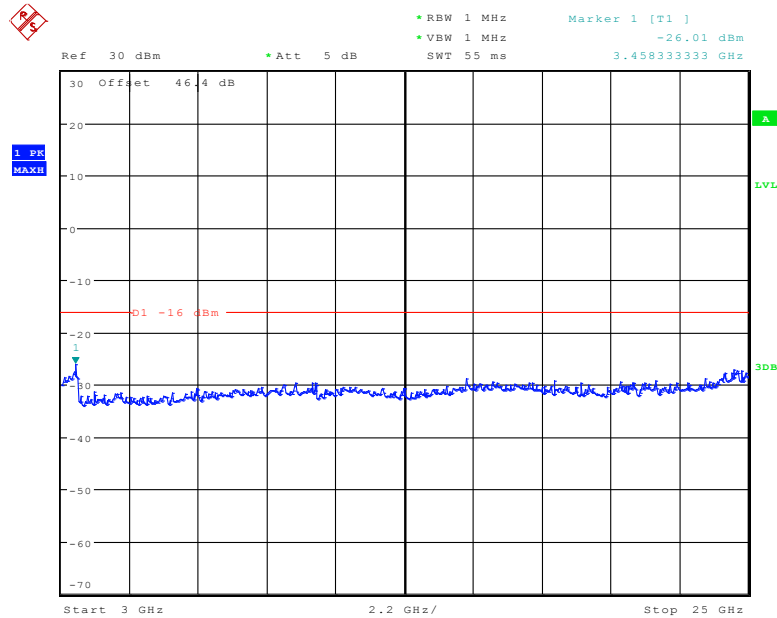
1.3GHz to 3GHz



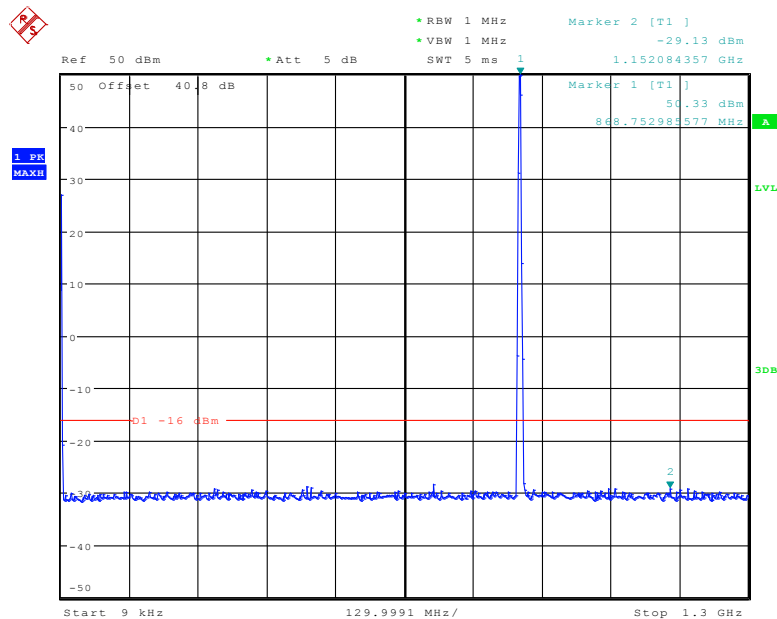
Date: 13.JUN.2012 04:36:07



Product Service

3GHz to 25GHz

Date: 12.JUN.2012 04:50:07

Configuration 1 – Mode 3 - 39kHz – 1.3GHz

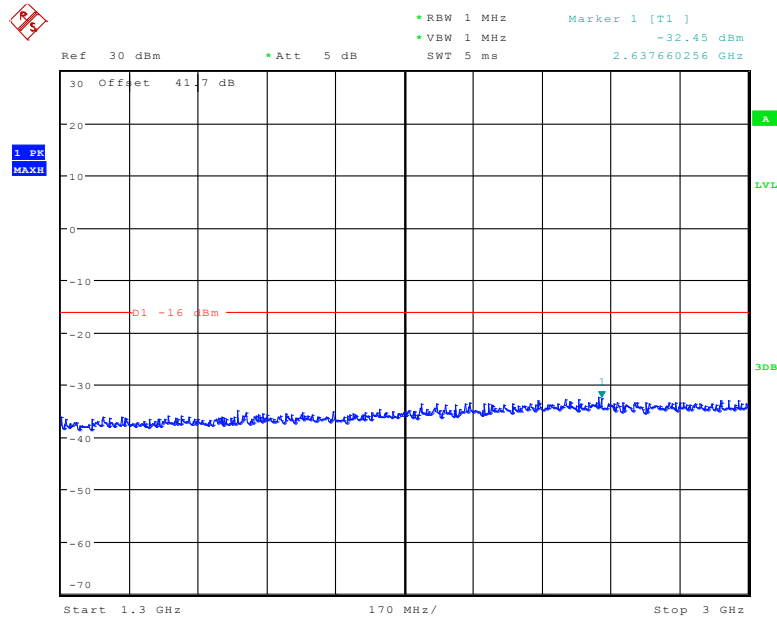
Date: 21.JUN.2012 09:40:51

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



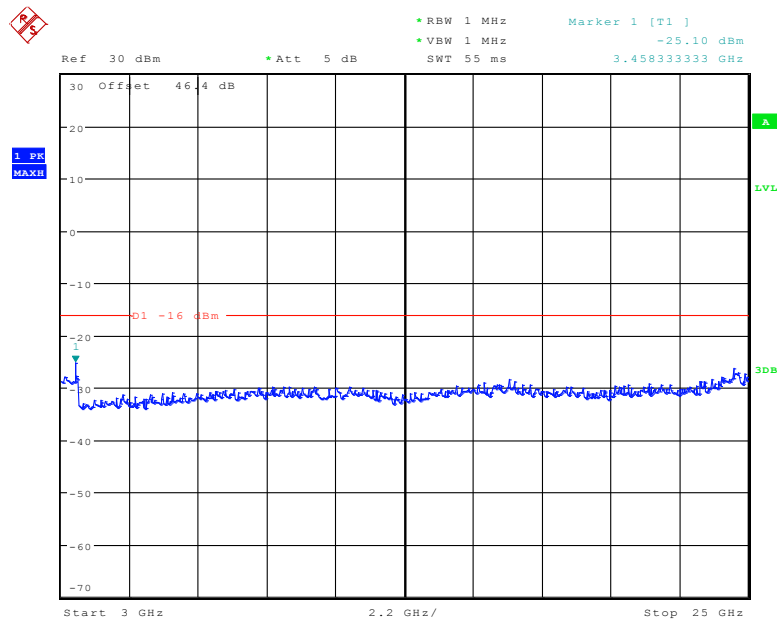
Product Service

1.3GHz – 3GHz



Date: 21.JUN.2012 10:11:59

3GHz – 25GHz



Date: 21.JUN.2012 09:42:12

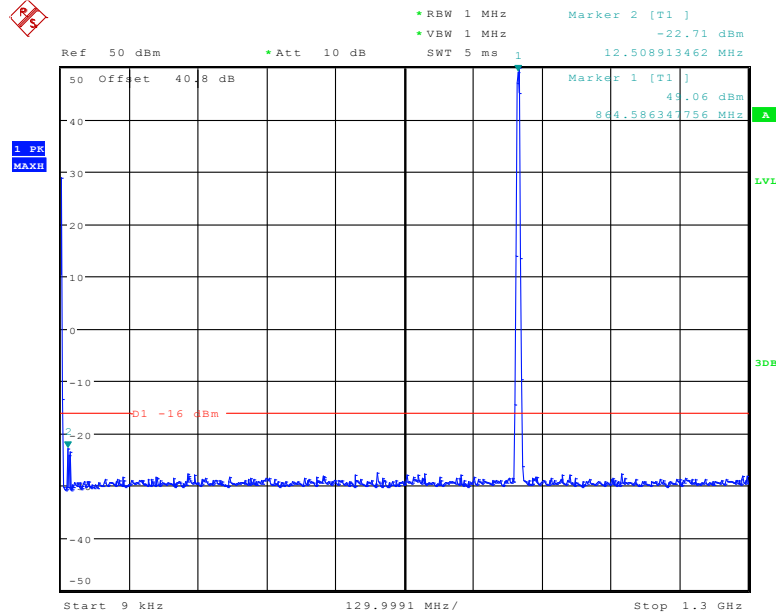


Product Service

5MHz Bandwidth

Configuration 1 - Mode 1 - 5

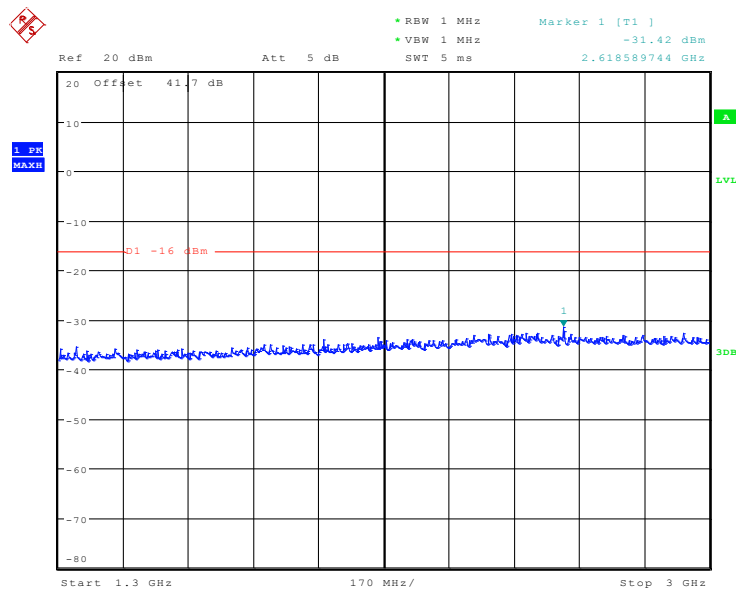
9kHz to 1.3GHz



Date: 12.JUN.2012 08:02:27

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

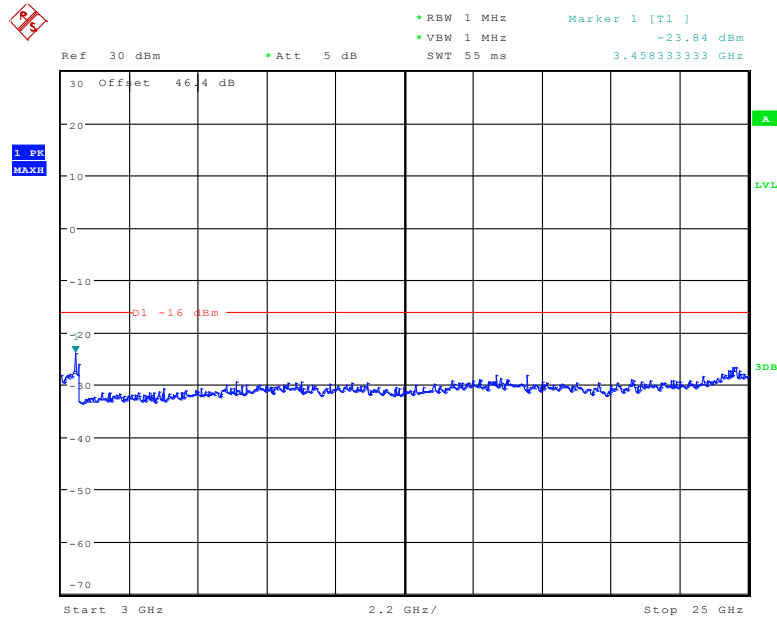
1.3GHz to 3GHz



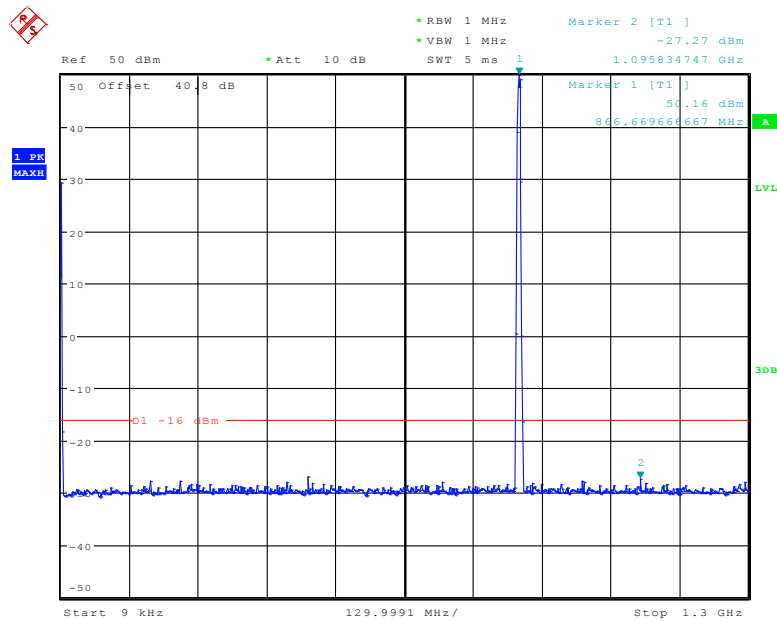
Date: 21.JUN.2012 11:07:34



Product Service

3GHz to 25GHz

Date: 12.JUN.2012 07:52:15

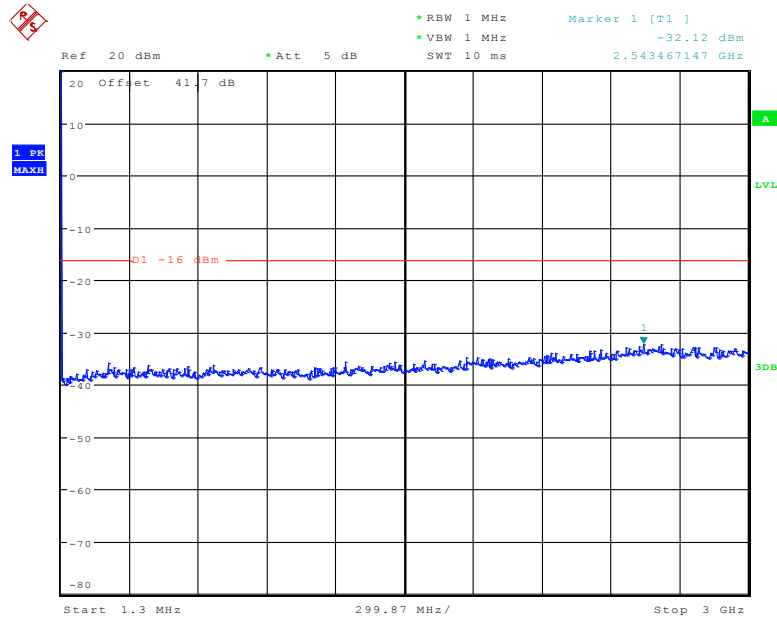
Configuration 1 - Mode 29kHz to 1.3GHz

Date: 12.JUN.2012 04:24:56

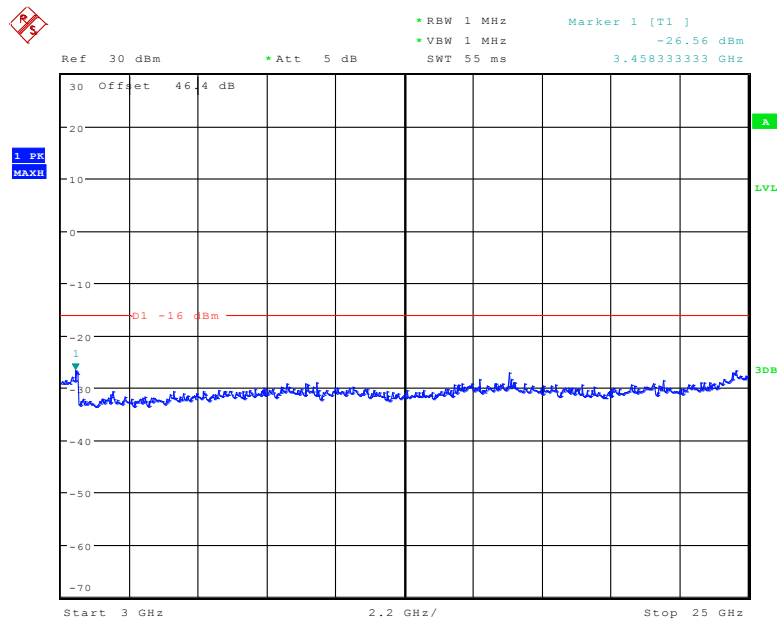
Note: The emission beyond the limit is the operating frequency.



Product Service

1.3GHz to 3GHz

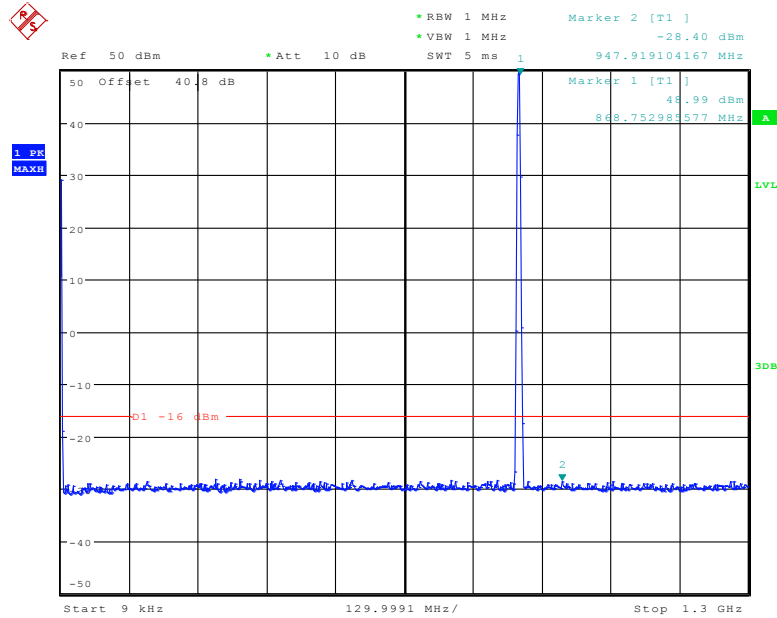
Date: 13.JUN.2012 04:47:21

3GHz to 25GHz

Date: 12.JUN.2012 04:21:06

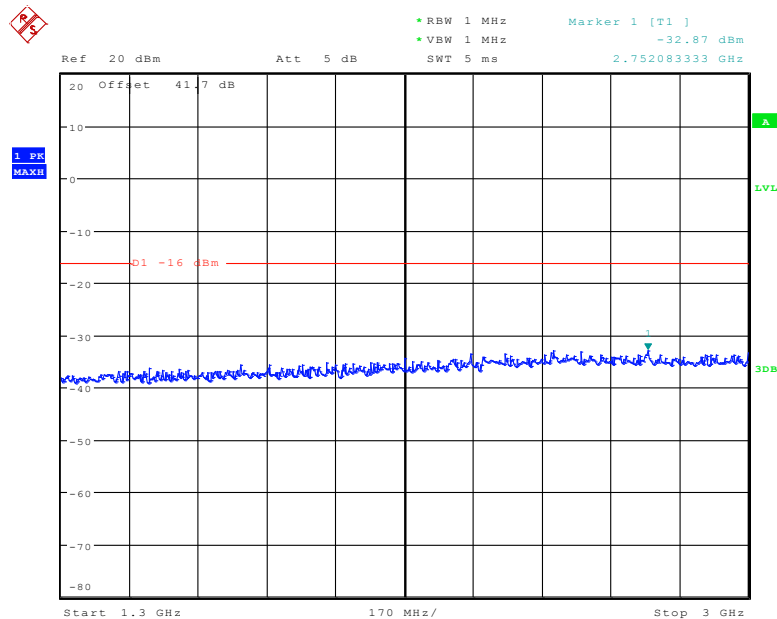


Product Service

Configuration 1 - Mode 3 - 59kHz to 1.3GHz

Date: 12.JUN.2012 04:19:46

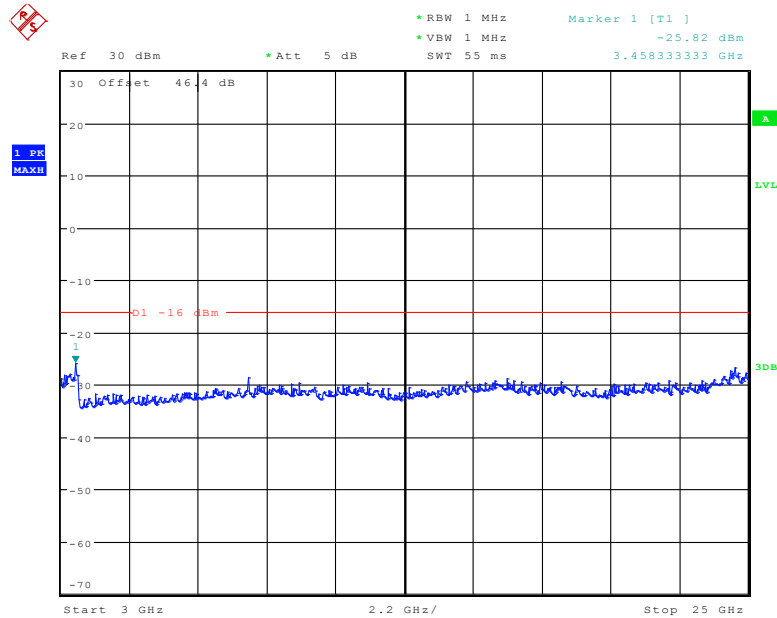
Note: The emission beyond the limit is the operating frequency.

1.3GHz to 3GHz

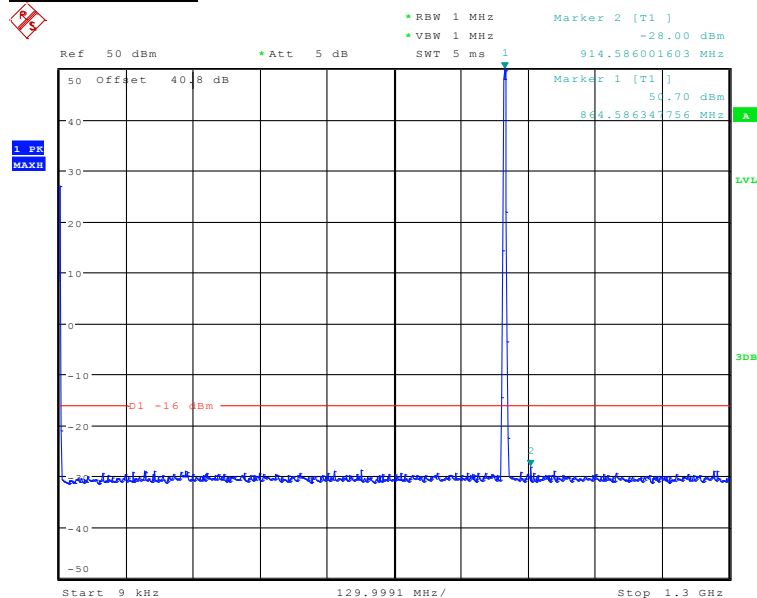
Date: 21.JUN.2012 11:06:42



Product Service

3GHz to 25GHz

Date: 12.JUN.2012 05:44:14

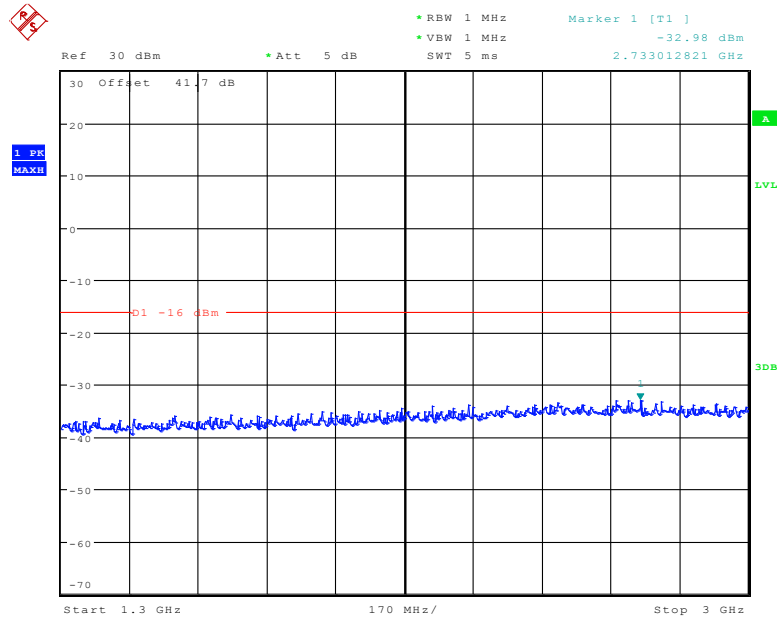
E-TM3.1**3MHz Bandwidth****Configuration 1 - Mode 1 - 3****9kHz to 1.3GHz**

Date: 21.JUN.2012 10:37:48

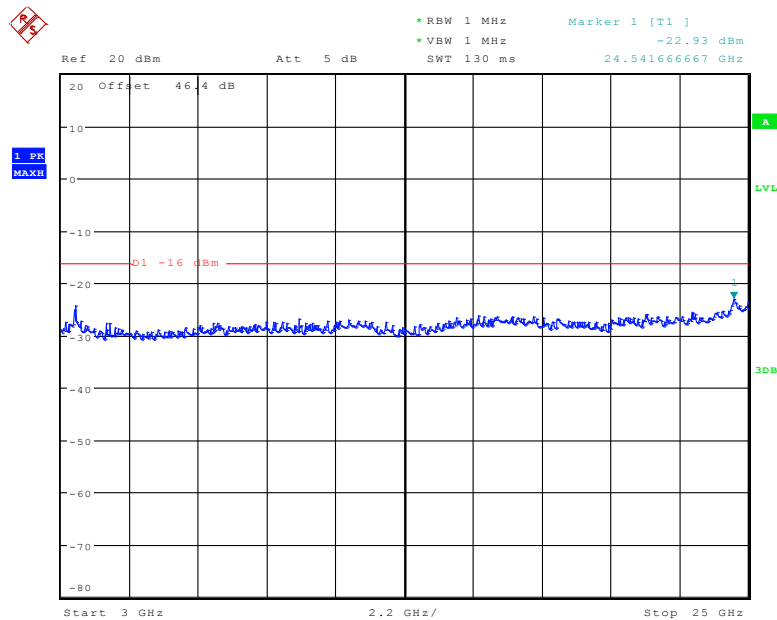
Note: The emission beyond the limit is the operating frequency.



Product Service

1.3GHz to 3GHz

Date: 21.JUN.2012 10:20:36

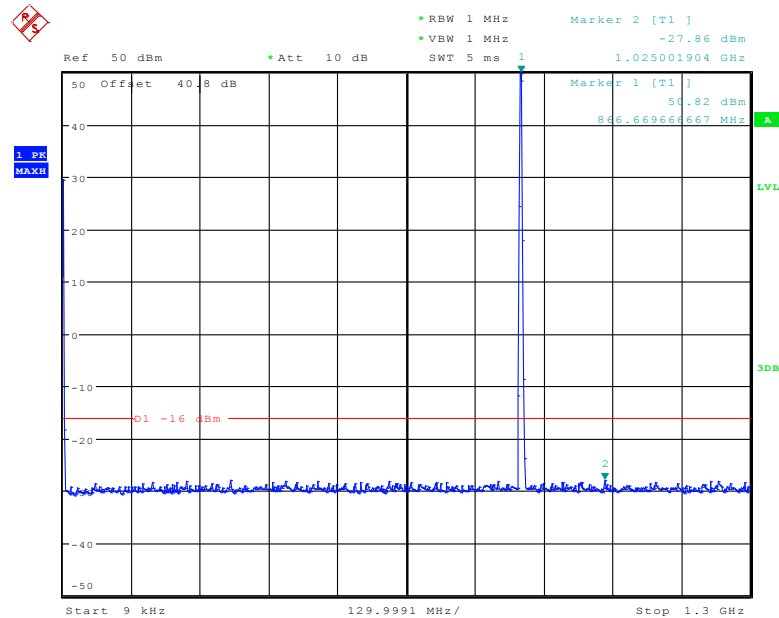
3GHz to 25GHz

Date: 21.JUN.2012 10:40:59



Configuration 1 - Mode 2

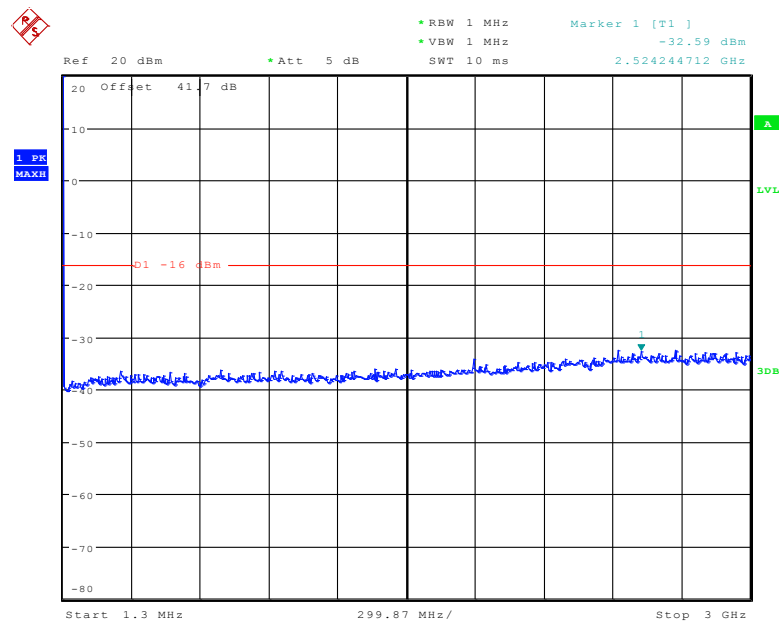
9kHz to 1.3GHz



Date: 11.JUN.2012 10:10:33

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

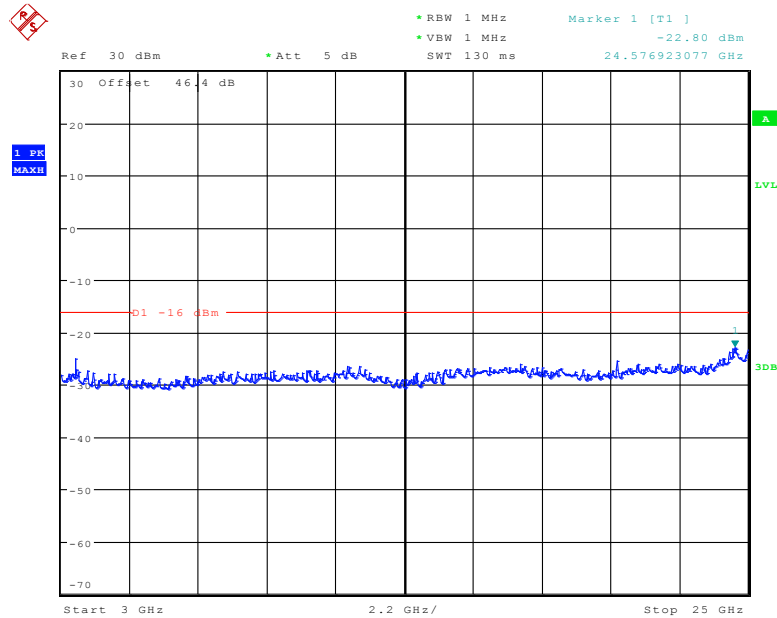
1.3GHz to 3GHz



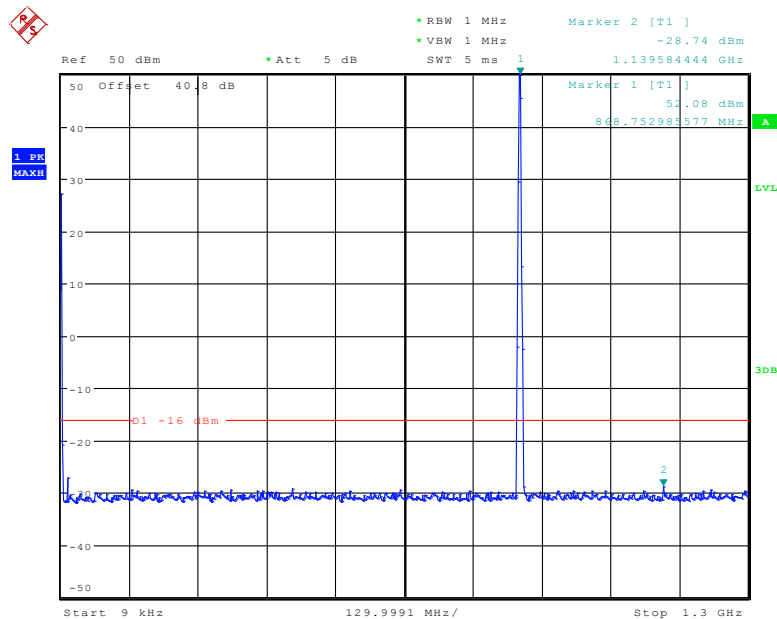
Date: 13.JUN.2012 04:23:41



Product Service

3GHz to 25GHz

Date: 11.JUN.2012 10:11:36

Configuration 1 – Mode 3 - 39kHz – 1.3GHz

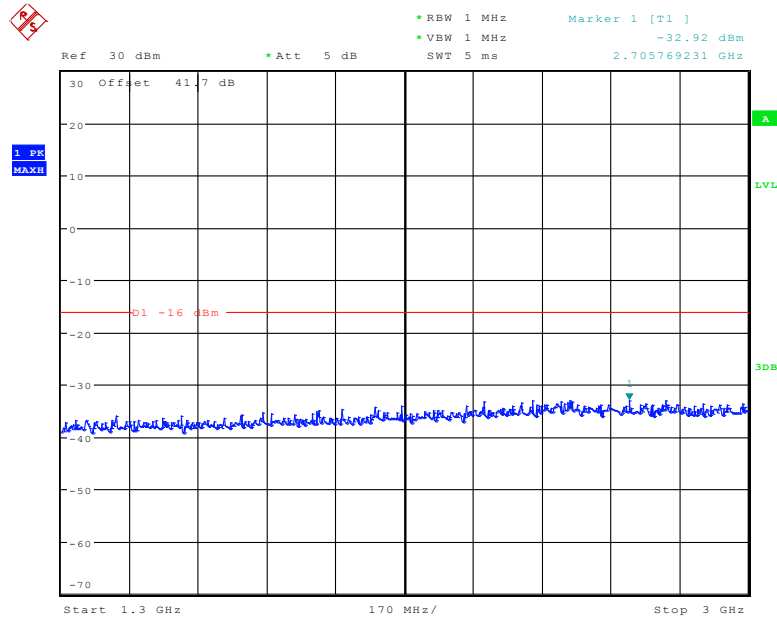
Date: 21.JUN.2012 08:54:48

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



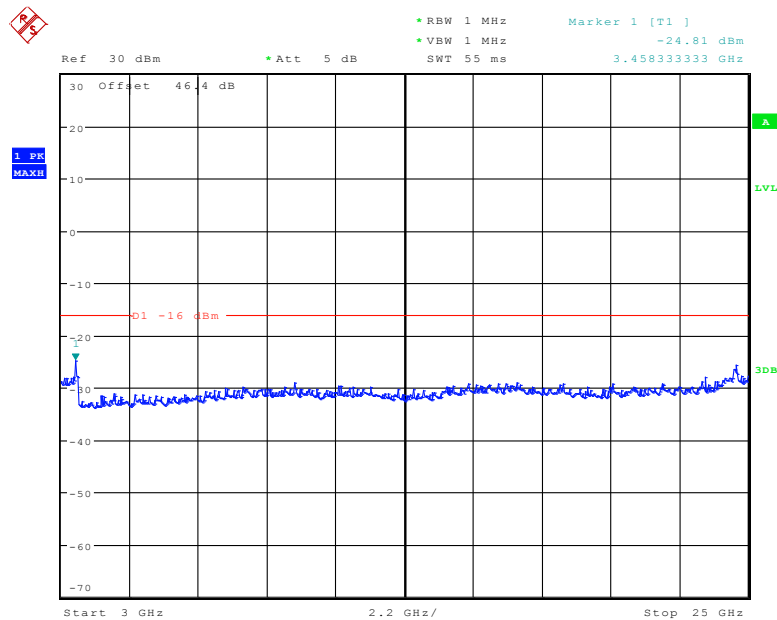
Product Service

1.3GHz – 3GHz



Date: 21.JUN.2012 10:18:51

3GHz – 25GHz



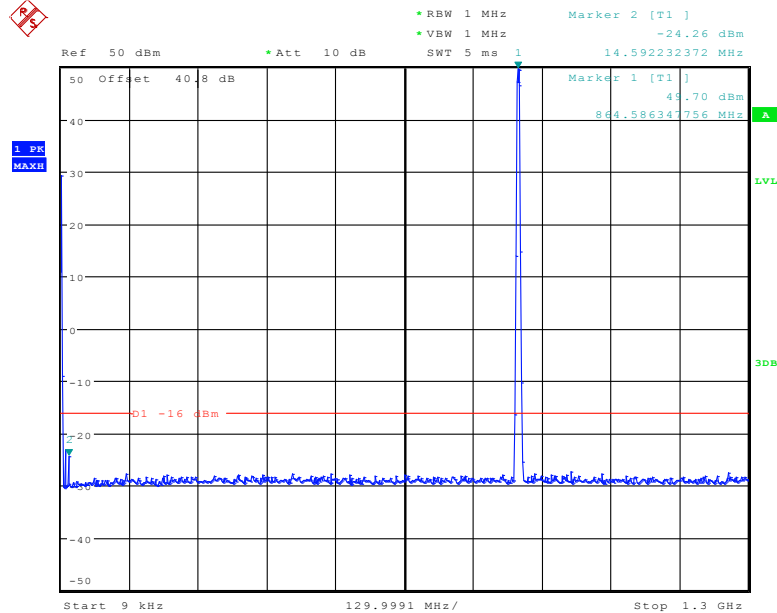
Date: 21.JUN.2012 08:56:03



5MHz Bandwidth

Configuration 1 - Mode 1 - 5

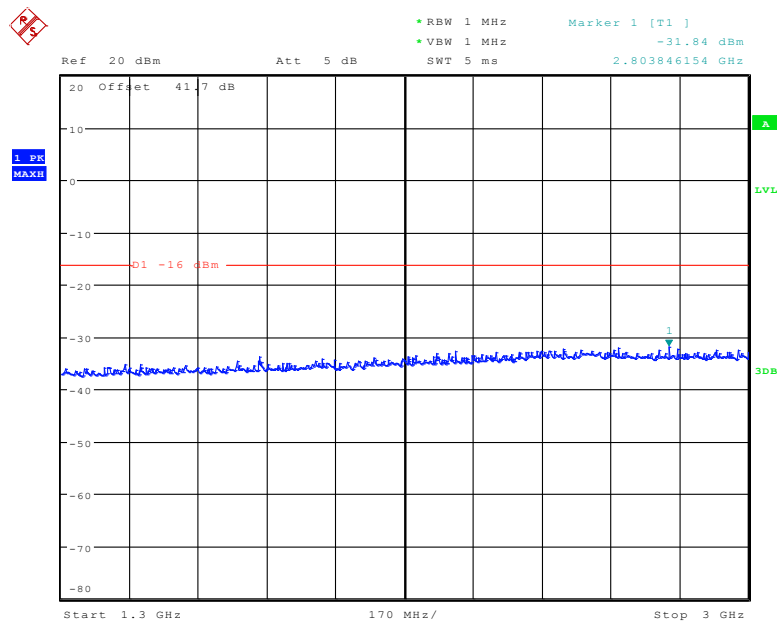
9kHz to 1.3GHz



Date: 12.JUN.2012 08:27:59

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

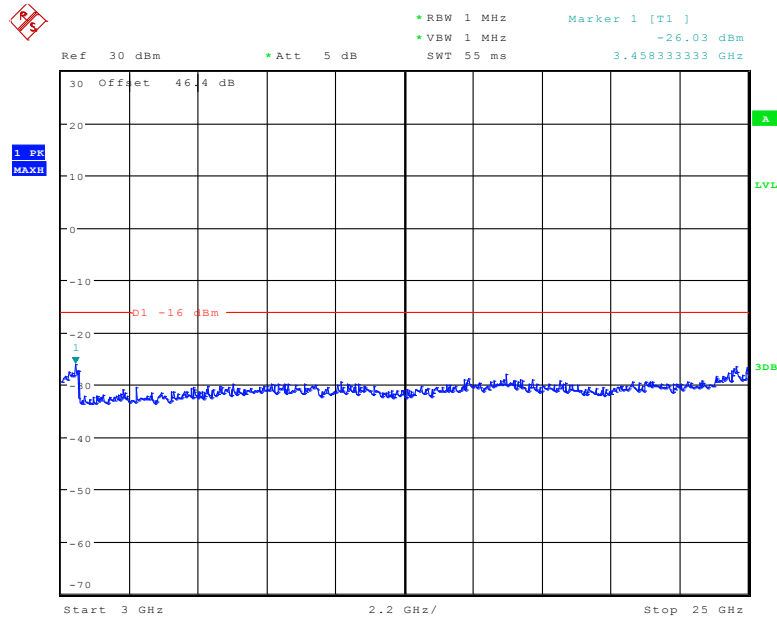
1.3GHz to 3GHz



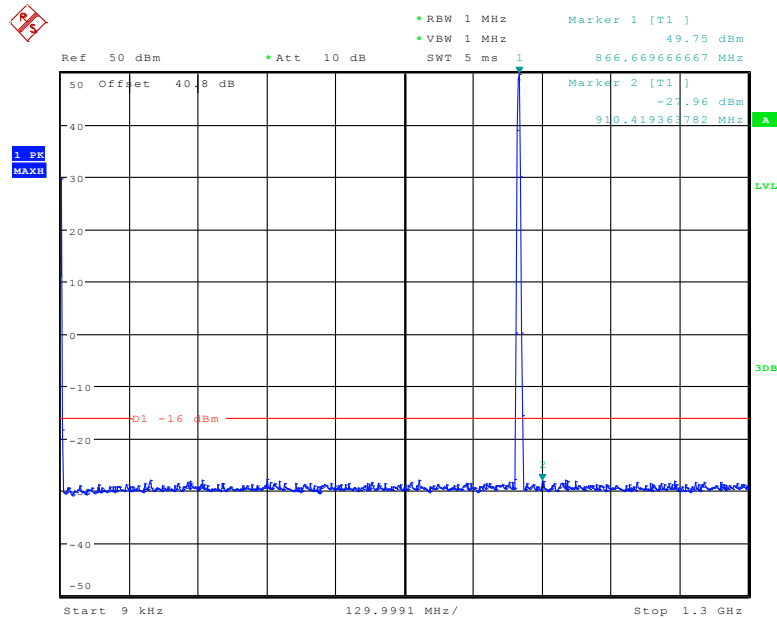
Date: 21.JUN.2012 10:58:33



Product Service

3GHz to 25GHz

Date: 12.JUN.2012 08:25:29

Configuration 1 - Mode 29kHz to 1.3GHz

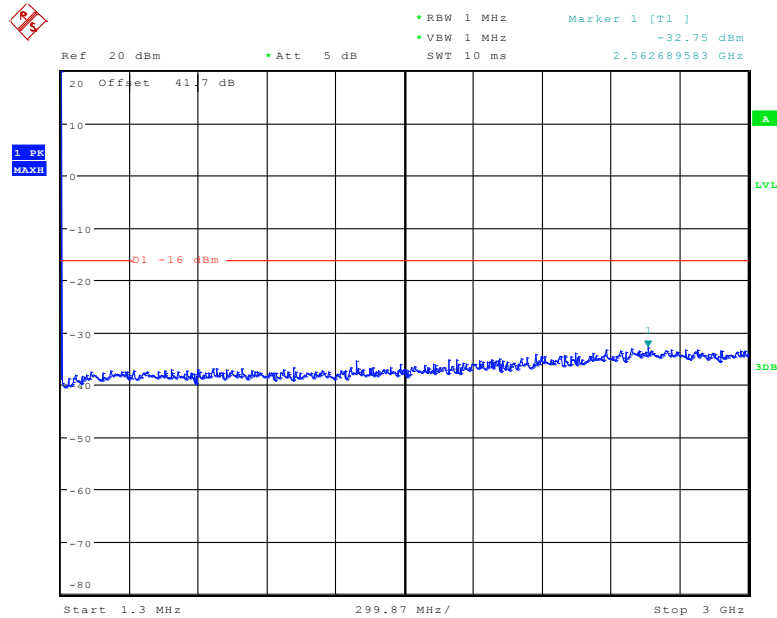
Date: 11.JUN.2012 08:07:32

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



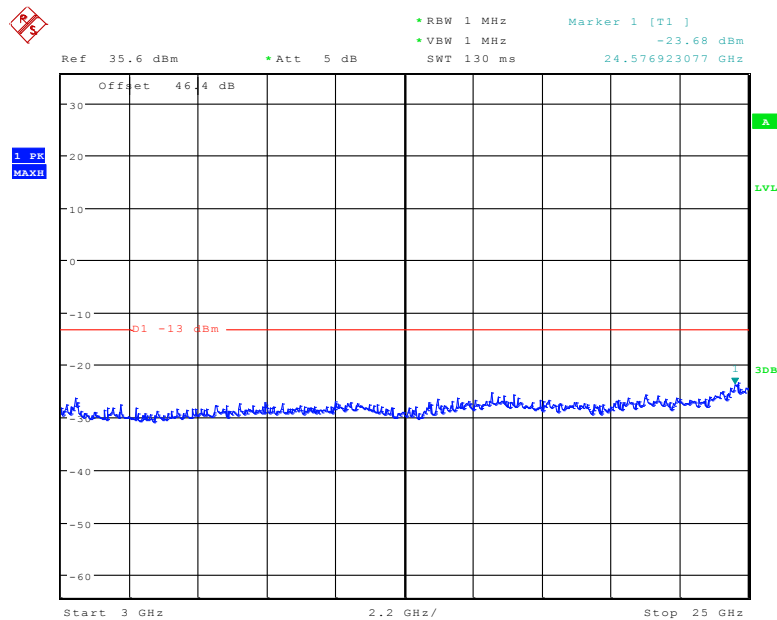
Product Service

1.3GHz to 3GHz



Date: 13.JUN.2012 05:19:16

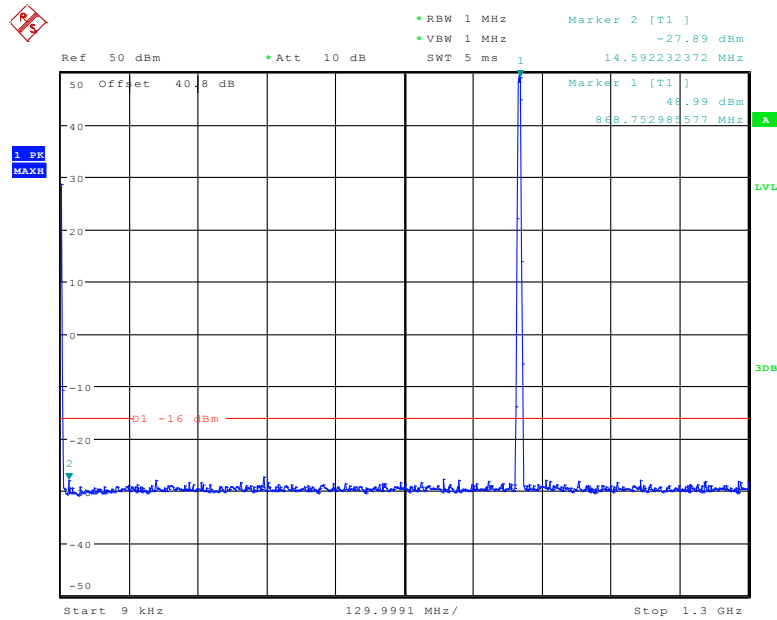
3GHz to 25GHz



Date: 11.JUN.2012 08:08:45

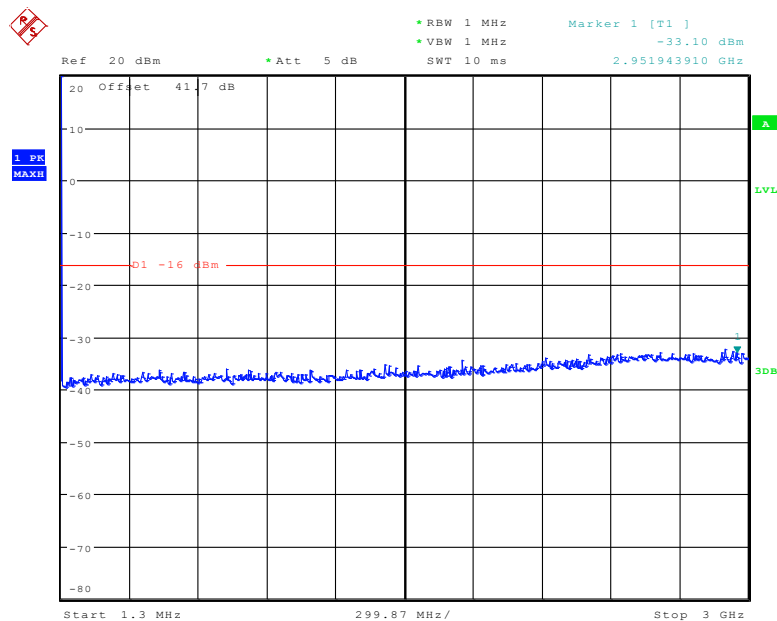


Product Service

Configuration 1 - Mode 3 - 59kHz to 1.3GHz

Date: 12.JUN.2012 08:44:46

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

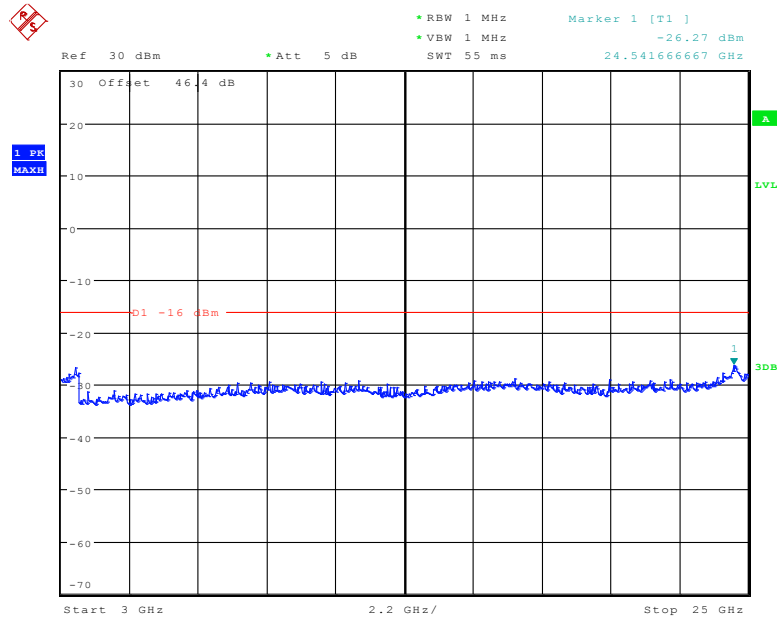
1.3GHz to 3GHz

Date: 13.JUN.2012 05:24:57



Product Service

3GHz to 25GHz



Date: 12.JUN.2012 08:45:37

Limit	-13dBm
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Remarks

The EUT does not exceed -13dBm at the frequency range of 9kHz to 25GHz.



Product Service

2.7 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.7.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 90, Clause 90.213

2.7.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.7.3 Date of Test and Modification State

4 and 5 June 2012 – Modification State 0

2.7.4 Test Equipment Used

The major items of test equipment used for the above 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 90.

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

The EUT was tested with test model E-TM1.1 in 3MHz bandwidth.

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

Configuration 1 - Mode 2 (3MHz OBW)

2.7.6 Environmental Conditions

	4 June 2012	5 June 2012
Ambient Temperature	25.5°C	25.7°C
Relative Humidity	52.0%	51.3%



2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 90 for Frequency Stability Under Temperature Variations.

The test results are shown below

Power Supply: -48V DC

E-TM1.1: 3MHz Bandwidth

Configuration 1 - Mode 2

Temperature Interval (°C)	Deviation (Hz)
-30	8.72
-20	6.92
-10	8.05
0	7.12
+10	9.36
+20	8.31
+30	11.19
+40	10.60
+50	9.71

Limit	± 1.5 ppm or ± 1.298 kHz
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Remarks

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

2.8 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.8.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 90, Clause 90.213

2.8.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: C825549933

2.8.3 Date of Test and Modification State

5 June 2012 – Modification State 0

2.8.4 Test Equipment Used

The major items of test equipment used for the above 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 90.

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

The EUT was tested with test model E-TM1.1 in 3MHz bandwidth.

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

Configuration 1 - Mode 2 (3MHz OBW)

2.8.6 Environmental Conditions

5 June 2012

Ambient Temperature 25.7°C

Relative Humidity 51.3%



2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 90 for Frequency Stability Under Voltage Variations.

The test results are shown below

Temperature: 20°C

E-TM1.1: 3MHz Bandwidth

Configuration 1 - Mode 2

DC Voltage (V)	Deviation (Hz)
-40.8	8.32
-48.0	8.31
-55.2	9.29

Limit	± 1.5 ppm or ± 1.298 kHz
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Remarks

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 equipments.

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
Section 2.1, 2.2, 2.3, 2.4 and 2.6 – Maximum Conducted Output Power, Modulation Characteristics, Occupied Bandwidth, Emission Masks, and Conducted Spurious Emissions.					
Spectrum Analyser	Rohde & Schwarz	FSQ26	201124	12	26-Jun-2013
Power Meter	Rohde & Schwarz	NRP2	101310	12	10-Aug-2012
Thermal Power Sensor	Rohde & Schwarz	NRP-Z51	102116	12	10-Aug-2012
Network Analyzer	Agilent	8720D	US36140166	12	09-Sep-2012
40 dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121616	-	O/P MON
Power Supply	Dahua	DH1716A-14	ETD/L041	12	24-Aug-2012
Digital Multi-meter	FLUKE	179	91820401	12	13-Dec-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	19-Dec-2012
Section 2.5 – Radiated Spurious Emissions					
Load	Shanghai Huaxiang	TF100	09121616	-	O/P MON
Load	Shanghai Huaxiang	TF100	08011709	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2012
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2012
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2012
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2012
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber (FCC List No.: 910917)	Frankonia	23.18m×16.88 m× 9.60m	-	12	19-Aug-2012
Power Supply	Dahua	DH1716A-14	ETD/L041	12	24-Aug-2012
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	19-Dec-2012



Section 2.7 and 2.8 – Frequency Stability Under Temperature and Voltage Variations					
Spectrum Analyser	Rohde & Schwarz	FSQ26	201124	12	26-Jun-2013
40 dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
Temperature Chamber	ZUNDAR	ZT1000	10080064	-	O/P MON
Power Supply	Dahua	DH1716A-14	ETD/L041	12	24-Aug-2012
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	19-Dec-2012

O/P MON
TU

Output monitored with calibration equipment
Traceability Unscheduled



3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30MHz to 10GHz Amplitude	0.5dB*
Conducted Emissions	30MHz to 40GHz Amplitude	3.0dB*
Frequency Stability	30MHz to 2GHz Amplitude	$<1 \times 10^{-7}$
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
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