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Report On

FCC Testing of the
Ericsson AB RRUS 11 B12 / KRC 161 241/1

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8BKRC161241-1

Document 75922948 Report 01 Issue 1 May 2013

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REPORT ON

FCC Testing of the
Ericsson RRUS 11 B12 / KRC 161 241/1

Document 75922948 Report 01 Issue 1

May 2013

PREPARED FOR

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PREPARED BY

G Zhao
Test Engineer

APPROVED BY

S Bennett
Authorised Signatory

DATED 30 May 2013

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

Test Engineer(s);

G Zhao X Zhang

Product Service

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Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Ericsson RRUS 11 B12 / KRC 161 241/1

Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 11 B12 / KRC 161 241/1 to the requirements of FCC CFR 47 Part 27.

Testing was carried out in support of a C2PC application for the Grant of RRUS 11 B12 / KRC 161 241/1 for hardware update and adding MIMO support

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 B12
Part Number	KRC 161 241/1
Serial Number(s)	CB4P949740
Software Version	CXP102051/16 Rev R28M
PIS Software Version	CXP9013268/6 Rev R49BK
Hardware Version	R3B
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 27: 2012
Incoming Release Date	Declaration of Build Status 23 April 2013
Order Number Date	PTP 25 April 2013
Start of Test	24 April 2013
Finish of Test	14 May 2013
Name of Engineer(s)	G Zhang X Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2012

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 27, is shown below.

Configuration 1 – Remote Radio Equipment						
Section	Spec Clause FCC Part 2 and 27	Test Description	Mode	Mod State	Result	Comments
	27.50 (c)	Effective Radiated Power	728.7MHz (1.4MHz OBW) / 735.5MHz (15.0MHz OBW)		N/A	No integral antenna.
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)		N/A	
			745.3MHz (1.4MHz OBW) / 738.5MHz (15.0MHz OBW)		N/A	
2.1	2.1046, 27.50 (c)	Maximum Peak Output Power - Conducted	728.7MHz (1.4MHz OBW) / 735.5MHz (15.0MHz OBW)	0	Pass	-
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)	0	Pass	
			745.3MHz (1.4MHz OBW) / 738.5MHz (15.0MHz OBW)	0	Pass	
2.2	27.50 (i)	Peak – Average Ratio	728.7MHz (1.4MHz OBW) / 735.5MHz (15.0MHz OBW)	0	Pass	-
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)	0	Pass	
			745.3MHz (1.4MHz OBW) / 738.5MHz (15.0MHz OBW)	0	Pass	
2.3	2.1047 (d)	Modulation Characteristics	729.5MHz (3.0MHz OBW)		N/A	-
			737.0MHz (3.0MHz OBW)	0	Pass	
			744.5MHz (3.0MHz OBW)		N/A	
2.4	2.1049, 27.53 (g)	Occupied Bandwidth	728.7MHz (1.4MHz OBW) / 735.5MHz (15.0MHz OBW)	0	Pass	-
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)	0	Pass	
			745.3MHz (1.4MHz OBW) / 738.5MHz (15.0MHz OBW)	0	Pass	
2.5	2.1051, 27.53 (g)	Spurious Emissions at Antenna Terminals (±1MHz)	728.7MHz (1.4MHz OBW) / 729.5MHz (3.0MHz OBW) / 730.5MHz (5.0MHz OBW) / 733.0MHz (10.0MHz OBW) / 735.5MHz (15.0MHz OBW)	0	Pass	-
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)		N/A	
			745.3MHz (1.4MHz OBW) / 744.5MHz (3.0MHz OBW) / 743.5MHz (5.0MHz OBW) / 741.0MHz (10.0MHz OBW) / 738.5MHz (15.0MHz OBW)	0	Pass	

Product Service

Configuration 1 – Remote Radio Equipment						
Section	Spec Clause FCC Part 2 and 27	Test Description	Mode	Mod State	Result	Comments
2.6	2.1053, 27.53 (g)	Radiated Spurious Emissions	728.7MHz (1.4MHz OBW)	0	Pass	-
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)	0	Pass	
			745.3MHz (1.4MHz OBW)	0	Pass	
2.7	2.1051, 27.53 (g)	Conducted Spurious Emissions	728.7MHz (1.4MHz OBW) / 735.5MHz (15.0MHz OBW)	0	Pass	-
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)	0	Pass	
			745.3MHz (1.4MHz OBW) / 738.5MHz (15.0MHz OBW)	0	Pass	
2.8	2.1055, 27.54	Frequency Stability Under Temperature Variations	729.5MHz (3.0MHz OBW)		N/A	-
			737.0MHz (3.0MHz OBW)	0	Pass	
			744.5MHz (3.0MHz OBW)		N/A	
2.9	2.1055, 27.54	Frequency Stability Under Voltage Variations	729.5MHz (3.0MHz OBW)		N/A	-
			737.0MHz (3.0MHz OBW)	0	Pass	
			744.5MHz (3.0MHz OBW)		N/A	
	-	Receiver Spurious Emissions	728.7MHz (1.4MHz OBW) / 729.5MHz (3.0MHz OBW) / 730.5MHz (5.0MHz OBW) / 733.0MHz (10.0MHz OBW) / 735.5MHz (15.0MHz OBW)		N/A	Note
			737.0MHz (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)		N/A	
			745.3MHz (1.4MHz OBW) / 744.5MHz (3.0MHz OBW) / 743.5MHz (5.0MHz OBW) / 741.0MHz (10.0MHz OBW) / 738.5MHz (15.0MHz OBW)		N/A	

N/A – Not Applicable

Note: The client declare that the test object no stand-by mode. Both TX ports are alway active. RX measurements was considered not applicable.

1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Remote Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NAME	RRUS 11 B12
PART NUMBER	KRC 161 241/1
SERIAL NUMBER	CB4P949740
HARDWARE VERSION	R3B
SOFTWARE VERSION	CXP102051/16 Rev R28M
PIS SOFTWARE VERSION	CXP9013268/6 Rev R49BK
TRANSMITTER OPERATING RANGE	TX: 728MHz - 746MHz RX: 698MHz - 716MHz
DUPLEXER MODE	FDD
MODULATIONS	QPSK, 16QAM, 64QAM
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	1M40F9W 3M00F9W 5M00F9W 10M0F9W 15M0F9W
SUPPORTED CHANNEL BANDWIDTH CONFIGURATION	1.4MHz, 3MHz, 5MHz, 10MHz and 15MHz according to 3GPP TS 36.141
OUTPUT POWER (RMS) (W or dBm)	2 x 44.8dBm (2 x 30W)
OUTPTU POWER TOLERANCE	± 2.0dB
NUMBER OF ANTENNA PORTS	2 TX/RX ports
SUPPORTED CONFIGURATION	Dual Single Carrier, TX Diversity and MIMO. Both RF chains are identical
FCC ID	TA8BKRC161241-1
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of LTE Base Station.

Signature

Date 16 May 2013

D of B S Serial No 75922948 /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.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) RRUS 11 B12 / KRC 161 241/1 is an Ericsson Remote Radio Equipment working in the public mobile service 728-746MHz band which provides communication connections to LTE network. The RRUS 11 B12 / KRC 161 241/1 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

1.4.2 Test Configuration

Configuration 1: Remote Radio Equipment

The EUT was configured in accordance with FCC CFR 47 Part 27.

The RRUS 11 B12 / KRC 161 241/1 supports Dual single mode, Tx Diversity and MIMO mode. All modes have been included when several settings were tested to find worst case setting, and Tx MIMO was used for the TX measurements.

The RRUS 11 B12 / KRC 161 241/1 supports Test Models E-TM1.1, E-TM3.2 and E-TM3.1 at 728-746MHz 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 settings below were found to be representative for all traffic scenarios when several settings with the different modulations, channel bandwidths were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted:

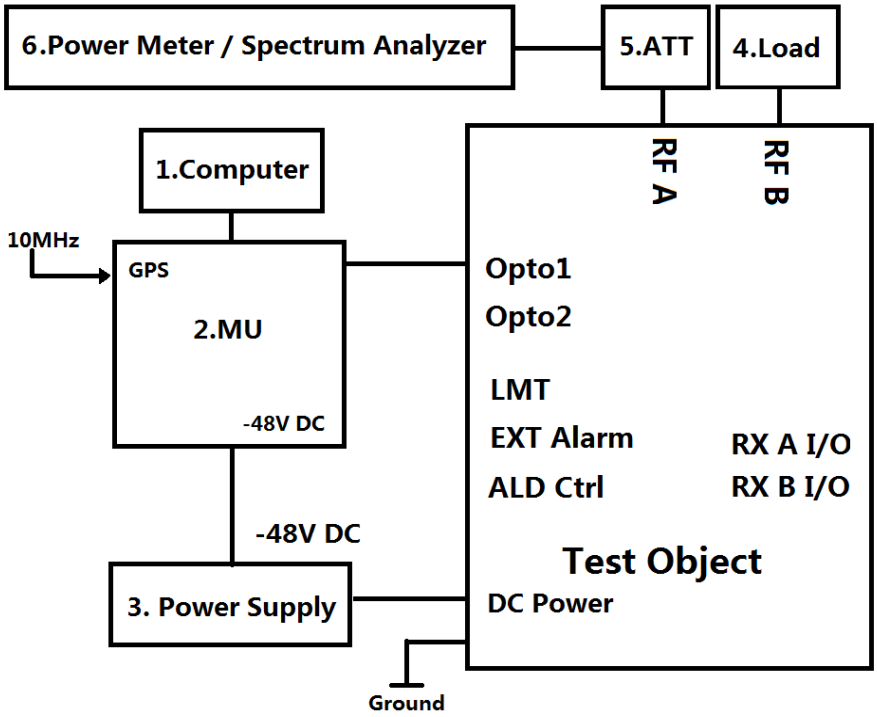
- Test Model E-TM1.1 in channel bandwidth 1.4MHz and 15MHz.

The EUT has two TX/RX ports and it can be configured to transmit in 728-746MHz with both TX are active.

For TX test cases: Maximum Conducted Output Power, Peak – Average Ratio, Spurious Emissions at Antenna Terminals (±1MHz) 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/RX output connector RF A. RX testing was considered not applicable due to the EUT does not have stand-by mode. 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.

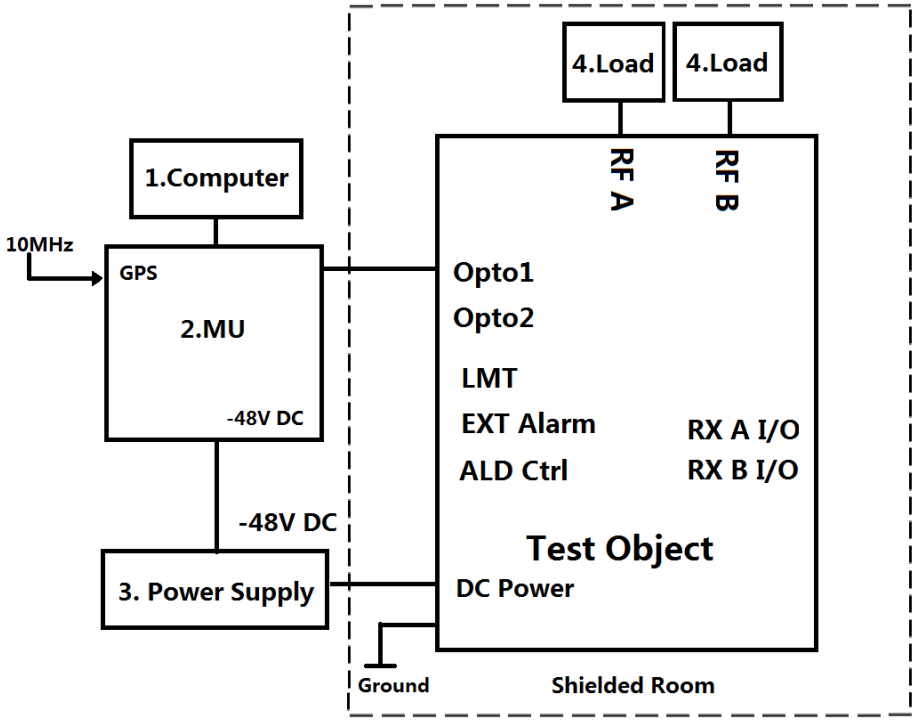
Test Setup, Conducted Measurement:



Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 11 B12 / KRC 161 241/1	R3B	CB4P949740

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP 8470P	--	AP533355
2	RBS 6601	BFL 901 009/1	--	--
	DUL 20 01	KDU 137 533/4	R1C	C824471956
	SUP 6601	1/BFL 901 009/1	R3B	BR80993658
3	Power Supply	DH1716-5D	--	20030062
4	Load	TF100	--	09121648
5	Attenuator	48-40-43-LIM	--	BR5020
6	Power Meter	Rohde & Schwarz NRP	--	101283
	Power Sensor	Rohde & Schwarz NRP-Z51	--	102433
	Spectrum Analyzer	Rohde & Schwarz FSQ26	--	200235
	Spectrum Analyzer	Rohde & Schwarz FSQ26		200759

Test Setup, Radiated Measurement:



Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 11 B12 / KRC 161 241/1	R3B	CB4P949740

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP 8470P	--	AP533355
2	RBS 6601	BFL 901 009/1	--	--
	DUL 20 01	KDU 137 533/4	R1C	C824471956
	SUP 6601	1/BFL 901 009/1	R3B	BR80993658
3	Power Supply	DH1716-5D	--	20030062
4	Load	TF100	--	09121648
	Load	TF100	--	09121605

1.4.3 Modes of Operation

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

Bottom Channel :

Mode 1 - 1.4 : EARFCN 5007: 728.7MHz (1.4MHz Bandwidth)

Mode 1 - 3 : EARFCN 5015: 729.5MHz (3.0MHz Bandwidth)

Mode 1 - 5 : EARFCN 5025: 730.5MHz (5.0MHz Bandwidth)

Mode 1 - 10 : EARFCN 5050: 733.0MHz (10.0MHz Bandwidth)

Mode 1 - 15 : EARFCN 5075: 735.5MHz (15.0MHz Bandwidth)

Middle Channel :

Mode 2 : EARFCN 5090: 737.0MHz

Top Channel :

Mode 3 - 1.4 : EARFCN 5173: 745.3MHz (1.4MHz Bandwidth)

Mode 3 - 3 : EARFCN 5165: 744.5MHz (3.0MHz Bandwidth)

Mode 3 - 5 : EARFCN 5155: 743.5MHz (5.0MHz Bandwidth)

Mode 3 - 10 : EARFCN 5130: 741.0MHz (10.0MHz Bandwidth)

Mode 3 - 15 : EARFCN 5105: 738.5MHz (15.0MHz Bandwidth)

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

1.5 TEST CONDITIONS

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

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

1.6 DEVIATIONS FROM THE STANDARD

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

1.7 MODIFICATION RECORD

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

1.8 ALTERNATIVE TEST SITE

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.

Product Service

SECTION 2

TEST DETAILS

FCC Testing of the
Ericsson RRUS 11 B12 / KRC 161 241/1

2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 27, Clause 27.50 (c)

2.1.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.1.3 Date of Test and Modification State

27, 28 April and 10 May 2013 – 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 27.

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-T1.1, E-TM3.2 and E-TM3.1 test models using the test mode described. Since the EUT transmits on two antennas simultaneously in the same frequency range, i.e, TX Diversity and MIMO using the Measure-and-Sum approach, the output power and power spectral density 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 - 1.4, Mode 1 - 15
- Mode 2 (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)
- Mode 3 - 1.4, Mode 3 - 15

2.1.6 Environmental Conditions

	27 April 2013	28 April 2013	10 May 2013
Ambient Temperature	22.8°C	23.5°C	22.0°C
Relative Humidity	29.5%	31.0%	54.0%

2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 27 for Maximum Peak Output Power.

The test results are shown below

Antenna A and B

E-TM1.1: 1.4MHz Bandwidth

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

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		
5007	728.7	44.30	26.92	44.13	25.88	47.23	52.80
5090	737.0	44.46	27.93	44.51	28.25	47.50	56.17
5173	745.3	44.23	26.49	44.37	27.35	47.31	53.84

E-TM1.1: 15.0MHz Bandwidth

Configuration 1 - Mode 1 - 15, Mode 2 and Mode 3 - 15

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		
5075	735.5	44.53	28.38	44.52	28.31	47.54	56.69
5090	737.0	44.47	27.99	44.52	28.31	47.51	56.30
5105	738.5	44.46	27.93	44.53	28.38	47.51	56.30

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

Configuration 1 - Mode 2

EARFCN/ Frequency (MHz)	BW Con-figuration (MHz)	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
5090 / 737.0	3.0	44.56	28.58	44.60	28.84	47.59	57.42
	5.0	44.57	28.64	44.61	28.91	47.60	57.55
	10.0	44.53	28.38	44.55	28.51	47.55	56.89

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

Configuration 1 - Mode 2

EARFCN/ Frequency (MHz)	Test Model	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
5090 / 737.0	E-TM3.2	44.43	27.73	44.52	28.31	47.49	56.05
	E-TM3.1	44.42	27.67	44.52	28.31	47.48	55.98

E-TM3.2 and E-TM3.1: 15.0MHz Bandwidth

Configuration 1 - Mode 2

EARFCN/ Frequency (MHz)	Test Model	Antenna A		Antenna B		Total (dBm) RMS	Total (W) RMS
		Result (dBm) RMS	Result (W) RMS	Result (dBm) RMS	Result (W) RMS		
5090 / 737.0	E-TM3.2	44.45	27.86	44.51	28.25	47.49	56.11
	E-TM3.1	44.45	27.86	44.52	28.31	47.50	56.18

Limit	≤1000W/MHz or ≤+60.0dBm/MHz

Remarks

The EUT does not exceed 1000W/MHz or 60.0dBm/MHz at the measured frequencies.

2.2 PEAK – AVERAGE RATIO

2.2.1 Specification Reference

FCC CFR 47 Part 27, Clause 27.50 (i)

2.2.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.2.3 Date of Test and Modification State

28 April and 2 May 2013 – Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above 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 27.

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

The measurements were performed on the combined output connector RF A. Limited complementary measurement were done at output conector RF B to verify identical performance for both transmitter chains in MIMO mode.

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:

Configuration 1 - Mode 1 - 1.4, Mode 1 - 15
- Mode 2 (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)
- Mode 3 - 1.4, Mode 3 - 15

2.2.6 Environmental Conditions

	28 April 2013	2 May 2013
Ambient Temperature	23.5°C	23.0°C
Relative Humidity	31.0%	37.0%

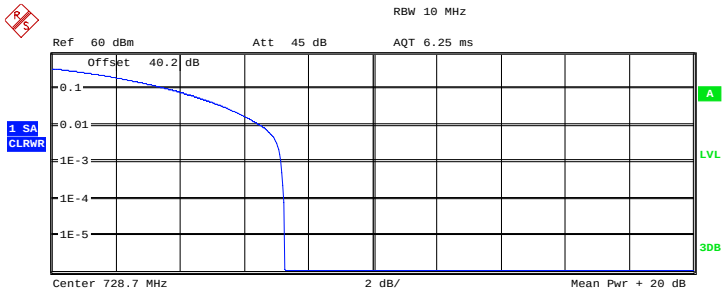
2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 27 for Peak - Average Ratio.

The test results are shown below.

Configuration 1 – Mode 1 -1.4

E-TM1.1: 1.4MHz Bandwidth



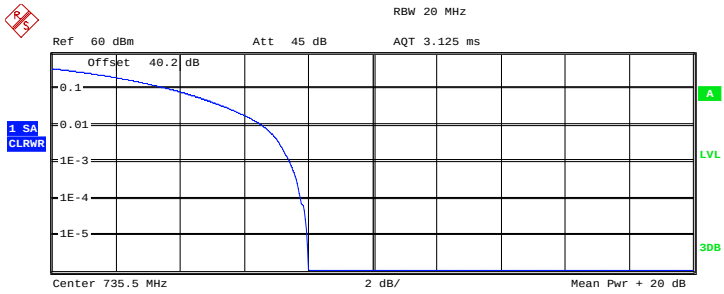
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	44.56 dBm
Peak	51.81 dBm
Crest	7.25 dB
10 %	3.65 dB
1 %	6.51 dB
.1 %	7.15 dB
.01 %	7.24 dB

Date: 2.MAY.2013 10:28:20

Configuration 1 - Mode 1 - 15

E-TM1.1: 15.0MHz Bandwidth



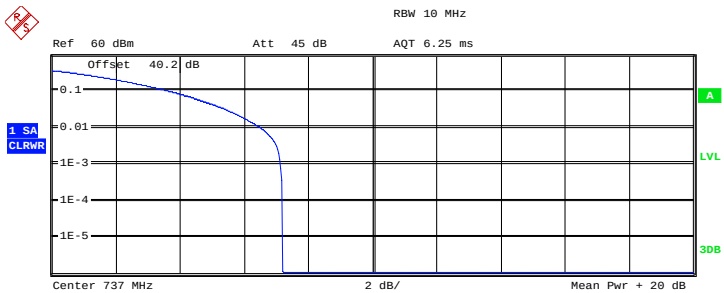
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 23.7MHz

	Trace 1
Mean	44.72 dBm
Peak	52.71 dBm
Crest	7.99 dB
10 %	3.72 dB
1 %	6.54 dB
.1 %	7.40 dB
.01 %	7.76 dB

Date: 28.APR.2013 15:53:03

Configuration 1 - Mode 2

E-TM1.1: 1.4MHz Bandwidth

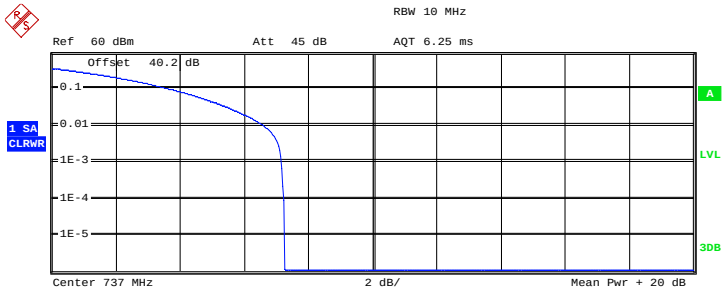


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	44.75 dBm
Peak	51.94 dBm
Crest	7.20 dB
10 %	3.65 dB
1 %	6.47 dB
.1 %	7.12 dB
.01 %	7.21 dB

Date: 2.MAY.2013 10:24:53

E-TM3.2: 1.4MHz Bandwidth

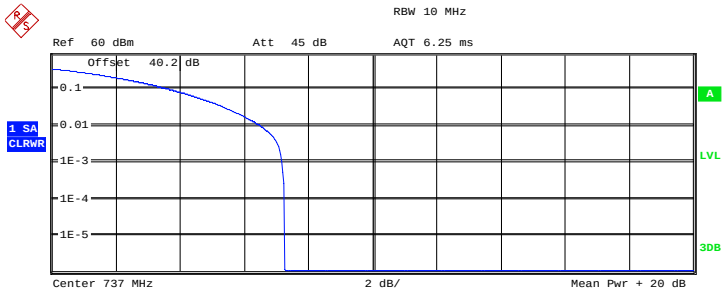


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	44.69 dBm
Peak	51.94 dBm
Crest	7.25 dB
10 %	3.69 dB
1 %	6.57 dB
.1 %	7.15 dB
.01 %	7.24 dB

Date: 2.MAY.2013 15:21:23

E-TM3.1: 1.4MHz Bandwidth

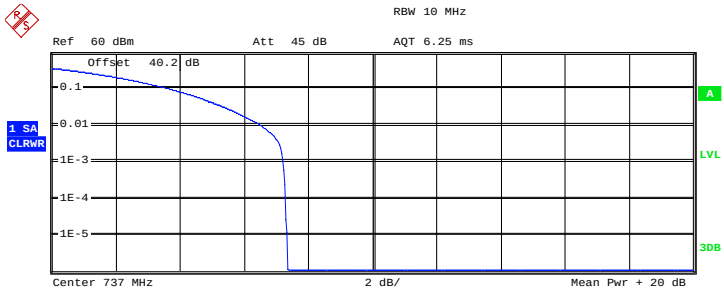


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	44.68 dBm
Peak	51.94 dBm
Crest	7.26 dB
10 %	3.69 dB
1 %	6.51 dB
.1 %	7.18 dB
.01 %	7.28 dB

Date: 2.MAY.2013 16:33:51

E-TM1.1: 3.0MHz Bandwidth

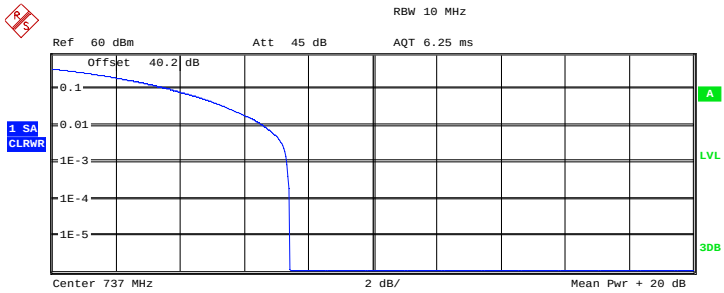


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	44.80 dBm
Peak	52.15 dBm
Crest	7.36 dB
10 %	3.69 dB
1 %	6.51 dB
.1 %	7.21 dB
.01 %	7.31 dB

Date: 2.MAY.2013 10:37:29

E-TM1.1: 5.0MHz Bandwidth

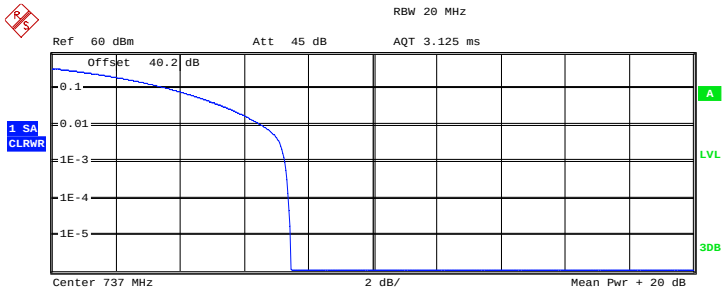


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	44.81 dBm
Peak	52.23 dBm
Crest	7.42 dB
10 %	3.72 dB
1 %	6.60 dB
.1 %	7.34 dB
.01 %	7.40 dB

Date: 2.MAY.2013 12:24:33

E-TM1.1: 10.0MHz Bandwidth

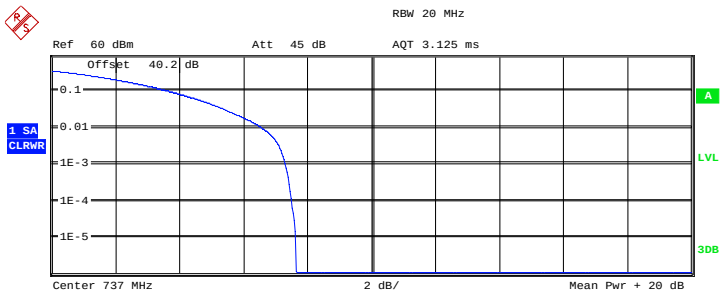


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 23.7MHz

	Trace 1
Mean	44.70 dBm
Peak	52.14 dBm
Crest	7.44 dB
10 %	3.69 dB
1 %	6.54 dB
.1 %	7.28 dB
.01 %	7.37 dB

Date: 2.MAY.2013 14:19:27

E-TM1.1: 15.0MHz Bandwidth

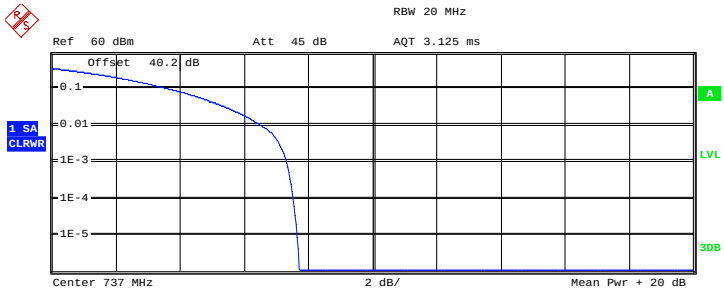


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 23.7MHz

	Trace 1
Mean	44.71 dBm
Peak	52.35 dBm
Crest	7.65 dB
10 %	3.72 dB
1 %	6.57 dB
.1 %	7.31 dB
.01 %	7.50 dB

Date: 28.APR.2013 13:51:27

E-TM3.2: 15.0MHz Bandwidth

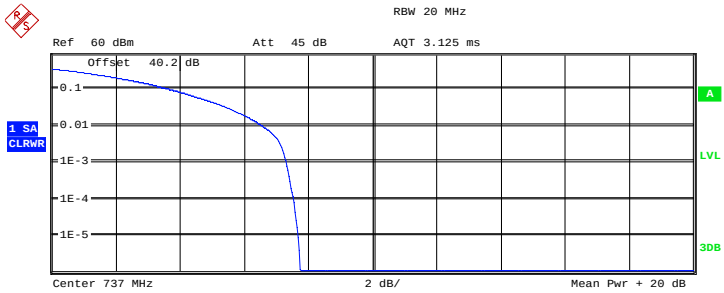


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 23.7MHz

	Trace 1
Mean	44.65 dBm
Peak	52.35 dBm
Crest	7.71 dB
10 %	3.69 dB
1 %	6.51 dB
.1 %	7.34 dB
.01 %	7.53 dB

Date: 2.MAY.2013 16:04:40

E-TM3.1: 15.0MHz Bandwidth



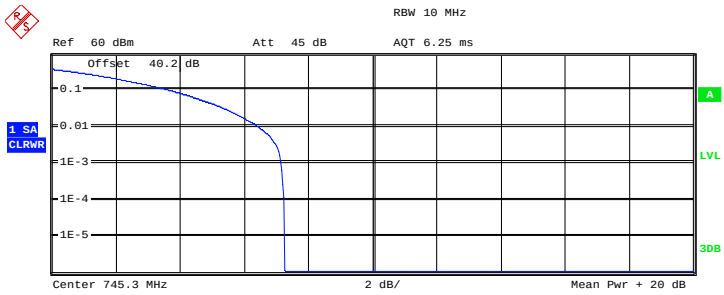
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 23.7MHz

	Trace 1
Mean	44.69 dBm
Peak	52.42 dBm
Crest	7.74 dB
10 %	3.69 dB
1 %	6.54 dB
.1 %	7.31 dB
.01 %	7.53 dB

Date: 2.MAY.2013 16:29:46

Configuration 1 - Mode 3 - 1.4

E-TM1.1: 1.4MHz Bandwidth



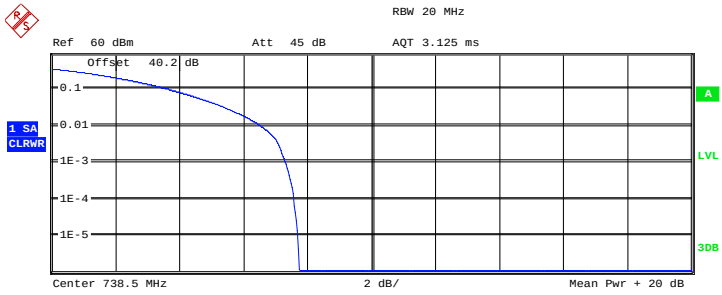
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	44.46 dBm
Peak	51.72 dBm
Crest	7.26 dB
10 %	3.65 dB
1 %	6.41 dB
.1 %	7.15 dB
.01 %	7.24 dB

Date: 2.MAY.2013 10:32:57

Configuration 1 - Mode 3 - 15

E-TM1.1: 15.0MHz Bandwidth



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 23.7MHz

	Trace 1
Mean	44.70 dBm
Peak	52.42 dBm
Crest	7.73 dB
10 %	3.69 dB
1 %	6.54 dB
.1 %	7.31 dB
.01 %	7.56 dB

Date: 28.APR.2013 16:03:26

Limit	13dB

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

2.3 MODULATION CHARACTERISTICS

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047 (d)

2.3.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.3.3 Date of Test and Modification State

6 May 2013 – 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.

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 modulations and was tested in 3MHz Bandwidth.

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

Configuration 1 - Mode 2 (3.0MHz OBW)

2.3.5 Environmental Conditions

	6 May 2013
Ambient Temperature	22.6°C
Relative Humidity	52.0%

2.3.6 Test Result

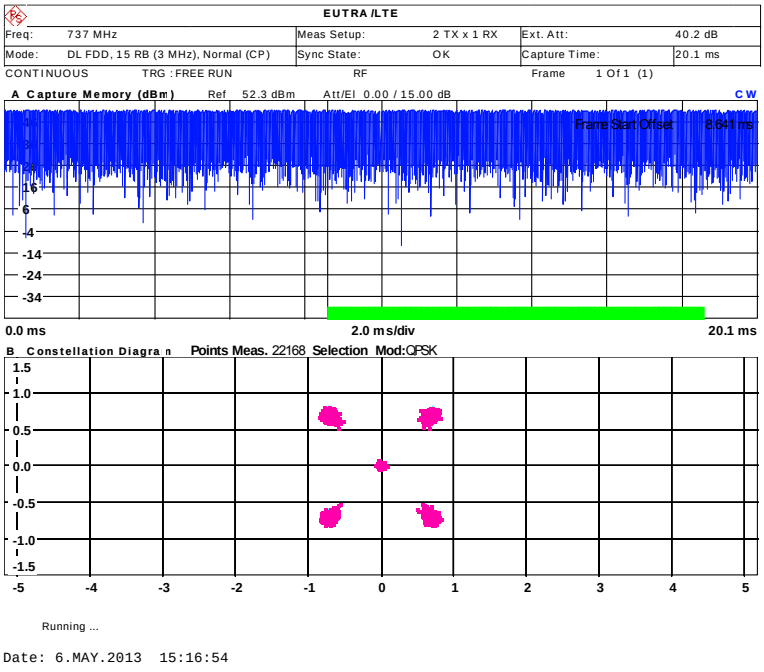
Plots are shown on the following showing the EUT transmitting with all of the modulations:

The test results are shown below

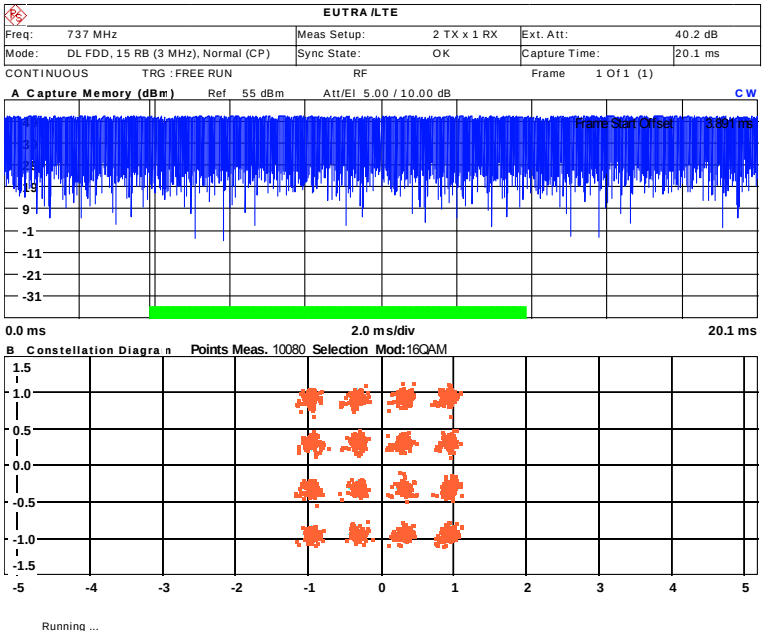
Configuration 1 - Mode 2

3.0MHz Bandwidth

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

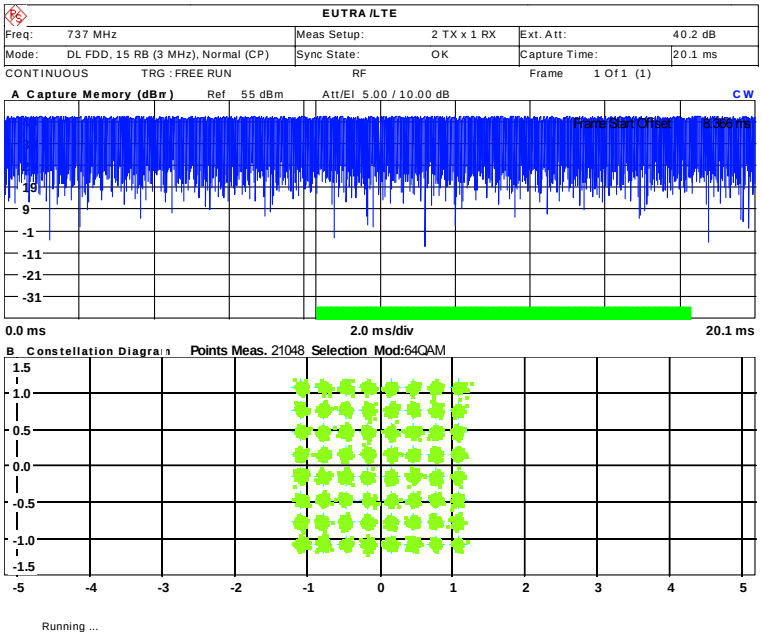


E-TM3.2: EUT transmitting with 16QAM modulation:



Date: 6.MAY.2013 15:24:56

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



Date: 6.MAY.2013 15:29:45

2.4 OCCUPIED BANDWIDTH

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
FCC CFR 47 Part 27, Clause 27.53 (g)

2.4.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.4.3 Date of Test and Modification State

27, 28 April and 2 May 2013 – 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 27.

The EUT was transmitting at maximum power, modulated using the test models E-TM1.1, E-TM3.2 and E-TM3.1. The EUT was tested in the 6 supported bandwidths. At least 1% of the emission bandwidths 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 1 - 1.4, Mode 1 - 15
- Mode 2 (1.4MHz, 3.0MHz, 5.0MHz, 10.0MHz, 15.0MHz OBW)
- Mode 3 - 1.4, Mode 3 - 15

2.4.6 Environmental Conditions

	27 April 2013	28 April 2013	2 May 2013
Ambient Temperature	22.8°C	23.5°C	23.0°C
Relative Humidity	29.5%	31.0%	37.0%

2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 27 for Occupied Bandwidth.

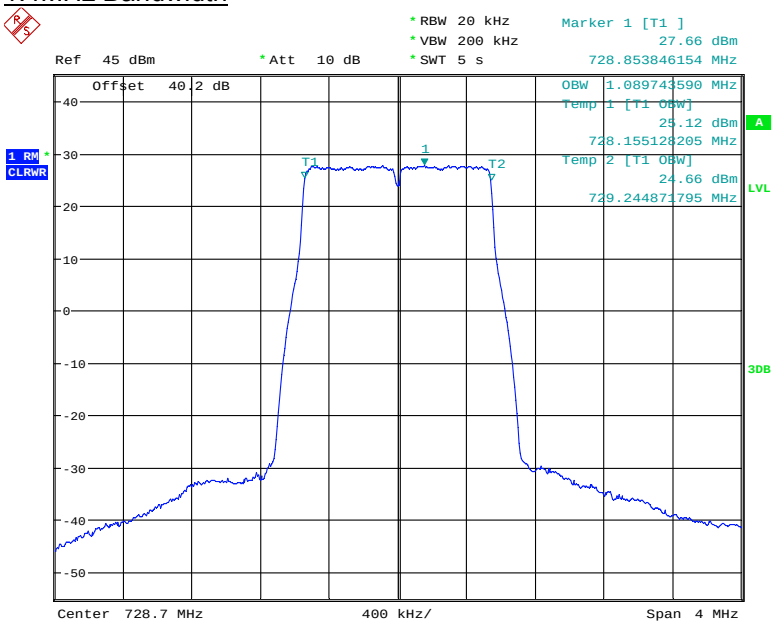
The test results are shown below

Test Model	BW configuration (MHz)	Frequency (MHz) / Channel	Occupied Bandwidth (MHz)
E-TM1.1	1.4	728.7 (Bottom)	1.09
	15.0	735.5 (Bottom)	13.41
	1.4	737.0 (Middle)	1.09
	3.0	737.0 (Middle)	2.69
	5.0	737.0 (Middle)	4.47
	10.0	737.0 (Middle)	8.97
	15.0	737.0 (Middle)	13.41
	1.4	745.3 (Top)	1.07
	15.0	738.5 (Top)	13.41
E-TM3.2	1.4	737.0 (Middle)	1.10
	15.0	737.0 (Middle)	13.41
E-TM3.1	1.4	737.0 (Middle)	1.09
	15.0	737.0 (Middle)	13.41

E-TM 1.1

Configuration 1 - Mode 1 - 1.4

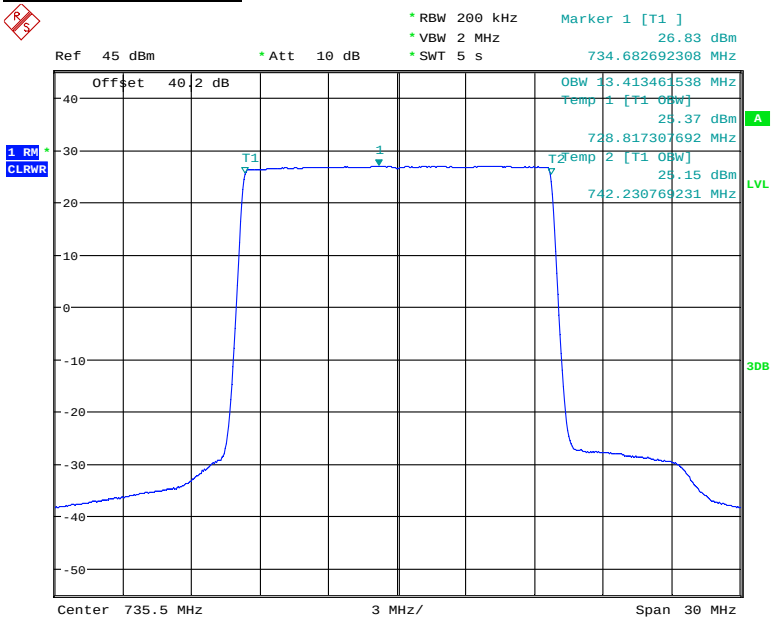
1.4MHz Bandwidth



Date: 27.APR.2013 18:12:32

Configuration 1 - Mode 1 – 15

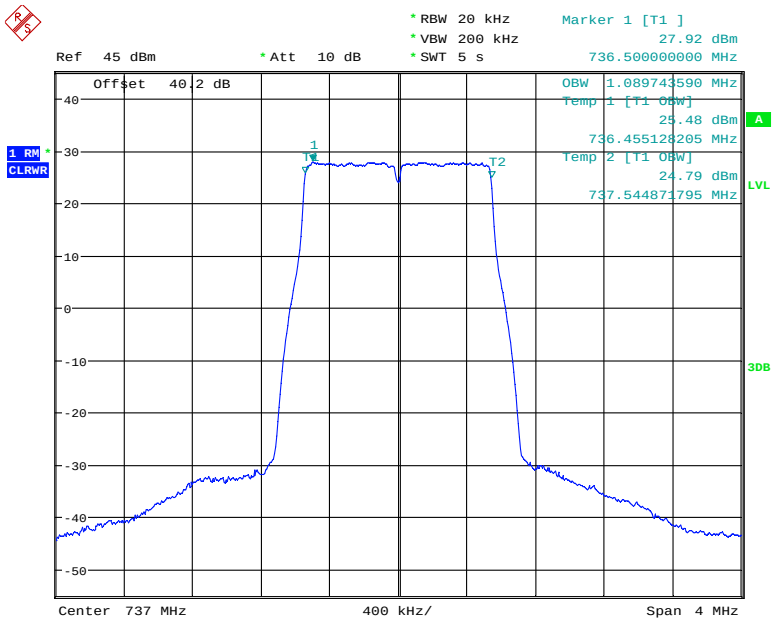
15.0MHz Bandwidth



Date: 28.APR.2013 15:54:45

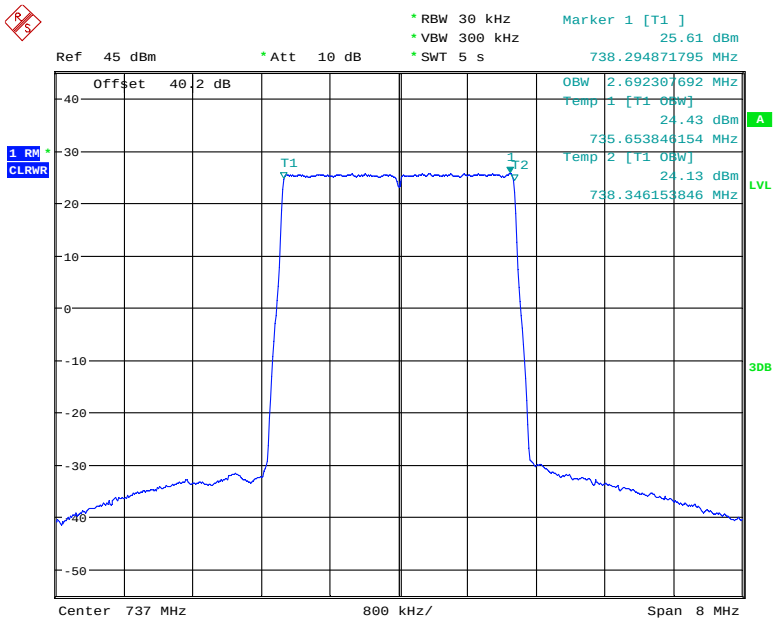
Configuration 1 - Mode 2

1.4MHz Bandwidth



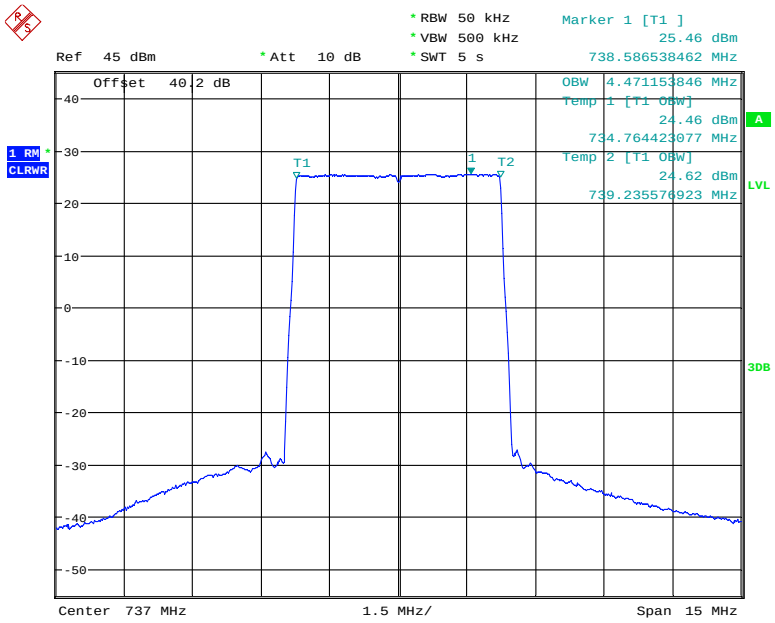
Date: 27.APR.2013 16:40:18

3.0MHz Bandwidth



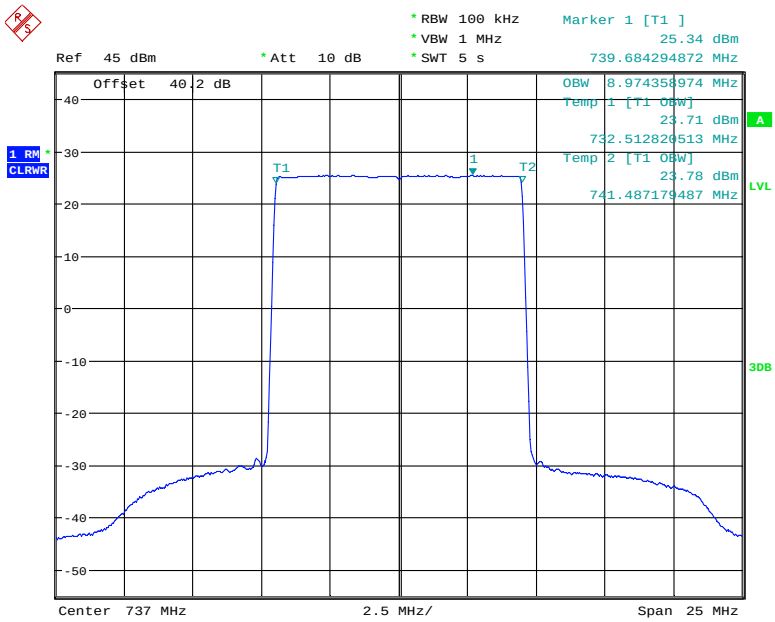
Date: 2.MAY.2013 10:40:25

5.0MHz Bandwidth



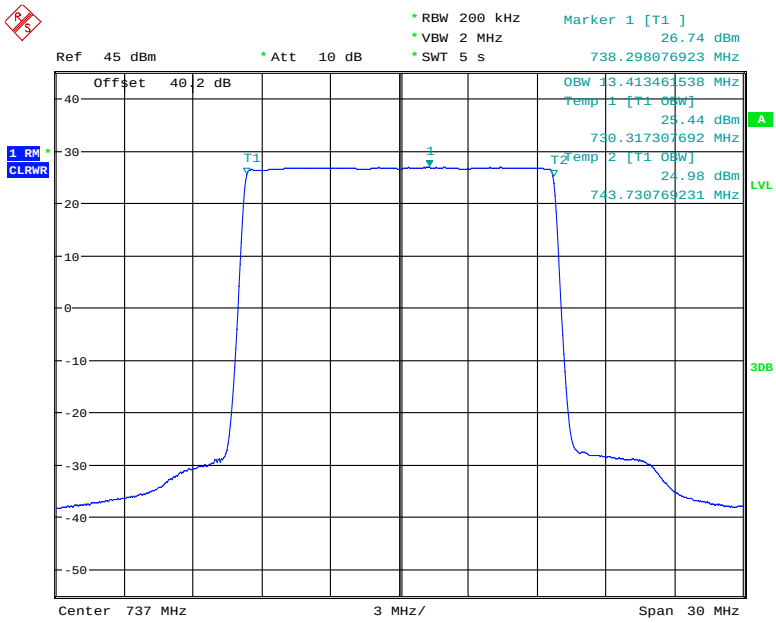
Date: 2.MAY.2013 12:18:34

10.0MHz Bandwidth



Date: 2.MAY.2013 14:16:36

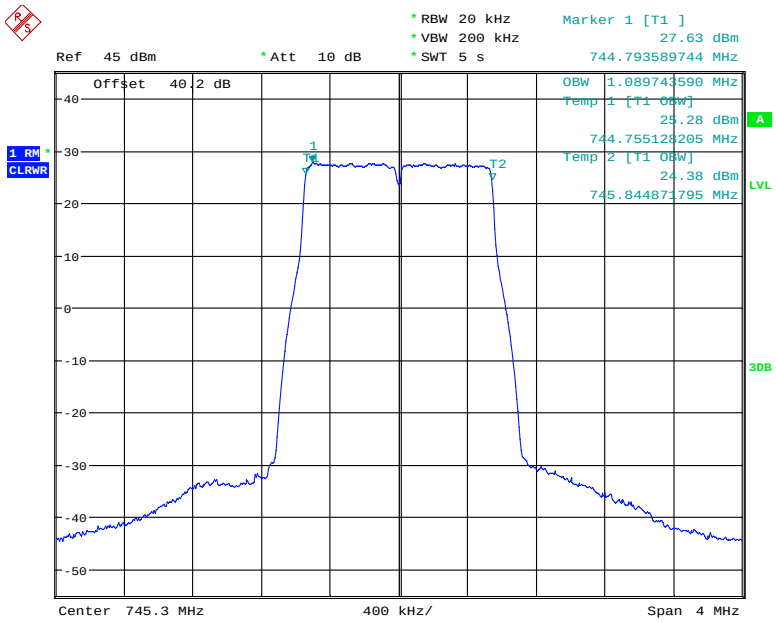
15.0MHz Bandwidth



Date: 28.APR.2013 13:57:38

Configuration 1 - Mode 3 - 1.4

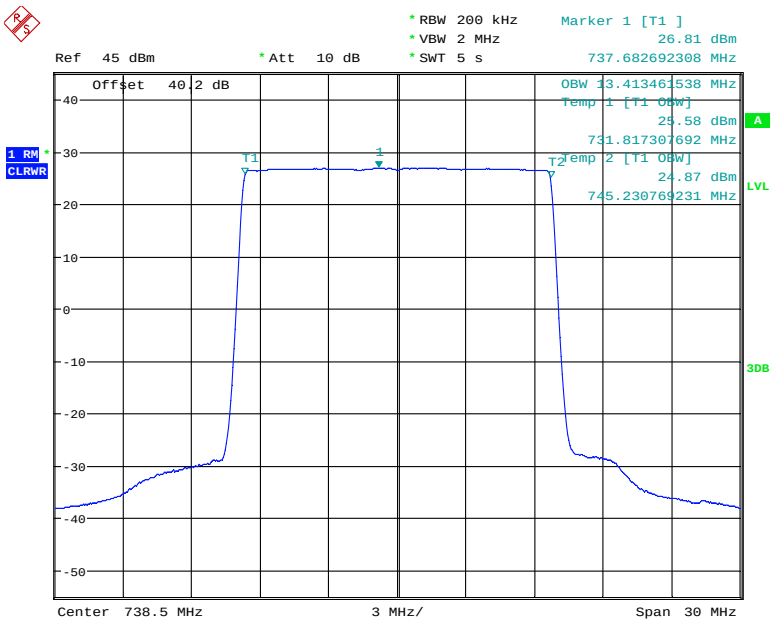
1.4MHz Bandwidth



Date: 28.APR.2013 10:27:36

Configuration 1 - Mode 3 - 15

15.0MHz Band

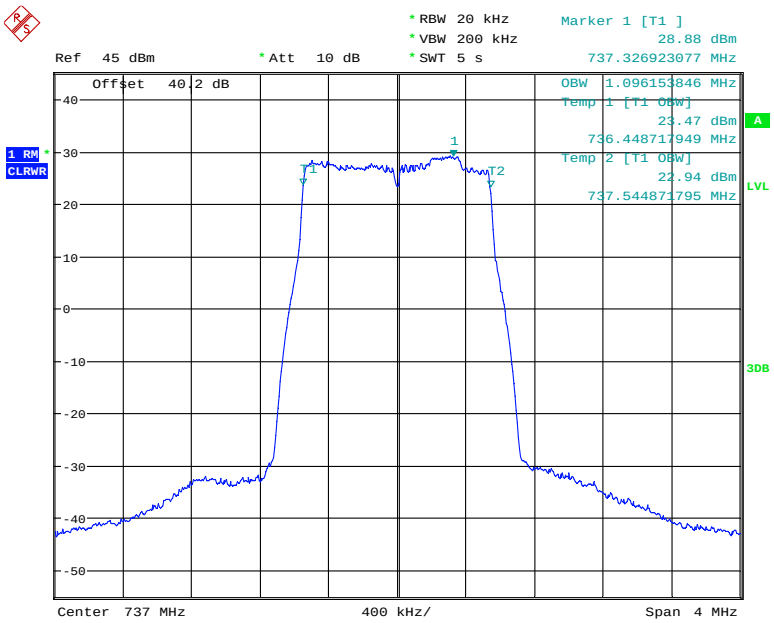


Date: 28.APR.2013 16:01:40

E-TM3.2

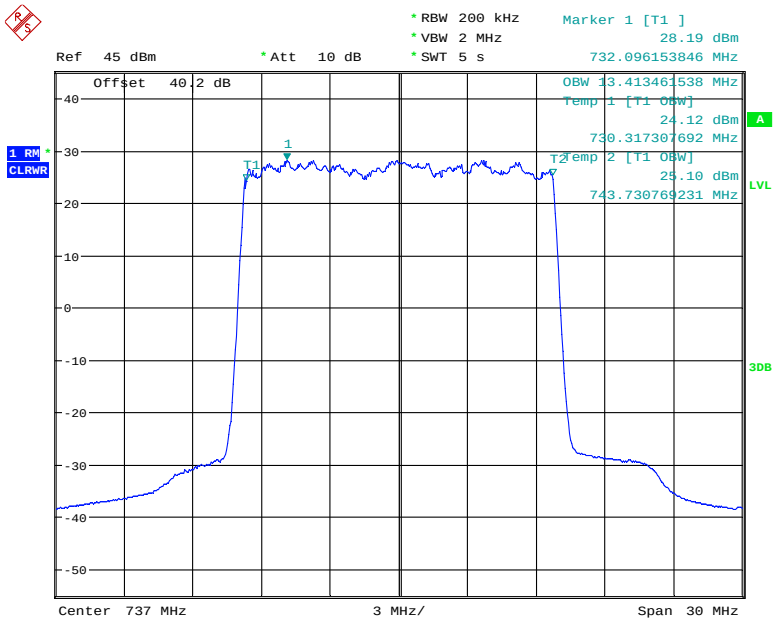
Configuration 1 - Mode 2

1.4MHz Bandwidth



Date: 2.MAY.2013 15:19:36

15.0MHz Bandwidth

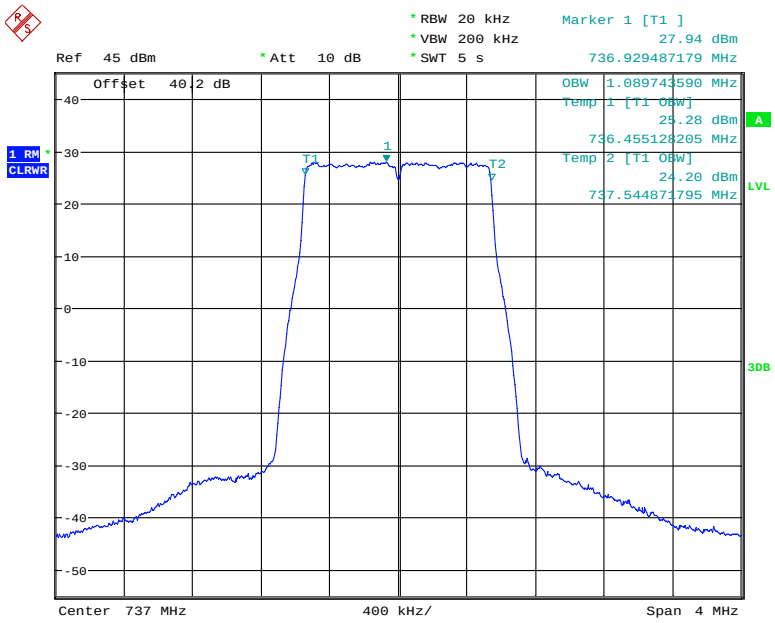


Date: 2.MAY.2013 16:05:55

E-TM3.1

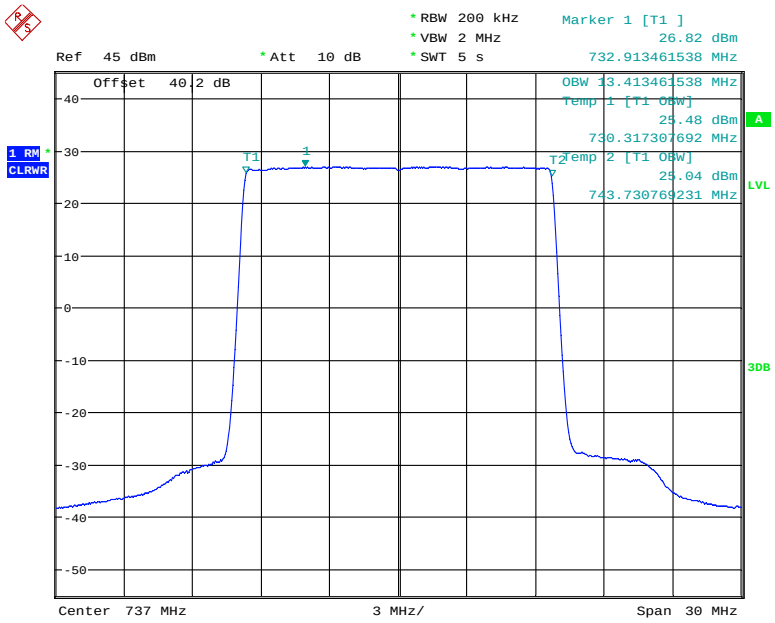
Configuration 1 - Mode 2

1.4MHz Bandwidth



Date: 2.MAY.2013 16:35:29

15.0MHz Bandwidth



Date: 2.MAY.2013 16:26:59

2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (±1MHz)

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53 (g)

2.5.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.5.3 Date of Test and Modification State

14 May 2013 – 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 27.

In accordance with 27.53(g), A resolution bandwidth of 30kHz was used for the frequencies offset up to 100KHz away from the block edge and the frequencies between 100kHz to 5MHz away from the band edge. As the FCC rules specify a RBW of 100kHz for measurements of emissions > 100kHz away from the band edges, the limit was adjusted with -13dB to -18.2dBm to compensate for the reduce mesurement bandwidth. Spectrum analyser detector was set as RMS.

Since the EUT transmits on two antennas simultaneously in the same frequency range, i.e, TX Diversity and MIMO using the Measure and Add 10log(N) dB technique, the limit was adjusted with a correction of 10log2 to -21.2dBm.

The measurements were performed on the combined output connector RF A. Limited complementary measurement were done at the output connector RF B to verify identical performance for both transmitter chains.

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

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

Configuration 1 - Mode 1 - 1.4, Mode 1 - 3, Mode 1 - 5, Mode 1 - 10, Mode 1 - 15

- Mode 3 - 1.4, Mode 3 - 3, Mode 3 - 5, Mode 3 - 10, Mode 3 - 15

2.5.6 Environmental Conditions

	14 May 2013
Ambient Temperature	24.5°C
Relative Humidity	35.0%

2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 27 for Spurious Emissions Antenna Terminals (±1MHz)

Below are the Frequencies the EUT was tested against along with the tested channels.

E-TM1.1:

1.4MHz Bandwidth

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

Band Edge Frequency	Edge Test with 1.4MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5007 Frequency: 728.7 MHz	30k / 300k
Top 746 MHz	Channel: 5173 Frequency: 745.3 MHz	

3.0MHz Bandwidth

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

Band Edge Frequency	Edge Test with 3.0MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5015 Frequency: 729.5 MHz	30k / 300k
Top 746 MHz	Channel: 5165 Frequency: 744.5 MHz	

5.0MHz Bandwidth

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

Band Edge Frequency	Edge Test with 5.0MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5025 Frequency: 730.5 MHz	30k / 300k
Top 746 MHz	Channel: 5155 Frequency: 743.5 MHz	

10.0MHz Bandwidth

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

Band Edge Frequency	Edge Test with 10.0MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5050 Frequency: 733.0 MHz	30k / 300k
Top 746 MHz	Channel: 5130 Frequency: 741.0 MHz	

15.0MHz Bandwidth

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

Band Edge Frequency	Edge Test with 15.0MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5075 Frequency: 735.5 MHz	30k / 300k
Top 746 MHz	Channel: 5105 Frequency: 738.5 MHz	

E-TM3.2:

1.4MHz Bandwidth

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

Band Edge Frequency	Edge Test with 1.4MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5007 Frequency: 728.7 MHz	30k / 300k
Top 746 MHz	Channel: 5173 Frequency: 745.3 MHz	

3.0MHz Bandwidth

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

Band Edge Frequency	Edge Test with 3.0MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5015 Frequency: 729.5 MHz	30k / 300k
Top 746 MHz	Channel: 5165 Frequency: 744.5 MHz	

E-TM3.1:

1.4MHz Bandwidth

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

Band Edge Frequency	Edge Test with 1.4MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5007 Frequency: 728.7 MHz	30k / 300k
Top 746 MHz	Channel: 5173 Frequency: 745.3 MHz	

3.0MHz Bandwidth

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

Band Edge Frequency	Edge Test with 3.0MHz Bandwidth Channel No./Frequency	RBW / VBW (Hz)
Bottom 728 MHz	Channel: 5015 Frequency: 729.5 MHz	30k / 300k
Top 746 MHz	Channel: 5165 Frequency: 744.5 MHz	

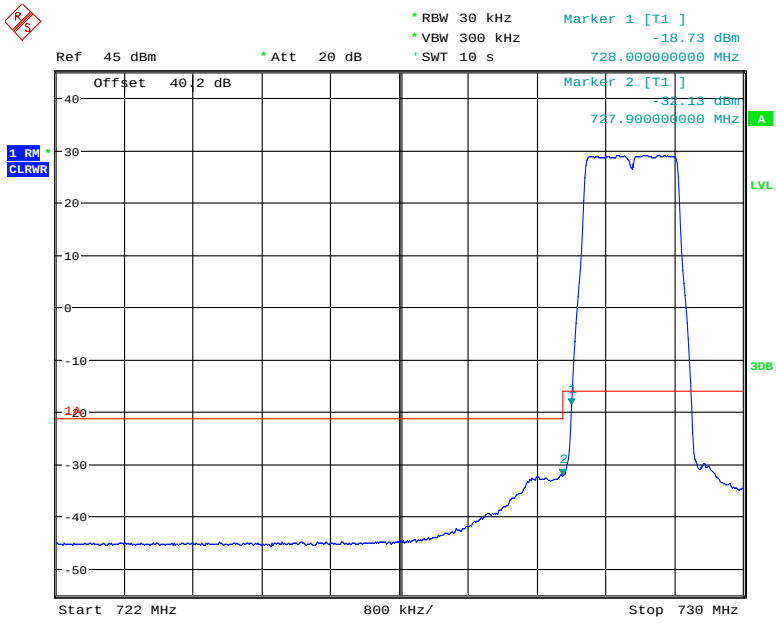
The channels shown in the table above are the minimum and maximum channels that can be used in the authorised frequency ranges to maintain compliance. Channels outside of ranges shown in the above tables shall not be made available to the end user.

The test results are shown below

E-TM1.1

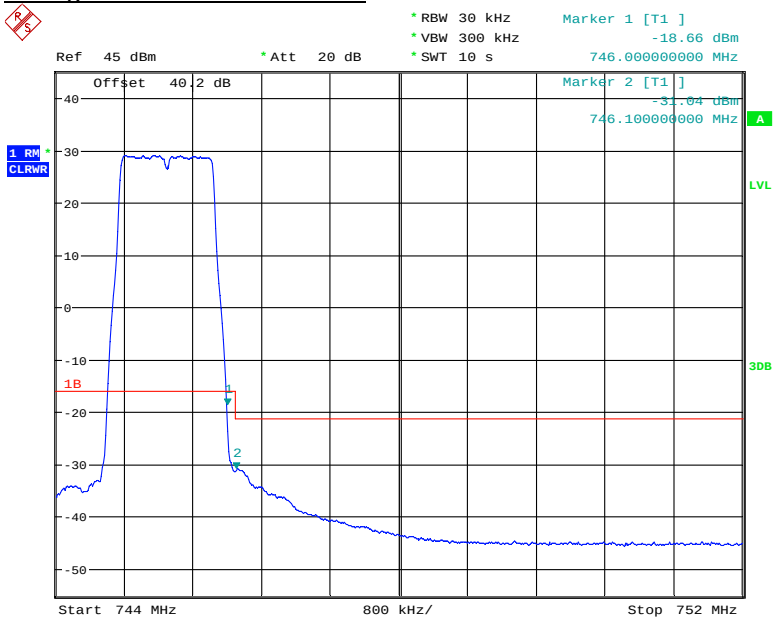
1.4MHz Bandwidth

Configuration 1 - Mode 1 - 1.4



Date: 14.MAY.2013 10:40:16

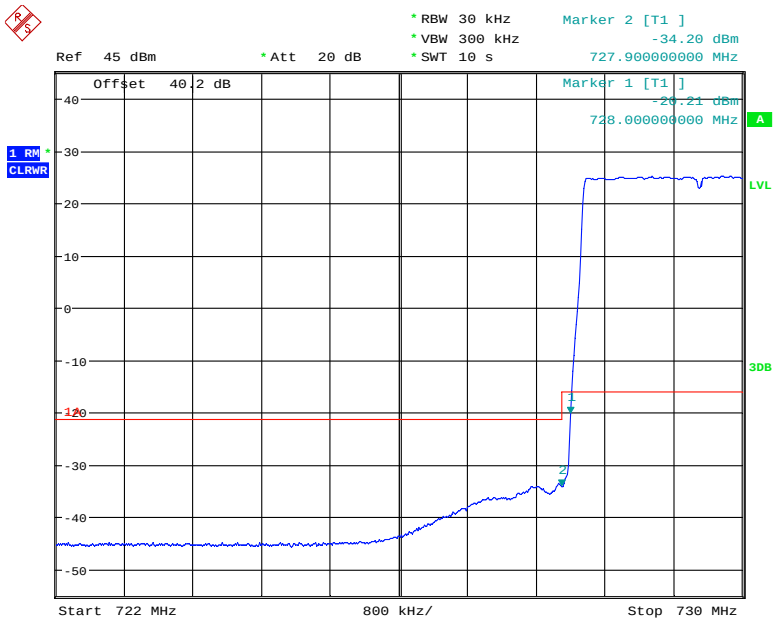
Configuration 1 - Mode 3 - 1.4



Date: 14.MAY.2013 10:47:30

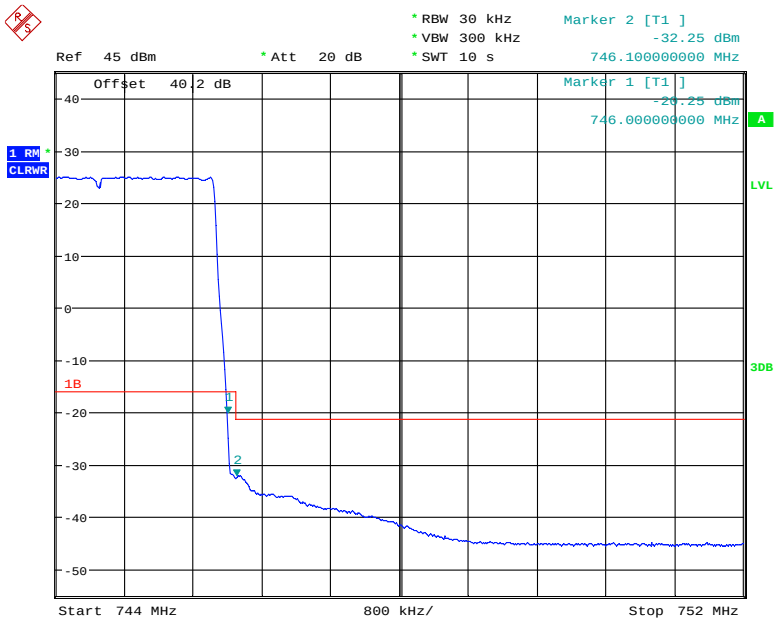
3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3



Date: 14.MAY.2013 10:53:58

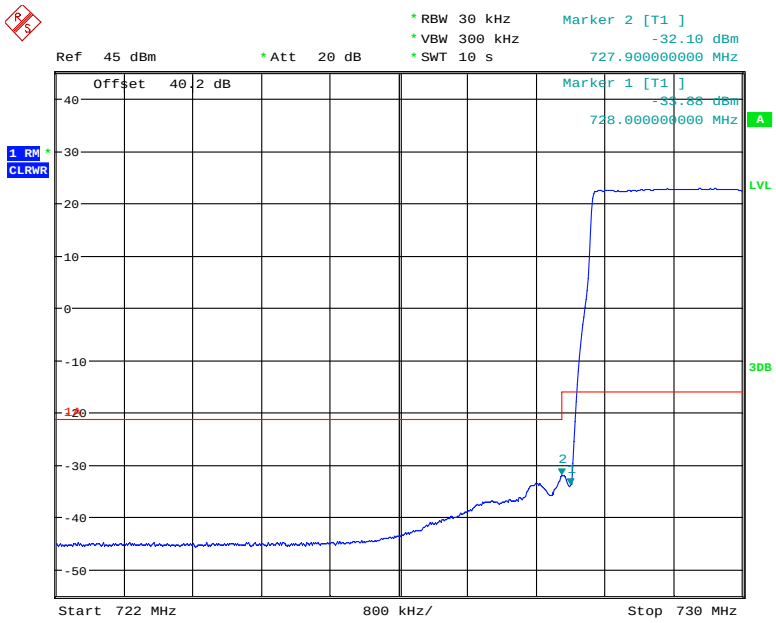
Configuration 1 - Mode 3 - 3



Date: 14.MAY.2013 10:57:52

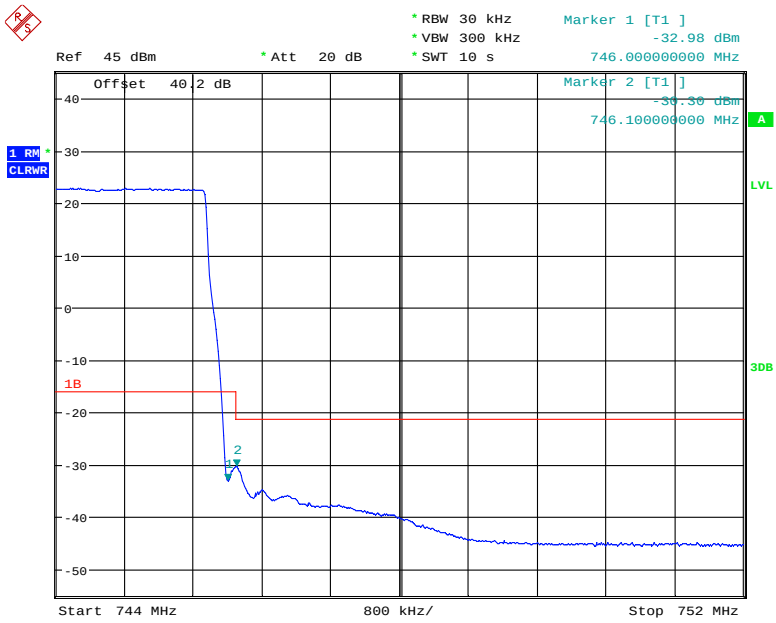
5.0MHz Bandwidth

Configuration 1 - Mode 1 - 5



Date: 14.MAY.2013 11:00:34

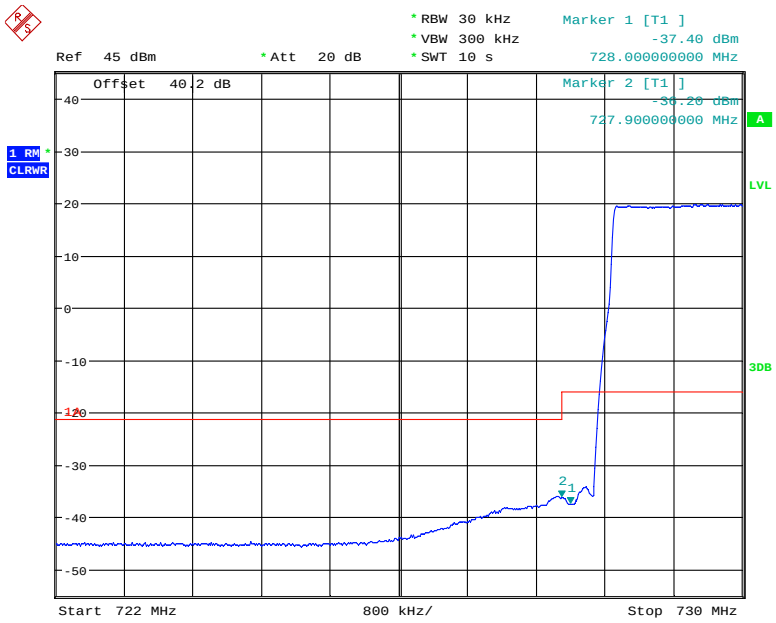
Configuration 1 - Mode 3 - 5



Date: 14.MAY.2013 10:59:29

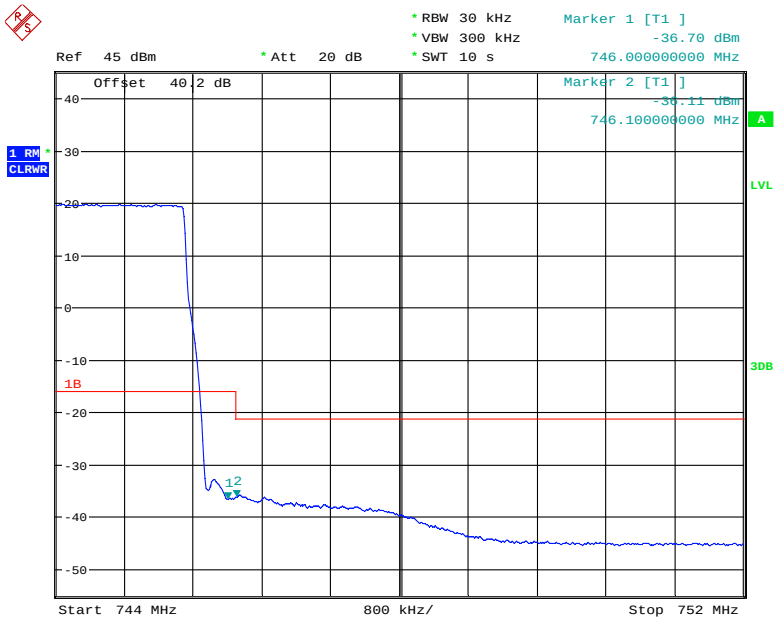
10.0MHz Bandwidth

Configuration 1 - Mode 1 - 10



Date: 14.MAY.2013 11:04:56

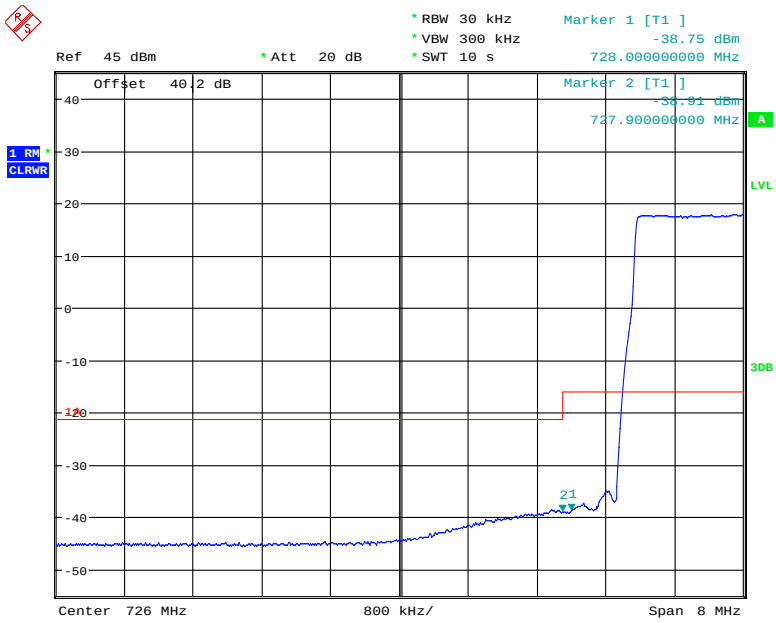
Configuration 1 - Mode 3 - 10



Date: 14.MAY.2013 11:07:03

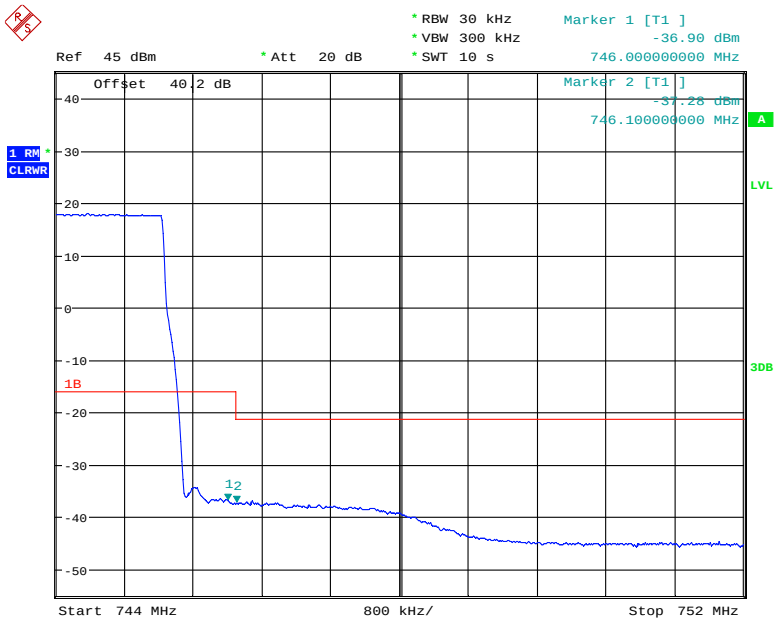
15.0MHz Bandwidth

Configuration 1 - Mode 1 - 15



Date: 14.MAY.2013 10:49:28

Configuration 1 - Mode 3 - 15

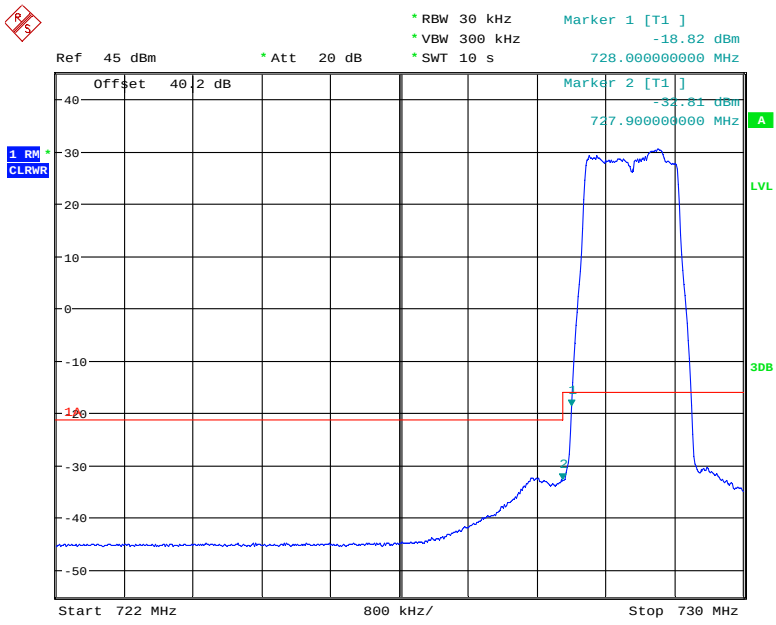


Date: 14.MAY.2013 10:51:50

E-TM3.2

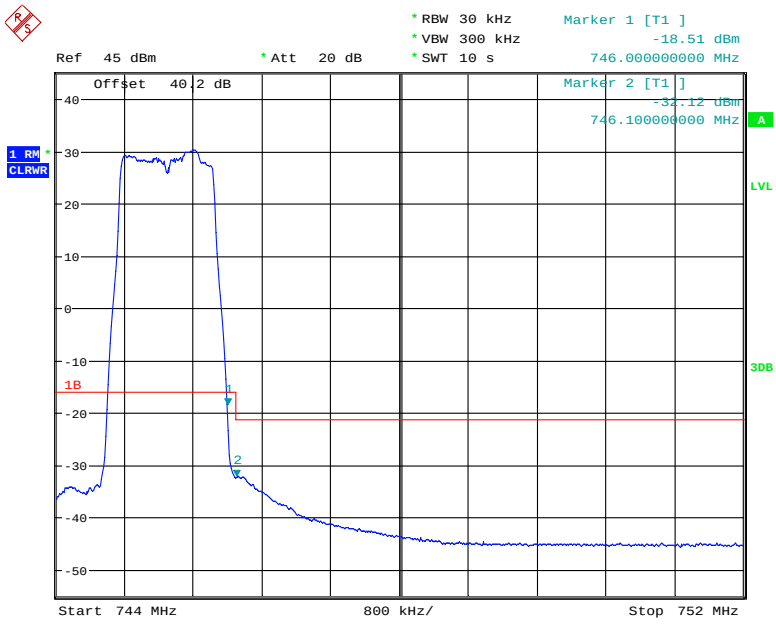
1.4MHz Bandwidth

Configuration 1 - Mode 1 - 1.4



Date: 14.MAY.2013 11:12:33

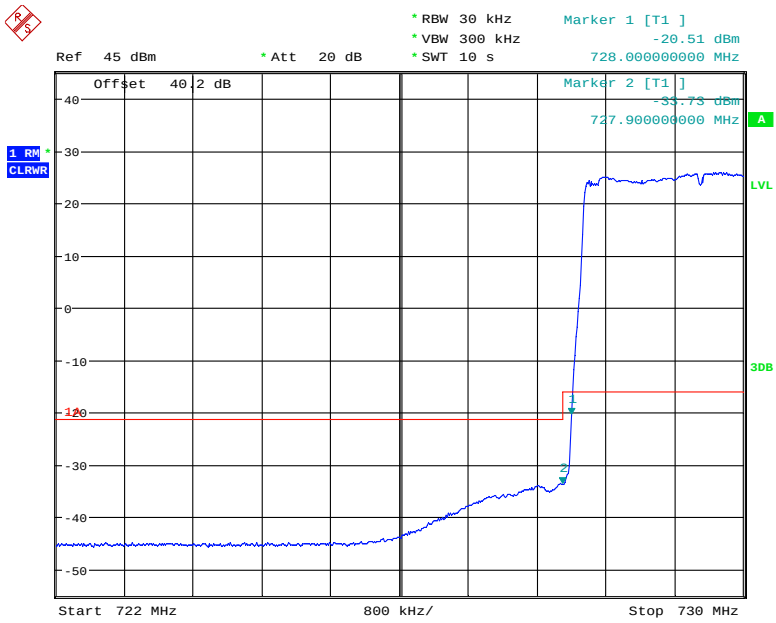
Configuration 1 - Mode 3 - 1.4



Date: 14.MAY.2013 11:09:15

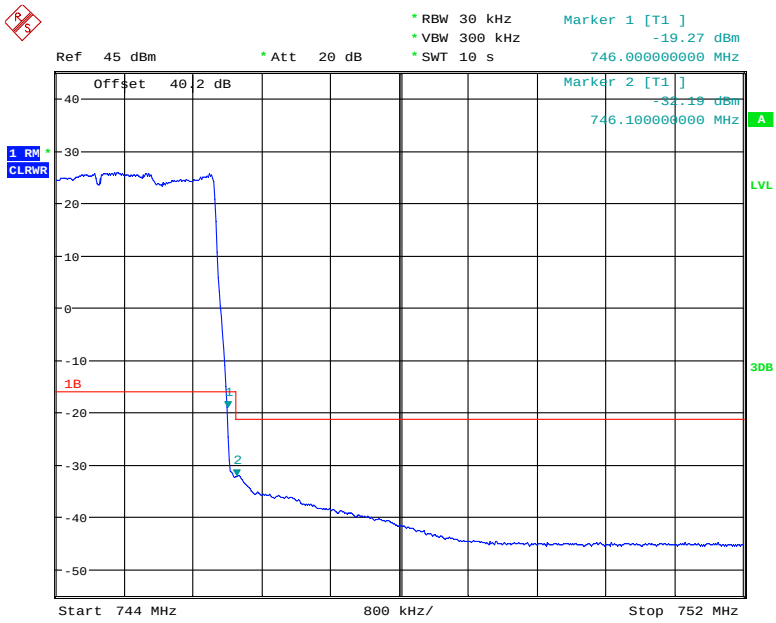
3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3



Date: 14.MAY.2013 11:20:03

Configuration 1 - Mode 3 - 3

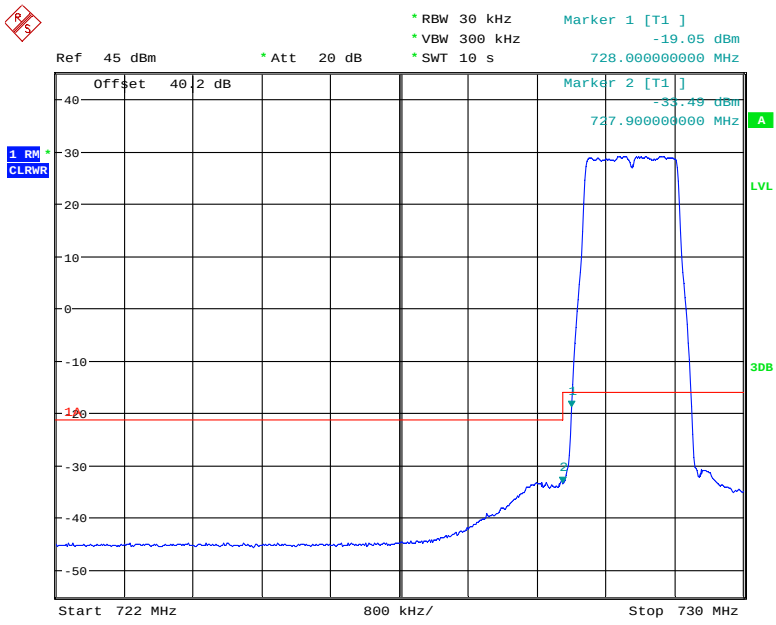


Date: 14.MAY.2013 11:21:21

E-TM3.1

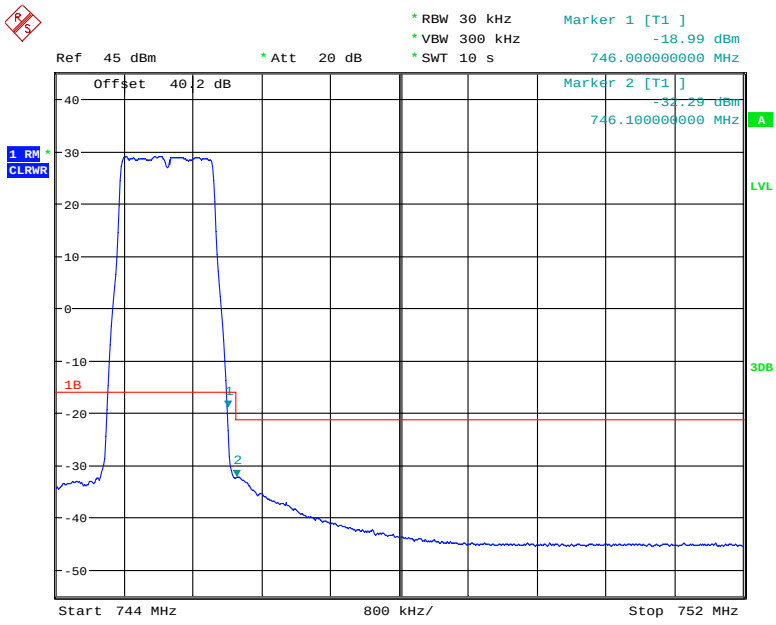
1.4MHz Bandwidth

Configuration 1 - Mode 1 - 1.4



Date: 14.MAY.2013 11:11:41

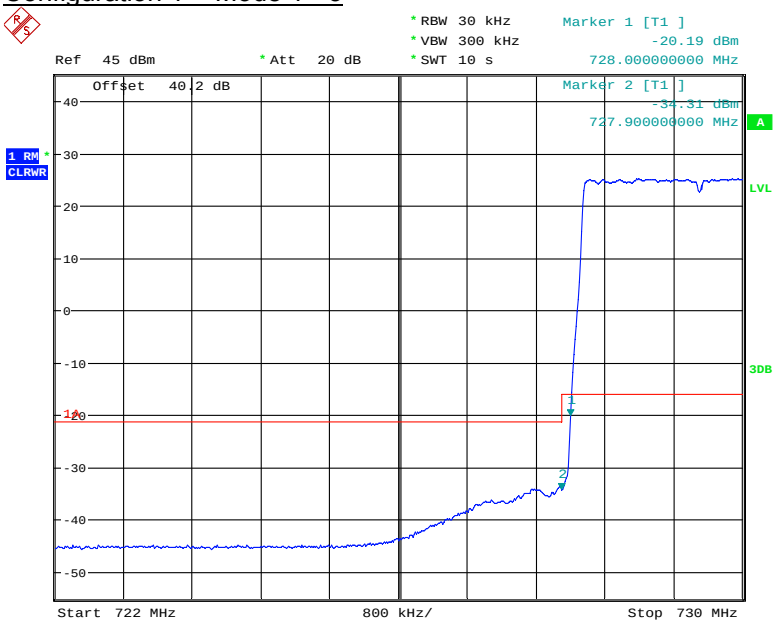
Configuration 1 - Mode 3 - 1.4



Date: 14.MAY.2013 11:10:27

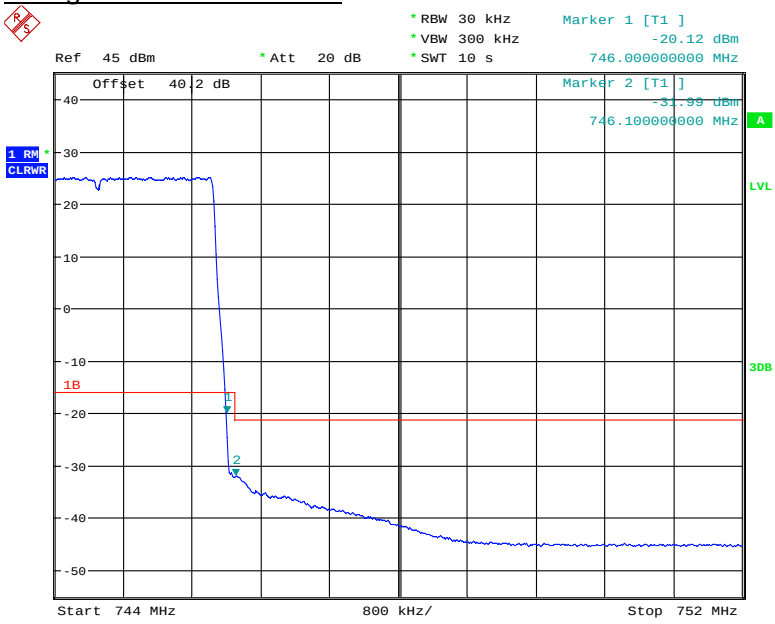
3.0MHz Bandwidth

Configuration 1 - Mode 1 - 3



Date: 14.MAY.2013 11:14:57

Configuration 1 - Mode 3 – 3



Date: 14.MAY.2013 11:22:26

Limit

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

2.6 RADIATED SPURIOUS EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 27, Clause 27.53 (g)

2.6.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.6.3 Date of Test and Modification State

24 and 26 April 2013 – 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 27.

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 – 10GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 10GHz, the measurement was performed with a resolution bandwidth of 1MHz as the worst case.

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

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

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

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

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:

$E_{(v/m)}=(30 \times 1.64 \times 52.80)^{0.5} / 3 = 16.989V/m = 144.6dB\mu V/m$

As per 27.53(g) the spurious emission must be attenuated by 43 + 10log (P_o) dB this gives:

43 + 10log(52.80) = 60.2dB

Therefore the limit at 3m measurement distance is:

144.6 – 60.2 = 84.4 dBµV/m

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

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

Configuration 1 - Mode 1 - 1.4
- Mode 2 (1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz OBW)
- Mode 3 - 1.4

2.6.6 Environmental Conditions

	24 April 2013	26 April 2013
Ambient Temperature	24.3°C	23.5°C
Relative Humidity	35.0%	26.8%

2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 & Part 27 for Radiated Spurious Emissions.

The results are shown below represent the test model which is worse in test.

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-TM 1.1: 1.4MHz, 3.0 MHz, 5.0MHz, 10MHz, 15MHz Bandwidth

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

E-TM 3.2: 1.4MHz Bandwidth

Configuration 1 - Mode 1

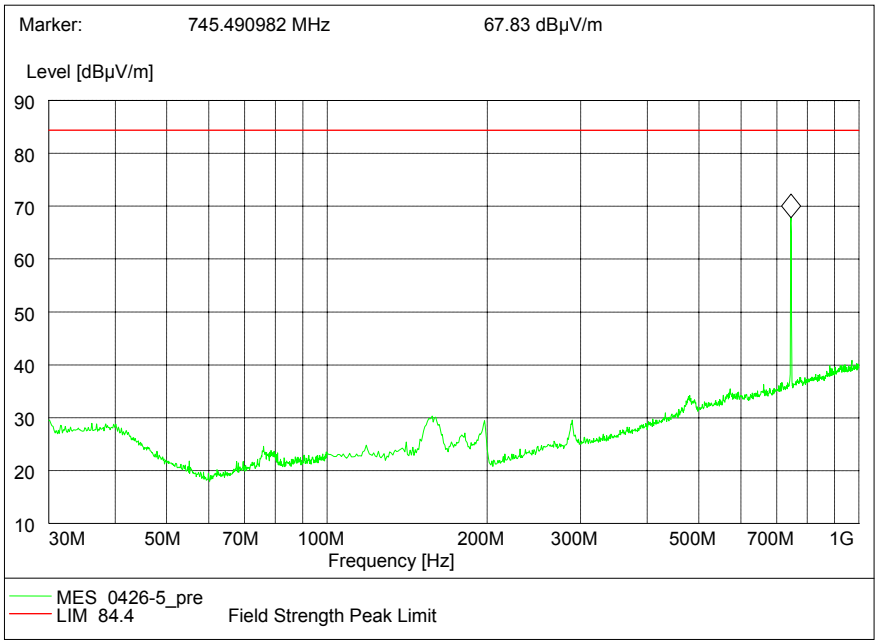
No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

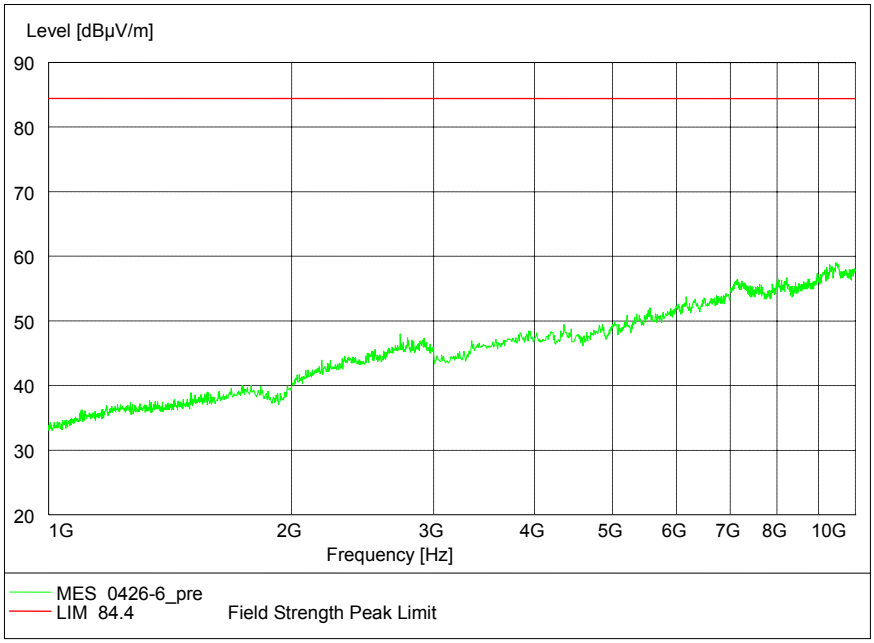
Configuration 1 - Mode 3

30MHz to 1GHz



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

1GHz to 10GHz



E-TM 3.1: 1.4MHz

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4dBµV/m

Remarks

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

2.7 CONDUCTED SPURIOUS EMISSIONS

2.7.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53 (g)

2.7.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.7.3 Date of Test and Modification State

14 May 2013 – 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 27.

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 10GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels for E-TM1.1 test model in 1.4MHz and 15MHz bandwidth and Middle channel for E-TM1.1 test model in 3MHz,5MHz and 10MHz configuations as the representative modes. The resolution was set to 100kHz for 9kHz to 10GHz thus meeting the requirements of Part 27.53(g). The spectrum analyser detector was set to peak and trace was kept on Max Hold.

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 accounting for simultaneous transmission from antenna ports RF A and RF B.

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

In addition, measurements were made up to the 10^{th} 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 - 1.4, Mode 1 - 15
- Mode 2 (1.4MHz, 3.0MHz, 5MHz, 10MHz, 15.0MHz OBW)
- Mode 3 - 1.4, Mode 3 - 15

2.7.6 Environmental Conditions

	14 May 2013
Ambient Temperature	24.5°C
Relative Humidity	35.0%

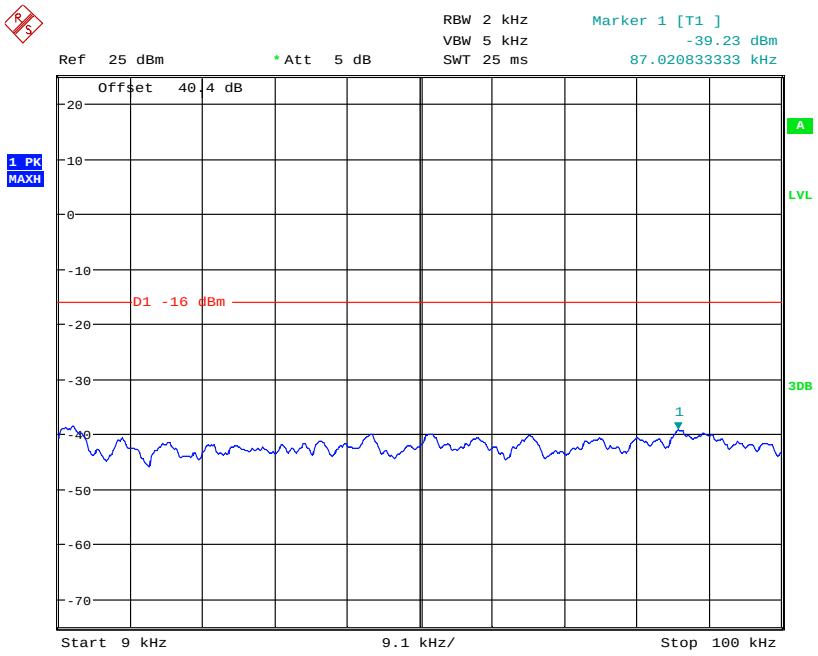
2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 27 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 measruement with a smaller Span showed that it was related to the LO feedthrough

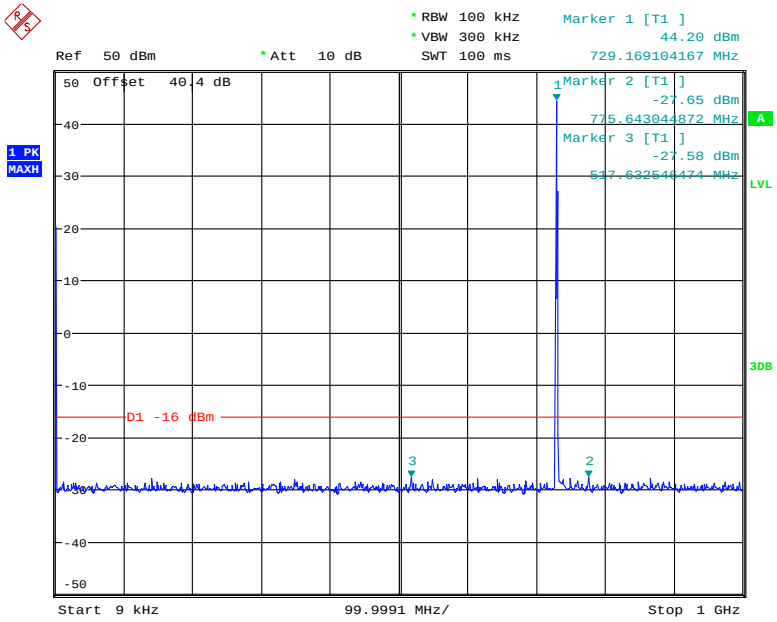


E-TM1.1

1.4MHz Bandwidth

Configuration 1 - Mode 1 - 1.4

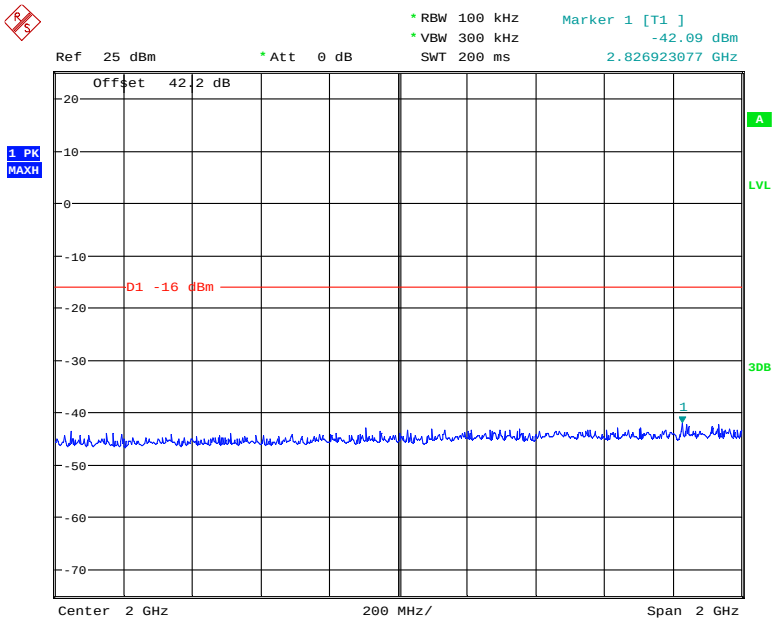
9kHz to 1GHz



Date: 14.MAY.2013 12:42:27

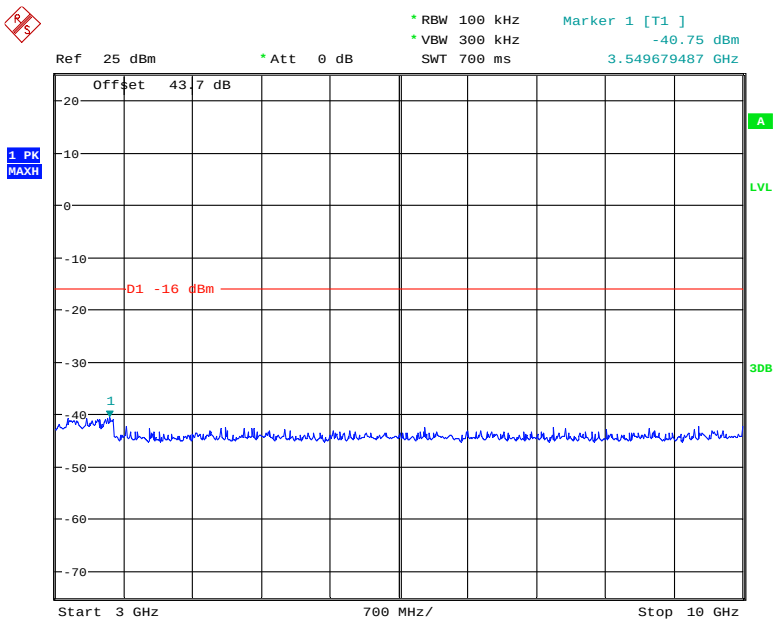
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 13:57:12

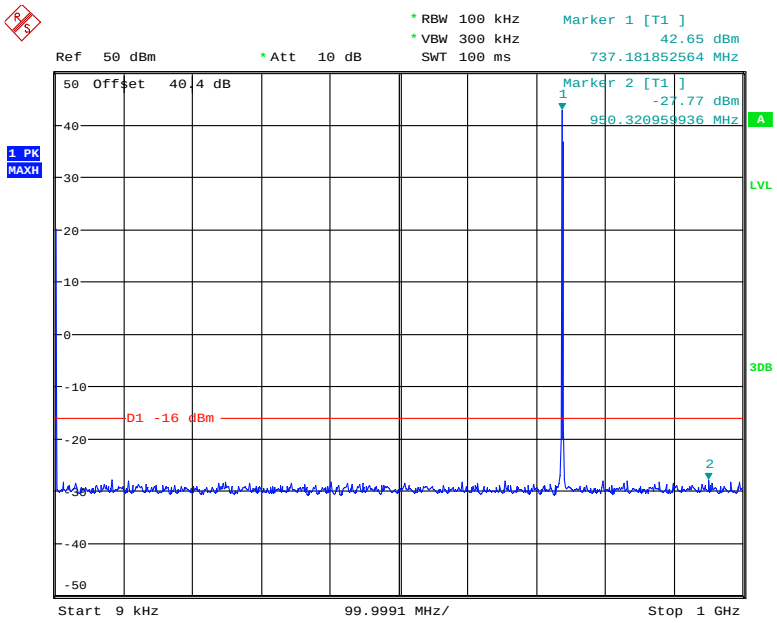
3GHz to 10GHz



Date: 14.MAY.2013 12:24:57

Configuration 1 - Mode 2

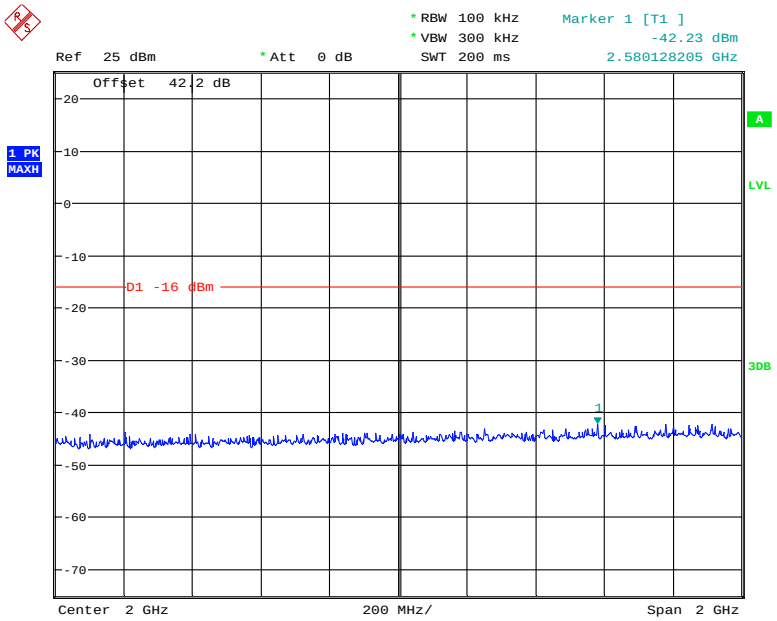
9kHz to 1GHz



Date: 14.MAY.2013 12:45:10

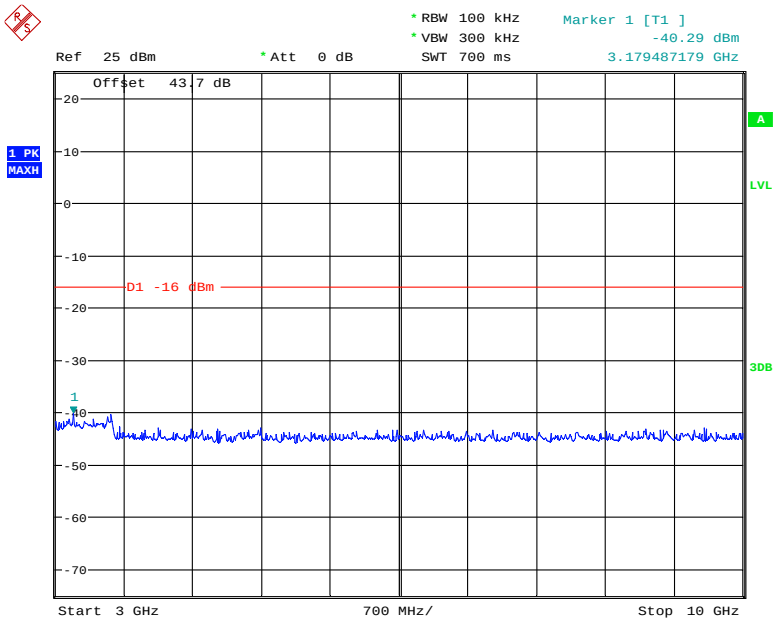
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 14:01:40

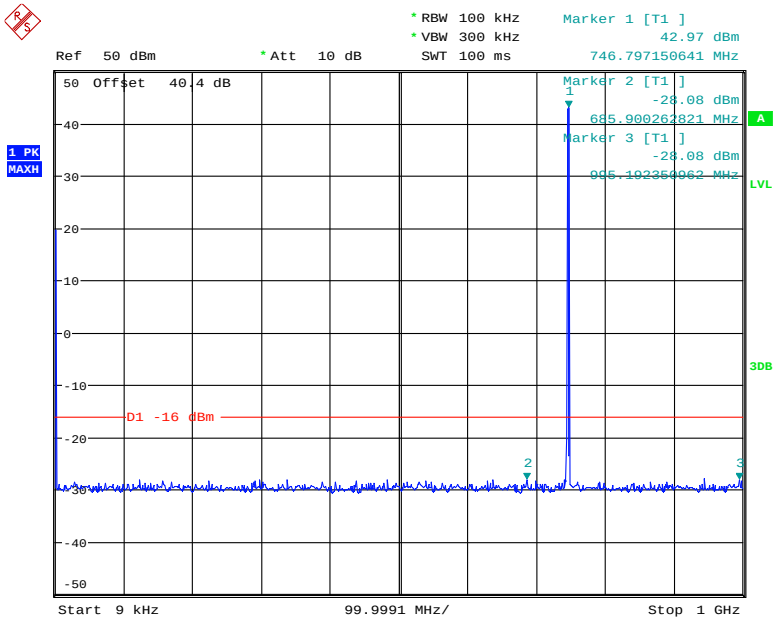
3GHz to 10GHz



Date: 14.MAY.2013 12:49:46

Configuration 1 - Mode 3 - 1.4

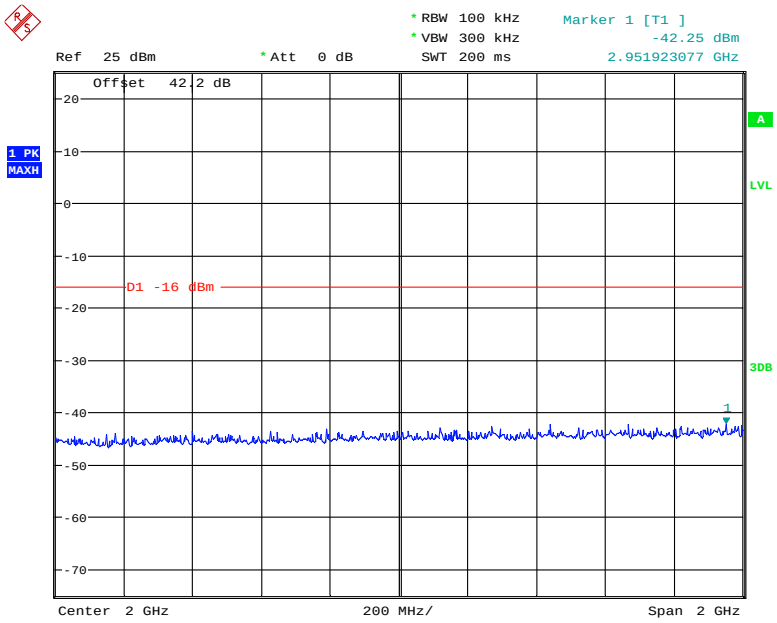
9kHz to 1GHz



Date: 14.MAY.2013 12:52:02

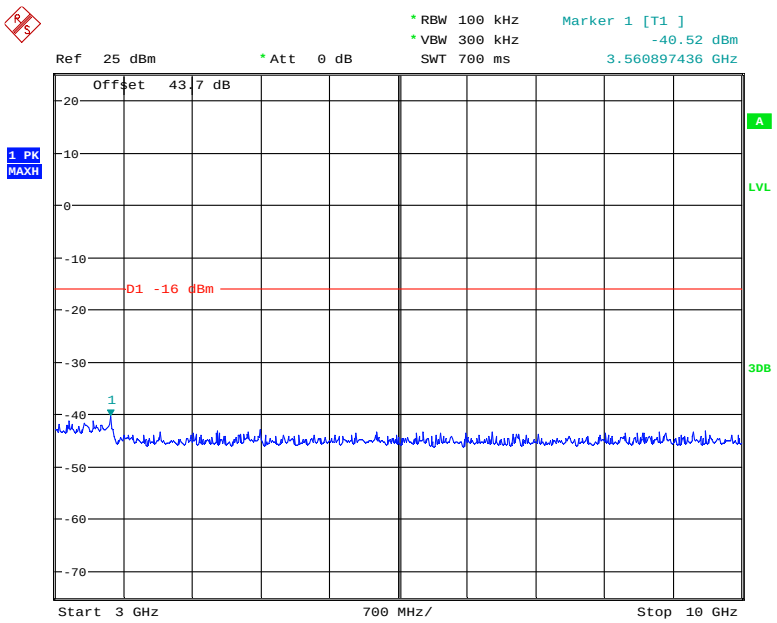
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 13:58:31

3GHz to 10GHz

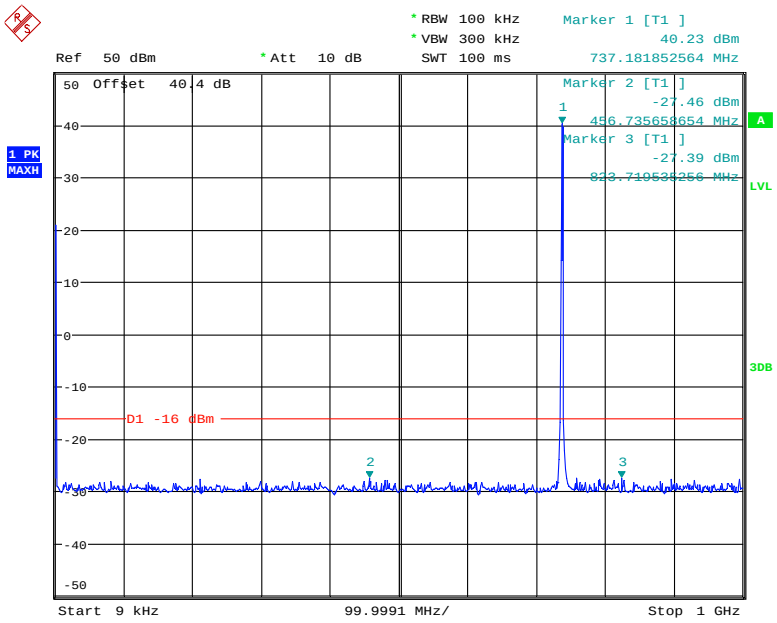


Date: 14.MAY.2013 12:49:28

3MHz Bandwidth

Configuration 1 - Mode 2

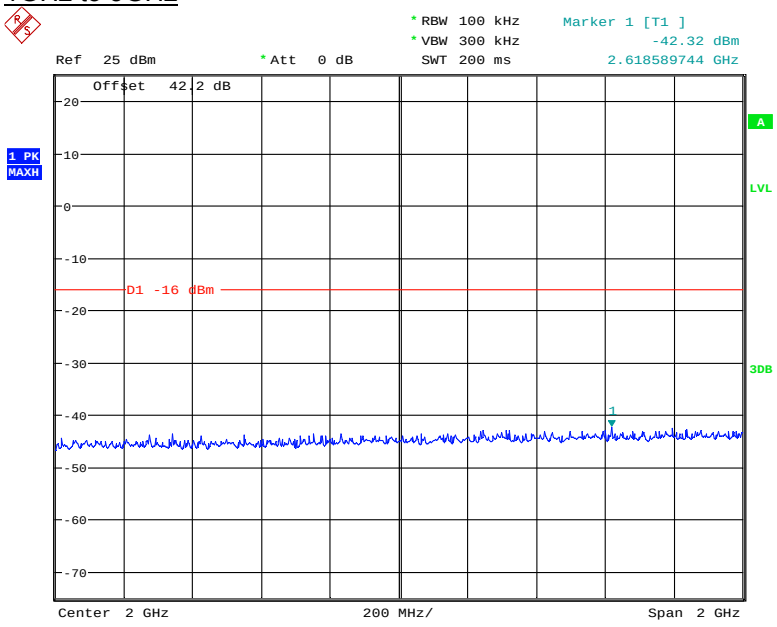
9kHz to 1GHz



Date: 14.MAY.2013 13:15:03

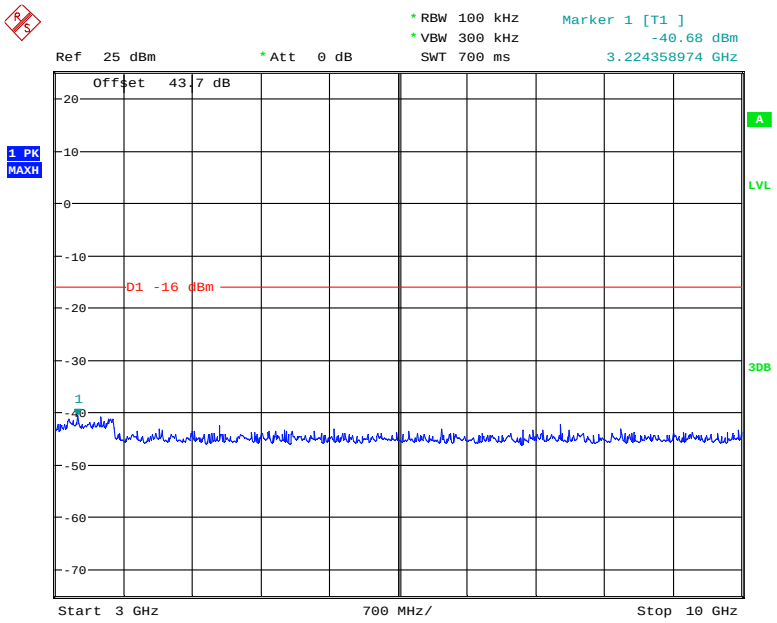
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 14:04:40

3GHz to 10GHz

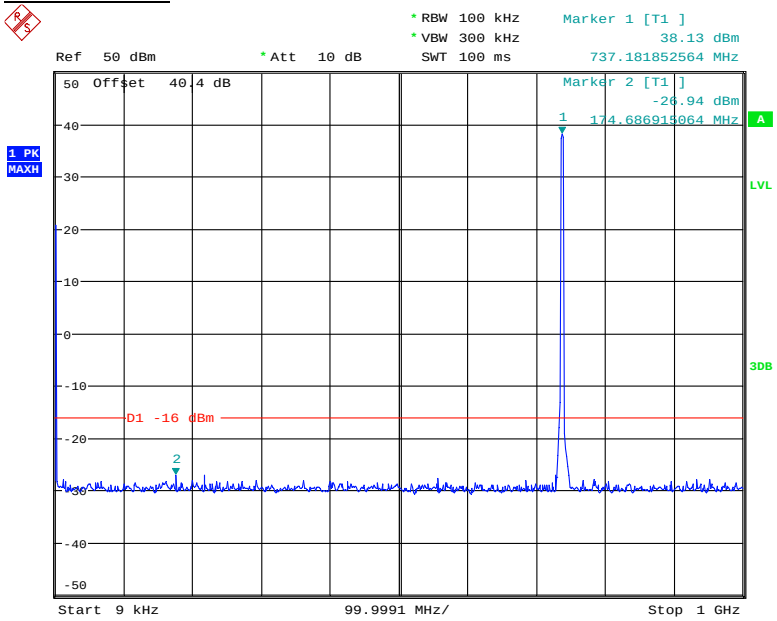


Date: 14.MAY.2013 13:12:45

5MHz Bandwidth

Configuration 1 - Mode 2

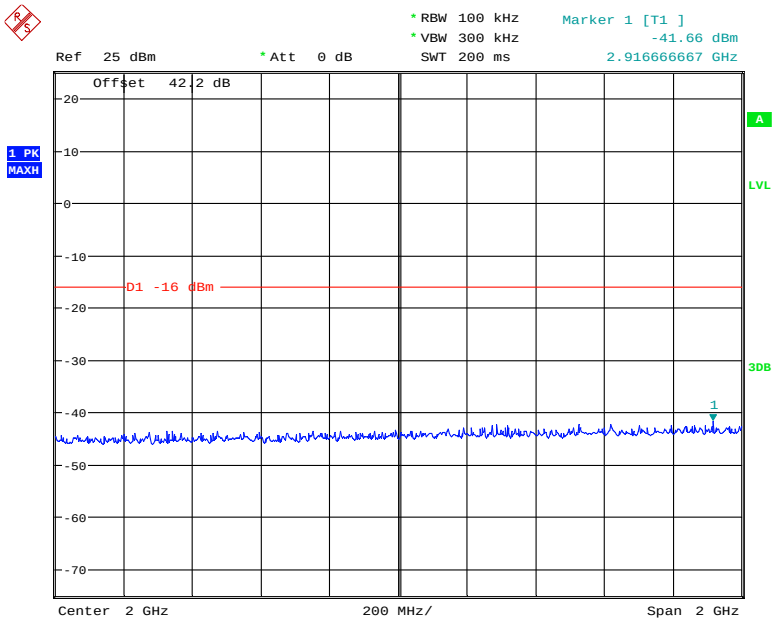
9kHz to 1GHz



Date: 14.MAY.2013 13:17:03

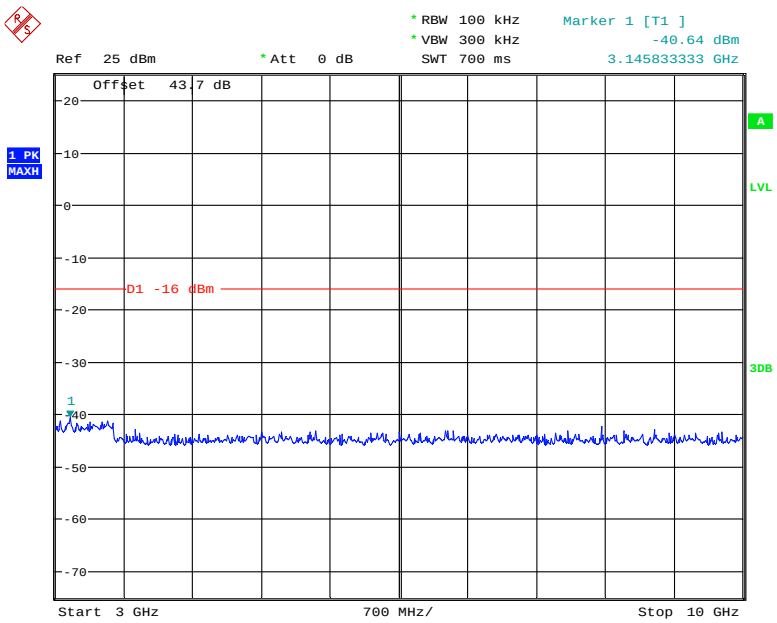
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 14:05:28

3GHz to 10GHz

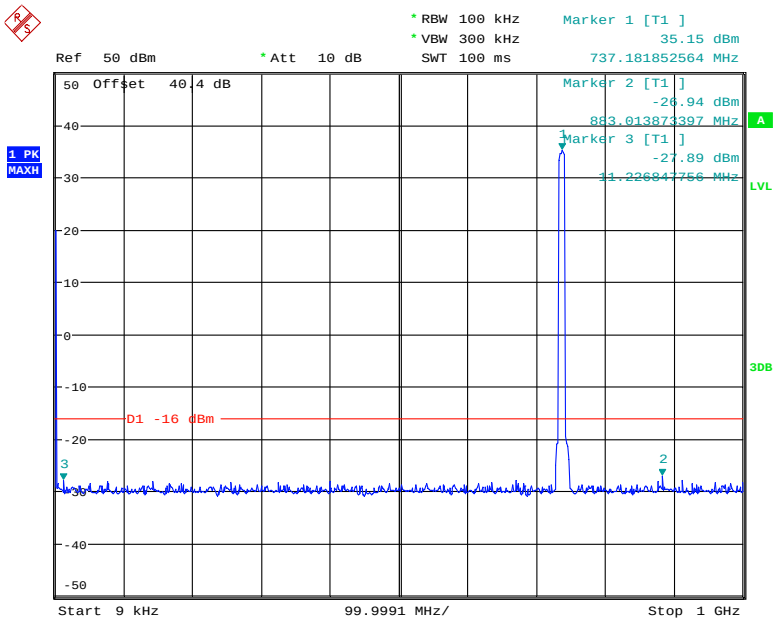


Date: 14.MAY.2013 13:18:08

10MHz Bandwidth

Configuration 1 - Mode 2

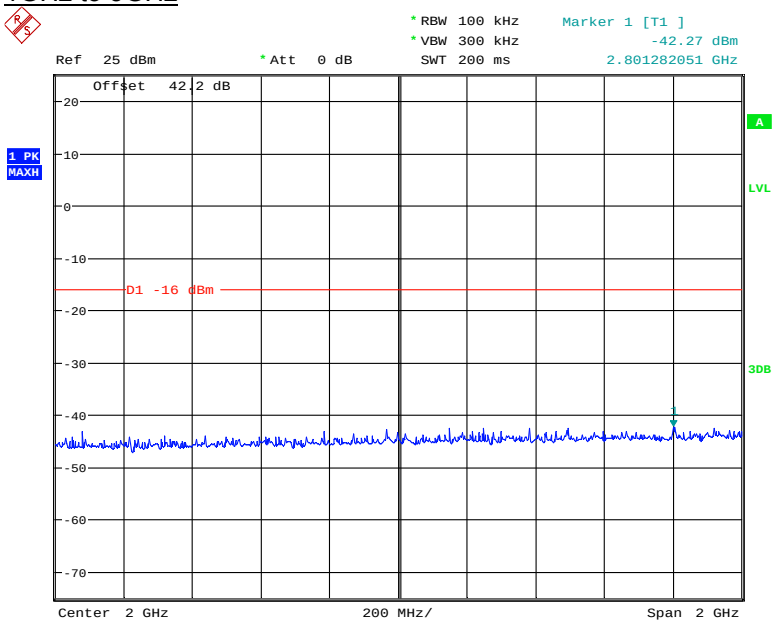
9kHz to 1GHz



Date: 14.MAY.2013 13:21:46

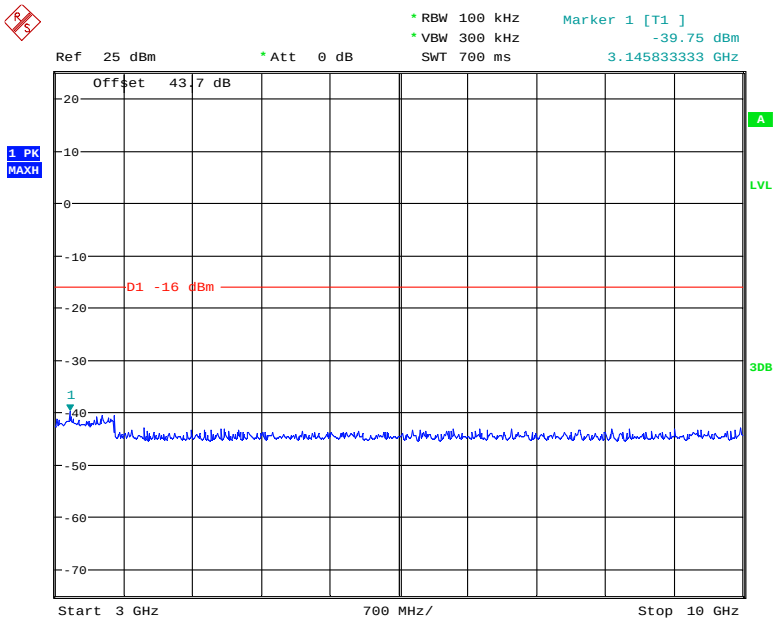
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 14:06:38

3GHz to 10GHz

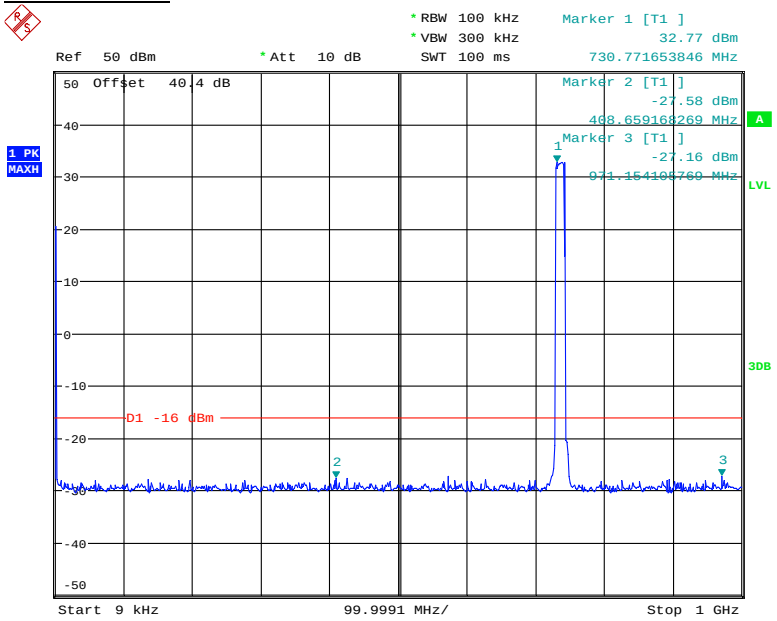


Date: 14.MAY.2013 13:20:21

15MHz Bandwidth

Configuration 1 - Mode 1 - 15

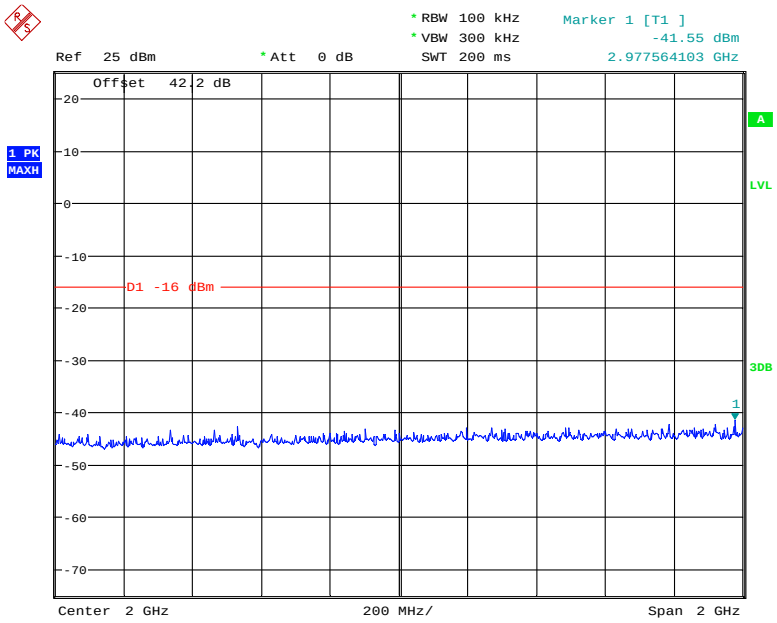
9kHz to 1GHz



Date: 14.MAY.2013 13:06:45

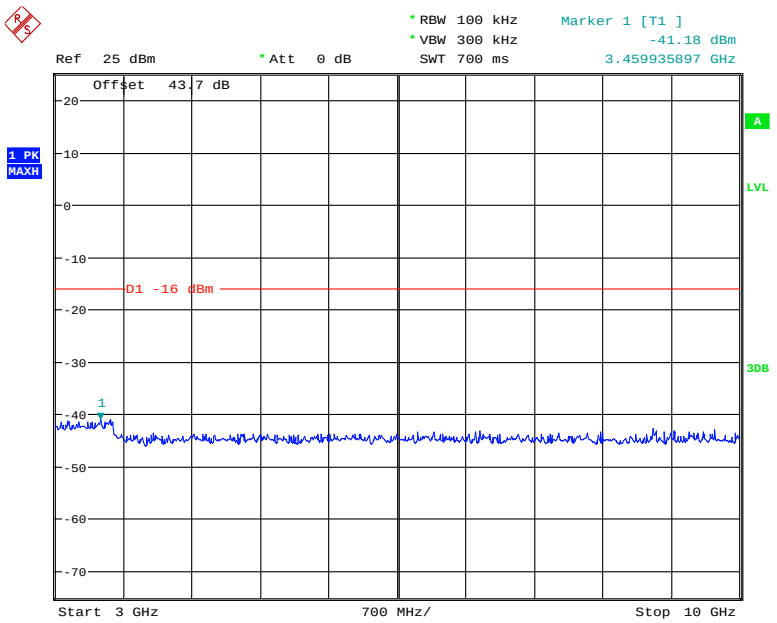
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 13:53:59

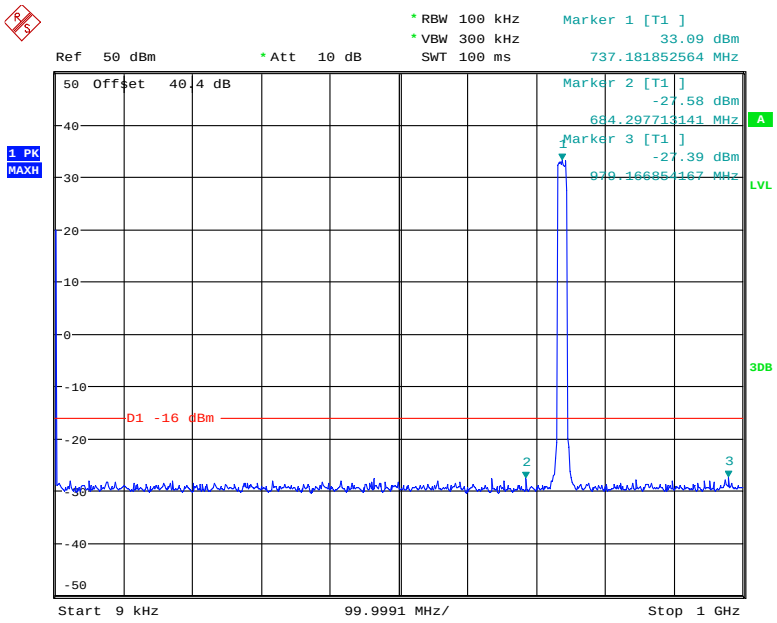
3GHz to 10GHz



Date: 14.MAY.2013 13:02:20

Configuration 1 - Mode 2

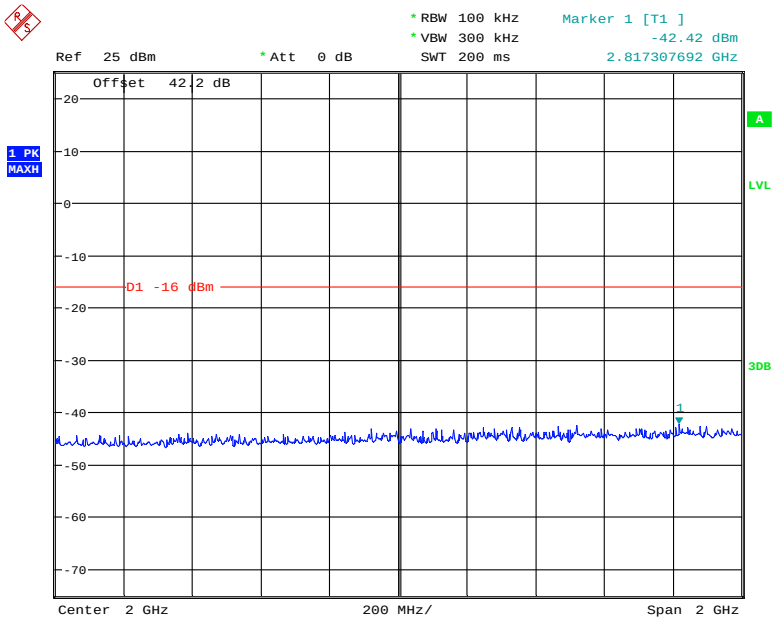
9kHz to 1GHz



Date: 14.MAY.2013 12:59:21

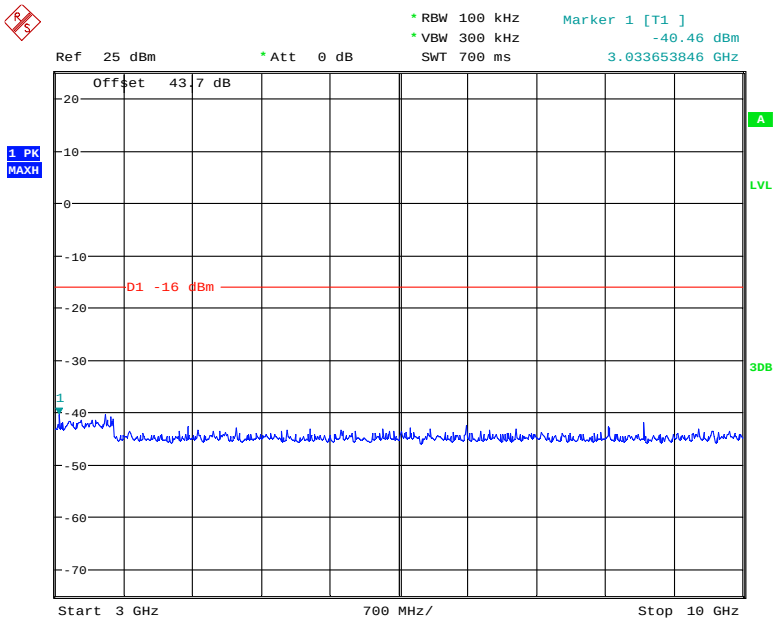
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 13:52:08

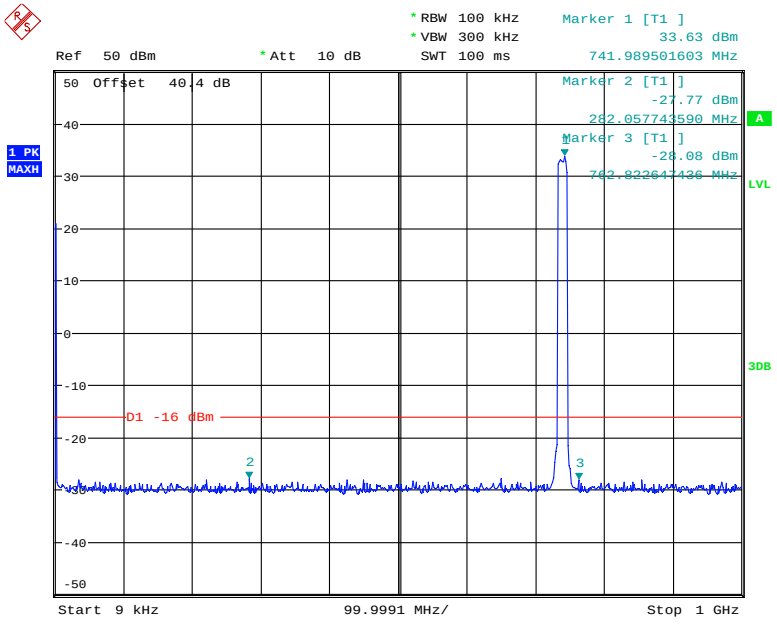
3GHz to 10GHz



Date: 14.MAY.2013 13:00:36

Configuration 1 - Mode 3 - 15

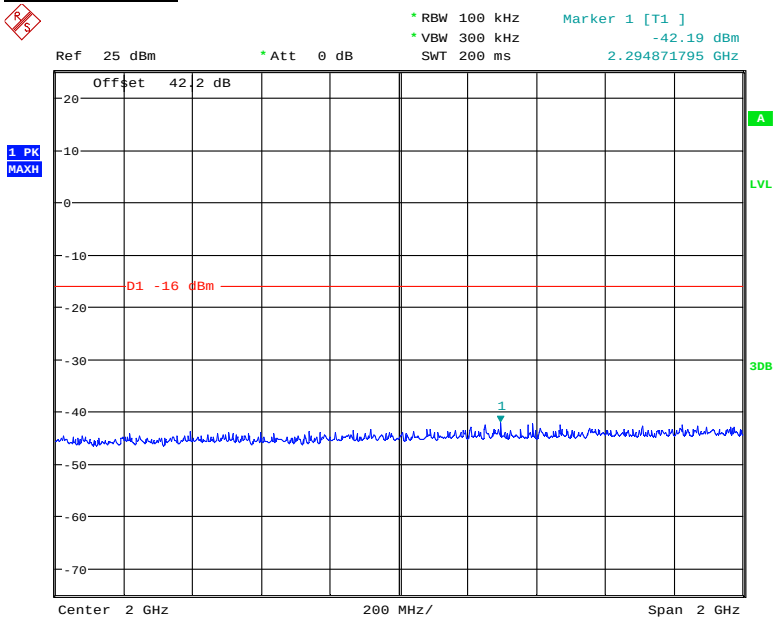
9kHz to 1GHz



Date: 14.MAY.2013 13:09:33

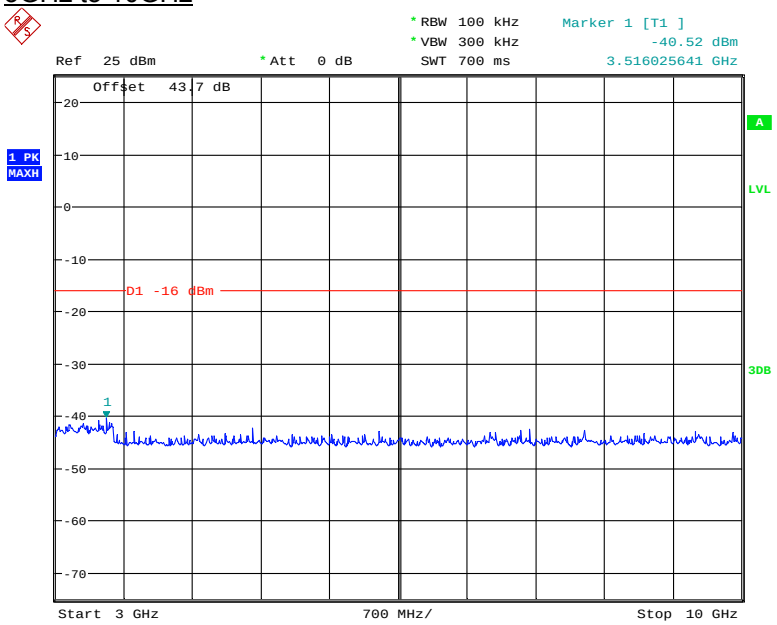
Note: The emission beyond the limit is the operating frequency.

1GHz to 3GHz



Date: 14.MAY.2013 13:55:02

3GHz to 10GHz



Date: 14.MAY.2013 13:10:50

Limit	-13dBm

Remarks

The EUT does not exceed -13dBm at the frequency range of 9kHz to 10GHz.

2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.8.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 27, Clause 27.54

2.8.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.8.3 Date of Test and Modification State

10 May 2013 – 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 27.

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

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

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

Configuration 1 - Mode 2 (3.0MHz OBW)

2.8.6 Environmental Conditions

	10 May 2013
Ambient Temperature	22.0°C
Relative Humidity	54.0%

Product Service

2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 27 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 (ºC)	Deviation (Hz)
-30	14.43
-20	14.57
-10	14.76
0	14.58
+10	14.77
+20	**14.64**
+30	12.26
+40	16.27
+50	16.18

Limit	±(0.05 ppm) or ± 36.85 Hz*

Remarks

* Limit according to 3GPP TS 36.141

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

2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.9.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 27, Clause 27.54

2.9.2 Equipment Under Test

RRUS 11 B12 / KRC 161 241/1, S/N: CB4P949740

2.9.3 Date of Test and Modification State

10 May 2013 – Modification State 0

2.9.4 Test Equipment Used

The major items of test equipment used for the above 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 27.

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 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 (3.0MHz OBW)

2.9.6 Environmental Conditions

	10 May 2013
Ambient Temperature	22.0°C
Relative Humidity	54.0%

2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 27 for Frequency Stability Under Voltage Variations.

The test results are shown below

Temperature: 20°C

Single Carrier

QPSK

Configuration 1 - Mode 2

DC Voltage (V)	Deviation (Hz)
-40.8	15.44
-48.0	**14.64**
-55.2	14.34

Limit	±(0.05 ppm) or ± 36.85 Hz*

Remarks

* Limit according to 3GPP TS 36.141

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 and 2.10 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (±1MHz) and Conducted Spurious Emissions.					
Spectrum Analyser	Rohde & Schwarz	FSQ26	200235	12	06-Sep-2013
Spectrum Analyser	Rohde & Schwarz	FSQ26	200759	12	07-Apr-2014
Power Meter	Rohde & Schwarz	NRP	101283	12	12-Aug-2013
Power Sensor	Rohde & Schwarz	NRP-Z51	102433	12	12-Aug-2013
Network Analyzer	Hewlett Packard	8720D	US36140166	12	06-Sep-2013
40 dB Attenuator	HJ	ATT-150W-40dB	8F42L12E017	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121648	-	O/P MON
Power Supply	Dahua	DH1716-5D	20030062	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013
Section 2.6 – Radiated Spurious Emissions					
Load	Shanghai Huaxiang	TF100	09121648	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121605	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2013
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2013
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2013
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2013
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	12	19-Aug-2013
Power Supply	Dahua	DH1716-5D	20030062	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013
Section 2.8 and 2.9 – Frequency Stability Under Temperature and Voltage Variations					
Spectrum Analyser	Rohde & Schwarz	FSQ26	200759	12	07-Apr-2014
40 dB Attenuator	HJ	ATT-150W-40dB	8F42L12E017	-	O/P MON
Temperature Chamber	THERMOTRON	SE-600-6-6	34648	-	O/P MON
Power Supply	Dahua	DH1716-5D	20030062	-	16-Apr-2014
Digital Multimeter	FLUKE	179	91820401	12	03-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013

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

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30MHz to 10GHz Amplitude	0.5dB*
Conducted Emissions	30MHz to 40GHz Amplitude	3.0dB*
Frequency Stability	30MHz to 2GHz Amplitude	$<1x10^{-7}$
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in 10^6		

* In accordance with CISPR 16-4

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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

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

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