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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 75924256 Report 02 Issue 1

October 2013



Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON

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

Document 75924256 Report 02 Issue 1

October 2013

PREPARED FOR

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PREPARED BY

G Zhao
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APPROVED BY

Simon Bennett
Authorised Signatory

DATED

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

Test Engineer(s);

G Zhao

X Zhang





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Ericsson 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 for hardware update in CDMA wireless network. The manufacturer has declared that this hardware update does not affect the frequency stability, therefore this requirement was not tested.

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)	CF81391251
Software Version	CXP102051/16 Rev R32BD
PIS Software Version	CXP9017316/1 Rev R44GS
Hardware Version	R2A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 90: 2012
Incoming Release Date	Declaration of Build Status 11 September 2013
Order Number Date	PTP 11 September 2013
Start of Test	11 September 2013
Finish of Test	27 September 2013
Name of Engineer(s)	G Zhao X Zhang
Related Document(s)	ANSI C63.4: 2009 ANSI/TIA-603-C-2004 FCC CFR 47 Part 2: 2012



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 – Remote Radio Equipment						
Section	Spec Clause FCC Part 2 and 90	Test Description	Mode	Mod State	Result	Comments
	90.635	Effective Radiated Power	862.90MHz		N/A	No integral antenna.
			865.50MHz		N/A	
			868.10MHz		N/A	
			862.90MHz + 864.15MHz		N/A	
			864.25MHz + 865.50MHz		N/A	
			866.85MHz + 868.10MHz		N/A	
2.1	2.1046, 90.635	Maximum Peak Output Power - Conducted	862.90MHz	0	Pass	-
			865.50MHz	0	Pass	
			868.10MHz	0	Pass	
			862.90MHz + 864.15MHz	0	Pass	
			864.25MHz + 865.50MHz	0	Pass	
			866.85MHz + 868.10MHz	0	Pass	
2.2	2.1047 (d)	Modulation Characteristics	862.90MHz		N/A	-
			865.50MHz	0	Pass	
			868.10MHz		N/A	
			862.90MHz + 864.15MHz		N/A	
			864.25MHz + 865.50MHz		N/A	
			866.85MHz + 868.10MHz		N/A	
2.3	2.1049 (h)	Occupied Bandwidth ¹	862.90MHz	0	Pass	-
			865.50MHz	0	Pass	
			868.10MHz	0	Pass	
			862.90MHz + 864.15MHz		N/A	
			864.25MHz + 865.50MHz		N/A	
			866.85MHz + 868.10MHz		N/A	
2.4	2.1051, 90.210 (g), 90.691	Emission Masks	862.90MHz	0	Pass	-
			865.50MHz		N/A	
			868.10MHz	0	Pass	
			862.90MHz + 864.15MHz	0	Pass	
			864.25MHz + 865.50MHz		N/A	
					N/A	



Configuration 1 – Remote Radio Equipment						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 90					
			866.85MHz + 868.10MHz	0	Pass	
2.5	2.1053, 90.691	Radiated Spurious Emissions	862.90MHz	0	Pass	-
			865.50MHz	0	Pass	
			868.10MHz	0	Pass	
			862.90MHz + 864.15MHz		N/A	
			864.25MHz + 865.50MHz	0	Pass	
			866.85MHz + 868.10MHz		N/A	
2.6	2.1051, 90.691	Conducted Spurious Emissions	862.90MHz	0	Pass	-
			865.50MHz	0	Pass	
			868.10MHz	0	Pass	
			862.90MHz + 864.15MHz	0	Pass	
			864.25MHz + 865.50MHz	0	Pass	
			866.85MHz + 868.10MHz	0	Pass	
	2.1055, 90.213	Frequency Stability Under Temperature Variations	862.90MHz		N/A	-
			865.50MHz		N/A	
			868.10MHz		N/A	
			862.90MHz + 864.15MHz		N/A	
			864.25MHz + 865.50MHz		N/A	
			866.85MHz + 868.10MHz		N/A	
	2.1055, 90.213	Frequency Stability Under Voltage Variations	862.90MHz		N/A	-
			865.50MHz		N/A	
			868.10MHz		N/A	
			862.90MHz + 864.15MHz		N/A	
			864.25MHz + 865.50MHz		N/A	
			866.85MHz + 868.10MHz		N/A	

N/A – Not Applicable

Note1: See Sprint Nextel's Request for Waiver to permit the operation of Broadband CDMA Technology in the 817-824/862-869 MHz band.



1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Remote Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NUMBER	RRUS 11 B26A
PART NUMBER	KRC 161 287/2
SERIAL NUMBER	CF81391251
HARDWARE VERSION	R2A
SOFTWARE VERSION	CXP102051/16 Rev R32BD
PIS SOFTWARE VERSION	CXP9017316/1 Rev R44GS
TRANSMITTER OPERATING RANGE	TX: 862MHz - 869MHz RX: 817MHz - 824MHz
MODULATIONS	QPSK, 8PSK, 16QAM
ITU DESIGNATION OF EMISSION	1M25F9W
CHANNEL BANDWIDTH	1.25MHz
OUTPUT POWER (RMS) (W or dBm)	Single Carrier: 1 x 46.0dBm per port(1 x 40W per port) Multi Carrier (x 2): 2 x 43.0dBm per port(2 x 20W per port)
OUTPUT POWER TOLERANCE	± 1.0dB
ANTENNA	No dedicated antenna, handled during licensing
NUMBER OF ANTENNA PORTS	2 TX/ RX ports
SUPPORTED CONFIGURATION	Dual Single Carrier or Multi Carrier. 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 CDMA Base Station.

Signature

Date

08 October 2013

D of B S Serial No

75924256 /02

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 provides communication connections to CDMA800 network. 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 CDMA with QPSK, 8PSK and 16QAM modulations at 800MHz. The settings below were found to be representative for all traffic scenarios when the number of carriers were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted:

- Single carrier:
QPSK Modulation
Forward Traffic Channel using Spreading Rate 1 (1X), Voice
User Channels: 6
Channel rate: 9.6kbps
Channel bandwidth: 1.25MHz

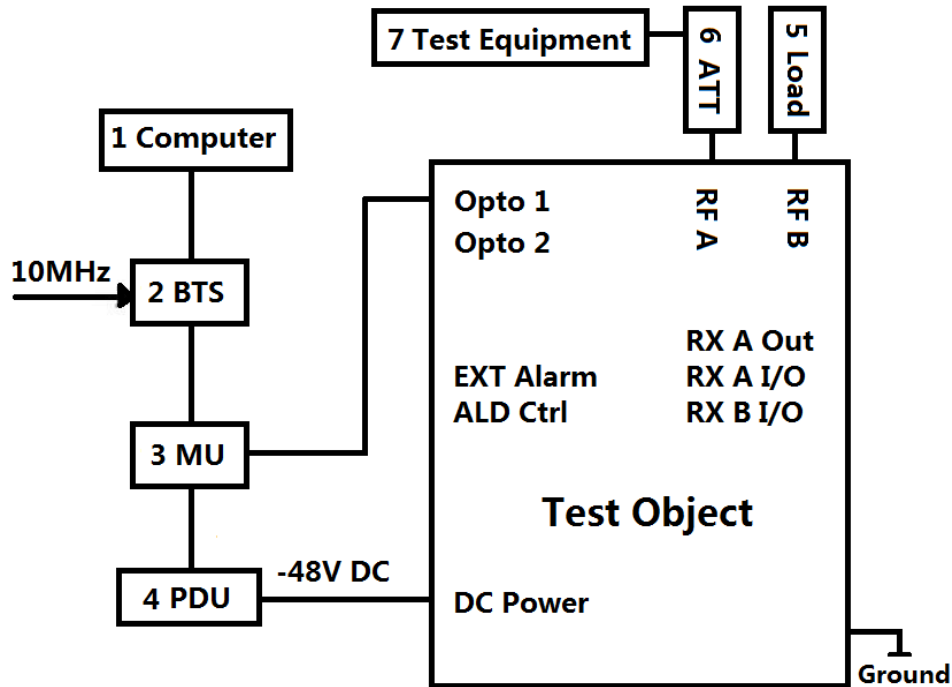
This setting was found to be representative in Occupied Bandwidth¹, Emission Masks, Radiated Spurious Emissions and Conducted Spurious Emissions tests.

For other modulations, the settings are as follows:

- QPSK Modulation: High Rate Packet Data
User Channels: 14
Channel rate: 614.4kbps
 - 8PSK Modulation: High Rate Packet Data
User Channels: 14
Channel rate: 921.6kbps
 - 16QAM Modulation: High Rate Packet Data
User Channels: 14
Channel rate: 2457.6kbps
- Channel bandwidth: 1.25MHz

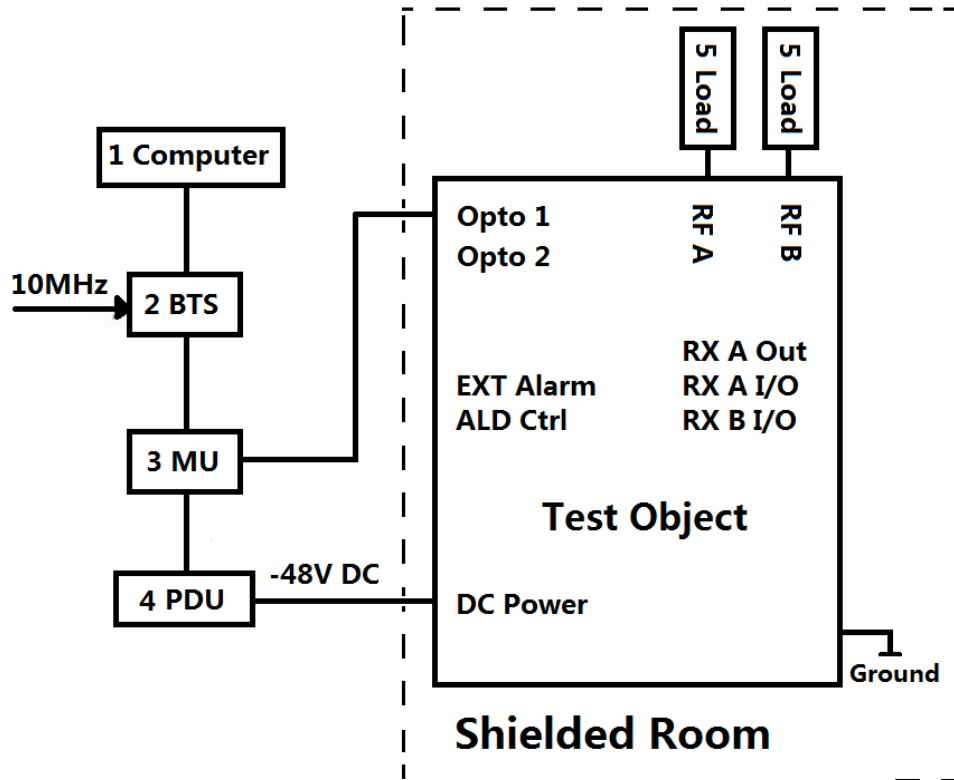
The EUT has two TX/RX ports and it can be configured to transmit with 800MHz single or multi carrier at both RF output connectors. All TX measurements were performed on the combined TX/RX output connector RF A. Limited complementary TX measurements were done at connector RF B to verify identical performance for both transmitter chains. 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:**

Product Name	Product Number	Version	Serial Number
RRUS 11 B26A	KRC 161 287/2	R2A	CF81391251

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP EliteBook 8460p	--	AP523464
2	DBA	NTLK90AAE5	09	NNTMPX00VD94
	XCEM-A	NTLK79AAE5	01	NNTMPX00JCKF
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY4
	AEM1302	NTLK85GAE5	07	NNTMPX00RV3M
3	RBS 6601	BFL 901 009/1	--	--
	XMU 02 01	KDU137 745/1	R2A	C825513800
	SUP 6601	1/BFL 901 009/1	R3B	BR81262578
4	Power Supply	DH1716-5D	--	2008040041
	Power Supply	DH1716-5D	--	2008040050
5	Load	TF100	--	09121648
6	40dB Attenuator	48-40-43-LIM	--	BR5020
7	Power Meter	Rohde & Schwarz NRP2	--	101283
	Power Sensor	Rohde & Schwarz NRP-Z51	--	102168
	Spectrum Analyzer	FSQ26	--	100253

**Test Setup, Radiated Measurement:**

Product Name	Product Number	Version	Serial Number
RRUS 11 B26A	KRC 161 287/2	R2A	CF81391251

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP EliteBook 8460p	--	AP523464
2	DBA	NTLK90AAE5	09	NNTMPX00VD94
	XCEM-A	NTLK79AAE5	01	NNTMPX00JCKF
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY4
	AEM1302	NTLK85GAE5	07	NNTMPX00RV3M
3	RBS 6601	BFL 901 009/1	--	--
	XMU 02 01	KDU137 745/1	R2A	C825513800
	SUP 6601	1/BFL 901 009/1	R3B	BR81262578
4	Power Supply	DH1716-5D	--	2008040041
	Power Supply	DH1716-5D	--	2008040050
5	Load	TF100	--	09121648
	Load	TF100	--	09121605



Product Service

1.4.3 Modes of Operation

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

Mode 1 - Channel No. 476: 862.90MHz (Bottom Channel)

Mode 2 - Channel No. 580: 865.50MHz (Middle Channel)

Mode 3 - Channel No. 684: 868.10MHz (Top Channel)

Mode 4 - Channel No. 476 + 526: 862.90MHz + 864.15MHz (B and B+1.25MHz)

Mode 5 - Channel No. 530 + 580: 864.25MHz + 865.50MHz (M-1.25MHz and M)

Mode 6 - Channel No. 634 + 684: 866.85MHz + 868.10MHz (T-1.25MHz and T)

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

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

1.8 ALTERNATIVE TEST SITE

Only Radiated Spurious Emission 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 B26A / KRC 161 287/2



2.1 MAXIMUM PEAK 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: CF81391251

2.1.3 Date of Test and Modification State

11, 12 and 13 September 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 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 all modulations.

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

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5
- Mode 6

2.1.6 Environmental Conditions

	11 September 2013	12 September 2013	13 September 2013
Ambient Temperature	24.0°C	23.5°C	24.0°C
Relative Humidity	67.0%	64.0%	64.0%



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 Peak Output Power.

The test results are shown below

Single Carrier

Configuration 1 - Mode 1, 2 and 3

QPSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
476 (Bottom)	862.90	45.54	35.81
580 (Middle)	865.50	46.16	41.30
684 (Top)	868.10	46.09	40.64

8PSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
476 (Bottom)	862.90	45.57	36.06
580 (Middle)	865.50	46.18	41.50
684 (Top)	868.10	46.12	40.93

16QAM

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
476 (Bottom)	862.90	45.62	36.48
580 (Middle)	865.50	46.22	41.88
684 (Top)	868.10	46.18	41.50

Multi Carrier (1x2)Configuration 1 - Mode 4, 5 and 6QPSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
476 & 526	862.90 & 864.15	46.00	39.81
530 & 580	864.25 & 865.50	46.03	40.09
634 & 684	866.85 & 868.10	46.14	41.11

8PSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
476 & 526	862.90 & 864.15	45.65	36.73
530 & 580	864.25 & 865.50	46.03	40.09
634 & 684	866.85 & 868.10	46.13	41.02

16QAM

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
476 & 526	862.90 & 864.15	45.72	37.33
530 & 580	864.25 & 865.50	46.09	40.64
634 & 684	866.85 & 868.10	46.19	41.59

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

Limit	$\leq 1000W$ or $\leq +60dBm$
-------	-------------------------------

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: CF81391251

2.2.3 Date of Test and Modification State

12 September 2013 – 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, 8PSK and 16QAM modulations.

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

Configuration 1 - Mode 2

2.2.5 Environmental Conditions

12 September 2013

Ambient Temperature 23.5°C

Relative Humidity 64.0%



Product Service

2.2.6 Test Results

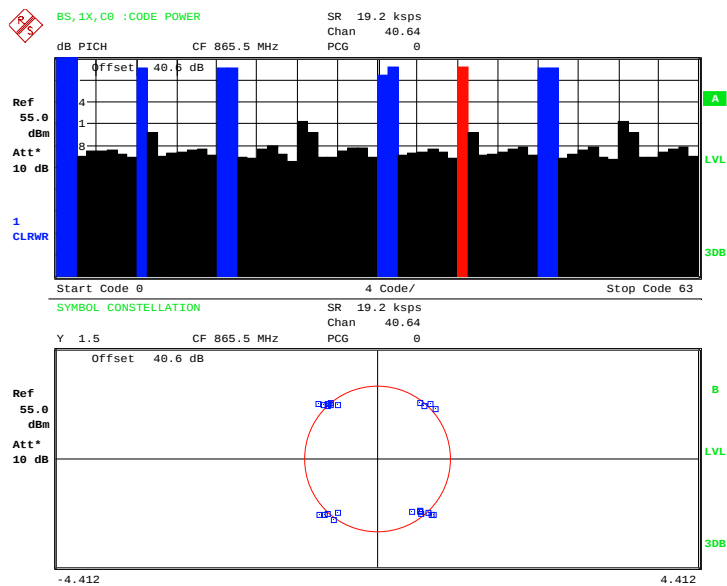
Plots are listed on the following showing the EUT transmitting with all of the modulations:

The test results are shown below

Single Carrier

Configuration 1 - Mode 2

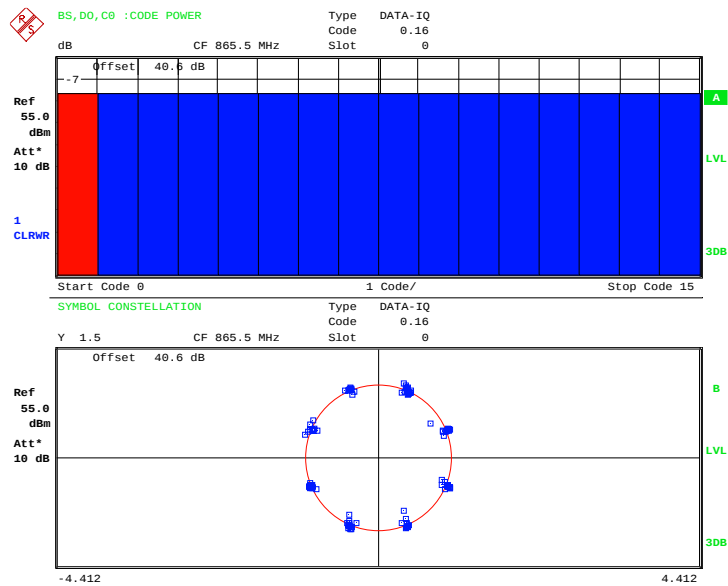
EUT transmitting with QPSK modulation:



Date: 12.SEP.2013 16:06:31

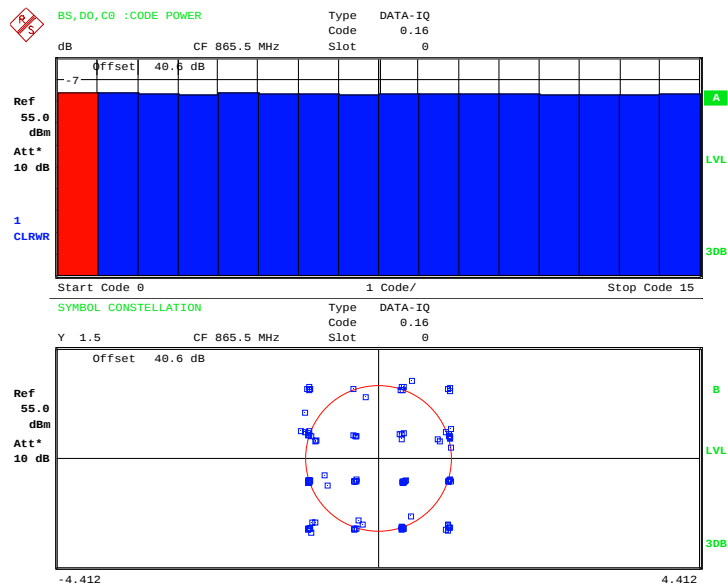


EUT transmitting with 8PSK modulation:



Date: 12.SEP.2013 15:50:46

EUT transmitting with 16QAM modulation:



Date: 12.SEP.2013 15:54:13



Product Service

2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049 (h)

2.3.2 Equipment Under Test

RRUS 11 B26A / KRC 161 287/2, S/N: CF81391251

2.3.3 Date of Test and Modification State

11, 12 and 13 September 2013 – 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 .

The EUT was transmitting at maximum power, modulated using QPSK as the representative test modulation. A resolution bandwidth of 20kHz and a video bandwidth of 200kHz were used for test.

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
 - Mode 2
 - Mode 3

2.3.6 Environmental Conditions

	11 September 2013	12 September 2013	13 September 2013
Ambient Temperature	24.0°C	23.5°C	24.0°C
Relative Humidity	67.0%	64.0%	64.0%



2.3.7 Test Results

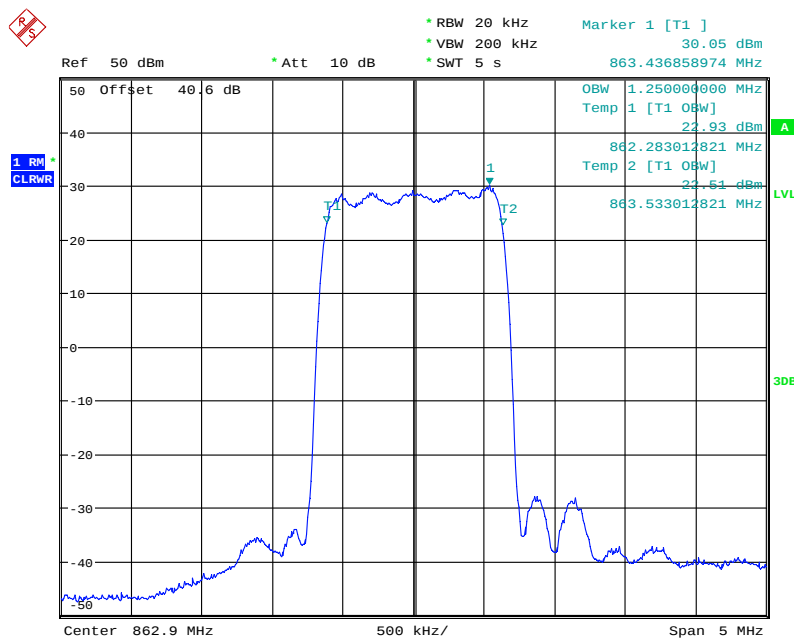
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 for Occupied Bandwidth.

The test results are shown below

Single Carrier:

QPSK

Configuration 1 – Mode 1

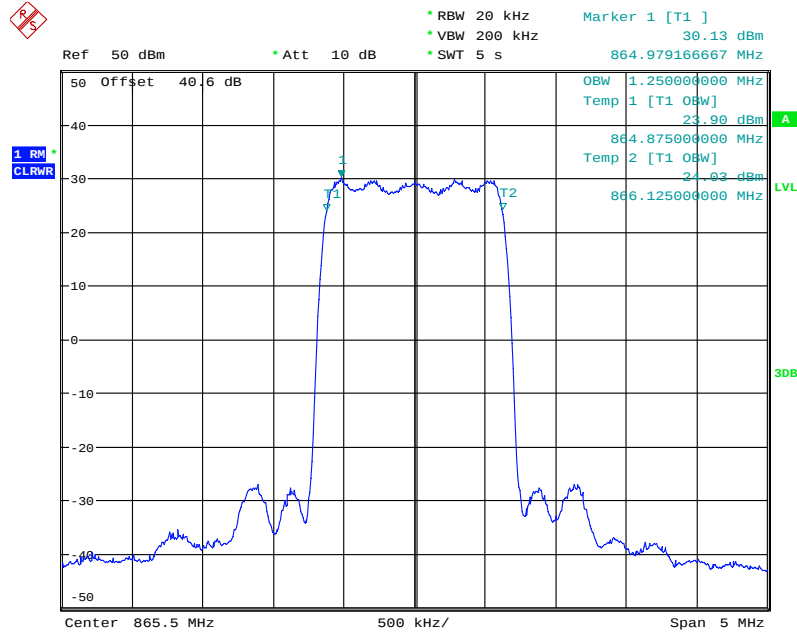


Date: 13.SEP.2013 15:31:40



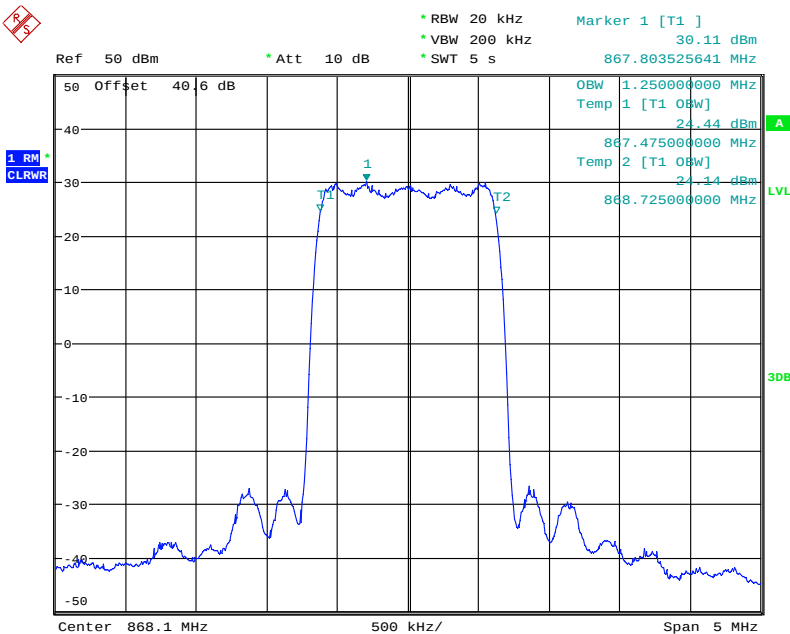
Product Service

Configuration 1 – Mode 2



Date: 11.SEP.2013 11:11:11

Configuration 1 – Mode 3

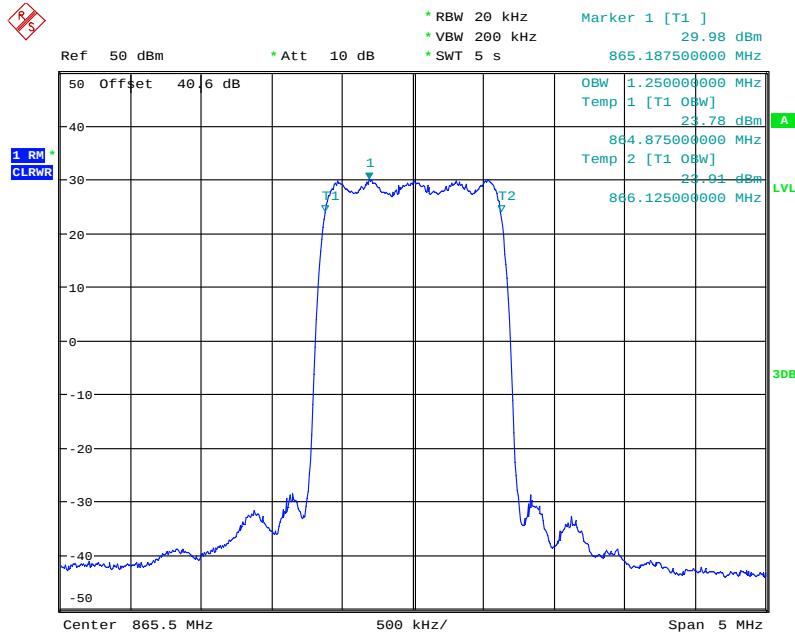


Date: 13.SEP.2013 15:48:51



8PSK

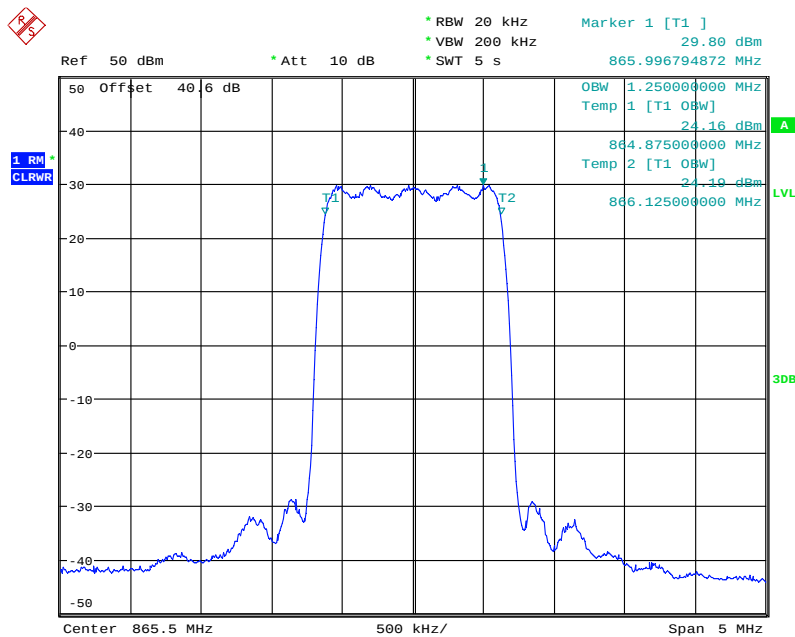
Configuration 1 – Mode 2



Date: 12.SEP.2013 15:50:59

16QAM

Configuration 1 – Mode 2



Date: 12.SEP.2013 15:37:14



Product Service

2.4 EMISSION MASK

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: CF81391251

2.4.3 Date of Test and Modification State

12 and 13 September 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 90.

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 1.25 MHz 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 $43+10\log(P)$. The plots shown in the test report show a tighter limit of $50+10\log(P)$.

The EUT was tested at its maximum power level. At least 1% of the emission bandwidth was used for the resolution bandwidth. Spectrum analyser detector was set as RMS.

The path loss measured and entered to the test equipment as a reference level offset to get a more accurate testing result.

The EUT was tested at its 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
 - Mode 3
 - Mode 4
 - Mode 6



2.4.6 Environmental Conditions

	12 September 2013	13 September 2013
Ambient Temperature	23.5°C	24.0°C
Relative Humidity	64.0%	64.0%

2.4.7 Test Results

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

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

QPSK

Single Carrier

Configuration 1 - Mode 1 and 3

Band Edge Frequency	Emission Mask Test with QPSK modulation Channel No./Frequencies
Bottom 862 MHz	Channel: 476 Frequency: 862.90 MHz
Top 869 MHz	Channel: 684 Frequency: 868.10 MHz

Multi Carrier (1x2)

Configuration 1 - Mode 4 and 6

Band Edge Frequency	Emission Mask Test with QPSK modulation Channel No./Frequencies
Bottom 862 MHz	Channel: 476 & 526 Frequency: 862.90 & 864.15 MHz
Top 869 MHz	Channel: 634 & 684 Frequency: 866.85 & 868.10 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 used outside of those stated and power levels used beyond those stated in the table exceed the specification limits, thus they cannot be used.

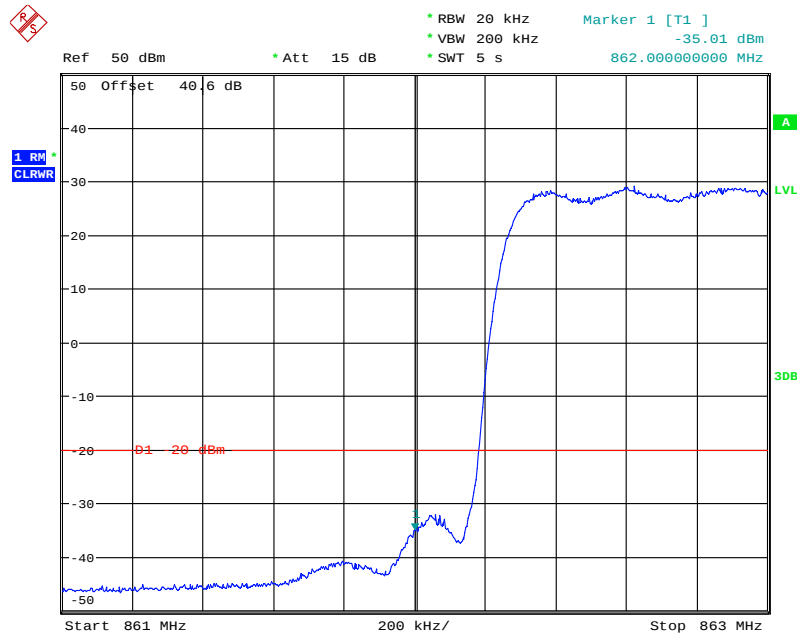
The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.

The test results are shown below

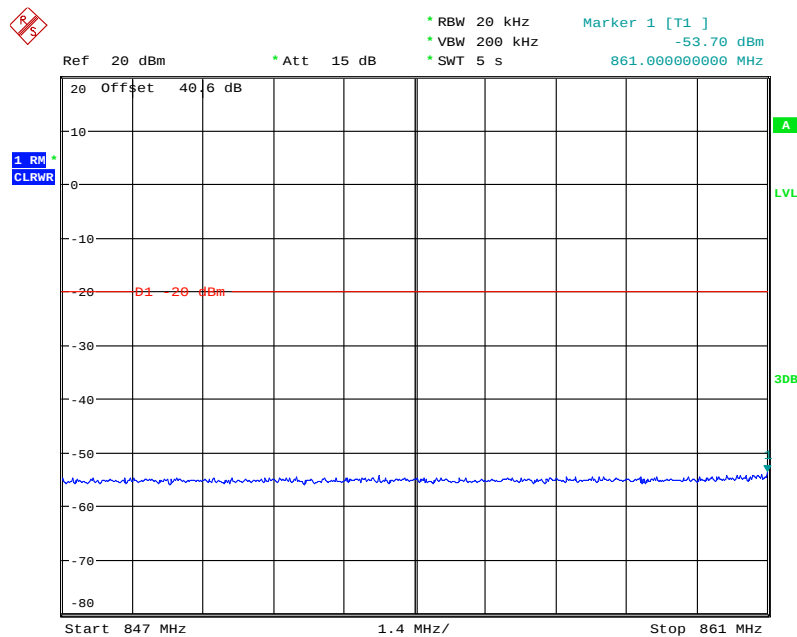
QPSK

Single Carrier

Configuration 1 - Mode 1



Date: 13.SEP.2013 15:26:24

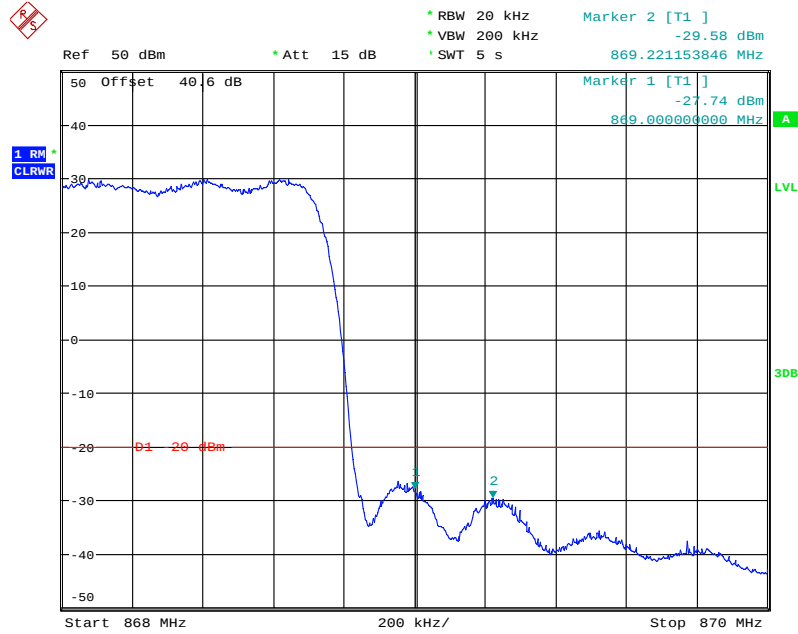


Date: 13.SEP.2013 15:27:16

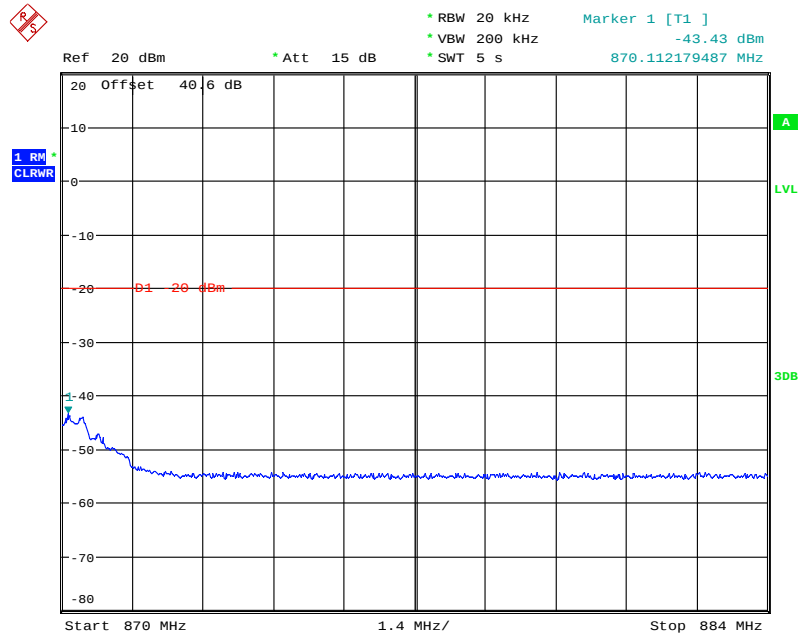


Product Service

Configuration 1 – Mode 3



Date: 13.SEP.2013 15:50:22



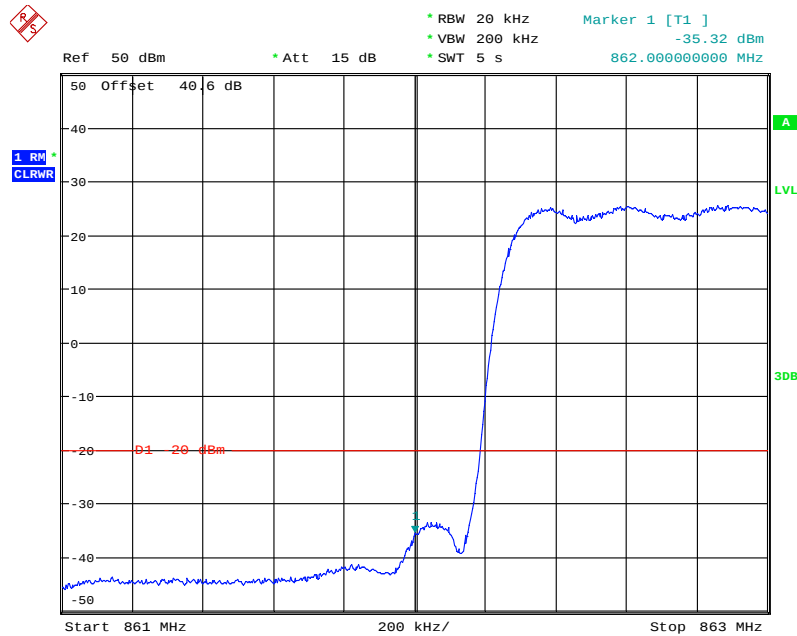
Date: 13.SEP.2013 15:51:39



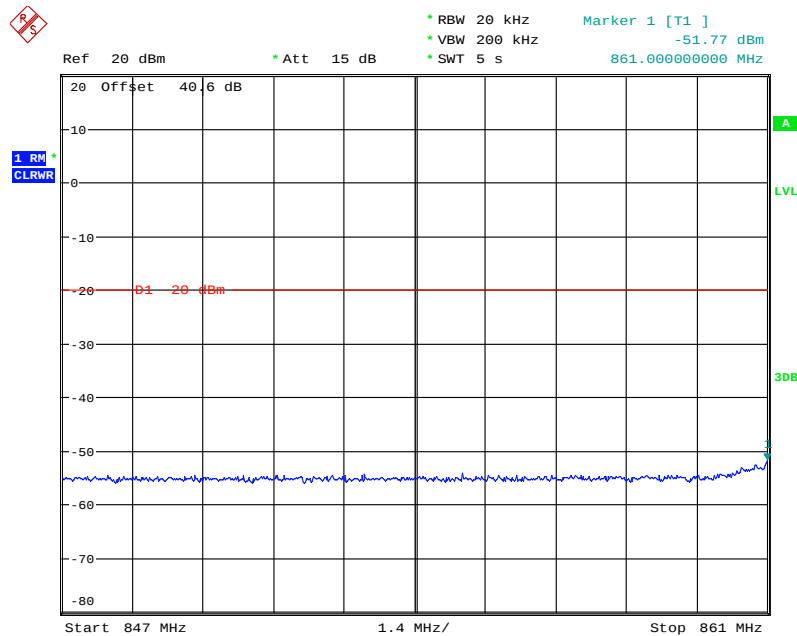
Product Service

Multi Carrier (1x2)

Configuration 1 - Mode 4



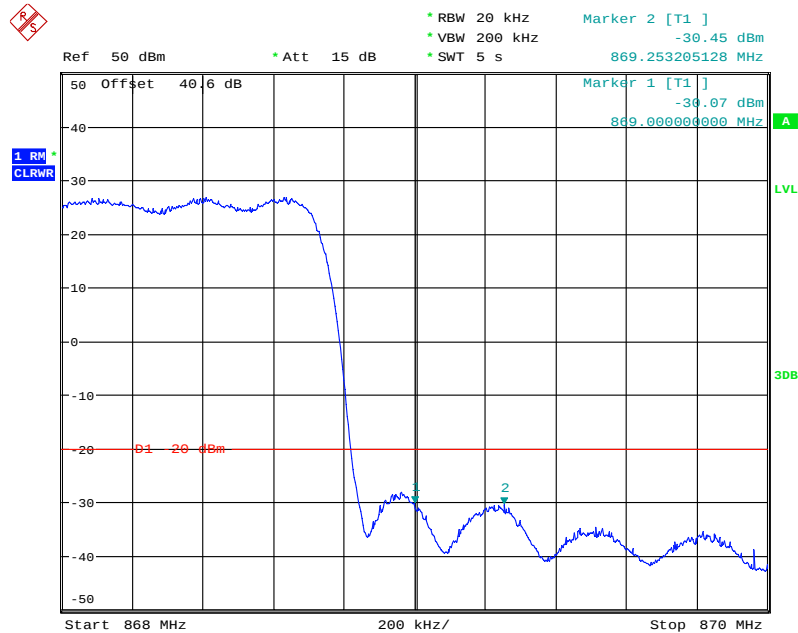
Date: 12.SEP.2013 17:00:49



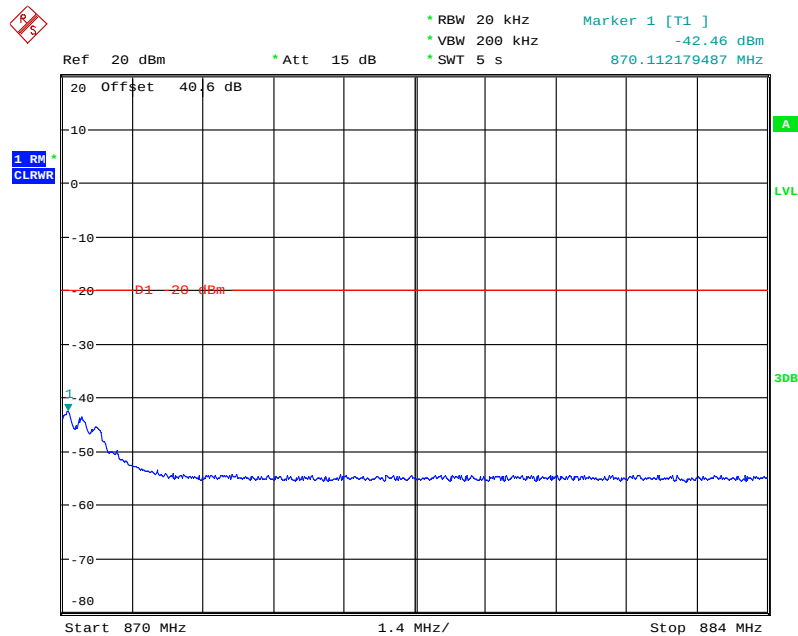
Date: 12.SEP.2013 17:01:34



Product Service

Configuration 1 - Mode 6

Date: 13.SEP.2013 09:47:18



Date: 13.SEP.2013 09:45:01

Limit

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



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: CF81391251

2.5.3 Date of Test and Modification State

25 and 27 September 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 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 – 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.

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:

$$E_{(v/m)} = (30 \times 1.64 \times 35.81)^{0.5} / 3 = 13.99V/m = 142.92dB\mu V/m$$

As per 22.917(a) the spurious emission must be attenuated by $43 + 10\log(P_o)$ dB this gives:

$$43 + 10\log(35.81) = 58.54dB$$

Therefore the limit at 3m measurement distance is:

$$142.92 - 58.54 = 84.4 \text{ dB}\mu V/m$$

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
 - Mode 2
 - Mode 3
 - Mode 5

2.5.6 Environmental Conditions

	25 September 2013	27 September 2013
Ambient Temperature	24.8°C	24.5°C
Relative Humidity	50.0%	49.0%



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.

Single Carrier

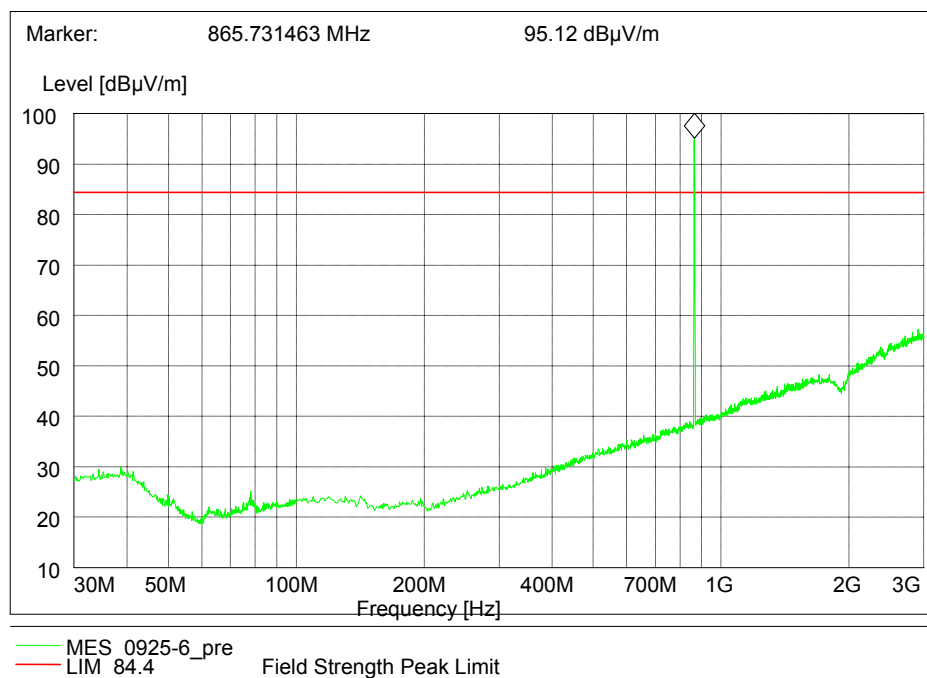
QPSK

Configuration 1 - Mode 1

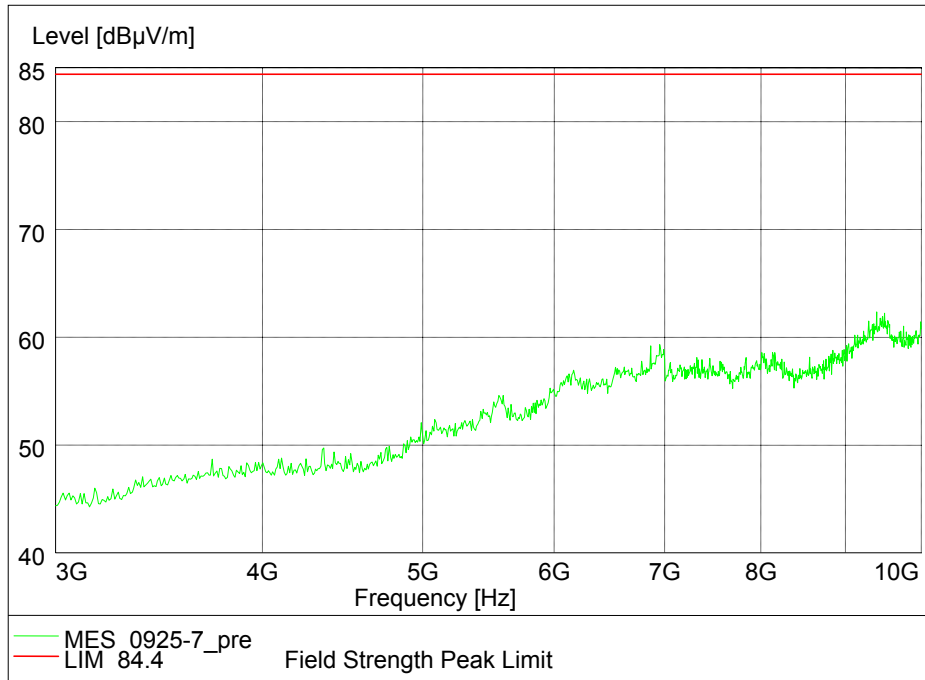
No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 2

30MHz – 3GHz



Note: The marked emission is the operating frequency.

4GHz to 10GHzConfiguration 1 - Mode 3

No emissions were detected within 20dB of the limit.

8PSKConfiguration 1 - Mode 2

No emissions were detected within 20dB of the limit.

16QAMConfiguration 1 - Mode 2

No emissions were detected within 20dB of the limit.

Multi Carrier (1x2)QPSKConfiguration 1 - Mode 5

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4 dBμV/m
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Remarks

The EUT does not exceed -13dBm 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: CF81391251

2.6.3 Date of Test and Modification State

11, 12 and 13 September 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 90.

In accordance with Part 2.1051 and Part 90.691, 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 resolution was set to 1MHz for 9kHz to 10GHz. The spectrum analyzer detector was set to peak and trace was kept on Max Hold.

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

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

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5
- Mode 6

2.6.6 Environmental Conditions

	11 September 2013	12 September 2013	13 September 2013
Ambient Temperature	24.0°C	23.5°C	24.0°C
Relative Humidity	67.0%	64.0%	64.0%



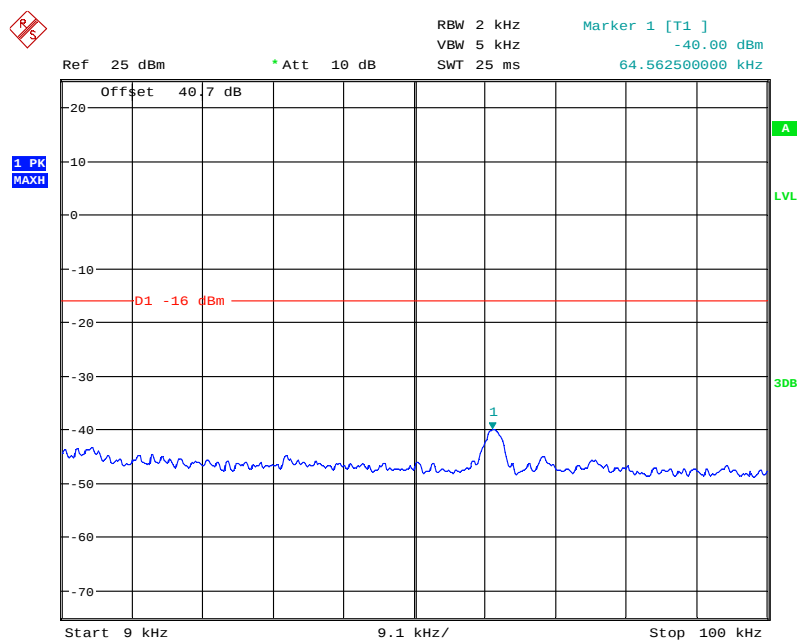
2.6.7 Test Results

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

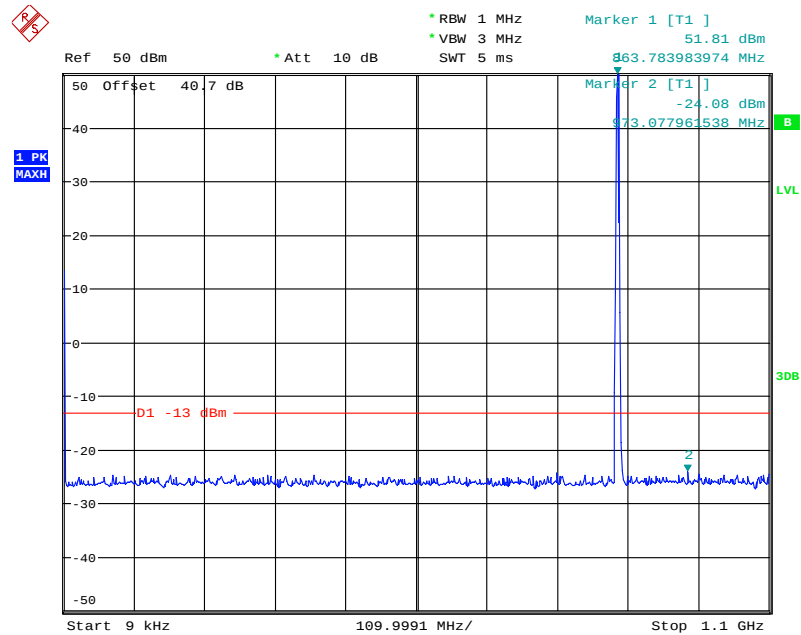
The test results are shown below

Remark:

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



Date: 11.SEP.2013 14:46:01

QPSKSingle CarrierConfiguration 1 - Mode 19kHz to 1.1GHz

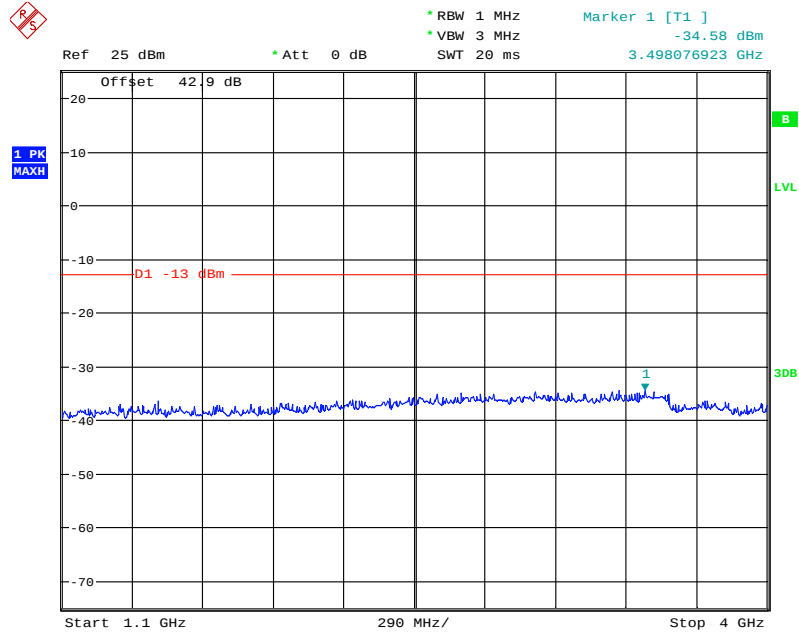
Date: 13.SEP.2013 15:28:45

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



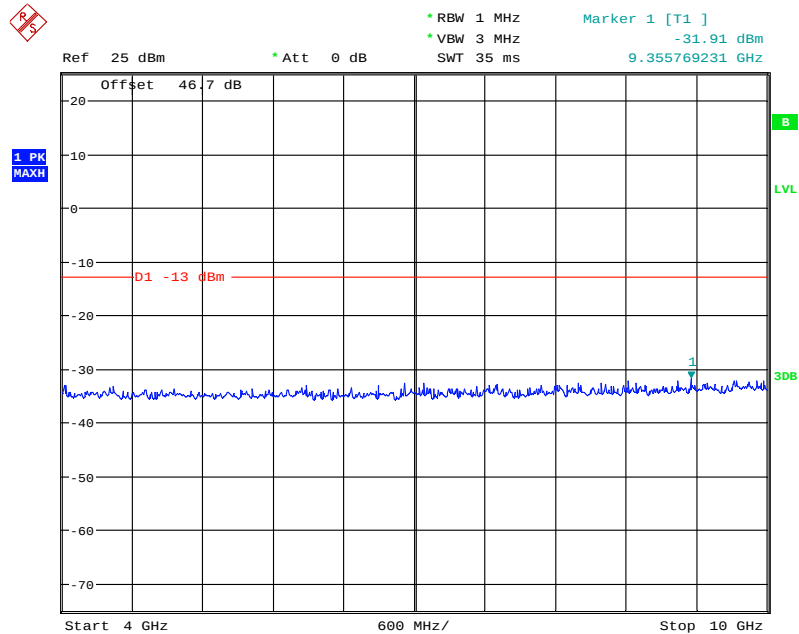
Product Service

1.1GHz to 4GHz



Date: 13.SEP.2013 15:34:09

4GHz to 10GHz

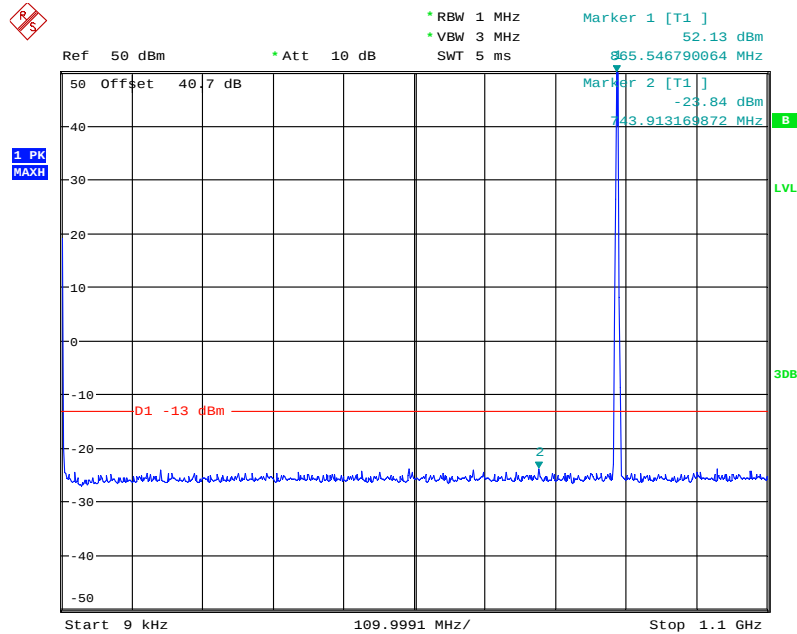


Date: 13.SEP.2013 15:30:15



Configuration 1 - Mode 2

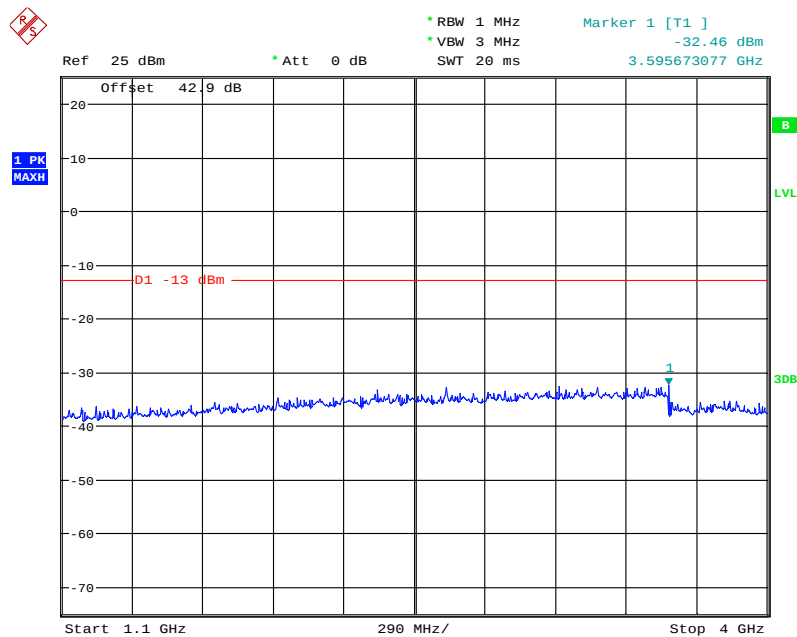
9kHz to 1.1GHz



Date: 11.SEP.2013 11:20:08

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

1.1GHz to 4GHz

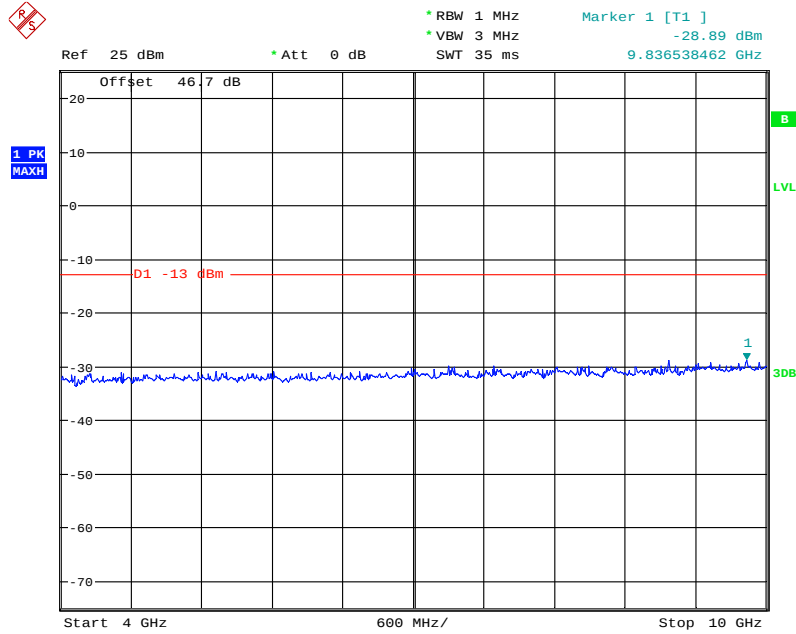


Date: 11.SEP.2013 11:35:26



Product Service

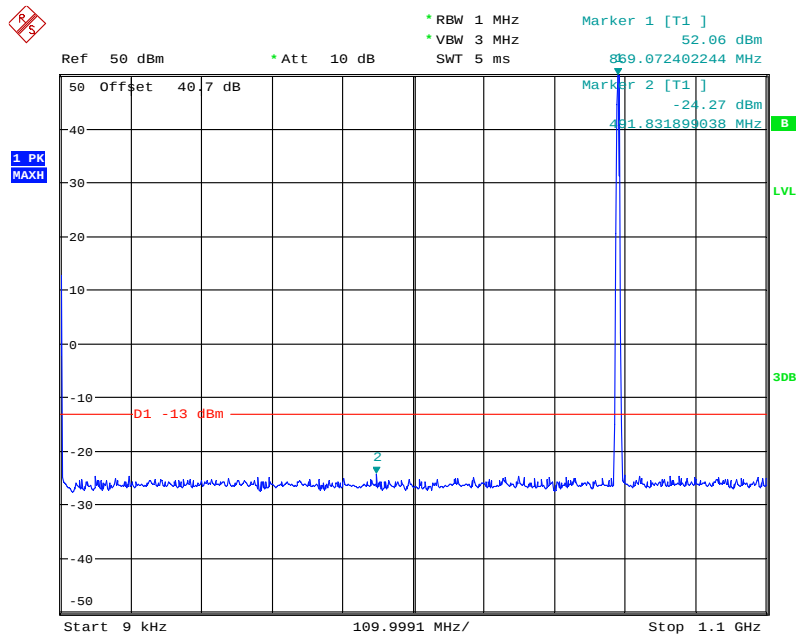
4GHz to 10GHz



Date: 11.SEP.2013 11:33:33

Configuration 1 – Mode 3

9kHz to 1.1GHz



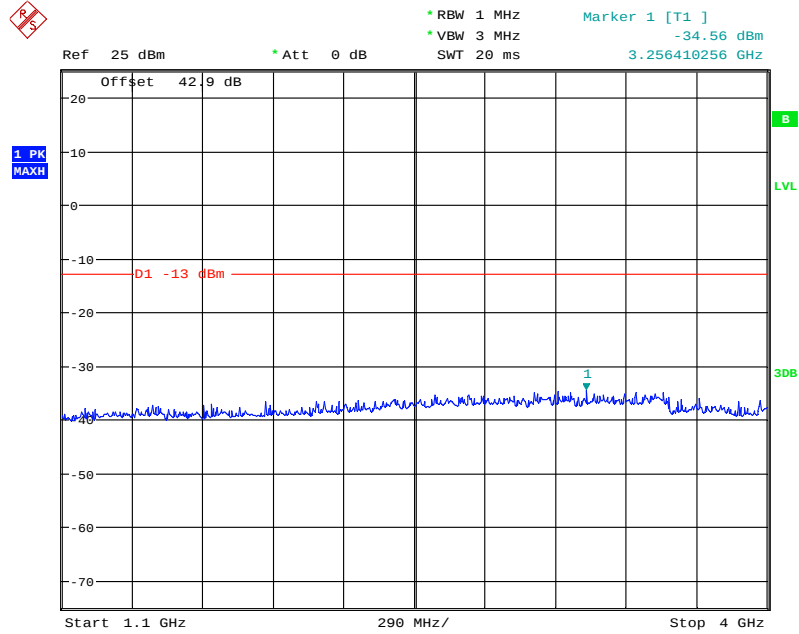
Date: 13.SEP.2013 15:47:30

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



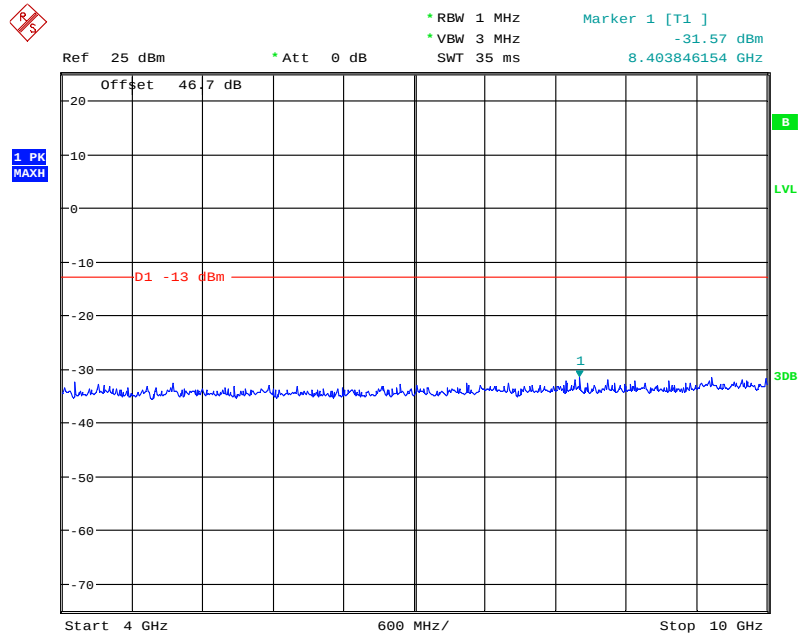
Product Service

1.1GHz to 4GHz

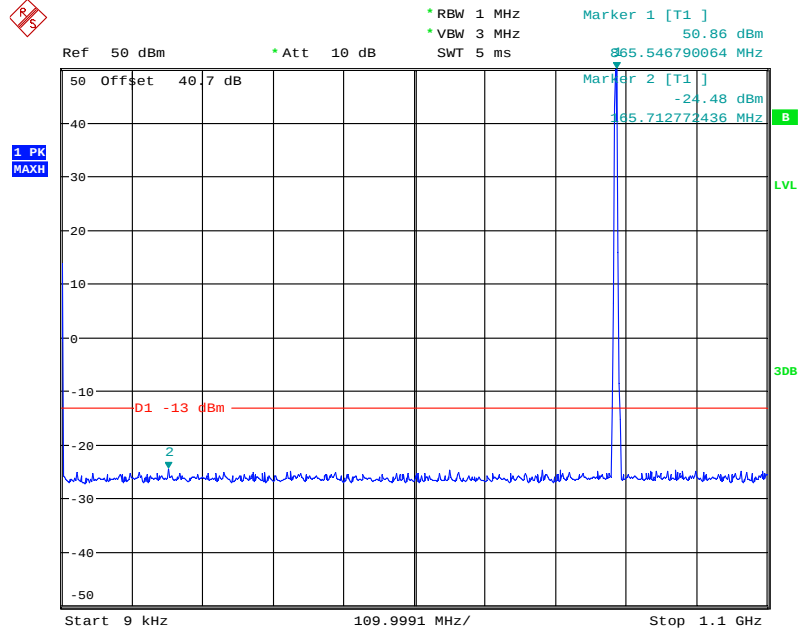


Date: 13.SEP.2013 15:35:01

4GHz to 10GHz

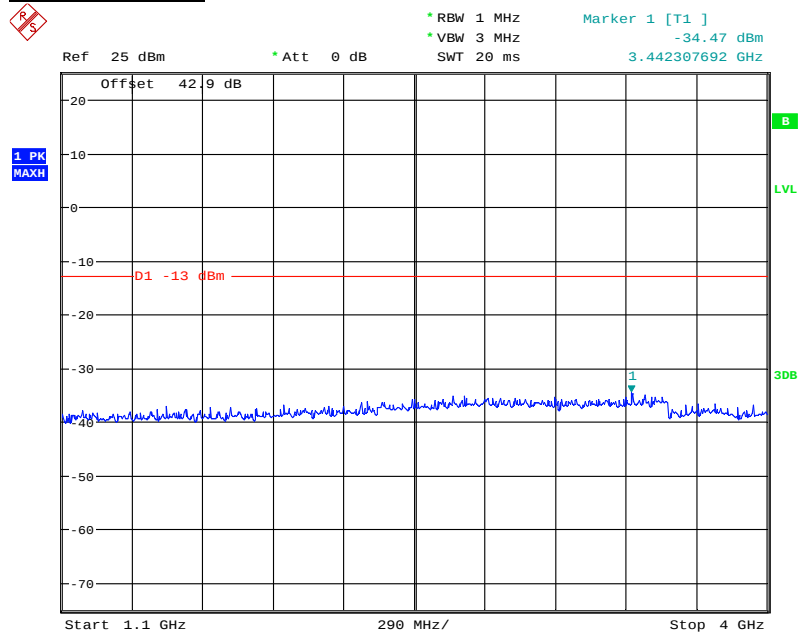


Date: 13.SEP.2013 15:46:24

Multi Carrier (1x2)Configuration 1 - Mode 49kHz to 1.1GHz

Date: 12.SEP.2013 17:04:46

Note: The emissions beyond the limit are the operating frequencies.

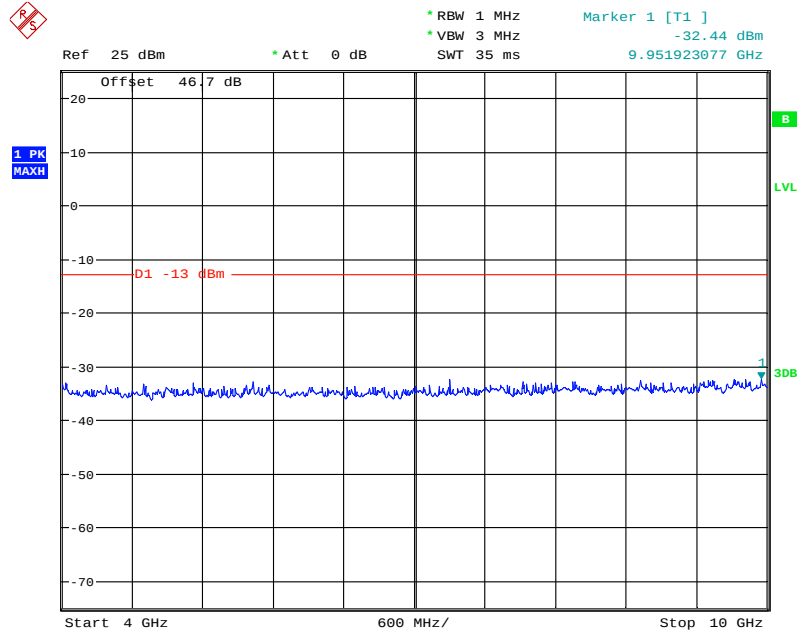
1.1GHz to 4GHz

Date: 12.SEP.2013 17:07:13



Product Service

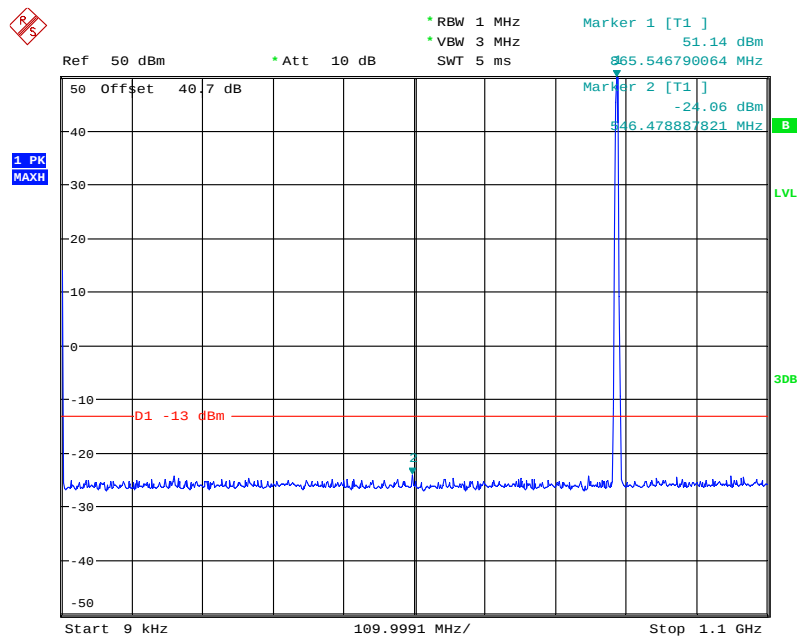
4GHz to 10GHz



Date: 12.SEP.2013 17:03:01

Configuration 1 - Mode 5

9kHz to 1.1GHz



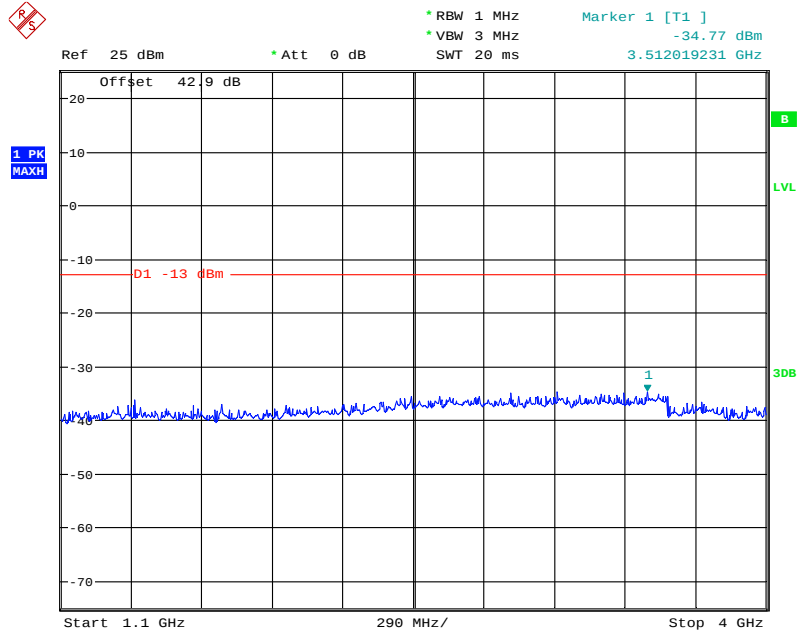
Date: 12.SEP.2013 16:31:53

Note: The emissions beyond the limit are the operating frequencies.



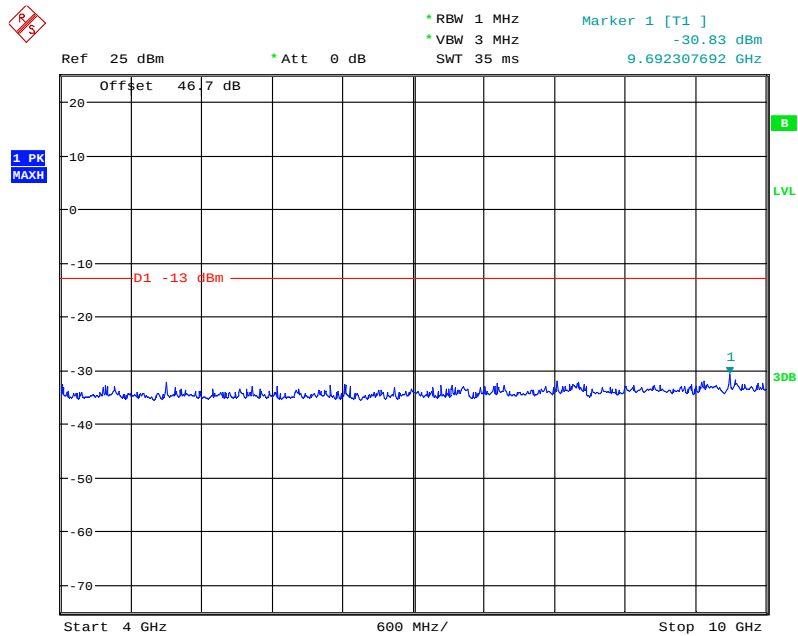
Product Service

1.1GHz to 4GHz



Date: 12.SEP.2013 16:36:40

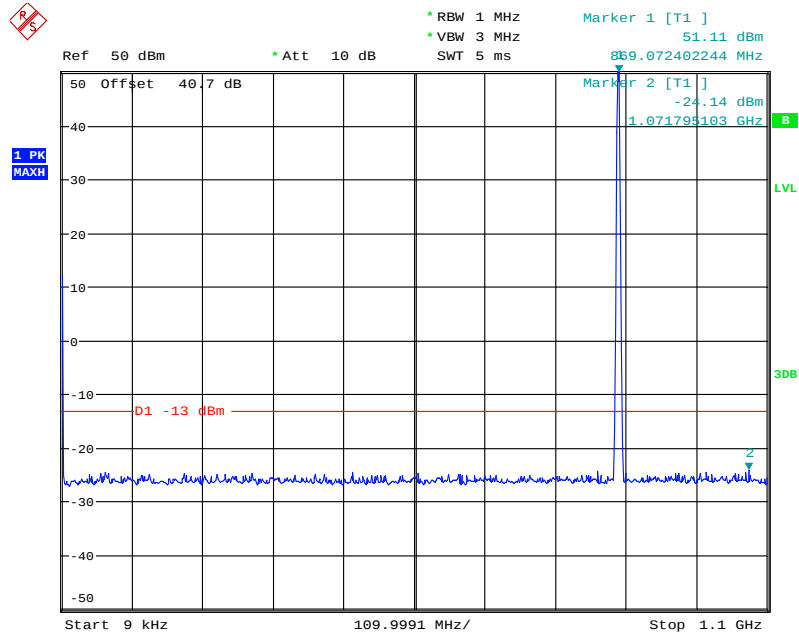
4GHz to 10GHz



Date: 12.SEP.2013 16:33:16

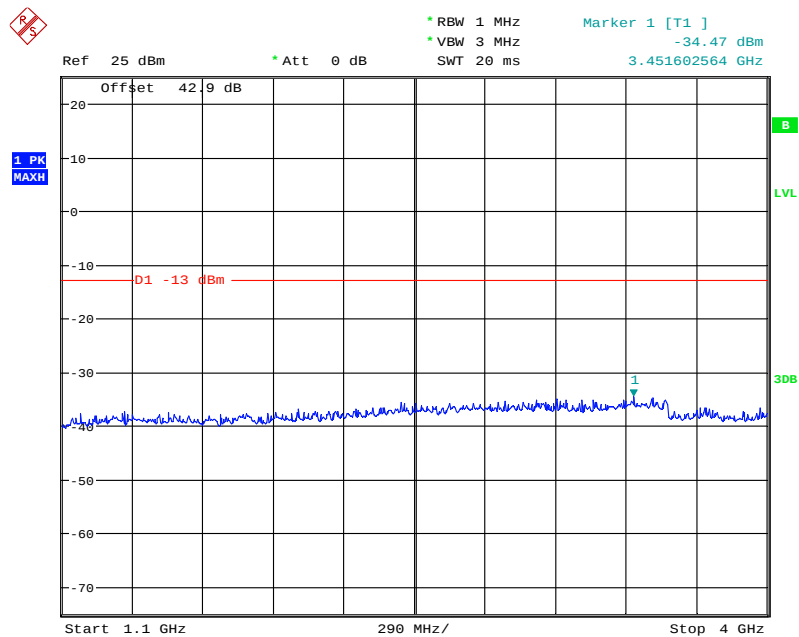


Product Service

Configuration 1 - Mode 69kHz to 1.1GHz

Date: 13.SEP.2013 09:43:58

Note: The emissions beyond the limit are the operating frequencies.

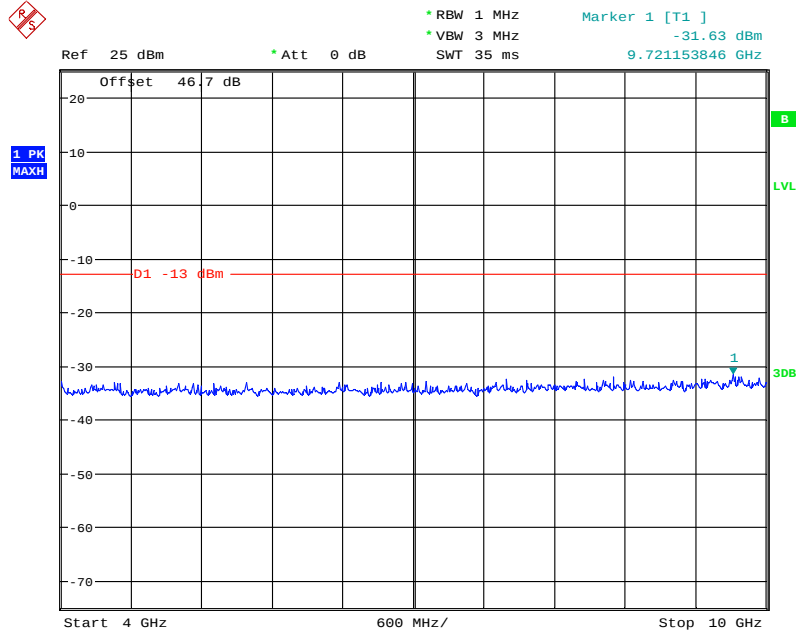
1.1GHz to 4GHz

Date: 13.SEP.2013 09:26:43



Product Service

4GHz to 10GHz



Date: 13.SEP.2013 09:41:57

Limit	-13dBm
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Remarks

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



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 Mask and Conducted Spurious Emissions.					
Spectrum Analyser	Rohde & Schwarz	FSQ26	100253	12	04-Aug-2014
Power Meter	Rohde & Schwarz	NRP2	101283	12	04-Aug-2014
Power Sensor	Rohde & Schwarz	NRP-Z51	102168	12	07-Apr-2014
Network Analyzer	Agilent	8720D	US36140166	12	09-Sep-2014
40 dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
Pass Filter	K&L	ULK 904 098/2	16	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121648	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040041	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040050	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	19-Dec-2013
Section 2.5 – 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-2014
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2014
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2014
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2014
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88 m×9.60m	-	12	19-Aug-2014
Power Supply	Dahua	DH1716-5D	2008040041	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040050	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	13-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*
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.

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Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
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