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# Report On

FCC and Industry Canada Testing of the  
Ericsson AB RRUS 11 B5 / KRC 161 285/2

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FCC ID: TA8AKRC161285-2  
IC ID: 287AB-AS1612852

Document 75923458 Report 05 Issue 1

September 2013



Product Service

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**REPORT ON**

FCC and Industry Canada Testing of the  
Ericsson RRUS 11 B5 / KRC 161 285/2

Document 75923458 Report 05 Issue 1

September 2013

**PREPARED FOR**

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**APPROVED BY**

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Authorised Signatory

**DATED**

27 September 2013

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**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 22 and Industry Canada RSS-132. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Zhao

X Zhang





## CONTENTS

Section	Page No
<b>1</b>	<b>REPORT SUMMARY ..... 3</b>
1.1	Introduction ..... 4
1.2	Brief Summary of Results ..... 5
1.3	Declaration of Build Status ..... 10
1.4	Product Information ..... 11
1.5	Test Conditions ..... 18
1.6	Deviations From the Standard ..... 18
1.7	Modification Record ..... 18
1.8	Alternative Test Site ..... 18
<b>2</b>	<b>TEST DETAILS ..... 19</b>
2.1	Maximum Peak Output Power - Conducted ..... 20
2.2	Peak – Average Ratio ..... 24
2.3	Spurious Emissions at Antenna Terminals ( $\pm 1$ MHz) ..... 37
2.4	Radiated Spurious Emissions ..... 45
2.5	Conducted Spurious Emissions ..... 50
2.6	Receiver Spurious Emissions ..... 63
<b>3</b>	<b>TEST EQUIPMENT USED ..... 69</b>
3.1	Test Equipment Used ..... 70
3.2	Measurement Uncertainty ..... 71
<b>4</b>	<b>ACCREDITATION, DISCLAIMERS AND COPYRIGHT ..... 72</b>
4.1	Accreditation, Disclaimers and Copyright ..... 73



## **SECTION 1**

### **REPORT SUMMARY**

FCC and Industry Canada Testing of the  
Ericsson RRUS 11 B5 / KRC 161 285/2



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 11 B5 / KRC 161 285/2 to the requirements of FCC CFR 47 Part 22 and Industry Canada RSS-132.

Testing was carried out in support of a C2PC application for Grant of RRUS 11 B5 / KRC 161 285/2 for hardware update in CDMA and LTE Multi Standard Radio mode. The manufacturer has declared that this hardware update does not affect the frequency stability, therefore this requirement was not tested.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Ericsson AB
Product Name	RRUS 11 B5
Part Number	KRC 161 285/2
IC Model Number	AS1612852
Serial Number(s)	CB4P587219
RBS Software Version	CXP102051/16 Rev R32BD
PIS Software Version	CXP9017316/1 Rev R39UL
Hardware Version	R2B
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 22: 2012 Industry Canada RSS-132 issue 3: 2013
Incoming Release Date	Declaration of Build Status 29 July 2013
Order Number Date	PTP 26 June 2013
Start of Test	29 July 2013
Finish of Test	27 August 2013
Name of Engineer(s)	G Zhao X Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2012 Industry Canada RSS-GEN Issue 3: 2010



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 22 and Industry Canada RSS-132, is shown below.

Configuration 1 – Remote Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
	22.913 (a)	5.4	Effective Radiated Power	869.7MHz(L1.4)+871.05MHz(C)		N/A	No integral antenna.
				881.5MHz(L1.4)+882.84MHz(C)		N/A	
				891.96MHz(C)+893.3MHz(L1.4)		N/A	
				870.5MHz(L3)+872.64MHz(C)		N/A	
				881.5MHz(L3)+883.65MHz(C)		N/A	
				890.37MHz(C)+892.5MHz(L3)		N/A	
				871.5MHz(L5)+874.65MHz(C)		N/A	
				881.5MHz(L5)+884.64MHz(C)		N/A	
				888.36MHz(C)+891.5MHz(L5)		N/A	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)		N/A	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)		N/A	
				878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)		N/A	
				2.1	2.1046, 22.913 (a)	5.4	
881.5MHz(L1.4)+882.84MHz(C)	0	Pass					
891.96MHz(C)+893.3MHz(L1.4)	0	Pass					
870.5MHz(L3)+872.64MHz(C)	0	Pass					
881.5MHz(L3)+883.65MHz(C)	0	Pass					
890.37MHz(C)+892.5MHz(L3)	0	Pass					
871.5MHz(L5)+874.65MHz(C)	0	Pass					
881.5MHz(L5)+884.64MHz(C)	0	Pass					
888.36MHz(C)+891.5MHz(L5)	0	Pass					
880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)	0	Pass					
879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)	0	Pass					
878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)	0	Pass					
880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)+884.07MHz(C)	0	Pass					
879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)+884.88MHz(C)	0	Pass					
878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)+885.87MHz(C)	0	Pass					



Configuration 1 – Remote Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
2.2	22.913 (a)	-	Peak – Average Ratio	869.7MHz(L1.4)+871.05MHz(C)	0	Pass	-
				881.5MHz(L1.4)+882.84MHz(C)	0	Pass	
				891.96MHz(C)+893.3MHz(L1.4)	0	Pass	
				870.5MHz(L3)+872.64MHz(C)	0	Pass	
				881.5MHz(L3)+883.65MHz(C)	0	Pass	
				890.37MHz(C)+892.5MHz(L3)	0	Pass	
				871.5MHz(L5)+874.65MHz(C)	0	Pass	
				881.5MHz(L5)+884.64MHz(C)	0	Pass	
				888.36MHz(C)+891.5MHz(L5)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)	0	Pass	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)	0	Pass	
				878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)+884.07MHz(C)	0	Pass	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)+884.88MHz(C)	0	Pass	
878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)+885.87MHz(C)	0	Pass					
	2.1047 (d)	5.2	Modulation Characteristics	869.7MHz(L1.4)+871.05MHz(C)		N/A	-
				881.5MHz(L1.4)+882.84MHz(C)		N/A	
				891.96MHz(C)+893.3MHz(L1.4)		N/A	
				870.5MHz(L3)+872.64MHz(C)		N/A	
				881.5MHz(L3)+883.65MHz(C)		N/A	
				890.37MHz(C)+892.5MHz(L3)		N/A	
				871.5MHz(L5)+874.65MHz(C)		N/A	
				881.5MHz(L5)+884.64MHz(C)		N/A	
				888.36MHz(C)+891.5MHz(L5)		N/A	
	2.1049, 22.917 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	869.7MHz(L1.4)+871.05MHz(C)		N/A	-
				881.5MHz(L1.4)+882.84MHz(C)		N/A	
				891.96MHz(C)+893.3MHz(L1.4)		N/A	
				870.5MHz(L3)+872.64MHz(C)		N/A	
				881.5MHz(L3)+883.65MHz(C)		N/A	
				890.37MHz(C)+892.5MHz(L3)		N/A	
				871.5MHz(L5)+874.65MHz(C)		N/A	
				881.5MHz(L5)+884.64MHz(C)		N/A	
888.36MHz(C)+891.5MHz(L5)		N/A					



Configuration 1 – Remote Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
2.3	2.1051, 22.917 (b)	5.5	Spurious Emissions at Antenna Terminals (±1MHz)	869.7MHz(L1.4)+871.05MHz(C)	0	Pass	-
				891.96MHz(C)+893.3MHz(L1.4)	0	Pass	
				870.5MHz(L3)+872.64MHz(C)	0	Pass	
				890.37MHz(C)+892.5MHz(L3)	0	Pass	
				871.5MHz(L5)+874.65MHz(C)	0	Pass	
				888.36MHz(C)+891.5MHz(L5)	0	Pass	
2.4	2.1053, 22.917 (a)	5.5	Radiated Spurious Emissions	881.5MHz(L1.4)+882.84MHz(C)	0	Pass	-
				870.5MHz(L3)+872.64MHz(C)	0	Pass	
				881.5MHz(L3)+883.65MHz(C)	0	Pass	
				890.37MHz(C)+892.5MHz(L3)	0	Pass	
				881.5MHz(L5)+884.64MHz(C)	0	Pass	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)	0	Pass	
2.5	2.1051, 22.917 (a)	5.5	Conducted Spurious Emissions	869.7MHz(L1.4)+871.05MHz(C)	0	Pass	-
				881.5MHz(L1.4)+882.84MHz(C)	0	Pass	
				891.96MHz(C)+893.3MHz(L1.4)	0	Pass	
				881.5MHz(L3)+883.65MHz(C)	0	Pass	
				881.5MHz(L5)+884.64MHz(C)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)+884.07MHz(C)	0	Pass	





Configuration 1 – Remote Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
	2.1055, 22.355	5.3	Frequency Stability Under Temperature Variations	881.5MHz(L1.4)+882.84MHz(C)		N/A	-
				881.5MHz(L3)+883.65MHz(C)		N/A	
				881.5MHz(L5)+884.64MHz(C)		N/A	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)		N/A	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)		N/A	
				878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)		N/A	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)+884.07MHz(C)		N/A	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)+884.88MHz(C)		N/A	
			878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)+885.87MHz(C)		N/A		
	2.1055, 22.355	5.3	Frequency Stability Under Voltage Variations	881.5MHz(L1.4)+882.84MHz(C)		N/A	-
				881.5MHz(L3)+883.65MHz(C)		N/A	
				881.5MHz(L5)+884.64MHz(C)		N/A	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)		N/A	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)		N/A	
				878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)		N/A	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)+884.07MHz(C)		N/A	
				879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)+884.88MHz(C)		N/A	
			878.37MHz(C)+881.5MHz(L5)+884.64MHz(C)+885.87MHz(C)		N/A		



Product Service

Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 15	RSS-132 and RSS-GEN					
2.6	15.111	-	Receiver Spurious Emissions	881.5MHz(L1.4)+882.84MHz(C)	0	Pass	-
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)+884.07MHz(C)	0	Pass	

N/A – Not Applicable

Note: “(L1.4)” denotes LTE network with 1.4MHz channel bandwidth.

“(L3)” denotes LTE network with 3MHz channel bandwidth.

“(L5)” denotes LTE network with 5MHz channel bandwidth.

“(C)” denotes CDMA network.



## 1.3 DECLARATION OF BUILD STATUS

<b>MAIN EUT</b>	
<b>MANUFACTURING DESCRIPTION</b>	Remote Radio Equipment
<b>MANUFACTURER</b>	Ericsson AB
<b>PRODUCT NAME</b>	RRUS 11 B5
<b>PART NUMBER</b>	KRC 161 285/2
<b>IC Model Number</b>	AS1612852
<b>SERIAL NUMBER(s)</b>	CB4P587219
<b>HARDWARE VERSION</b>	R2B
<b>RBS SOFTWARE VERSION</b>	CXP102051/16 Rev R32BD
<b>PIS SOFTWARE VERSION</b>	CXP9017316/1 Rev R39UL
<b>TRANSMITTER OPERATING RANGE</b>	TX: 869MHz - 894MHz RX: 824MHz - 849MHz
<b>MODULATIONS</b>	LTE: QPSK, 16QAM, 64QAM CDMA: QPSK, 8PSK, 16QAM
<b>INTERMEDIATE FREQUENCIES</b>	--
<b>ITU DESIGNATION OF EMISSION</b>	1M25F9W, 1M40F9W, 3M00F9W, 5M00F9W
<b>SUPPORTED CHANNEL BANDWIDTH CONFIGURATION</b>	LTE: 1.4MHz, 3MHz, 5MHz according to 3GPP TS 36.141 CDMA: 1.25MHz
<b>OUTPUT POWER (RMS) (W or dBm)</b>	<b>LTE/CDMA Mix Carrier (x 2):</b> Antenna A: LTE + CDMA: 46dBm (40W); Antenna B: LTE + CDMA: 46dBm (40W);
	<b>LTE/CDMA Mix Carrier (x3):</b> Antenna A: LTE + 2 x CDMA: 46dBm (40W); Antenna B: LTE + CDMA: 44.8dBm (30W);
	<b>LTE/CDMA Mix Carrier (x4):</b> Antenna A: LTE + 3 x CDMA: 46dBm (40W); Antenna B: LTE: 40.0dBm (10W);
<b>OUTPUT POWER TOLERANCE</b>	± 1.0dB
<b>ANTENNA</b>	No dedicated antenna, handled during licensing
<b>NUMBER OF ANTENNA PORTS</b>	2 TX/ RX ports
<b>SUPPORTED CONFIGURATION</b>	Multi-standard (LTE/CDMA) configured for Mix Carrier. Both RF chains are identical.
<b>FCC ID</b>	TA8AKRC161285-2
<b>IC ID</b>	287AB-AS1612852
<b>TECHNICAL DESCRIPTION (a brief description of the intended use and operation)</b>	The equipment is the Radio Part of LTE, CDMA Base Station.

Signature

Date

08 August 2013

D of B S Serial No

75923458/05

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 B5 / KRC 161 285/2 is an Ericsson Radio Equipment working in the public mobile service 850MHz band which provides communication connections to LTE and CDMA network. The RRUS 11 B5 / KRC 161 285/2 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 22 and Industry Canada RSS-132.

The RRUS 11 B5 / KRC 161 285/2 supports Multi-standard (LTE/CDMA) configured for mix-carrier. LTE supports Test Models E-TM1.1 (QPSK), E-TM3.2 (16QAM) and E-TM3.1 (64QAM) defined in 3GPP TS 36.141 and CDMA supports QPSK, 8PSK and 16QAM modulations at 850MHz.

The setting below was found to be representative for all traffic scenarios when several settings with the different modulations, the number of carriers and the output power combinations were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted:

- LTE/CDMA Mix Carrier:

The Output Power settings as below:

Port A: Mix Carrier (x2): LTE(20W) & CDMA(20W), while  
Port B: Mix Carrier (x2): LTE(20W) & CDMA(20W)

Port A: Mix Carrier (x3): LTE(20W) & CDMA(10W) & CDMA(10W), while  
Port B: Mix Carrier (x2): LTE(20W) & CDMA(10W)

Port A: Mix Carrier (x4): LTE(10W) & CDMA(10W) & CDMA(10W) & CDMA(10W), while  
Port B: Single Carrier: LTE(10W)

LTE in test models E-TM1.1, E-TM3.2 and E-TM3.1, transmit in TX MIMO;

CDMA with QPSK Modulation

Forward Traffic Channel using Spreading Rate 1 (1X), Voice

User Channels: 6

Channel rate: 9.6kbps

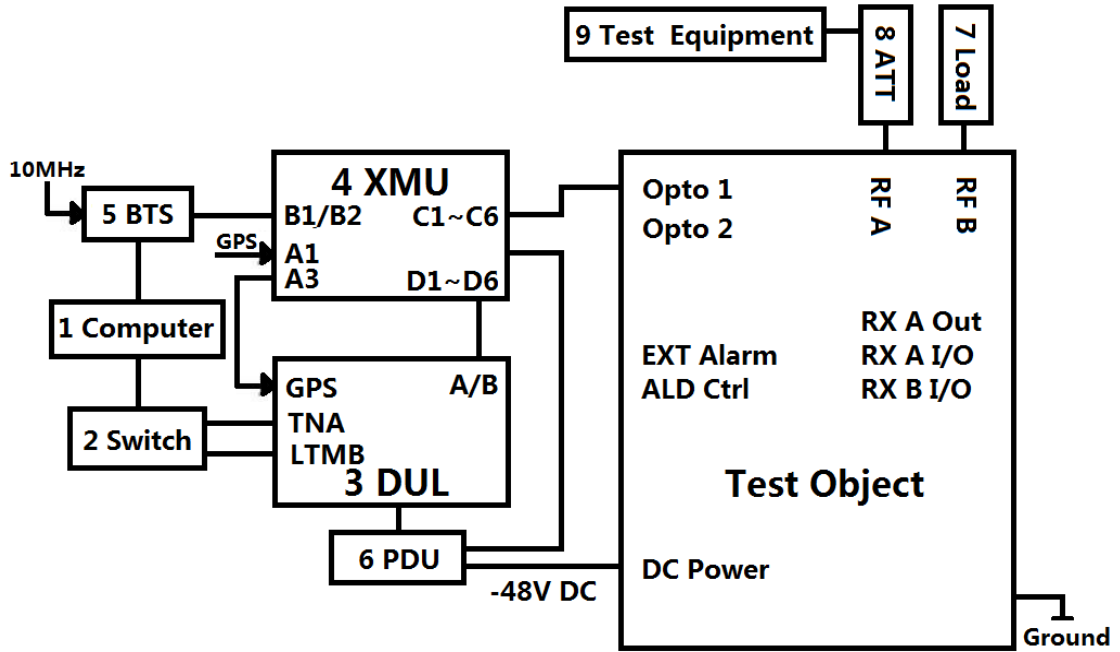
Channel bandwidth: 1.25MHz

The EUT has two TX/RX ports and it can be configured to transmit with 850MHz 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:





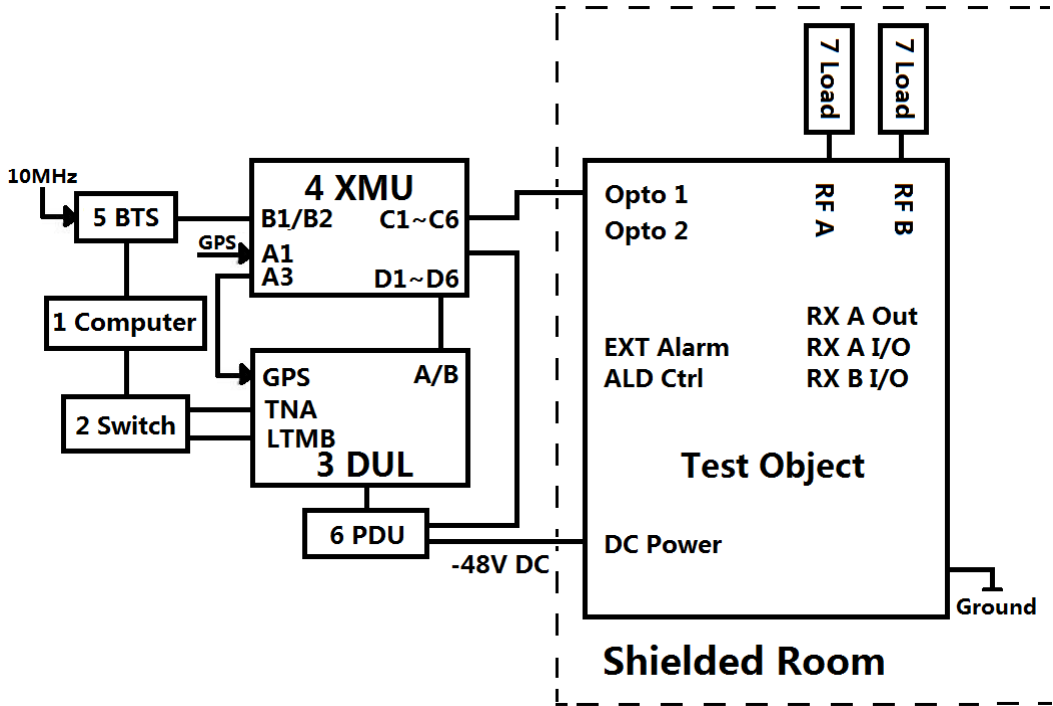
Product Service

Product Name	Product Number	Version	Serial Number
RRUS 11 B5	KRC 161 285/2	R2B	CB4P587219

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP EliteBook 8460p	--	AP523464
2	Switch	TL-SF1008+	--	11936826484
3	RBS 6601	BFL 901 009/1	--	--
	DUL 20 01	KDU 137 533/4	R1C	CB4H365213
	SUP 6601	1/BFL 901 009/1	R3B	BR80993658
4	RBS 6601	BFL 901 009/1	--	--
	XMU 02 01	KDU137 745/1	R2A	C825513800
	SUP 6601	1/BFL 901 009/1	R3B	BR81262578
5	DBA	NTLK90AAE5	09	NNTMPX00VD94
	XCEM-A	NTLK79AAE5	01	NNTMPX00JCKF
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY4
	AEM1302	NTLK85GAE5	07	NNTMPX00RV3M
6	Power Supply	DH1716-5D	--	2008040041
	Power Supply	DH1716-5D	--	2008040050
7	Load	TF100	--	09121648
8	30dB Attenuator	DTS100G	--	08011715
	10dB Attenuator	6810.17.B	--	776489
9	Power Meter	Rohde & Schwarz NRP2	--	101283
	Power Sensor	Rohde & Schwarz NRP-Z51	--	102310
	Spectrum Analyzer	FSQ26	--	100253



**Test Setup, Radiated Measurement:**



Product Name	Product Number	Version	Serial Number
RRUS 11 B5	KRC 161 285/2	R2B	CB4P587219

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP EliteBook 8460p	--	AP523464
2	Switch	TL-SF1008+	--	11936826484
3	RBS 6601	BFL 901 009/1	--	--
	DUL 20 01	KDU 137 533/4	R1C	CB4H365213
	SUP 6601	1/BFL 901 009/1	R3B	BR80993658
4	RBS 6601	BFL 901 009/1	--	--
	XMU 02 01	KDU137 745/1	R2A	C825513800
	SUP 6601	1/BFL 901 009/1	R3B	BR81262578
5	DBA	NTLK90AAE5	09	NNTMPX00VD94
	XCEM-A	NTLK79AAE5	01	NNTMPX00JCKF
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY4
	AEM1302	NTLK85GAE5	07	NNTMPX00RV3M
6	Power Supply	DH1716-5D	--	2008040041
	Power Supply	DH1716-5D	--	2008040050
7	Load	TF100	--	09121648
	Load	TF100	--	09121605





### 1.4.3 Modes of Operation

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

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

L1.4 denotes LTE network with 1.4MHz channel bandwidth.

L3 denotes LTE network with 3MHz channel bandwidth.

L5 denotes LTE network with 5MHz channel bandwidth.

C denotes CDMA network.

#### **Mix Carrier (x2)**

Mode 1 - L1.4&C, L3&C, L5&C

MSR	Channel No.	Frequency (MHz)
L1.4(B)&C	2407 & 35	869.7+871.05
L3(B)&C	2415 & 88	870.5+872.64
L5(B)&C	2425 & 155	871.5+874.65

Mode 2 - L1.4&C, L3&C, L5&C

MSR	Channel No.	Frequency (MHz)
L1.4(M)&C	2525 & 428	881.5+882.84
L3(M)&C	2525 & 455	881.5+883.65
L5(M)&C	2525 & 488	881.5+884.64

Mode 3 - C&L1.4, C&L3, C&L5

MSR	Channel No.	Frequency (MHz)
C&L1.4(T)	732 & 2643	891.96+893.3
C&L3(T)	679 & 2635	890.37+892.5
C&L5(T)	612 & 2625	888.36+891.5

**Mix Carrier (x3)**

Mode 4 - C&amp;L1.4&amp;C, C&amp;L3&amp;C, C&amp; L5&amp;C

<b>MSR</b>	Channel No.	Frequency (MHz)
C&L1.4(M)&C	339 & 2525 & 428	880.17+881.5+882.84
C&L3(M)&C	312 & 2525 & 455	879.36+881.5+883.65
C&L5(M)&C	279 & 2525 & 488	878.37+881.5+884.64

**Mix Carrier (x4)**

Mode 5 - C&amp;L1.4&amp;C&amp;C, C&amp;L3&amp;C&amp;C, C&amp; L5&amp;C&amp;C

<b>MSR</b>	Channel No.	Frequency (MHz)
C&L1.4(M)&C&C	339 & 2525 & 428 & 469	880.17+881.5+882.84+884.07
C&L3(M)&C&C	312 & 2525 & 455 & 496	879.36+881.5+883.65+884.88
C&L5(M)&C&C	279 & 2525 & 488 & 529	878.37+881.5+884.64+885.87

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

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.

Industry Canada Accreditation 7308A-1:

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



Product Service

## **SECTION 2**

### **TEST DETAILS**

FCC and Industry Canada Testing of the  
Ericsson RRUS 11 B5 / KRC 161 285/2



Product Service

## 2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

### 2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046  
 FCC CFR 47 Part 22, Clause 22.913 (a)  
 Industry Canada RSS-132, Clause 5.4

### 2.1.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

### 2.1.3 Date of Test and Modification State

30, 31 July and 01 August 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 22 and Industry Canada RSS-132.

Using a power meter and attenuator(s), the output power of the EUT was measured at the antenna terminal.

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 - L1.4&C, L3&C, L5&C  
 - Mode 2 - L1.4&C, L3&C, L5&C  
 - Mode 3 - C&L1.4, C&L3, C&L5  
 - Mode 4 - C&L1.4&C, C&L3&C, C&L5&C  
 - Mode 5 - C&L1.4&C&C, C&L3&C&C, C&L5&C&C

### 2.1.6 Environmental Conditions

	30 July 2013	31 July 2013	01 August 2013
Ambient Temperature	24.0°C	24.0°C	23.5°C
Relative Humidity	68.0%	66.0%	68.0%



## 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 for Maximum Peak Output Power.

The test results are shown below

### Mix Carrier (x2)

#### Configuration 1 - Mode 1 - L1.4&C, L3&C, L5&C

##### **LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2407 & 35	869.7+871.05	45.31	33.96
L3&C	2415 & 88	870.5+872.64	45.92	39.08
L5&C	2425 & 155	871.5+874.65	46.00	39.81

##### **LTE (E-TM3.2) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2407 & 35	869.7+871.05	45.30	33.88
L3&C	2415 & 88	870.5+872.64	45.90	38.90
L5&C	2425 & 155	871.5+874.65	45.97	39.54

##### **LTE (E-TM3.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2407 & 35	869.7+871.05	45.29	33.81
L3&C	2415 & 88	870.5+872.64	45.91	38.99
L5&C	2425 & 155	871.5+874.65	45.99	39.72

#### Configuration 1 - Mode 2 - L1.4&C, L3&C, L5&C

##### **LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2525 & 428	881.5+882.84	45.42	34.83
L3&C	2525 & 455	881.5+883.65	45.97	39.54
L5&C	2525 & 488	881.5+884.64	45.98	39.63

##### **LTE (E-TM3.2) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2525 & 428	881.5+882.84	45.40	34.67
L3&C	2525 & 455	881.5+883.65	45.95	39.36
L5&C	2525 & 488	881.5+884.64	45.95	39.36

**LTE (E-TM3.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2525 & 428	881.5+882.84	45.39	34.59
L3&C	2525 & 455	881.5+883.65	45.95	39.36
L5&C	2525 & 488	881.5+884.64	45.97	39.54

**Configuration 1 - Mode 3 - C&L1.4, C&L3, C&L5****LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4	732 & 2643	891.96+893.3	45.25	33.50
C&L3	679 & 2635	890.37+892.5	45.94	39.26
C&L5	612 & 2625	888.36+891.5	46.02	39.99

**LTE (E-TM3.2) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4	732 & 2643	891.96+893.3	45.24	33.42
C&L3	679 & 2635	890.37+892.5	45.92	39.08
C&L5	612 & 2625	888.36+891.5	45.98	39.63

**LTE (E-TM3.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4	732 & 2643	891.96+893.3	45.23	33.34
C&L3	679 & 2635	890.37+892.5	45.93	39.17
C&L5	612 & 2625	888.36+891.5	46.01	39.90

**Mix Carrier (x3)****Configuration 1 - Mode 4 – C&L1.4&C, C&L3&C, C&L5&C****LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4&C	339 & 2525 & 428	880.17+881.5+882.84	45.93	39.17
C&L3&C	312 & 2525 & 455	879.36+881.5+883.65	44.98	31.48
C&L5&C	279 & 2525 & 488	878.37+881.5+884.64	46.00	39.81



Product Service

**LTE (E-TM3.2) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4&C	339 & 2525 & 428	880.17+881.5+882.84	45.94	39.26
C&L3&C	312 & 2525 & 455	879.36+881.5+883.65	44.96	31.33
C&L5&C	279 & 2525 & 488	878.37+881.5+884.64	45.96	39.45

**LTE (E-TM3.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4&C	339 & 2525 & 428	880.17+881.5+882.84	45.92	39.08
C&L3&C	312 & 2525 & 455	879.36+881.5+883.65	44.97	31.41
C&L5&C	279 & 2525 & 488	878.37+881.5+884.64	45.99	39.72

**Mix Carrier (x4)**

**Configuration 1 - Mode 5 – C&L1.4&C&C, C&L3&C&C, C&L5&C&C**

**LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4&C&C	339 & 2525 & 428 & 469	880.17+881.5+882.84+884.07	45.52	35.65
C&L3&C&C	312 & 2525 & 455 & 496	879.36+881.5+883.65+884.88	46.03	40.09
C&L5&C&C	279 & 2525 & 488 & 529	878.37+881.5+884.64+885.87	46.06	40.36

**LTE (E-TM3.2) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4&C&C	339 & 2525 & 428 & 469	880.17+881.5+882.84+884.07	45.52	35.65
C&L3&C&C	312 & 2525 & 455 & 496	879.36+881.5+883.65+884.88	46.02	39.99
C&L5&C&C	279 & 2525 & 488 & 529	878.37+881.5+884.64+885.87	46.04	40.18

**LTE (E-TM3.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
C&L1.4&C&C	339 & 2525 & 428 & 469	880.17+881.5+882.84+884.07	45.51	35.56
C&L3&C&C	312 & 2525 & 455 & 496	879.36+881.5+883.65+884.88	46.03	40.09
C&L5&C&C	279 & 2525 & 488 & 529	878.37+881.5+884.64+885.87	46.05	40.27

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). Licensee's are the 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	≤820W or ≤+59.1dBm
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**Remarks**

The EUT does not exceed 820W or 59.1dBm at the measured frequencies.





**2.2 PEAK – AVERAGE RATIO**

**2.2.1 Specification Reference**

FCC CFR 47 Part 22, Clause 22.913 (a)  
 Industry Canada RSS-132, Clause 5.4

**2.2.2 Equipment Under Test**

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

**2.2.3 Date of Test and Modification State**

30, 31 July and 01 August 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 22 and Industry Canada RSS-132.

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

The 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 - L1.4&C, L3&C, L5&C
- Mode 2 - L1.4&C, L3&C, L5&C
- Mode 3 - C&L1.4, C&L3, C&L5
- Mode 4 - C&L1.4&C, C&L3&C, C&L5&C
- Mode 5 - C&L1.4&C&C, C&L3&C&C, C&L5&C&C

**2.2.6 Environmental Conditions**

	30 July 2013	31 July 2013	01 August 2013
Ambient Temperature	24.0°C	24.0°C	23.5°C
Relative Humidity	68.0%	66.0%	68.0%



Product Service

**2.2.7 Test Results**

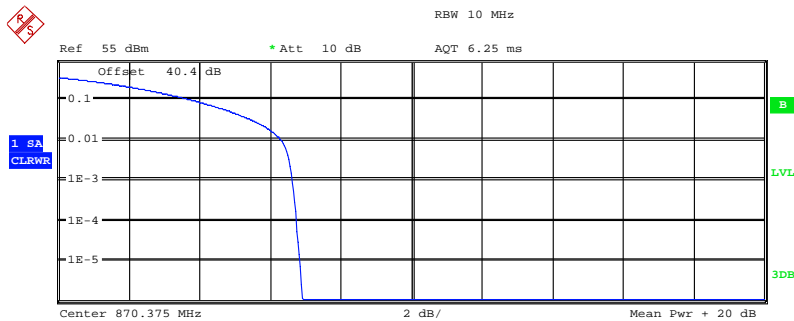
For the period of test the EUT met the requirements of FCC CFR 47 Part 22 for Peak – Average Ratio.

The test results are shown below.

**Mix Carrier (x2)**

**Configuration 1 - Mode 1 - L1.4&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



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

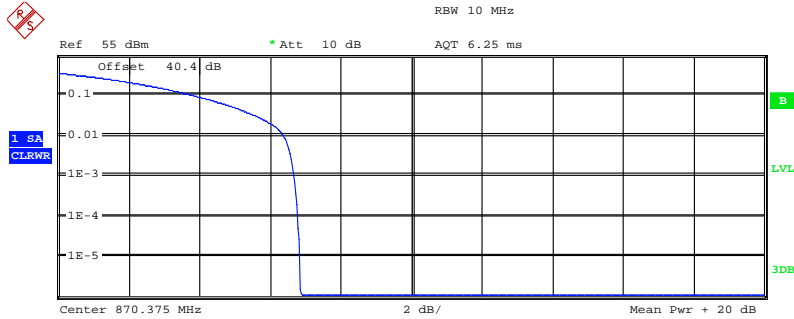
Trace 1	
Mean	45.29 dBm
Peak	52.19 dBm
Crest	6.90 dB
10 %	3.78 dB
1 %	6.31 dB
.1 %	6.63 dB
.01 %	6.76 dB

Date: 31.JUL.2013 13:20:55



Product Service

**LTE (E-TM3.2) & CDMA (QPSK)**



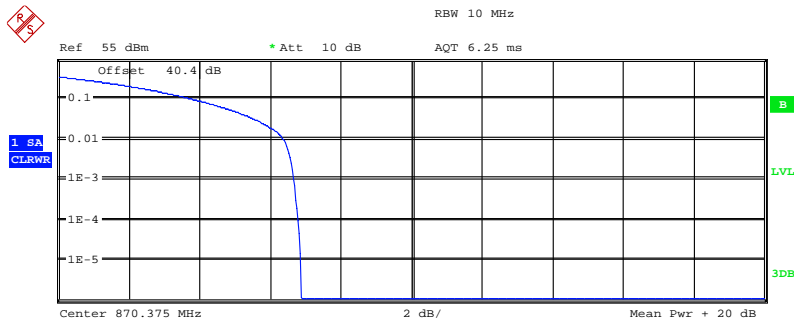
Center 870.375 MHz 2 dB/ Mean Pwr + 20 dB  
 Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

Trace 1

Mean	45.27 dBm
Peak	52.12 dBm
Crest	6.85 dB
10 %	3.85 dB
1 %	6.38 dB
.1 %	6.67 dB
.01 %	6.79 dB

Date: 31.JUL.2013 13:40:20

**LTE (E-TM3.1) & CDMA (QPSK)**



Center 870.375 MHz 2 dB/ Mean Pwr + 20 dB  
 Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

Trace 1

Mean	45.26 dBm
Peak	52.12 dBm
Crest	6.86 dB
10 %	3.85 dB
1 %	6.38 dB
.1 %	6.67 dB
.01 %	6.79 dB

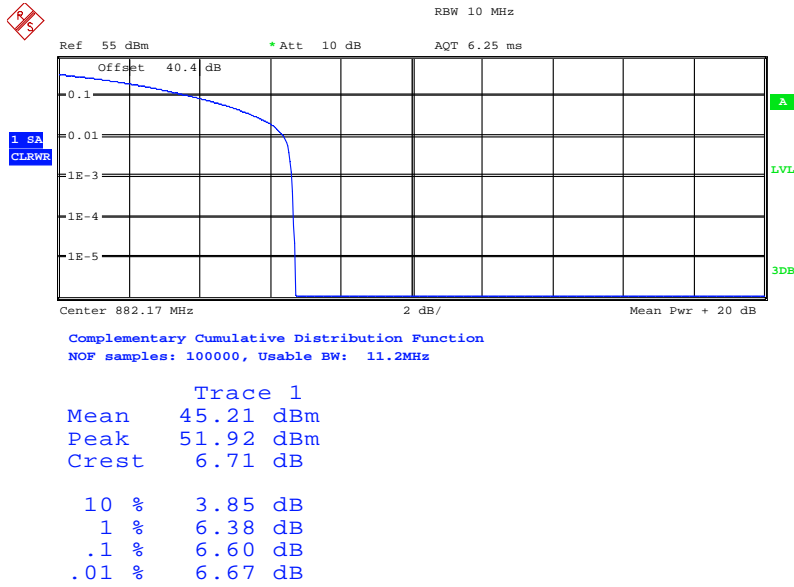
Date: 31.JUL.2013 13:42:12



Product Service

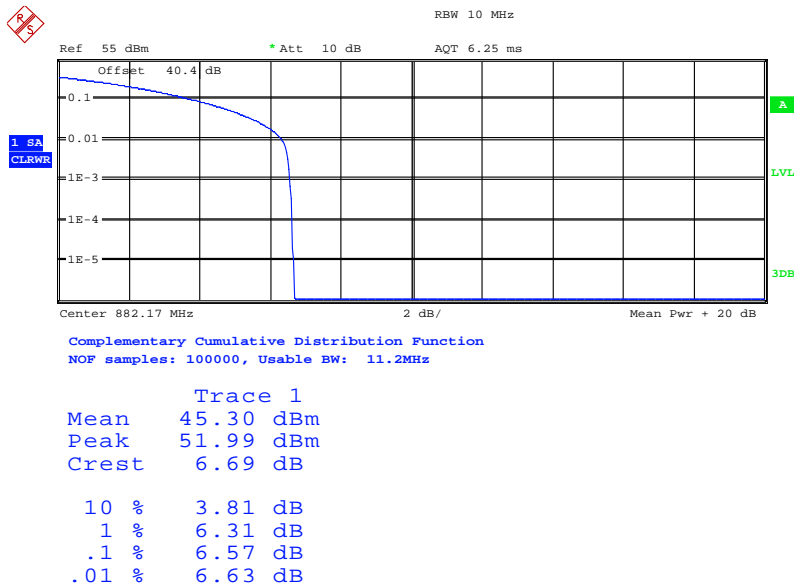
**Configuration 1 - Mode 2 - L1.4&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 31.JUL.2013 09:37:27

**LTE (E-TM3.2) & CDMA (QPSK)**

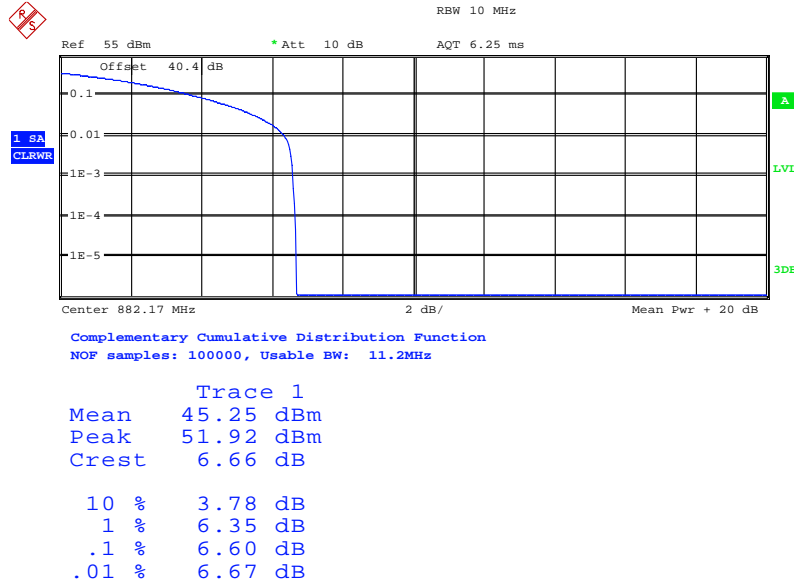


Date: 31.JUL.2013 09:44:59



Product Service

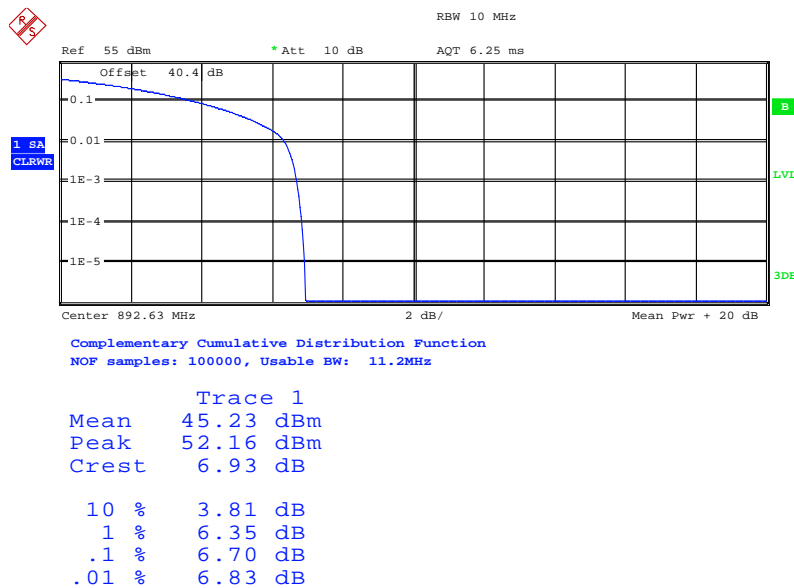
**LTE (E-TM3.1) & CDMA (QPSK)**



Date: 31.JUL.2013 09:46:30

**Configuration 1 - Mode 3 - C&L1.4**

**LTE (E-TM1.1) & CDMA (QPSK)**

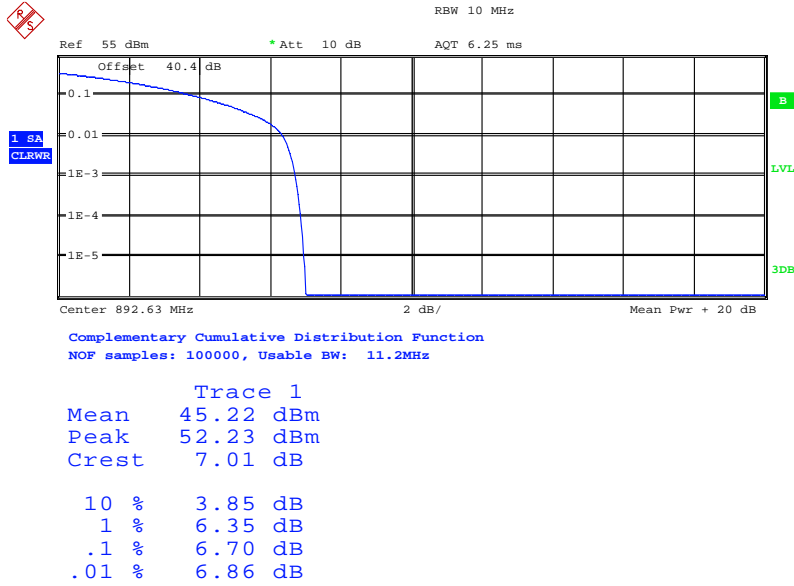


Date: 31.JUL.2013 16:14:00



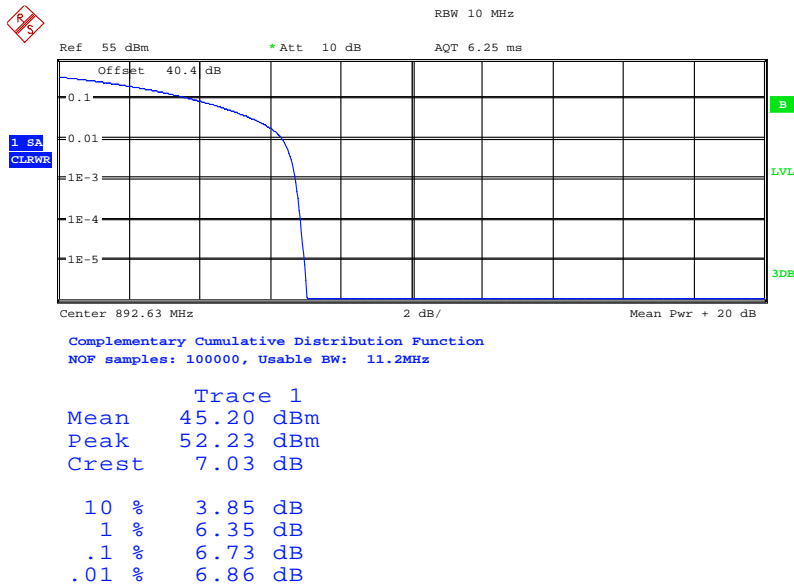
Product Service

**LTE (E-TM3.2) & CDMA (QPSK)**



Date: 31.JUL.2013 16:13:12

**LTE (E-TM3.1) & CDMA (QPSK)**



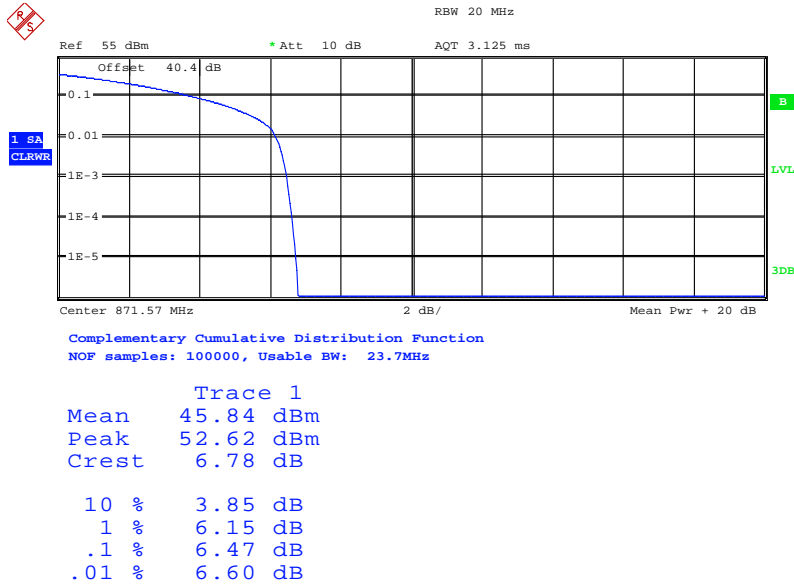
Date: 31.JUL.2013 16:12:27



Product Service

**Configuration 1 - Mode 1- L3&C**

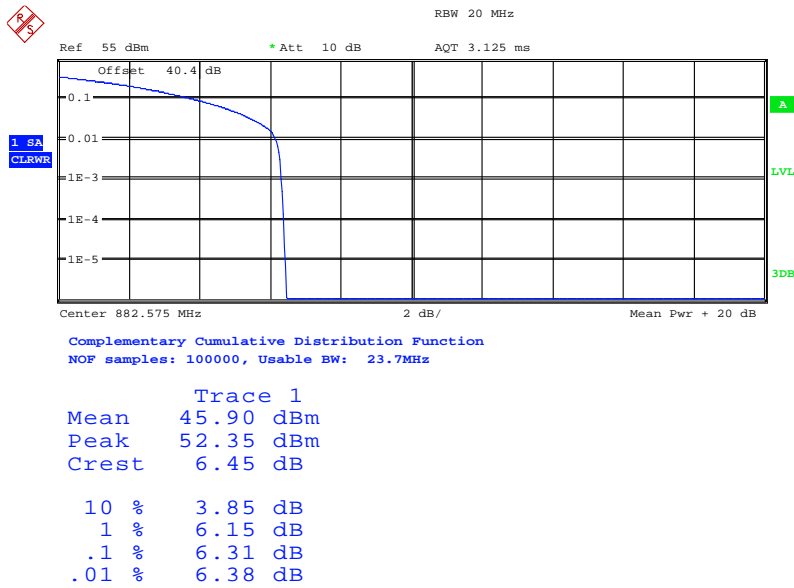
**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 31.JUL.2013 14:40:17

**Configuration 1 - Mode 2 - L3&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



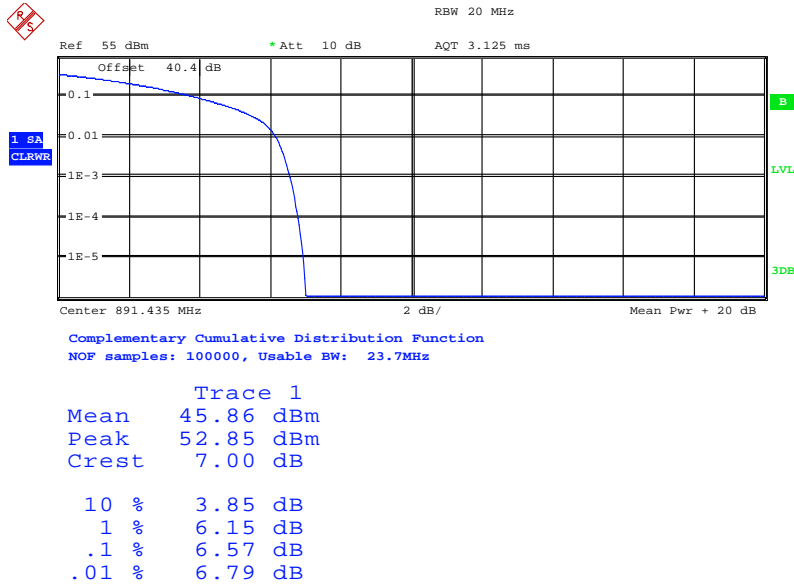
Date: 31.JUL.2013 10:34:41



Product Service

**Configuration 1 - Mode 3 - C&L3**

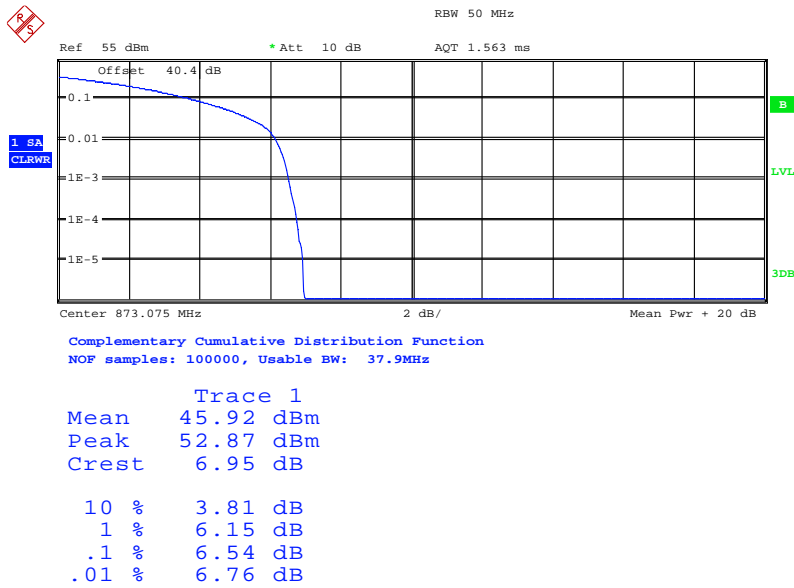
**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 31.JUL.2013 16:46:41

**Configuration 1 - Mode 1 - L5&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 31.JUL.2013 15:16:27

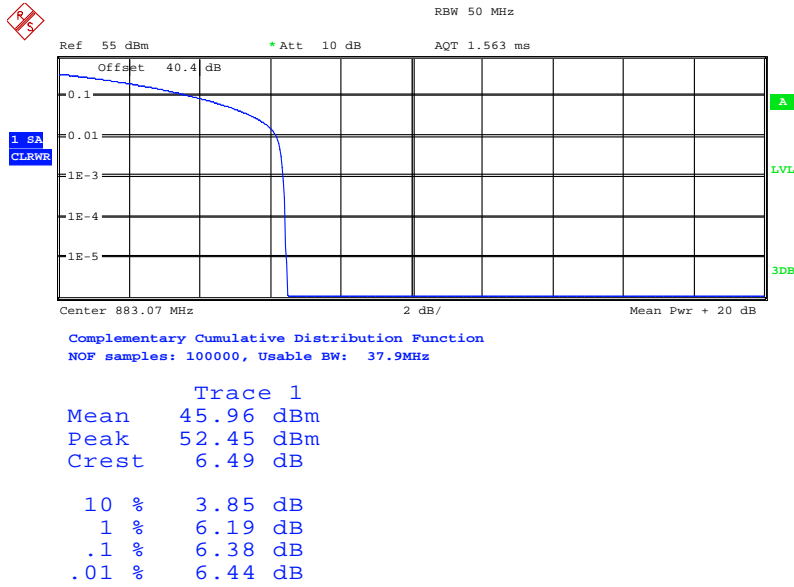




Product Service

**Configuration 1 - Mode 2 - L5&C**

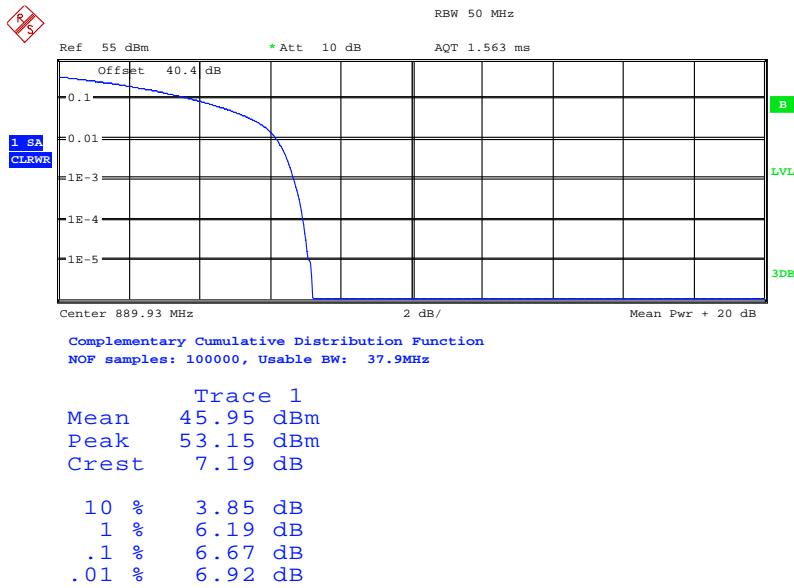
**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 31.JUL.2013 11:14:54

**Configuration 1 - Mode 3 - C&L5**

**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 1.AUG.2013 09:56:48

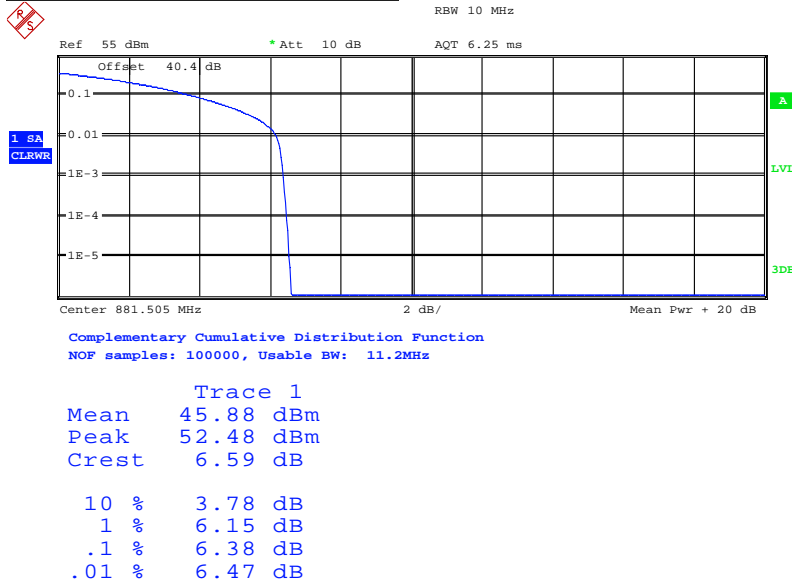


Product Service

**Mix Carrier (x3)**

**Configuration 1 - Mode 4 - C&L1.4&C**

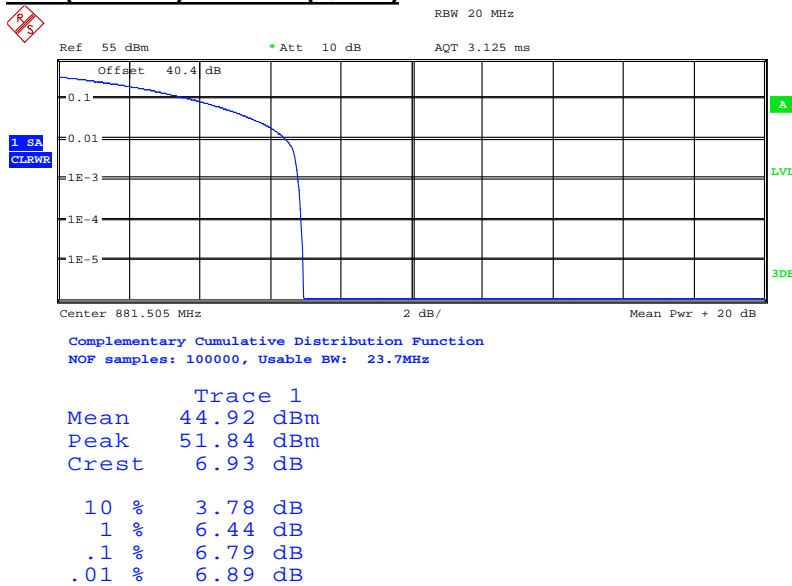
**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 30.JUL.2013 10:19:08

**Configuration 1 - Mode 4 - C&L3&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



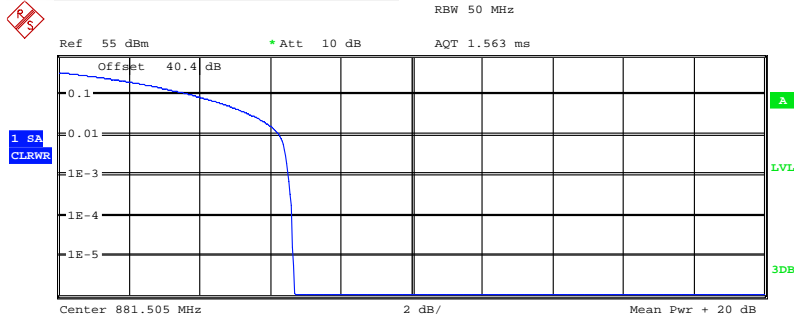
Date: 30.JUL.2013 16:28:47



Product Service

**Configuration 1 - Mode 4 - C&L5&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



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

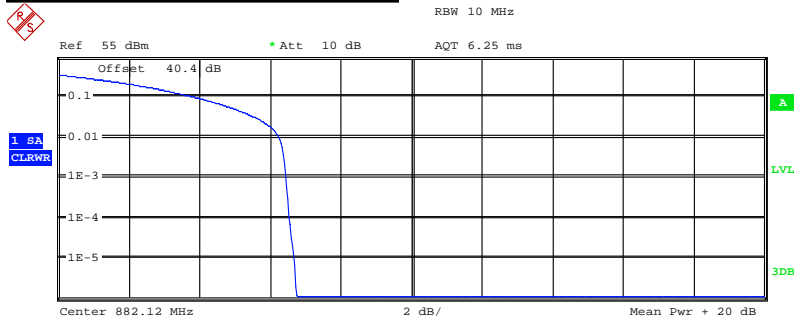
Trace 1	
Mean	45.95 dBm
Peak	52.64 dBm
Crest	6.70 dB
10 %	3.81 dB
1 %	6.25 dB
.1 %	6.51 dB
.01 %	6.60 dB

Date: 30.JUL.2013 17:00:43

**Mix Carrier (x4)**

**Configuration 1 - Mode 5 - C&L1.4&C&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



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

Trace 1	
Mean	45.47 dBm
Peak	52.20 dBm
Crest	6.73 dB
10 %	3.88 dB
1 %	6.25 dB
.1 %	6.44 dB
.01 %	6.54 dB

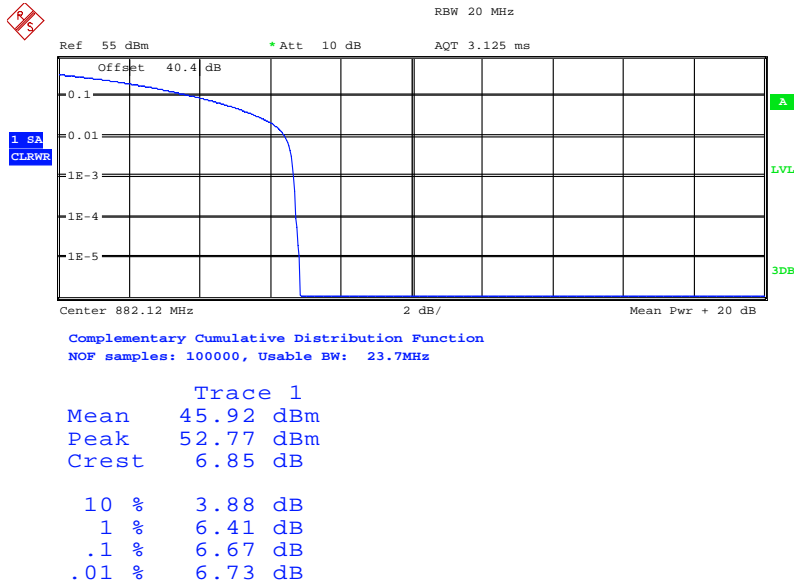
Date: 1.AUG.2013 10:44:56



Product Service

**Configuration 1 - Mode 5 - C&L3&C&C**

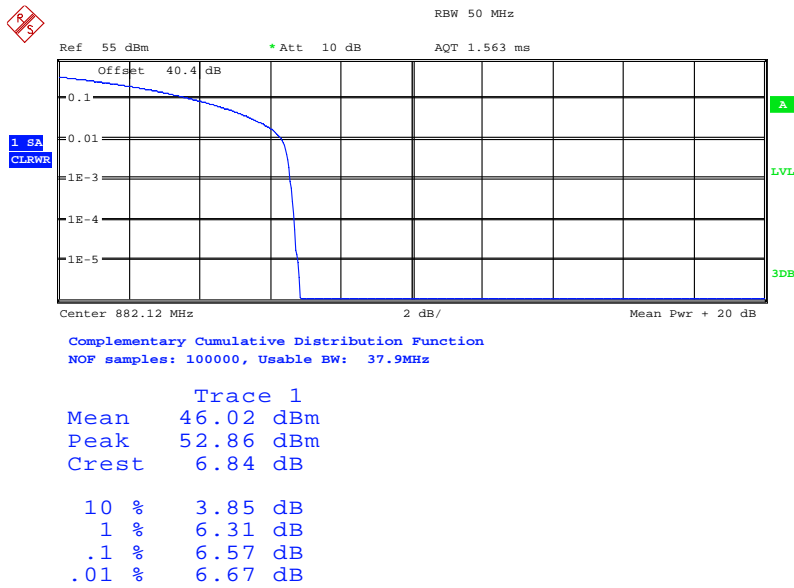
**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 1.AUG.2013 13:08:15

**Configuration 1 - Mode 5 - C&L5&C&C**

**LTE (E-TM1.1) & CDMA (QPSK)**



Date: 1.AUG.2013 13:57:30



Product Service

Limit	13dB
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Remarks

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



## 2.3 SPURIOUS EMISSIONS AT ANTENNA TERMINALS ( $\pm 1$ MHz)

### 2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051  
 FCC CFR 47 Part 22, Clause 22.917 (b)  
 Industry Canada RSS-132 Clause 5.5

### 2.3.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

### 2.3.3 Date of Test and Modification State

31 July and 01 August 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 and Part 22 and Industry Canada RSS-132.

In accordance with 22.917(b), at least 1% of the emission bandwidth shall be used as resolution bandwidth for the frequencies offset up to 1MHz away from the block edge and a RBW of 100kHz for measurements of emissions > 1MHz away from the band edges. The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least  $43 + 10\log P$  dB. After calculation, the limit is -13dBm. As the EUT can operate in LTE TX-MIMO mode, according to KDB 662911D01, the limit should be adjusted to:  
 $P(\text{dBm}) - (43 + 10\log P(\text{W})) - 10\log(N_{\text{ANT}})$

For CDMA/LTE mix carrier(x2), with LTE signal at the edge, which is selected as the worst case. The LTE emission bandwidth of the EUT support are 1.4MHz, 3MHz and 5MHz, the CDMA emission bandwidth is 1.25MHz. Then, 20kHz RBW was used for frequencies offset up to 1MHz away from the band edges when the mix carrier of LTE bandwidth is 1.4MHz, 30kHz RBW was used when the mix carrier of LTE bandwidth is 3MHz, and 50kHz RBW was used when the mix carrier of LTE bandwidth is 5MHz. Due to LTE transmit in TX-MIMO in Mix carrier mode and the EUT has Two transmit ports, the limit was adjusted to -16dBm. A resolution bandwidth of 100kHz was used between 1MHz to 5MHz away from the band edge. . Spectrum analyser detector was set as RMS.

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

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

Configuration 1 - Mode 1 - L1.4&C, L3&C, L5&C  
 - Mode 3 - C&L1.4, C&L3, C&L5



**2.3.6 Environmental Conditions**

	31 July 2013	01 August 2013
Ambient Temperature	24.0°C	23.5°C
Relative Humidity	66.0%	68.0%

**2.3.7 Test Results**

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 for Spurious Emissions Antenna Terminals ( $\pm 1$ MHz)

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

**Mix Carrier (x2)**

**LTE (E-TM1.1) & CDMA (QPSK)**

**Configuration 1 - Mode 1 - L1.4&C, Mode 3 - C&L1.4**

Band Edge Frequency	Edge Test with LTE at the Bottom and Top Channel	RBW / VBW (Hz)
Bottom 869 MHz	Channel No. 2407 & 35 Frequencies 869.7MHz(L1.4)+871.05MHz(C)	20k / 200k
Top 894 MHz	Channel No. 732 & 2643 Frequencies 891.96MHz(C)+893.3MHz(L1.4)	

**Configuration 1 - Mode 1 - L3&C, Mode 3 - C&L3**

Band Edge Frequency	Edge Test with LTE at the Bottom and Top Channel	RBW / VBW (Hz)
Bottom 869 MHz	Channel No. 2415 & 88 Frequencies 870.5MHz(L3)+872.64MHz(C)	30k / 300k
Top 894 MHz	Channel No. 679 & 2635 Frequencies 890.37MHz(C)+892.5MHz(L3)	

**Configuration 1 - Mode 1 - L5&C, Mode 3 - C&L5**

Band Edge Frequency	Edge Test with LTE at the Bottom and Top Channel	RBW / VBW (Hz)
Bottom 869 MHz	Channel No. 2425 & 155 Frequencies 871.5MHz(L5)+874.65MHz(C)	50k / 500k
Top 894 MHz	Channel No. 612 & 2625 Frequencies 888.36MHz(C)+891.5MHz(L5)	

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

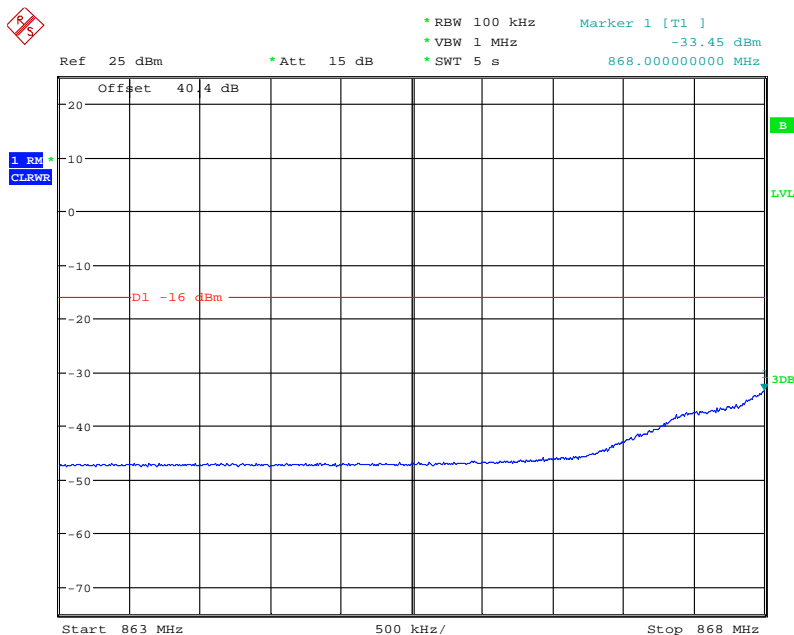
**Mix Carrier (x2)**

**LTE (E-TM1.1) & CDMA (QPSK)**

**Configuration 1 - Mode 1 - L1.4&C**



Date: 31.JUL.2013 13:32:22

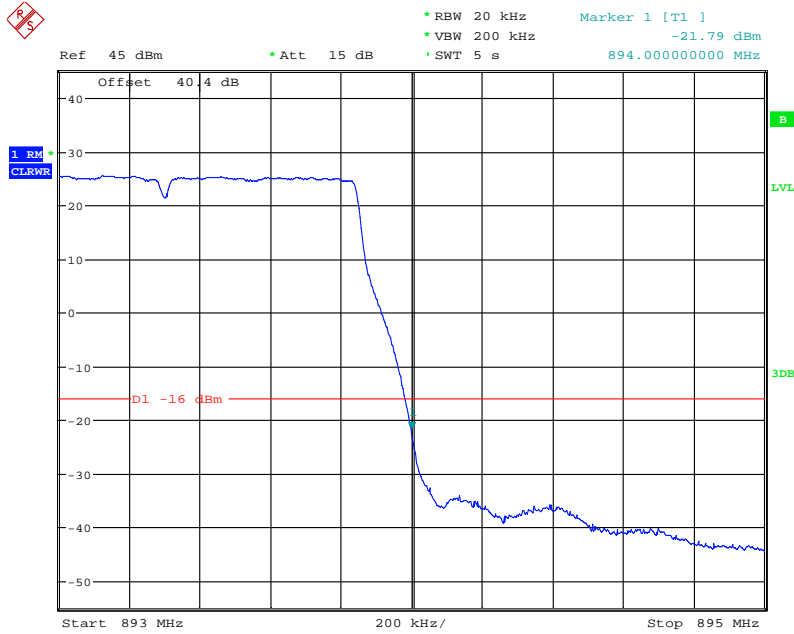


Date: 31.JUL.2013 13:33:04

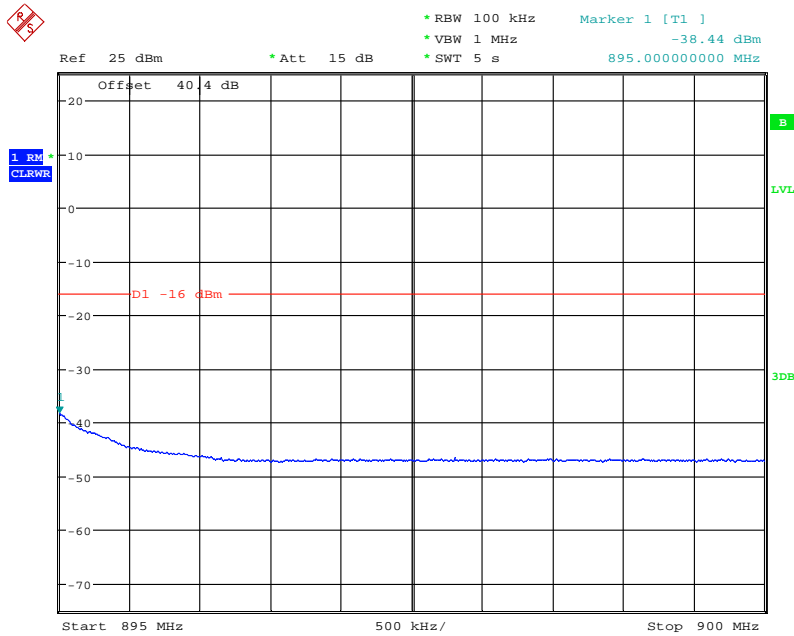




**Configuration 1 - Mode 3 - C&L1.4**



Date: 31.JUL.2013 16:15:14

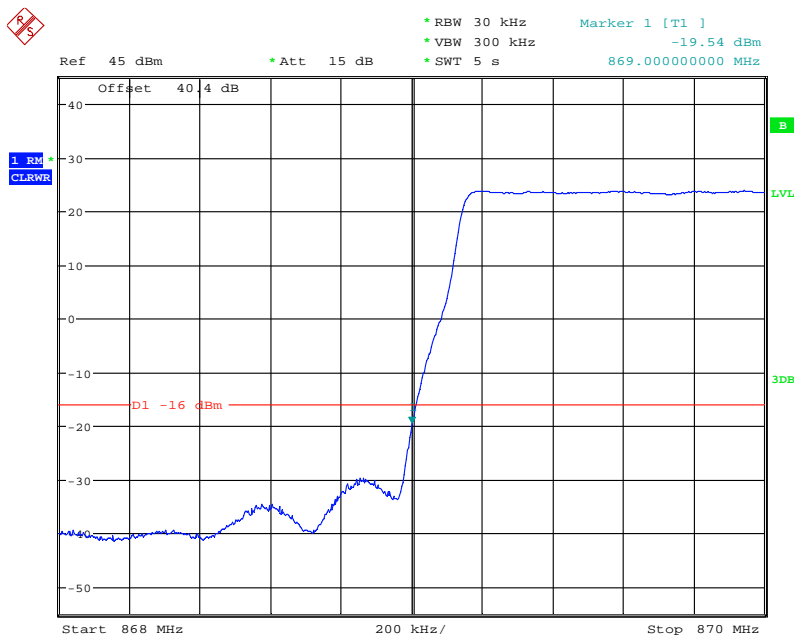


Date: 31.JUL.2013 16:16:13

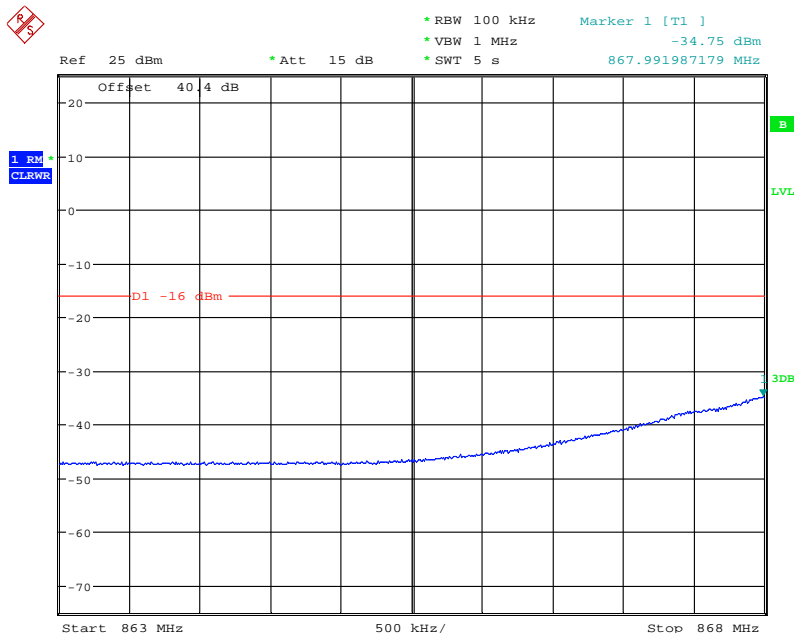


Product Service

**Configuration 1 - Mode 1 - L3&C**



Date: 31.JUL.2013 14:38:28

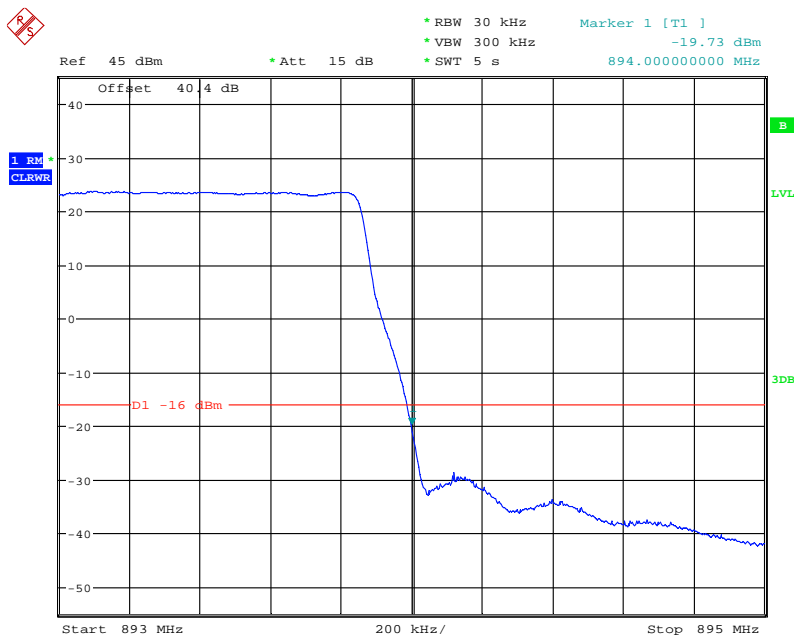


Date: 31.JUL.2013 14:37:28

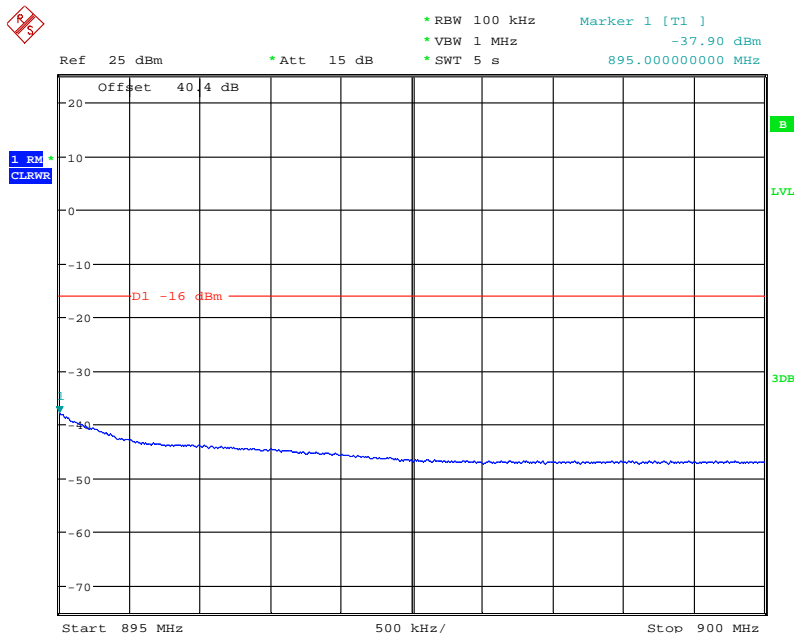


Product Service

**Configuration 1 - Mode 3 - C&L3**



Date: 31.JUL.2013 17:00:53

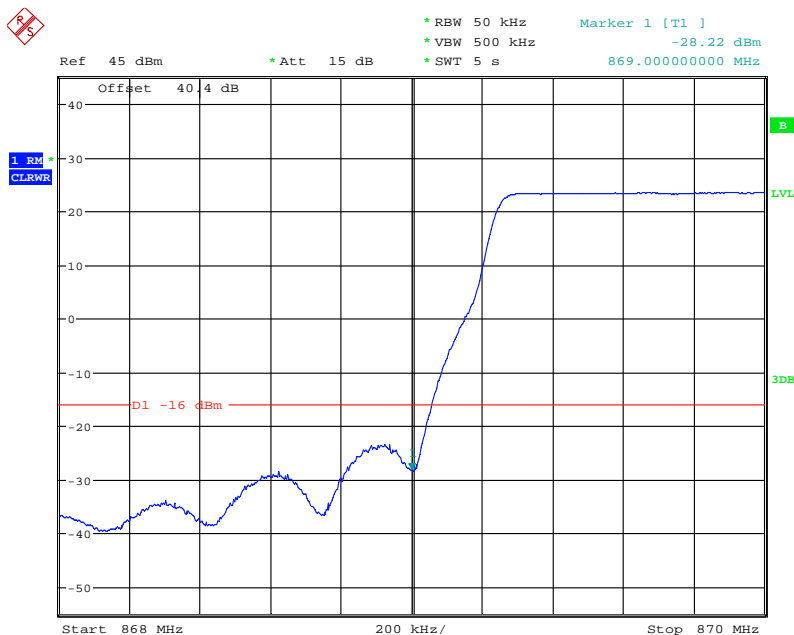


Date: 31.JUL.2013 17:01:44

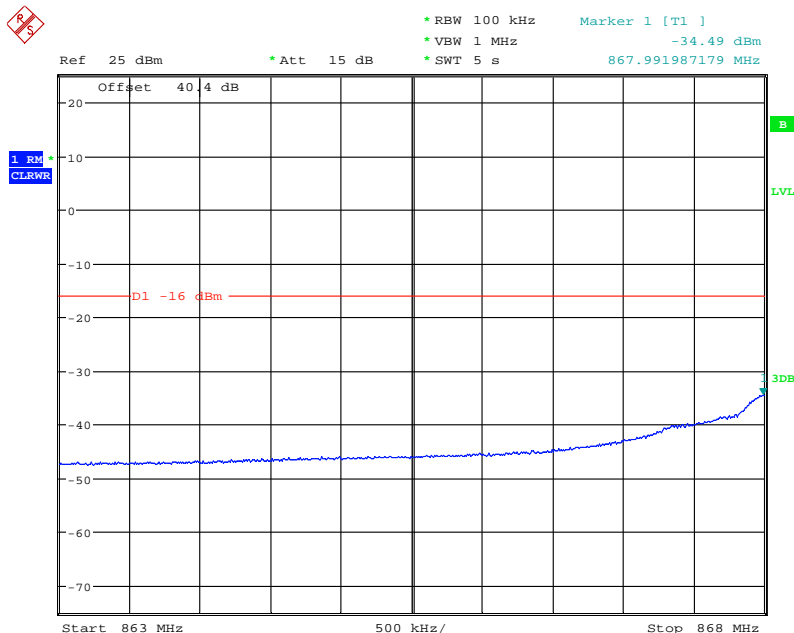


Product Service

**Configuration 1 - Mode 1 - L5&C**



Date: 31.JUL.2013 15:31:27

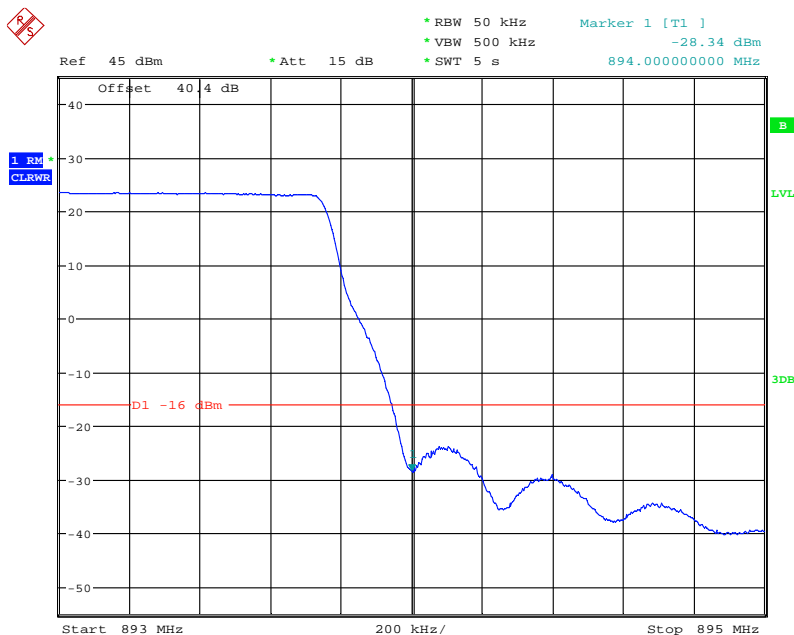


Date: 31.JUL.2013 15:32:10

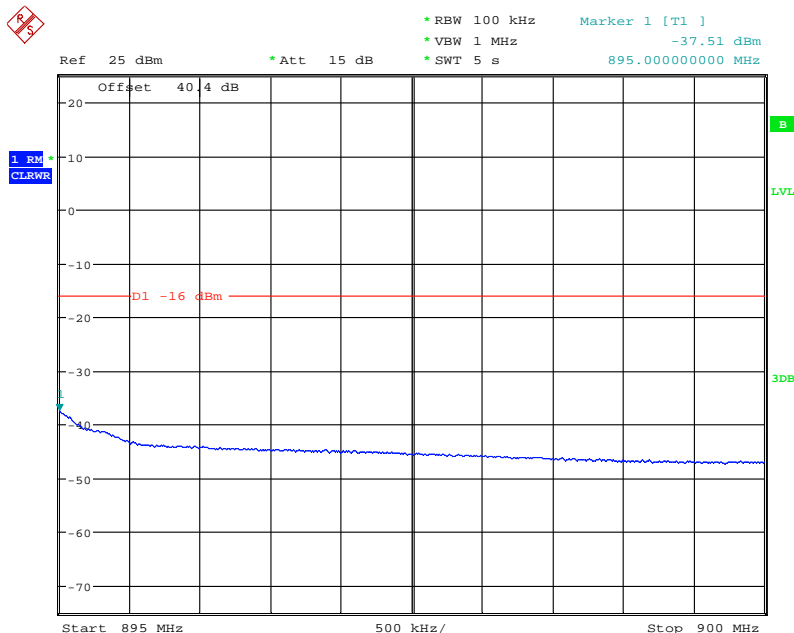


Product Service

**Configuration 1 - Mode 3 - C&L5**



Date: 1.AUG.2013 09:59:11



Date: 1.AUG.2013 10:00:02

Limit

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



## **2.4 RADIATED SPURIOUS EMISSIONS**

### **2.4.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1053  
FCC CFR 47 Part 22, Clause 22.917 (a)  
Industry Canada RSS-132, Clause 5.5

### **2.4.2 Equipment Under Test**

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

### **2.4.3 Date of Test and Modification State**

23 and 27 August 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 22 and Industry Canada RSS-132.

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 Polarizations.

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 -  $(43 + 10\text{Log}(P))$  dB

Where:

Field Strength is measured in dB $\mu$ 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:

$$E_{(v/m)} = (30 \times 1.64 \times 31.33)^{0.5} / 3 = 13.09V/m = 142.34dB\mu V/m$$

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

$$43 + 10\log(31.33) = 57.96dB$$

Therefore the limit at 3m measurement distance is:

$$142.34 - 57.96 = 84.4 \text{ dB}\mu V/m$$

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

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

- Configuration 1
- Mode 1 – L3&C
  - Mode 2 - L1.4&C, L3&C, L5&C
  - Mode 3 - C&L3
  - Mode 4 - C&L3&C
  - Mode 5 - C&L3&C&C

### 2.4.6 Environmental Conditions

	23 August 2013	27 August 2013
Ambient Temperature	23.5°C	23.0°C
Relative Humidity	53.0%	54.0%



**2.4.7 Test Results**

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 & Part 22 and Industry Canada RSS-132 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

**Mix Carrier (x2)**

**LTE (E-TM1.1) & CDMA (QPSK)**

**Configuration 1 - Mode 2 - L1.4&C**

Note: The emission marked is the operating frequency.

**LTE (E-TM3.2) & CDMA (QPSK)**

**Configuration 1 - Mode 1 - L3&C**

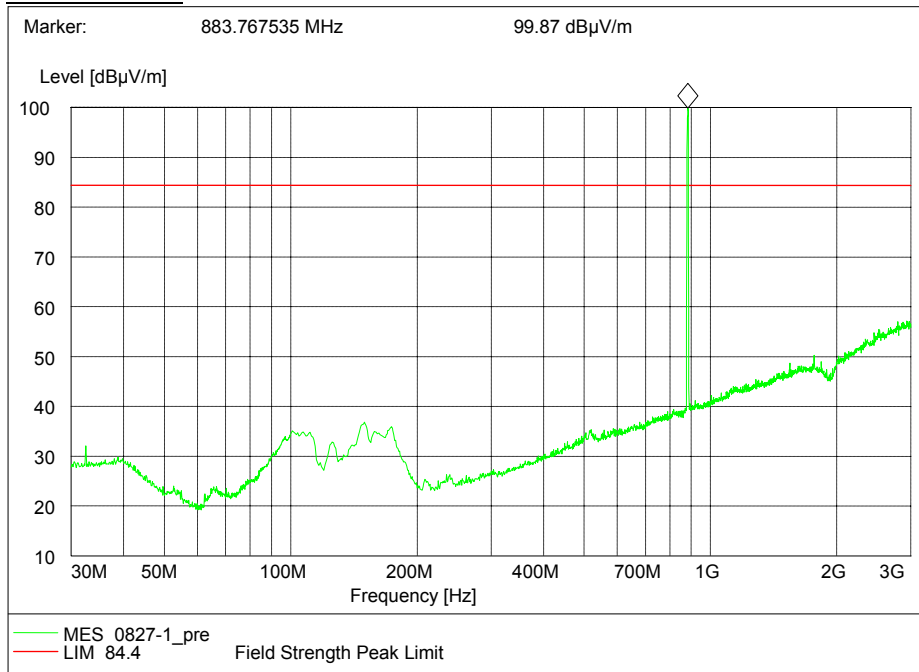
No emissions were detected within 20dB of the limit.

**Configuration 1 - Mode 2 - L1.4&C**

Note: The emission marked is the operating frequency.

**Configuration 1 - Mode 2 - L3&C**

30MHz - 3GHz

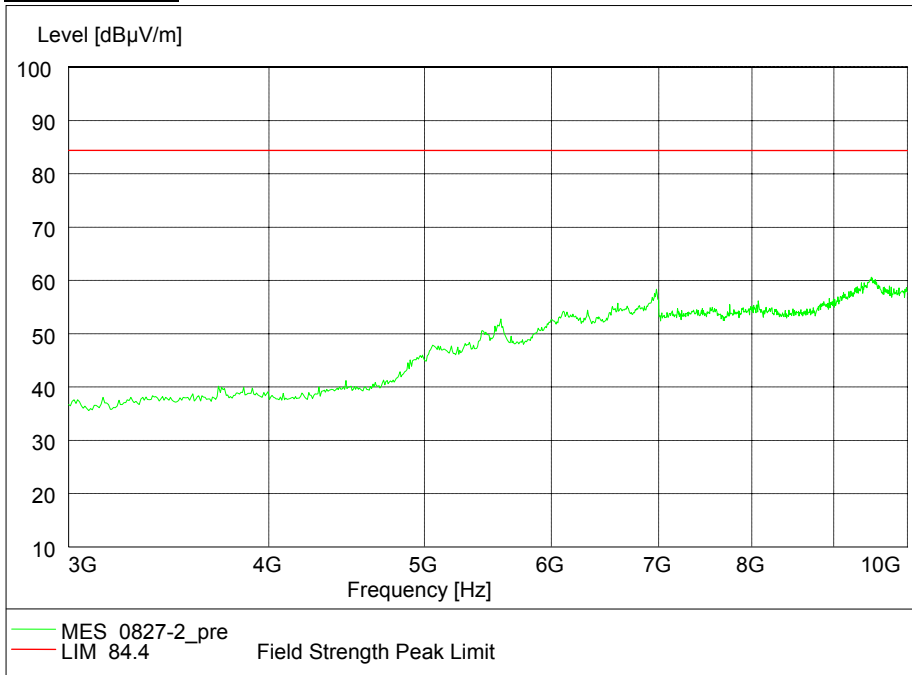


Note: The emission beyond the limit is the operating frequency





**3GHz - 10GHz**



**Configuration 1 - Mode 2 - L5&C**

No emissions were detected within 20dB of the limit.

**Configuration 1 - Mode 3 - C&L3**

No emissions were detected within 20dB of the limit.

**LTE (E-TM3.1) & CDMA (QPSK)**

**Configuration 1 - Mode 2 - L1.4&C**

No emissions were detected within 20dB of the limit.

**Mix Carrier (x3)**

**LTE (E-TM3.2) & CDMA (QPSK)**

**Configuration 1 - Mode 4 - C&L3&C**

No emissions were detected within 20dB of the limit.

**MixCarrier (x4)**

**LTE (E-TM3.2) & CDMA (QPSK)**

**Configuration 1 - Mode 5 - C&L3&C&C**

No emissions were detected within 20dB of the limit.



Product Service

Limit	-13dBm / 84.4dB $\mu$ V/m
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Remarks

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



## 2.5 CONDUCTED SPURIOUS EMISSIONS

### 2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051  
 FCC CFR 47 Part 22, Clause 22.917 (a)  
 Industry Canada RSS-132, Clause 5.5

### 2.5.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

### 2.5.3 Date of Test and Modification State

30, 31 July and 01 August 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 22 and Industry Canada RSS-132.

In accordance with Part 22.917 (a), the spurious emissions from the antenna terminal were measured. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB. After calculation, the limit is -13dBm. As the EUT can operate in LTE TX-MIMO mode, according to KDB 662911, the limit should be adjusted to:  
 $P(\text{dBm}) - (43 + 10 \log P(\text{W})) - 10 \log(N_{\text{ANT}})$

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. The resolution was set to 1MHz for 9kHz to 10GHz thus meeting the requirements of Industry Canada RSS-132 Clause 5.5. The spectrum analyser detector was set to peak and trace was kept on Max Hold. As LTE transmit in TX-MIMO and the EUT has Two transmit ports, the limit was adjusted to -16dBm.

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

Measurements were made up to the 10<sup>th</sup> 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 - L1.4&C
- Mode 2 - L1.4&C, L3&C, L5&C
- Mode 3 - C&L1.4
- Mode 4 - C&L1.4&C
- Mode 5 - C&L1.4&C&C



Product Service

**2.5.6 Environmental Conditions**

	30 July 2013	31 July 2013	01 August 2013
Ambient Temperature	24.0°C	24.0°C	23.5°C
Relative Humidity	68.0%	66.0%	68.0%

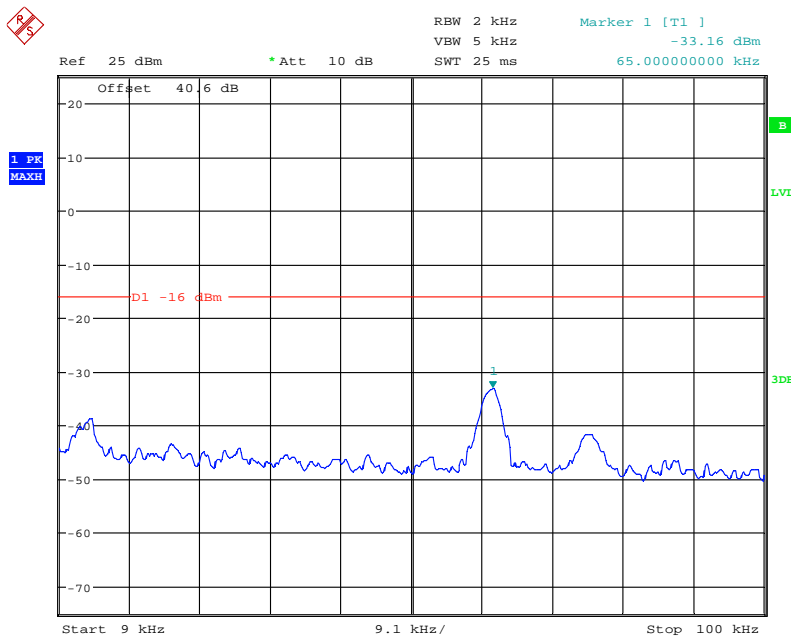
**2.5.7 Test Results**

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 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: 29.JUL.2013 16:07:25



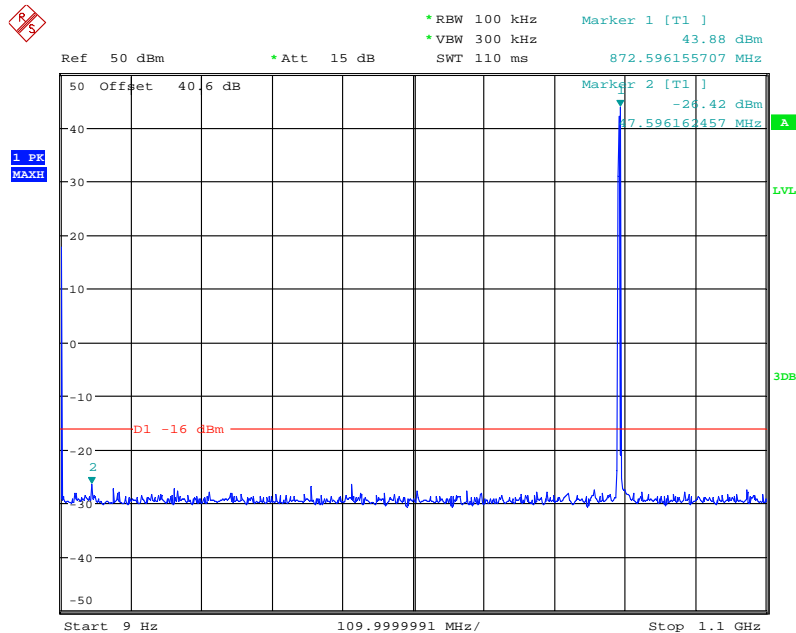
Product Service

**LTE (E-TM1.1) & CDMA (QPSK)**

**Mix Carrier (x2)**

**Configuration 1 - Mode 1 - L1.4&C**

**9kHz to 1.1GHz**



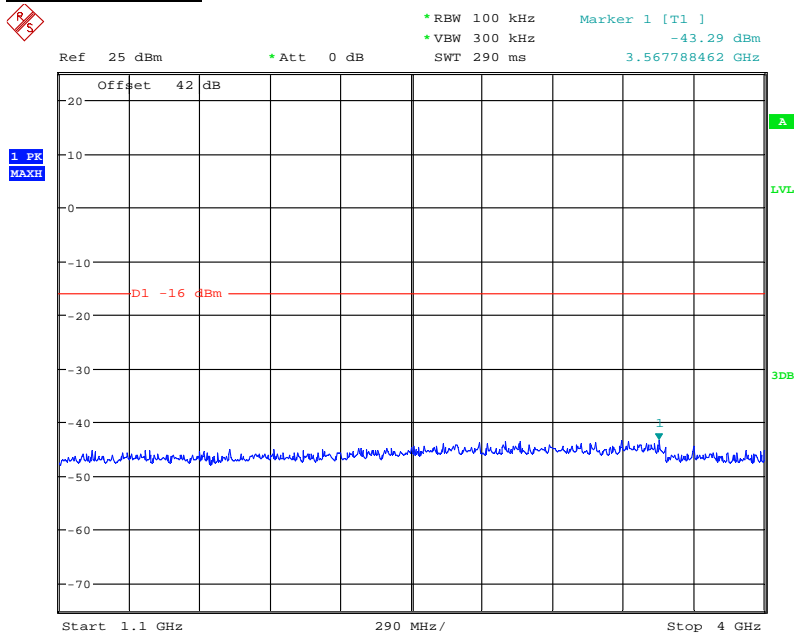
Date: 31.JUL.2013 13:24:16

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



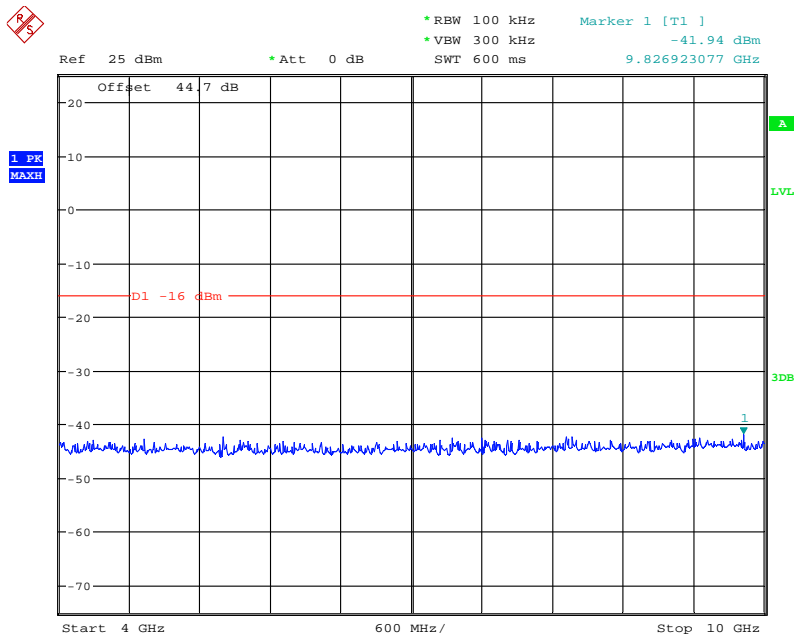
Product Service

### 1.1GHz to 4GHz



Date: 31.JUL.2013 13:34:03

### 4GHz to 10GHz



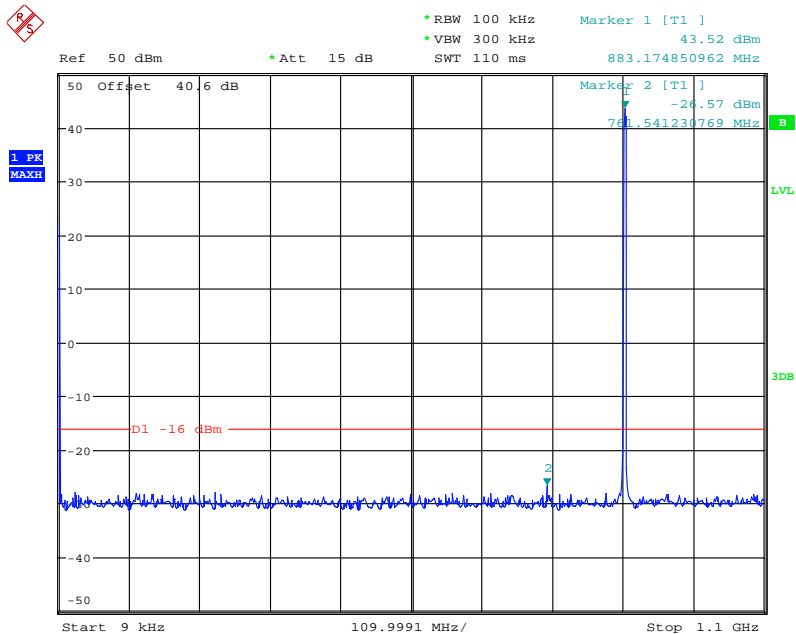
Date: 31.JUL.2013 13:26:09



Product Service

**Configuration 1 - Mode 2 - L1.4&C**

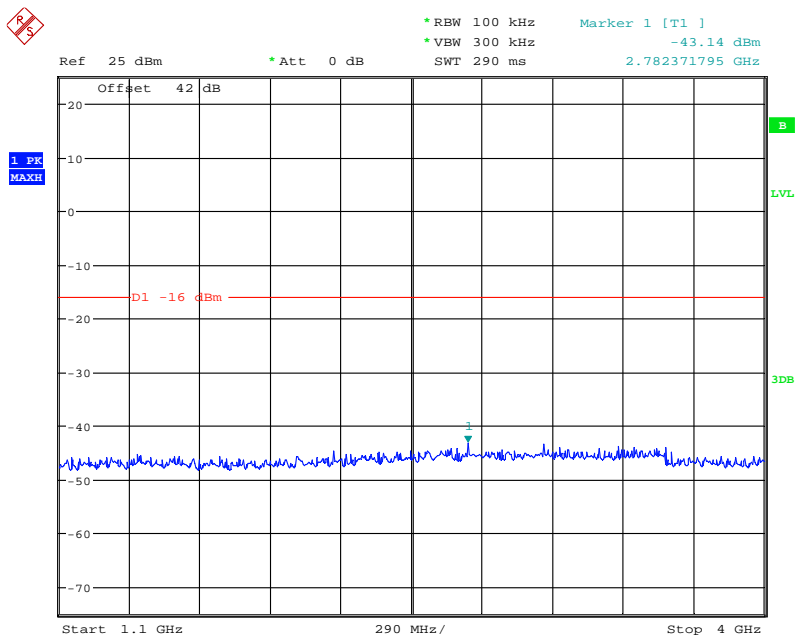
**9kHz to 1.1GHz**



Date: 31.JUL.2013 09:39:13

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

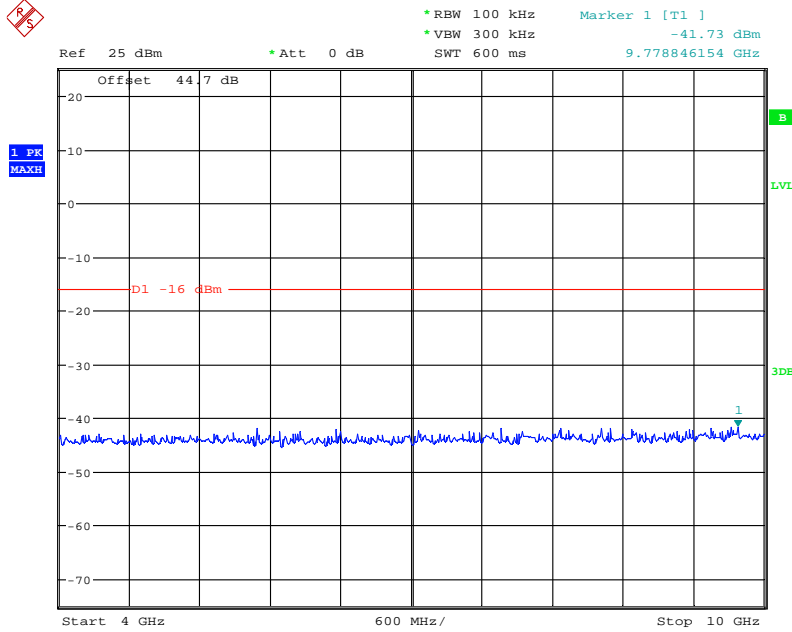
**1.1GHz to 4GHz**



Date: 31.JUL.2013 09:40:09



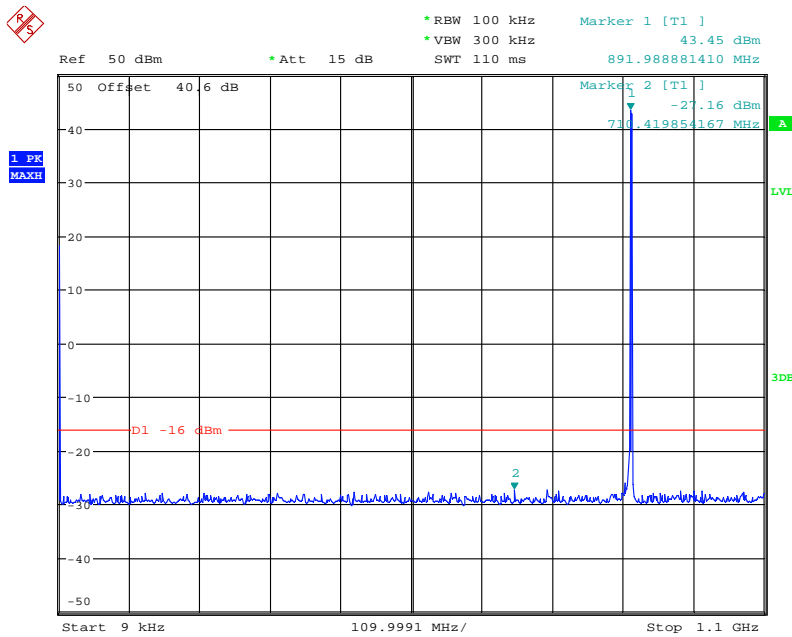
**4GHz to 10GHz**



Date: 31.JUL.2013 09:38:26

**Configuration 1 - Mode 3 - C&L1.4**

**9kHz to 1.1GHz**



Date: 31.JUL.2013 16:18:45

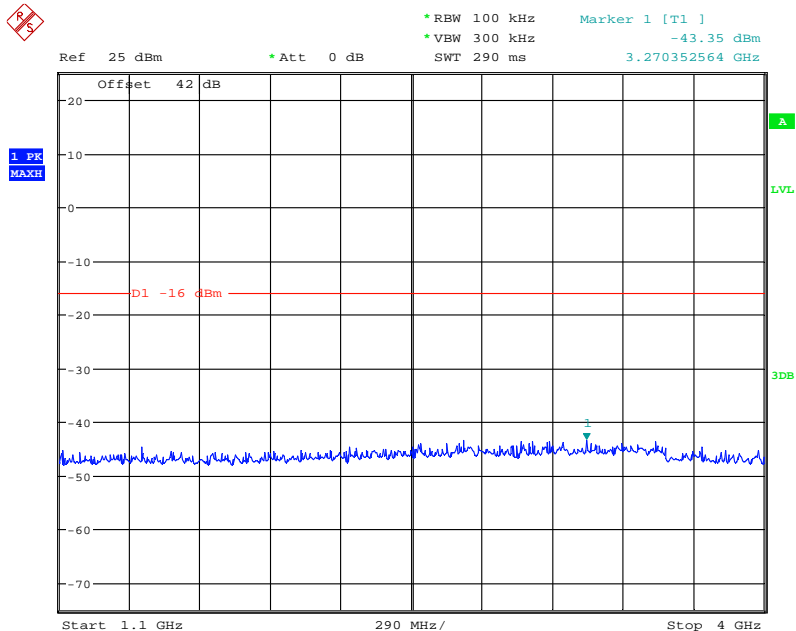
Note: The emission beyond the limit is the operating frequency.





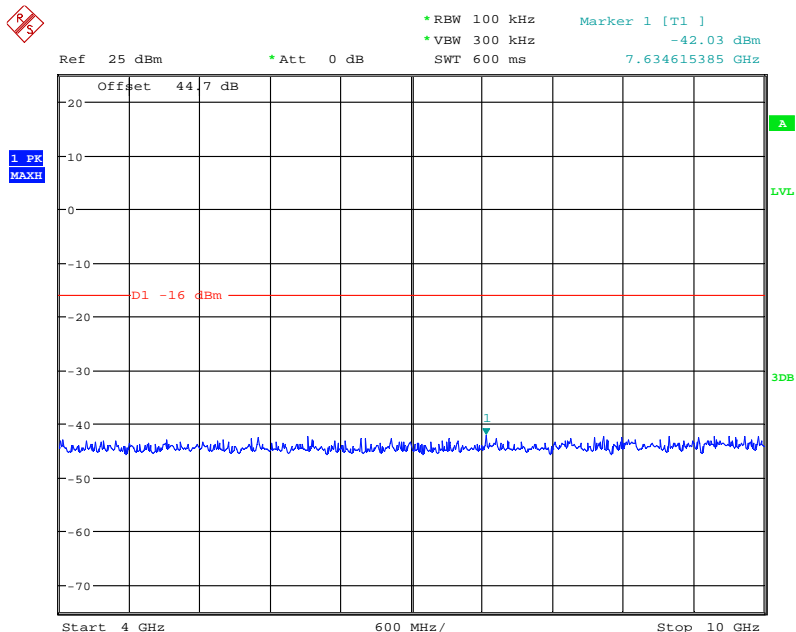
Product Service

1.1GHz to 4GHz



Date: 31.JUL.2013 16:21:38

4GHz to 10GHz



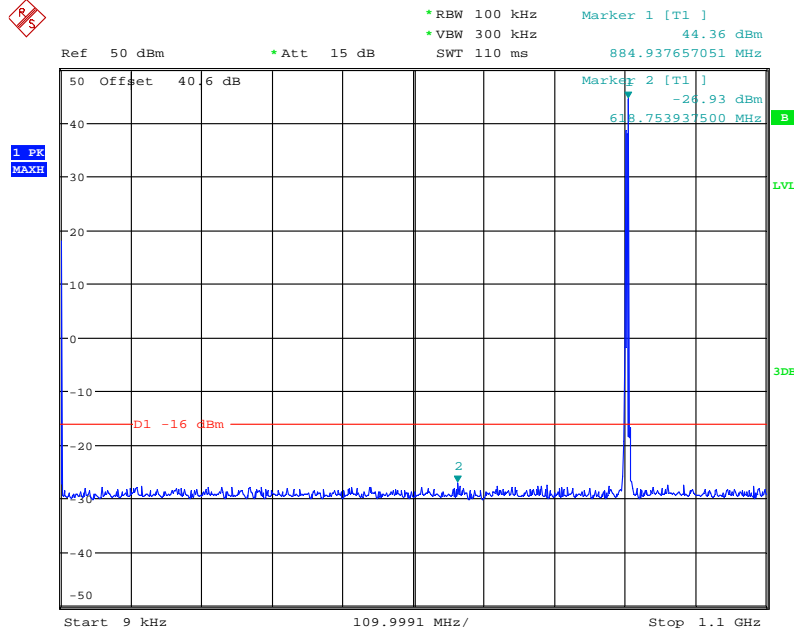
Date: 31.JUL.2013 16:20:48



Product Service

**Configuration 1 - Mode 2 - L3&C**

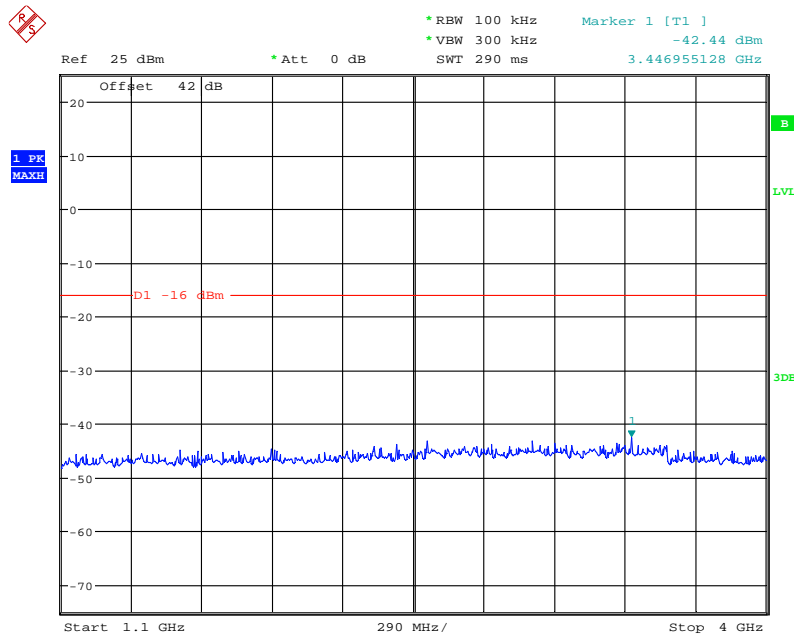
**9kHz to 1.1GHz**



Date: 31.JUL.2013 10:33:39

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

**1.1GHz to 4GHz**

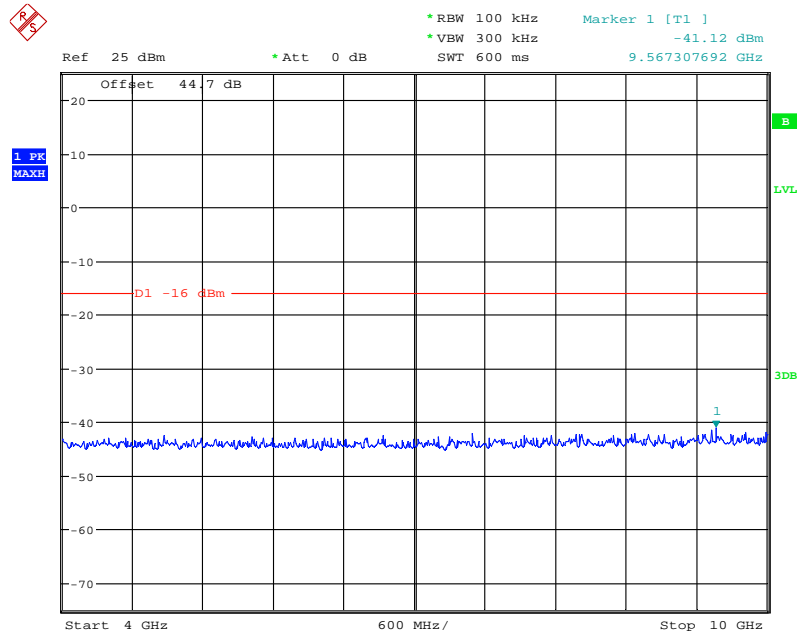


Date: 31.JUL.2013 10:35:52



Product Service

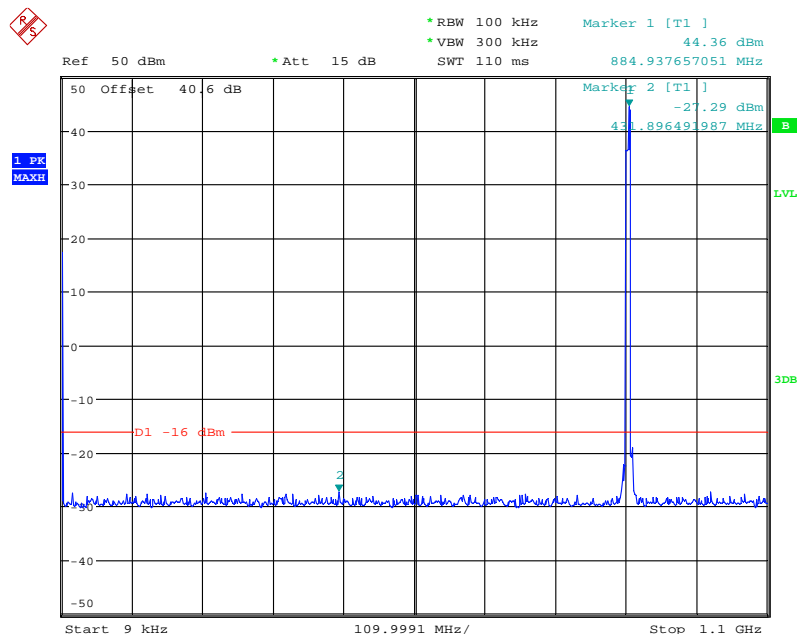
### 4GHz to 10GHz



Date: 31.JUL.2013 10:32:18

### Configuration 1 - Mode 2 - L5&C

### 9kHz to 1.1GHz



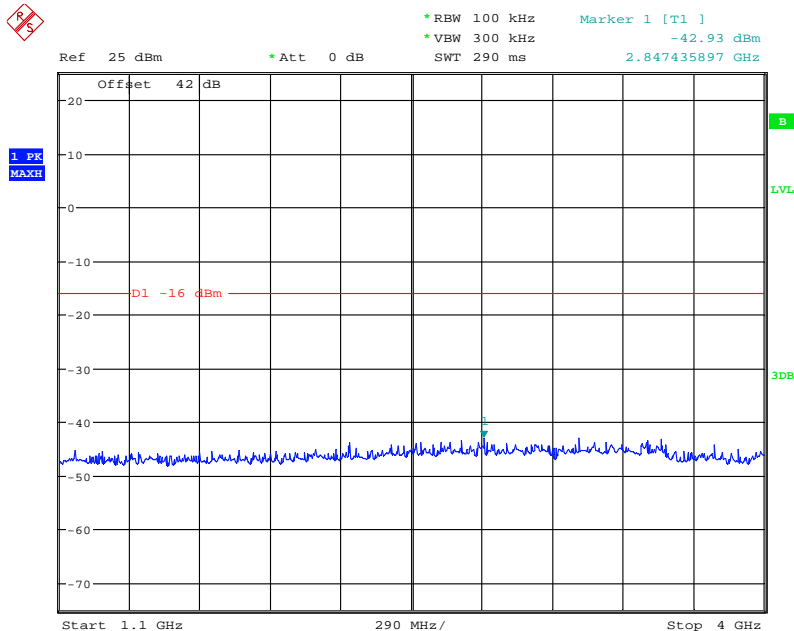
Date: 31.JUL.2013 11:13:46

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



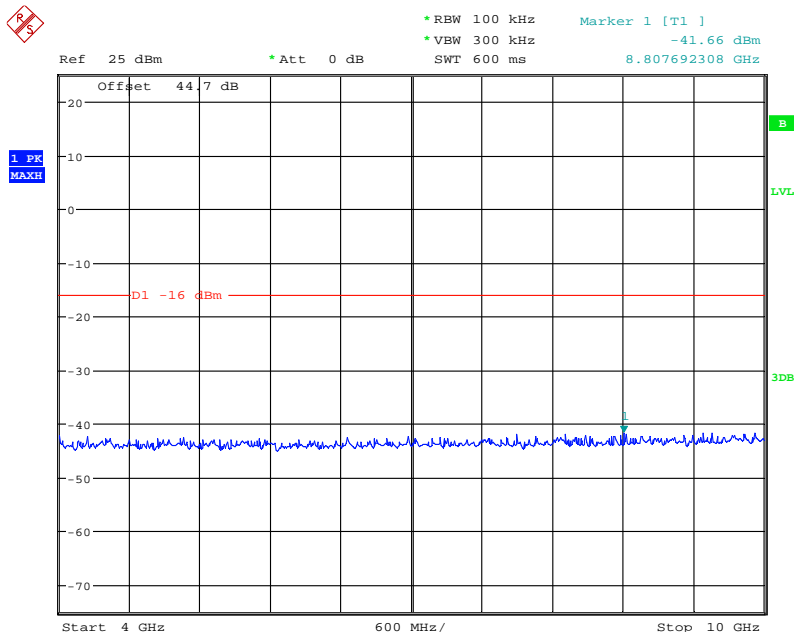
Product Service

### 1.1GHz to 4GHz



Date: 31.JUL.2013 11:15:45

### 4GHz to 10GHz



Date: 31.JUL.2013 11:12:00

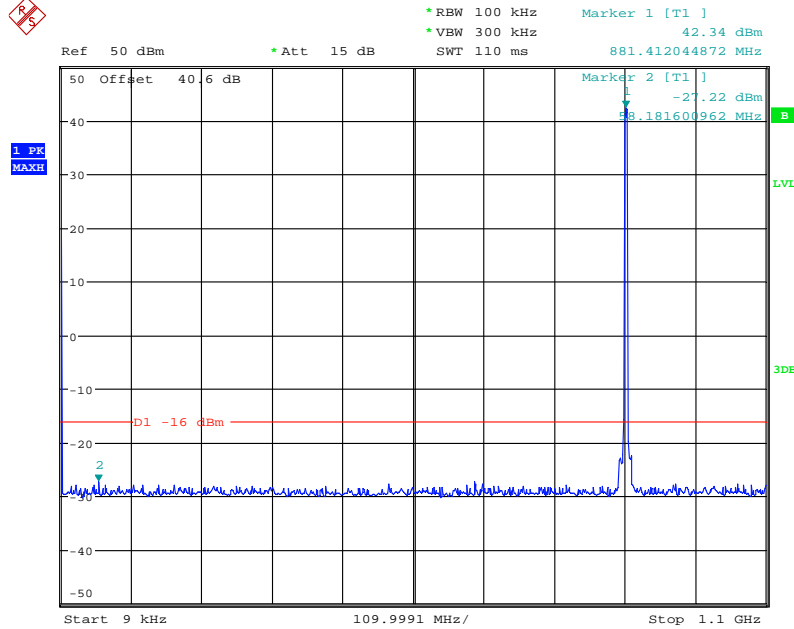


Product Service

**Mix Carrier (x3)**

**Configuration 1 - Mode 4 - C&L1.4&C**

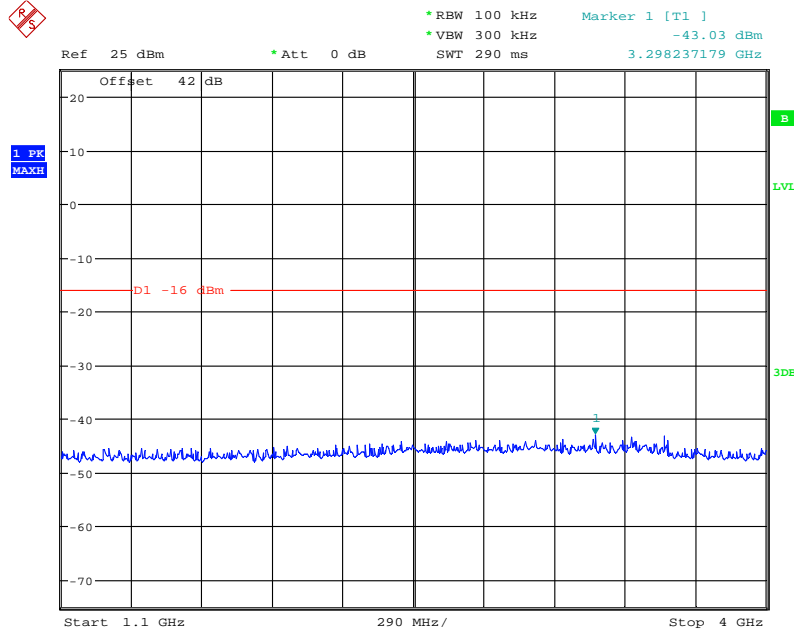
**9kHz to 1.1GHz**



Date: 30.JUL.2013 10:18:13

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

**1.1GHz to 4GHz**

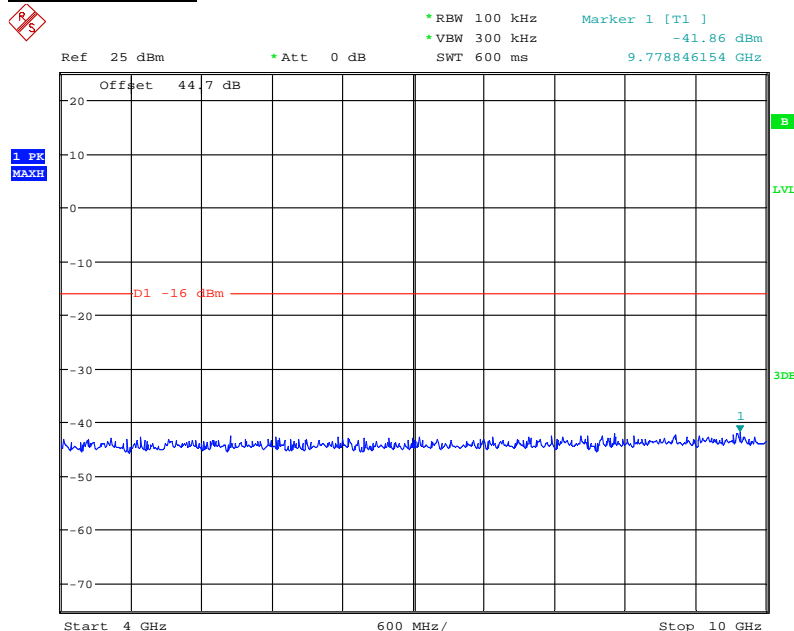


Date: 30.JUL.2013 10:09:33



Product Service

### 4GHz to 10GHz

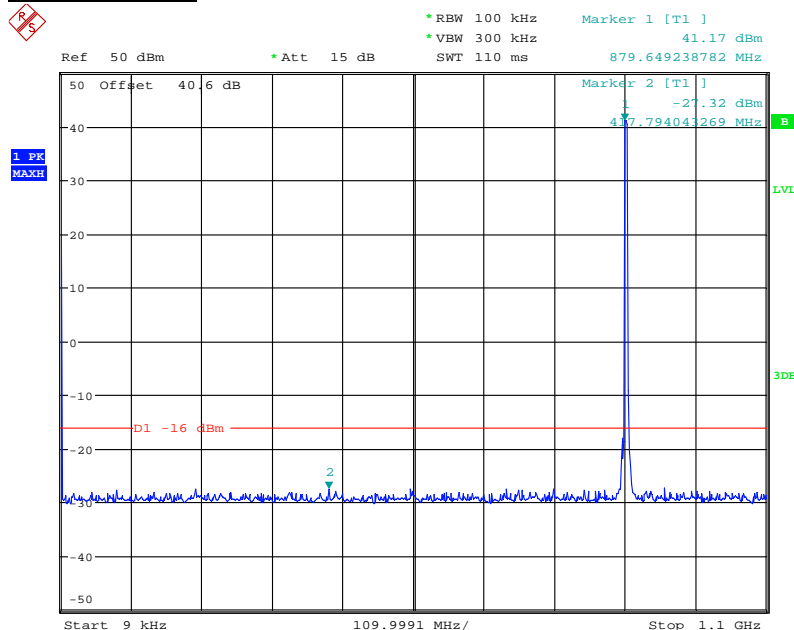


Date: 30.JUL.2013 10:11:10

### Mix Carrier (x4)

### Configuration 1 - Mode 5 - C&L1.4&C&C

### 9kHz to 1.1GHz



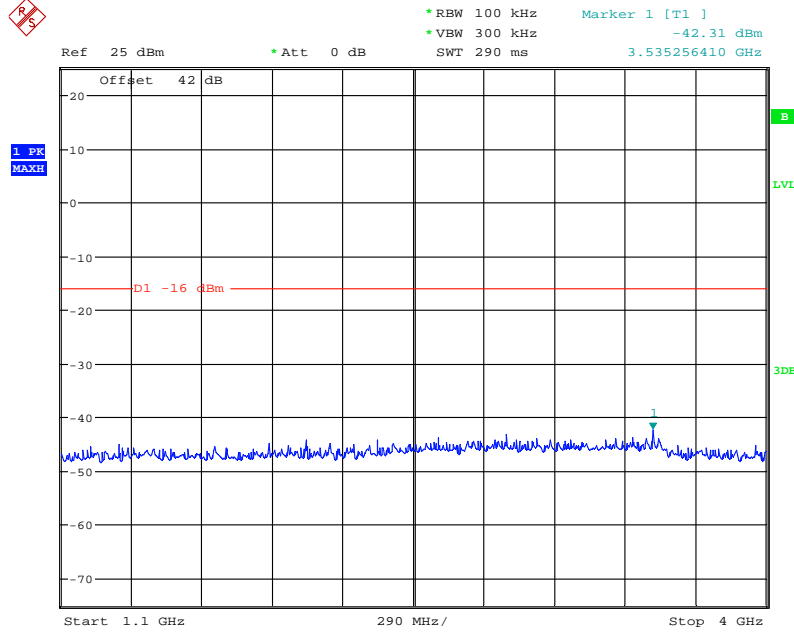
Date: 1.AUG.2013 10:41:45

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



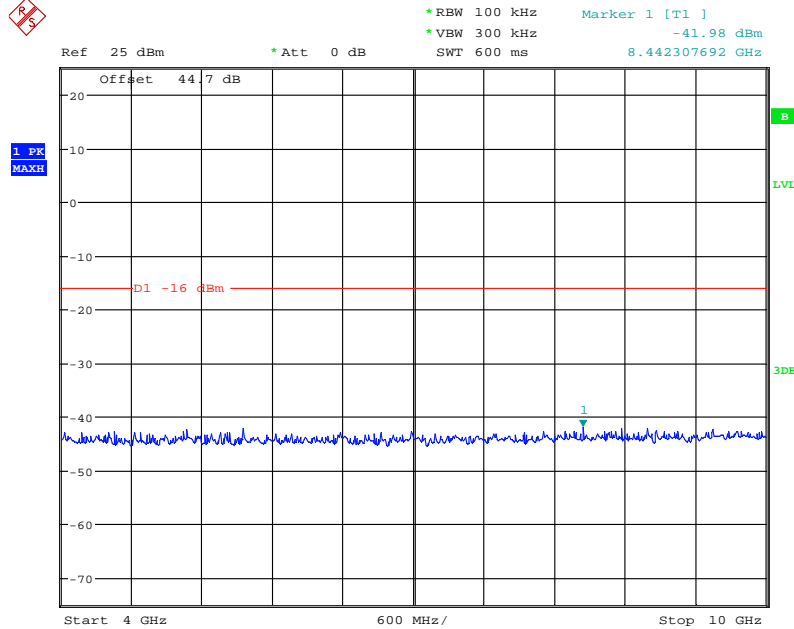
Product Service

**1.1GHz to 4GHz**



Date: 1.AUG.2013 10:46:03

**4GHz to 10GHz**



Date: 1.AUG.2013 10:40:06

Limit	-16dBm
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Remarks

The EUT does not exceed -16dBm at the frequency range of 9kHz to 10GHz.



## 2.6 RECEIVER SPURIOUS EMISSIONS

### 2.6.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.111

### 2.6.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

### 2.6.3 Date of Test and Modification State

30, 31 July and 01 August 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 15.

In accordance with FCC CFR 47 Part 15 Clause 15.111, the receiver spurious emissions from the antenna terminal were measured. Measurements were performed on the antenna connector RF B. The EUT was set to transmitter mode on the TX connector RF A and during the measurement the RF A was terminated with match load, (50 Ohm).

The resolution was set to 1MHz in the frequency range 9kHz to 10GHz. The spectrum analyser detector was set to peak and trace was kept on Max Hold to give the worst case. The limit line was displayed, showing the -57dBm, 2 nanowatts in band 9kHz to 10GHz.

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

Measurements were made from 9kHz up to the 5<sup>th</sup> 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 2 - L1.4&C  
 - Mode 4 - C&L1.4&C  
 - Mode 5 - C&L1.4&C&C

### 2.6.6 Environmental Conditions

	30 July 2013	31 July 2013	01 August 2013
Ambient Temperature	24.0°C	24.0°C	23.5°C
Relative Humidity	68.0%	66.0%	68.0%





Product Service

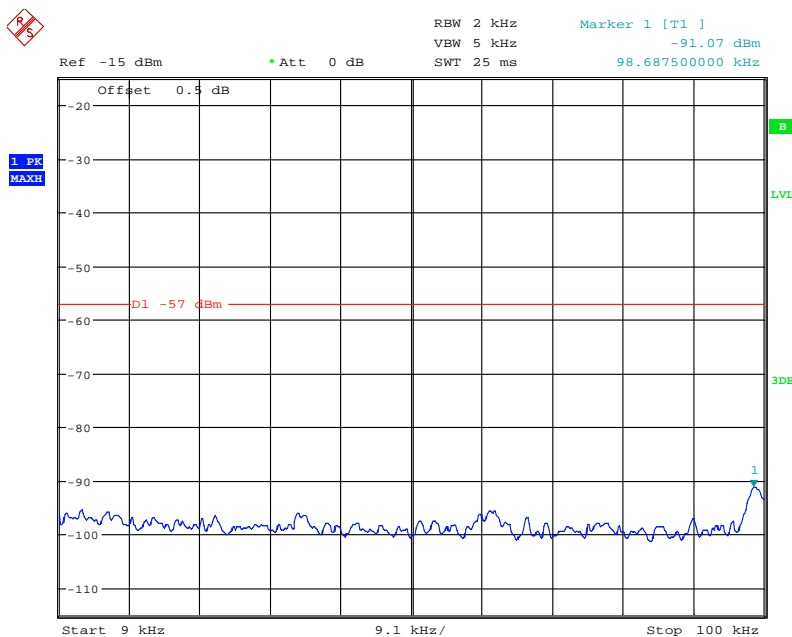
**2.6.7 Test Results**

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 for Receiver 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: 29.JUL.2013 13:49:07



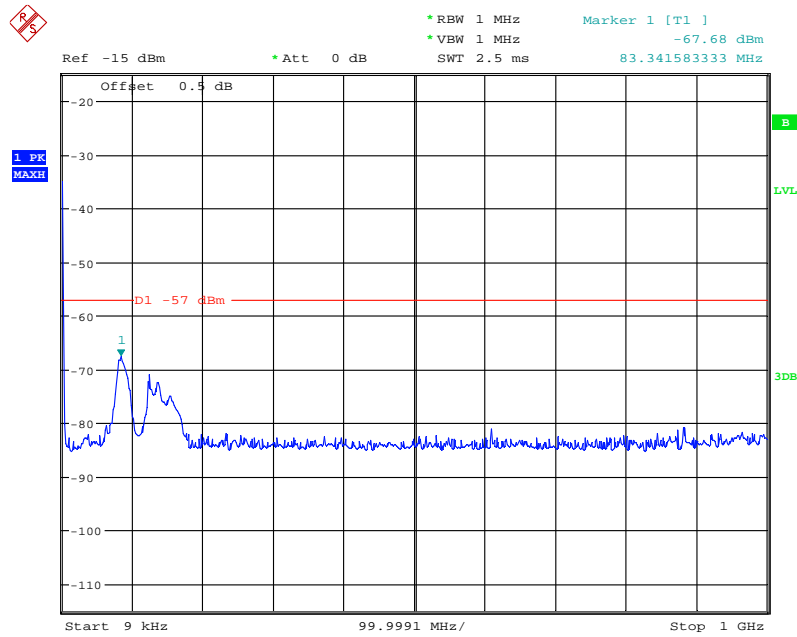
Product Service

**LTE (E-TM1.1) & CDMA (QPSK)**

**Mix Carrier (x2)**

**Configuration 1 - Mode 2 - L1.4&C**

**9kHz to 1GHz**

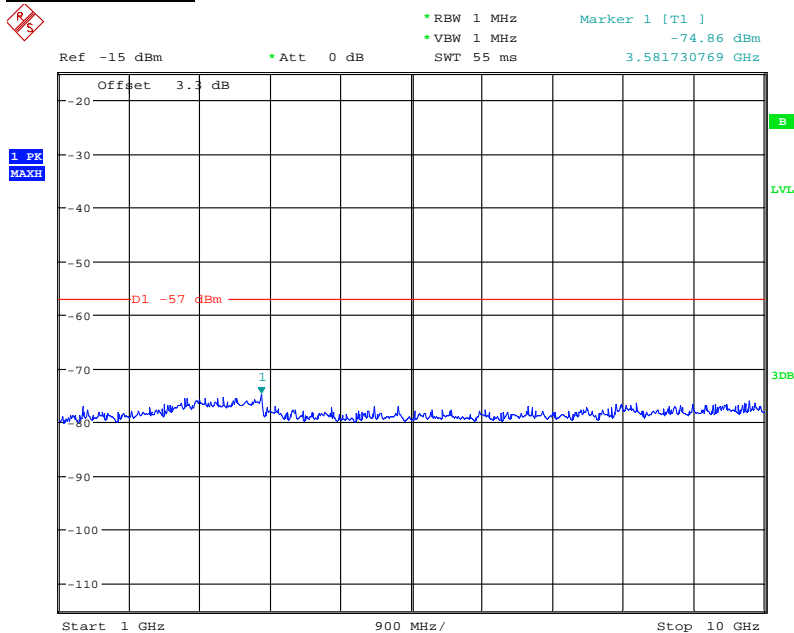


Date: 31.JUL.2013 10:02:58



Product Service

### 1GHz to 10GHz

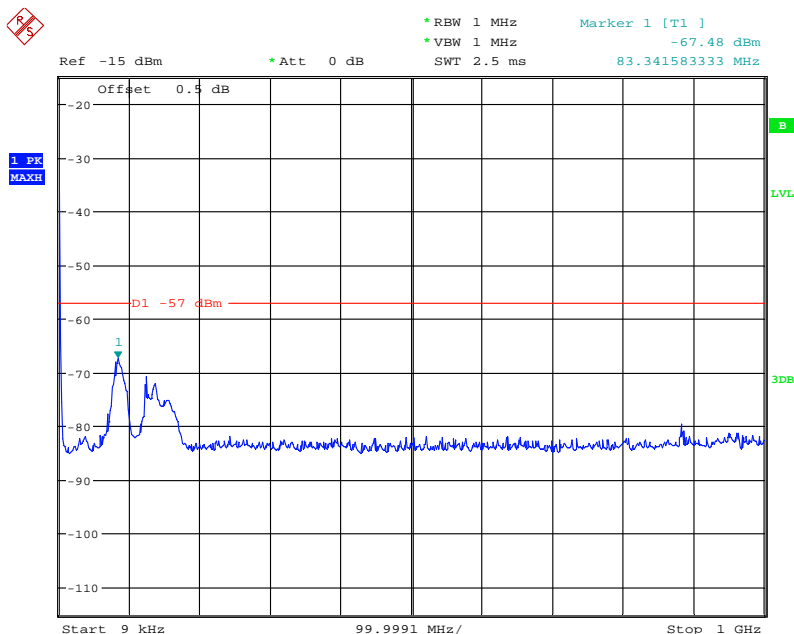


Date: 31.JUL.2013 10:02:20

### Mix Carrier (x3)

### Configuration 1 - Mode 4 - C&L1.4&C

### 9kHz to 1GHz

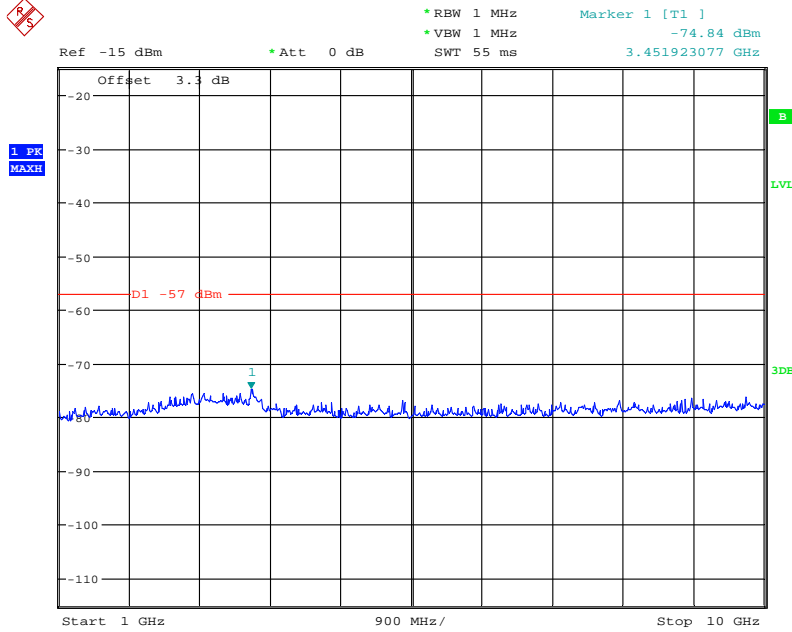


Date: 30.JUL.2013 10:24:24



Product Service

**1GHz to 10GHz**

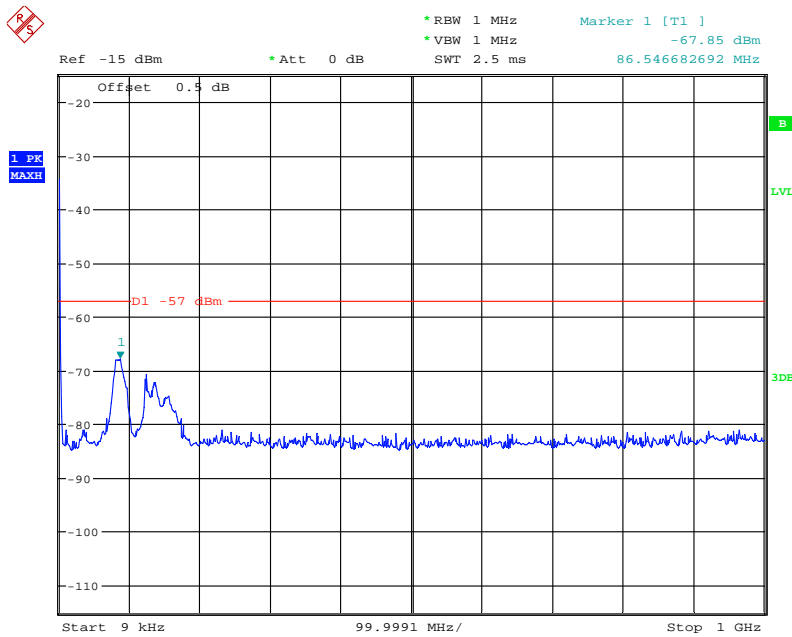


Date: 30.JUL.2013 10:25:35

**Mix Carrier (x4)**

**Configuration 1 - Mode 5 – C& L1.4&C&C**

**9kHz to 1GHz**

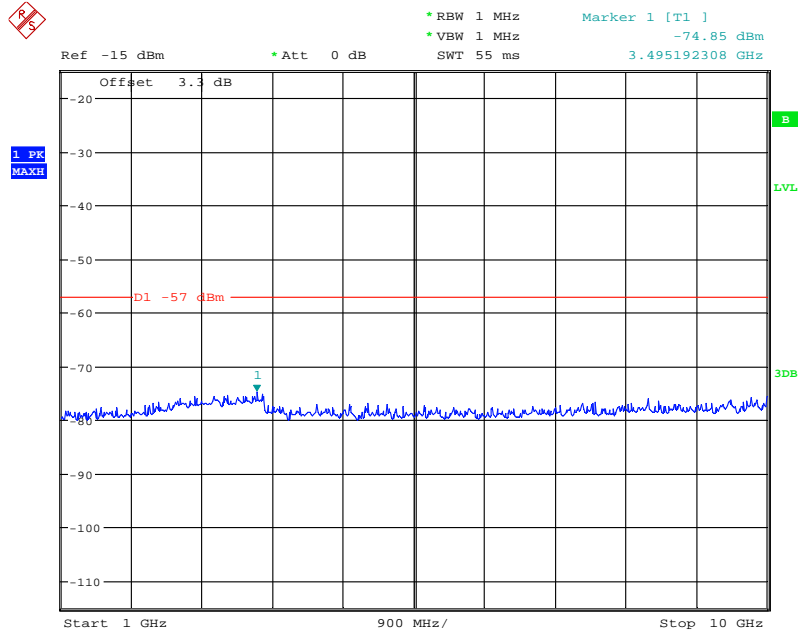


Date: 1.AUG.2013 11:01:58



Product Service

1GHz to 10GHz



Date: 1.AUG.2013 11:00:55

Limit	-57dBm
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Remarks

The EUT does not exceed -57dBm 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 equipment.

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
<b>Section 2.1, 2.2, 2.3, 2.5, 2.6 – Maximum Conducted Output Power, Peak – Average Ratio, Spurious Emissions at Antenna Terminals (<math>\pm 1</math>MHz), Conducted Spurious Emissions and Receiver Spurious Emissions.</b>					
Spectrum Analyser	Rohde & Schwarz	FSQ26	100253	12	31-Aug-2013
Power Meter	Rohde & Schwarz	NRP2	101283	12	12-Aug-2013
Power Sensor	Rohde & Schwarz	NRP-Z51	102310	12	16-Jul-2014
Network Analyzer	Agilent	8720D	US36140166	12	06-Sep-2013
30dB Attenuator	SHX	DTS100G	08011715	-	O/P MON
10dB Attenuator	HUBER+SUHNER	6810.17.B	776489	-	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	16-Dec-2013
<b>Section 2.4 – Radiated Spurious Emissions</b>					
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 Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2014
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2014
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88 m×9.60m	-	12	19-Aug-2014
Power Supply	Dahua	DH1716-5D	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



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### 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 <sup>6</sup>		

\* In accordance with CISPR 16-4





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## **SECTION 4**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



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#### 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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

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