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Report On

FCC and Industry Canada Testing of the
Ericsson AB RRUS 12 B5 / KRC 161 321/2

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FCC ID: TA8AKRC161321-2
IC ID: 287AB-AS1613212

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August 2013



Product Service

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REPORT ON

FCC and Industry Canada Testing of the
Ericsson RRUS 12 B5 / KRC 161 321/2

Document 75923485 Report 02 Issue 1

August 2013

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DATED

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

Test Engineer(s);

Y He

C Zhang



0141



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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Ericsson RRUS 12 B5 / KRC 161 321/2



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 12 B5 / KRC 161 321/2 to the requirements of FCC CFR 47 Part 22 and Industry Canada RSS-132.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of RRUS 12 B5 / KRC 161 321/2.

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 12 B5
Part Number	KRC 161 321/2
IC Model Number	AS1613212
Serial Number(s)	CB26989524
RBS Software Version	CXP 102 051/19 R18BA
PIS Software Version	CXP 901 3268/9 R51MM
Hardware Version	R1B
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 16 July 2013
Order Number Date	PTP 17 July 2013
Start of Test	18 July 2013
Finish of Test	8 August 2013
Name of Engineer(s)	Y He C 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 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and Part 22	RSS-132 and RSS-GEN					
	22.913 (a)	5.4	Effective Radiated Power	881.5MHz(L1.4)+882.84MHz(C)		N/A	No integral antenna.
				881.5MHz(L3)+883.65MHz(C)		N/A	
				881.5MHz(L5)+884.64MHz(C)		N/A	
				881.5MHz(L10)+887.13MHz(C)		N/A	
2.1	2.1046, 22.913 (a)	5.4	Maximum Peak Output Power - Conducted	869.7MHz(L1.4)+870.78MHz(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	
				874.0MHz(L10)+879.63MHz(C)	0	Pass	
				881.5MHz(L10)+887.13MHz(C)	0	Pass	
				883.35MHz(C)+889.0MHz(L10)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.9MHz(L1.4)	0	Pass	
				879.36MHz(C)+881.5MHz(L3)+884.5MHz(L3)	0	Pass	
				878.37MHz(C)+881.5MHz(L5)+886.5MHz(L5)	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					
878.40MHz(C)+881.5MHz(L5)+884.64MHz(C)+885.87MHz(C)	0	Pass					



Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and Part 22	RSS-132 and RSS-GEN					
2.2	22.913 (a)	-	Peak – Average Ratio	869.7MHz(L1.4)+870.78MHz(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	
				874.0MHz(L10)+879.63MHz(C)	0	Pass	
				881.5MHz(L10)+887.13MHz(C)	0	Pass	
				883.35MHz(C)+889.0MHz(L10)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.9MHz(L1.4)	0	Pass	
				879.36MHz(C)+881.5MHz(L3)+884.5MHz(L3)	0	Pass	
				878.37MHz(C)+881.5MHz(L5)+886.5MHz(L5)	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					
878.40MHz(C)+881.5MHz(L5)+884.64MHz(C)+885.87MHz(C)	0	Pass					
	2.1047 (d)	5.2	Modulation Characteristics	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	
				881.5MHz(L10)+887.13MHz(C)		N/A	
	2.1049, 22.917 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	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	
				881.5MHz(L10)+887.13MHz(C)		N/A	



Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and Part 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)+870.78MHz(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	
				874.0MHz(L10)+879.63MHz(C)	0	Pass	
				883.35MHz(C)+889.0MHz(L10)	0	Pass	
				869.7MHz(L1.4)+871.1MHz(L1.4)+872.43MHz(C)	0	Pass	
				890.55MHz(C)+891.9MHz(L1.4)+893.3MHz(L1.4)	0	Pass	
				870.5MHz(L3)+873.5MHz(L3)+875.64MHz(C)	0	Pass	
				887.37MHz(C)+889.5MHz(L3)+892.5MHz(L3)	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	
				881.5MHz(L10)+887.13MHz(C)	0	Pass	
				879.36MHz(C)+881.5MHz(L3)+884.5MHz(L3)	0	Pass	
879.36MHz(C)+881.5MHz(L3)+883.65MHz(C)+884.88MHz(C)	0	Pass					



Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and Part 22	RSS-132 and RSS-GEN					
2.5	2.1051, 22.917 (a)	5.5	Conducted Spurious Emissions	869.7MHz(L1.4)+870.78MHz(C)	0	Pass	-
				881.5MHz(L1.4)+882.84MHz(C)	0	Pass	
				891.96MHz(C)+893.3MHz(L1.4)	0	Pass	
				890.37MHz(C)+892.5MHz(L3)	0	Pass	
				881.5MHz(L5)+884.64MHz(C)	0	Pass	
				881.5MHz(L10)+887.13MHz(C)	0	Pass	
				880.17MHz(C)+881.5MHz(L1.4)+882.9MHz(L1.4)	0	Pass	
880.17MHz(C)+881.5MHz(L1.4)+882.84MHz(C)+884.07MHz(C)	0	Pass					
	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	
				881.5MHz(L10)+887.13MHz(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	
				881.5MHz(L10)+887.13MHz(C)		N/A	

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.

“(L10)” denotes LTE network with 10MHz channel bandwidth.

“(C)” denotes CDMA network.



Product Service

1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NAME	RRUS 12 B5
PART NUMBER	KRC 161 321/2
IC Model Number	AS1613212
SERIAL NUMBER(s)	CB26989524
HARDWARE VERSION	R1B
RBS SOFTWARE VERSION	CXP 102 051/19 R18BA
PIS SOFTWARE VERSION	CXP 901 3268/9 R51MM
TRANSMITTER OPERATING RANGE	TX: 869MHz - 894MHz RX: 824MHz - 849MHz
MODULATIONS	LTE: QPSK, 16QAM, 64QAM CDMA: QPSK, 8PSK, 16QAM
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	CDMA: 1M25F9W, LTE: 1M40F9W, 3M00F9W, 5M00F9W, 10M0F9W
SUPPORTED CHANNEL BANDWIDTH CONFIGURATION	LTE: 1.4MHz, 3MHz, 5MHz, 10MHz according to 3GPP TS 36.141 CDMA: 1.25MHz
OUTPUT POWER (RMS) (W or dBm)	LTE/CDMA Mix Carrier (x 2): LTE + CDMA: 47.8dBm (60W) per port
	LTE/CDMA Mix Carrier (x3): 2 x LTE + CDMA: 47.5dBm (56.2W) per port, or LTE + 2 x CDMA: 47.5dBm (56.2W) per port
	LTE/CDMA Mix Carrier (x4): LTE + 3 x CDMA: 46.7dBm (46.8W) per port, or 2 x LTE + 2 x CDMA: 46.7dBm (46.8W) per port
OUTPUT POWER TOLERANCE	± 1.0dB
NUMBER OF ANTENNA PORTS	2 TX/ RX ports
SUPPORTED CONFIGURATION	Multi-standard (LTE/CDMA) configured for Mix Carrier. Both RF chains are identical.
FCC ID	TA8AKRC161321-2
IC ID	287AB-AS1613212
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of LTE / CDMA Base Station.

Signature

Date

13 August 2013

D of B S Serial No

75923485/01

No responsibility will be accepted by TÜV SÜD Product Service as to the accuracy of the information declared in this document by the manufacturer.



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) RRUS 12 B5 / KRC 161 321/2 is an Ericsson Radio Equipment working in the public mobile service 850MHz band which provides communication connections to LTE&CDMA network. The RRUS 12 B5 / KRC 161 321/2 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 12 B5 / KRC 161 321/2 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(30W) + CDMA(30W), while
Port B: Mix Carrier (x2): LTE(30W) + CDMA(30W)

Port A: Mix Carrier (x3): CDMA(20W) + 2 x LTE(2 x 20W), while
Port B: Mix Carrier (x3): CDMA(20W) + 2 x LTE(2 x 20W)

Port A: Mix Carrier (x4): LTE(15W) + 3 x CDMA(3 x 15W), while
Port B: Mix Carrier (x4): LTE(15W) + 3 x CDMA(3 x 15W),

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

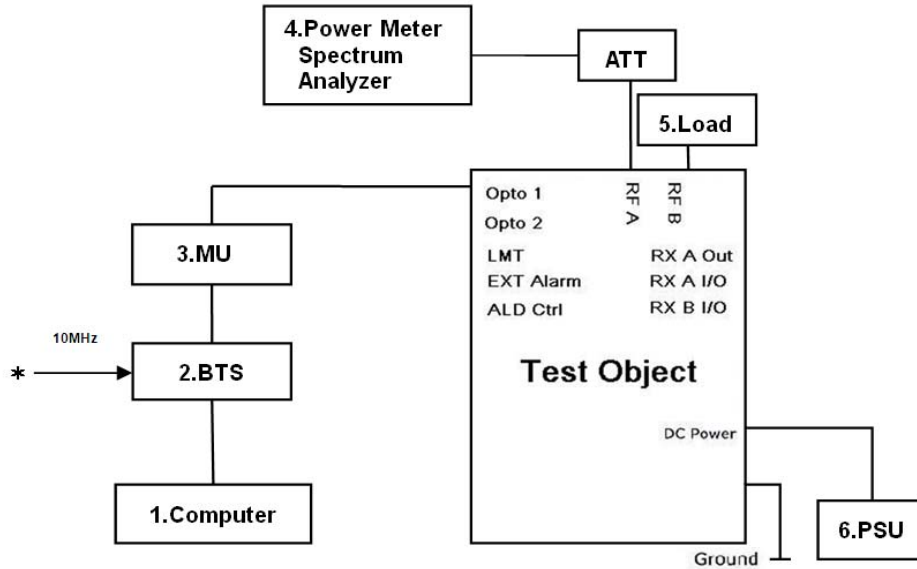
CDMA with QPSK Modulation
Forward Traffic Channel using Spreading Rate 1 (1X), Voice
User Channels: 6
Channel rate: 9.6kbps
Channel bandwidth: 1.25MHz

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:

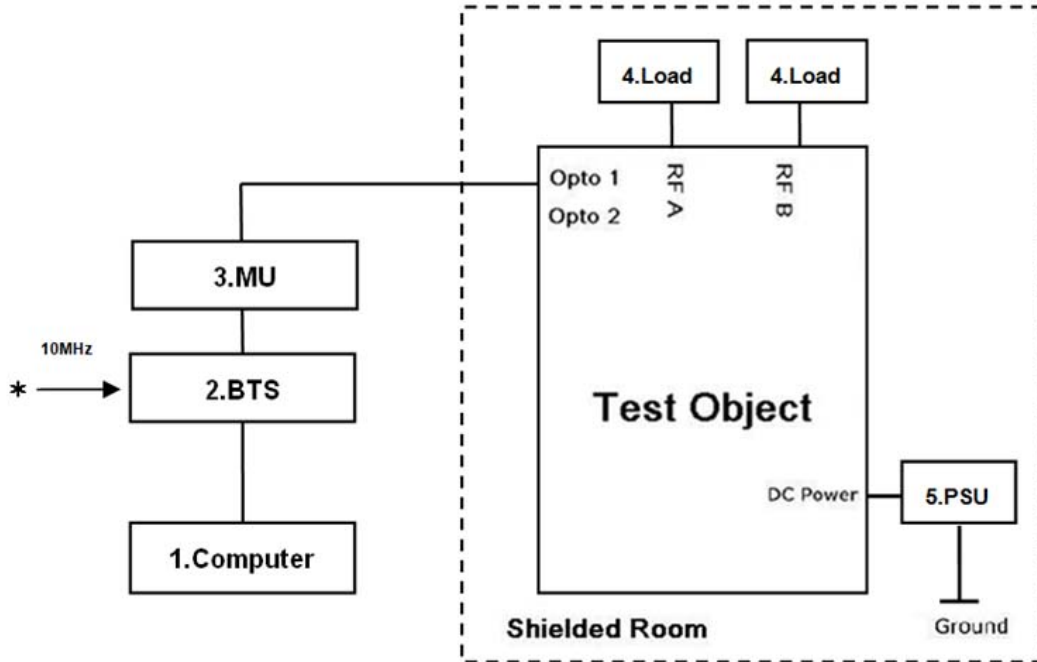


Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 12 B5 / KRC 161 321/2	R1B	CB26989524

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP DC5100SFF	--	CNG6510B8B
2	BTS 602	--	--	--
	DBA	NTLK90AAE5	A1	NNTMPX00MEM6
	XCEM-A	NTLK86AAE5	02	NNTMPX00MRRF
	XCEM-A	NTLK86AAE5	02	NNTMPX00MHPR
	XCEM-A	NTLK86AAE5	02	NNTMPX00MPRG
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY0
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY3
3	DUS 41 01	KDU 137 624/1	R5A	A402058111
	XMU 02 01	KDU 137 745/1	R2A	C825513812
	SUP 6601	BFL 901 009/1	R3B	BR81066826
4	Power Meter	R&S NRP	--	101593
	Power Sensor	R&S NRP Z51	--	102224
	Power Sensor	R&S NRP Z51	--	102933
	Spectrum Analyzer	R&S FSQ	--	201122
5	Load	TF100	--	09121602
6	Power Supply	DH1716A-14	--	20080401



Test Setup, Radiated Measurement:



Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 12 B5 / KRC 161 321/2	R1B	CB26989524

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP DC5100SFF	--	CNG6510B8B
2	BTS 602A	--	--	--
	DBA	NTLK90AAE5	A1	NNTMPX00MEM6
	XCEM-A	NTLK86AAE5	02	NNTMPX00MRRF
	XCEM-A	NTLK86AAE5	02	NNTMPX00MHPR
	XCEM-A	NTLK86AAE5	02	NNTMPX00MPRG
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY0
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY3
3	DUS 41 01	KDU 137 624/1	R5A	A402058111
	XMU 02 01	KDU 137 745/1	R2A	C825513812
	SUP 6601	BFL 901 009/1	R3B	BR81066826
4	Load	TF100	--	09121631
	Load	TF100	--	09121602
5	Power Supply	DH1716A-14	--	20080401



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.
 L10 denotes LTE network with 10MHz channel bandwidth.
 C denotes CDMA network.

Mix Carrier (x2)

Mode 1 - L1.4&C, L3&C, L5&C, L10&C

MSR	Channel No.	Frequency (MHz)
L1.4&C	2407 & 35	869.7+871.05
L3&C	2415 & 88	870.5+872.64
L5&C	2425 & 155	871.5+874.65
L10&C	2450 & 321	874.0+879.63

Mode 2 - L1.4&C, L3&C, L5&C, L10&C

MSR	Channel No.	Frequency (MHz)
L1.4&C	2525 & 428	881.5+882.84
L3&C	2525 & 455	881.5+883.65
L5&C	2525 & 488	881.5+884.64
L10&C	2525 & 571	881.5+887.13

Mode 3 - C&L1.4, C&L3, C&L5, C&L10

MSR	Channel No.	Frequency (MHz)
C&L1.4	732 & 2643	891.96+893.3
C&L3	679 & 2635	890.37+892.5
C&L5	612 & 2625	888.36+891.5
C&L10	445 & 2600	883.35+889.0

**Mix Carrier (x3)**

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

MSR	Channel No.	Frequency (MHz)
L1.4&L1.4&C	2407 & 2421 & 81	869.7+871.1+872.43
L3&L3&C	2415 & 2445 & 188	870.5+873.5+875.64
L5&L5&C	2425 & 2475 & 321	871.5+876.5+879.63

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

MSR	Channel No.	Frequency (MHz)
C&L1.4&L1.4	339 & 2525 & 2539	880.17+881.5+882.9
C&L3&L3	312 & 2525 & 2555	879.36+881.5+884.5
C&L5&L5	279 & 2525 & 2575	878.37+881.5+886.5

Mode 6 - C&L1.4&L1.4, C&L3&L3, C&L5&L5

MSR	Channel No.	Frequency (MHz)
C&L1.4&L1.4	685 & 2629 & 2643	890.55+891.9+893.3
C&L3&L3	579 & 2605 & 2635	887.37+889.5+892.5
C&L5&L5	445 & 2575 & 2625	883.35+886.5+891.5

Mix Carrier (x4)

Mode 7 - C&L1.4&C&C, C&L3&C&C, C& L5&C&C

MSR	Channel No.	Frequency (MHz)
C&L1.4&C&C	339 & 2525 & 428 & 469	880.17+881.5+882.84+884.07
C&L3&C&C	312 & 2525 & 455 & 496	879.36+881.5+883.65+884.88
C&L5&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

No modifications were made to the EUT during testing.

1.8 ALTERNATIVE TEST SITE

Under our group UKAS Accreditation, TÜV SÜD Product Service conducted the following tests at Ericsson in Beijing, China:

- Maximum Peak Output Power – Conducted
- Peak to Average Ratio
- Band Edge
- Conducted Spurious Emissions

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

FCC Accreditation 910917:

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

Industry Canada Accreditation 7308A-1:

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



Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Ericsson RRUS 12 B5 / KRC 161 321/2



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 12 B5 / KRC 161 321/2, S/N: CB26989524

2.1.3 Date of Test and Modification State

19, 22 July and 05 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 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, L10&C
 - Mode 2 - L1.4&C, L3&C, L5&C, L10&C
 - Mode 3 - C&L1.4, C&L3, C&L5, C&L10
 - Mode 5 - C&L1.4&L1.4, C&L3&L3, C&L5&L5
 - Mode 7 - C&L1.4&C&C, C&L3&C&C, C&L5&C&C

2.1.6 Environmental Conditions

	19 July 2013	22 July 2013	05 August 2013
Ambient Temperature	23.5°C	22.0°C	23.8°C
Relative Humidity	60.5%	62.0%	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 22 and Industry Canada RSS-132 for Maximum Peak Output Power.

The test results are shown below

Mix Carrier (x2)

Declarative Maximum Output Power:

L1.4&C, L3&C, L5&C: 47.80dBm

L10&C: 47.50dBm

Configuration 1 - Mode 1 - L1.4&C, L3&C, L5&C, L10&C

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2407 & 35	869.7+871.05	40.3	47.71	59.02
L3&C	2415 & 88	870.5+872.64	40.3	47.96	62.52
L5&C	2425 & 155	871.5+874.65	40.3	47.80	60.26
L10&C	2450 & 321	874.0+879.63	40.3	47.48	55.98

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2407 & 35	869.7+871.05	40.3	47.70	58.88
L3&C	2415 & 88	870.5+872.64	40.3	47.92	61.94
L5&C	2425 & 155	871.5+874.65	40.3	47.76	59.70
L10&C	2450 & 321	874.0+879.63	40.3	47.47	55.85

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2407 & 35	869.7+871.05	40.3	47.69	58.75
L3&C	2415 & 88	870.5+872.64	40.3	47.94	62.23
L5&C	2425 & 155	871.5+874.65	40.3	47.78	59.98
L10&C	2450 & 321	874.0+879.63	40.3	47.49	56.10

**Configuration 1 - Mode 2 - L1.4&C, L3&C, L5&C, L10&C****LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2525 & 428	881.5+882.84	40.3	47.68	58.61
L3&C	2525 & 455	881.5+883.65	40.3	47.76	59.70
L5&C	2525 & 488	881.5+884.64	40.3	47.75	59.57
L10&C	2525 & 571	881.5+887.13	40.3	47.45	55.59

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2525 & 428	881.5+882.84	40.3	47.69	58.75
L3&C	2525 & 455	881.5+883.65	40.3	47.75	59.57
L5&C	2525 & 488	881.5+884.64	40.3	47.73	59.29
L10&C	2525 & 571	881.5+887.13	40.3	47.44	55.46

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
L1.4&C	2525 & 428	881.5+882.84	40.3	47.67	58.48
L3&C	2525 & 455	881.5+883.65	40.3	47.75	59.57
L5&C	2525 & 488	881.5+884.64	40.3	47.75	59.57
L10&C	2525 & 571	881.5+887.13	40.3	47.41	55.08

Configuration 1 - Mode 3 - C&L1.4, C&L3, C&L5, C&L10**LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
C&L1.4	732 & 2643	891.96+893.3	40.3	47.71	59.02
C&L3	679 & 2635	890.37+892.5	40.3	47.63	57.94
C&L5	612 & 2625	888.36+891.5	40.3	47.68	58.61
C&L10	445 & 2600	883.35+889.0	40.3	47.40	54.95

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
C&L1.4	732 & 2643	891.96+893.3	40.3	47.71	59.02
C&L3	679 & 2635	890.37+892.5	40.3	47.62	57.81
C&L5	612 & 2625	888.36+891.5	40.3	47.66	58.34
C&L10	445 & 2600	883.35+889.0	40.3	47.37	54.58



Product Service

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
C&L1.4	732 & 2643	891.96+893.3	40.3	47.68	58.61
C&L3	679 & 2635	890.37+892.5	40.3	47.65	58.21
C&L5	612 & 2625	888.36+891.5	40.3	47.68	58.61
C&L10	445 & 2600	883.35+889.0	40.3	47.39	54.83

Mix Carrier (x3)**Declarative Maximum Output Power:****C&L1.4&L1.4: 47.50dBm****C&L3&L3: 47.43dBm****C&L5&L5: 47.40dBm****Configuration 1 - Mode 5 – C&L1.4&L1.4, C&L3&L3, C&L5&L5****LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
C&L1.4&L1.4	339 & 2525 & 2539	880.17+881.5+882.9	40.3	46.75	47.32
C&L3&L3	312 & 2525 & 2555	879.36+881.5+884.5	40.3	47.36	54.45
C&L5&L5	279 & 2525 & 2575	878.37+881.5+886.5	40.3	47.32	53.95

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
C&L1.4&L1.4	339 & 2525 & 2539	880.17+881.5+882.9	40.3	46.76	47.42
C&L3&L3	312 & 2525 & 2555	879.36+881.5+884.5	40.3	47.35	54.33
C&L5&L5	279 & 2525 & 2575	878.37+881.5+886.5	40.3	47.35	54.33

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

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
C&L1.4&L1.4	339 & 2525 & 2539	880.17+881.5+882.9	40.3	46.77	47.53
C&L3&L3	312 & 2525 & 2555	879.36+881.5+884.5	40.3	47.35	54.33
C&L5&L5	279 & 2525 & 2575	878.37+881.5+886.5	40.3	47.29	53.58



Product Service

Mix Carrier (x4)**Declarative Maximum Output Power:****C&L1.4&C&C: 46.70dBm****C&L3&C&C: 46.50dBm****C&L5&C&C: 46.60dBm****Configuration 1 - Mode 7 – C&L1.4&C&C, C&L3&C&C, C&L5&C&C****LTE (E-TM1.1) & CDMA (QPSK)**

MSR	Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
C&L1.4&C&C	339 & 2525 & 428 & 469	880.17+881.5+882.84+884.07	40.3	46.71	46.88
C&L3&C&C	312 & 2525 & 455 & 496	879.36+881.5+883.65+884.88	40.3	46.65	46.24
C&L5&C&C	280 & 2525 & 488 & 529	878.40+881.5+884.64+885.87	40.3	46.68	46.56

Limit	≤500W or ≤+57dBm
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Remarks

The EUT does not exceed 500W or 57dBm at the measured frequencies.



2.2 PEAK – AVERAGE RATIO

2.2.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.913 (a)

2.2.2 Equipment Under Test

RRUS 12 B5 / KRC 161 321/2, S/N: CB26989524

2.2.3 Date of Test and Modification State

05, 06, 07 and 08 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.

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, L10&C
- Mode 2 - L1.4&C, L3&C, L5&C, L10&C
- Mode 3 - C&L1.4, C&L3, C&L5, C&L10
- Mode 5 - C&L1.4&L1.4, C&L3&L3, C&L5&L5
- Mode 7 - C&L1.4&C&C, C&L3&C&C, C&L5&C&C

2.2.6 Environmental Conditions

	05 August 2013	06 August 2013	07 August 2013	08 August 2013
Ambient Temperature	23.8°C	23.5°C	24.8°C	24.5°C
Relative Humidity	64.0%	67.0%	66.6%	64.2%



Product Service

2.2.7 Test Results

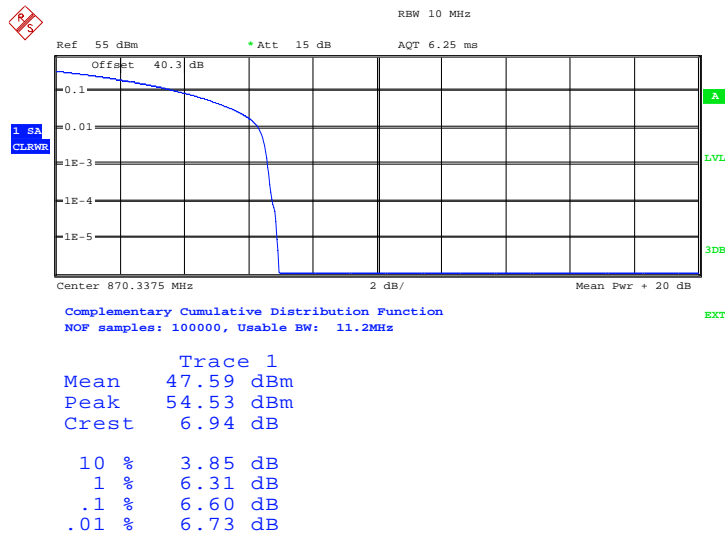
For the period of test the EUT met the requirements of FCC CFR 47 Part 22 for Peak – Average Ratio.

The test results are shown below.

Mix Carrier (x2)

Configuration 1 - Mode 1 - L1.4&C

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



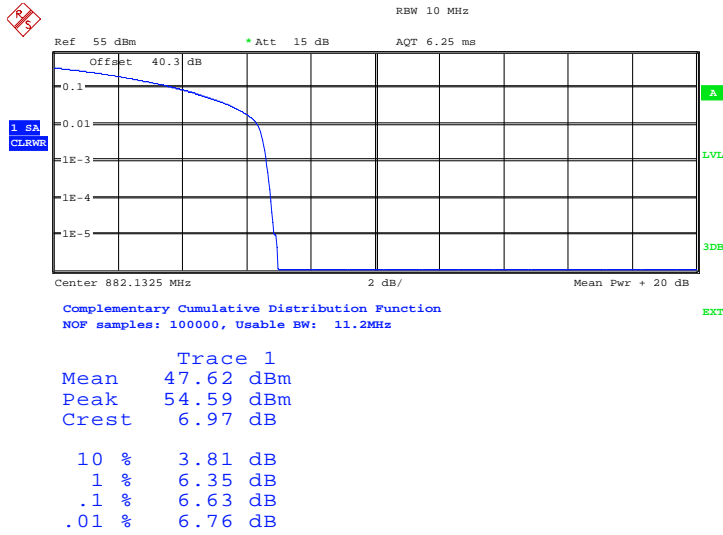
Date: 5.AUG.2013 11:09:13



Product Service

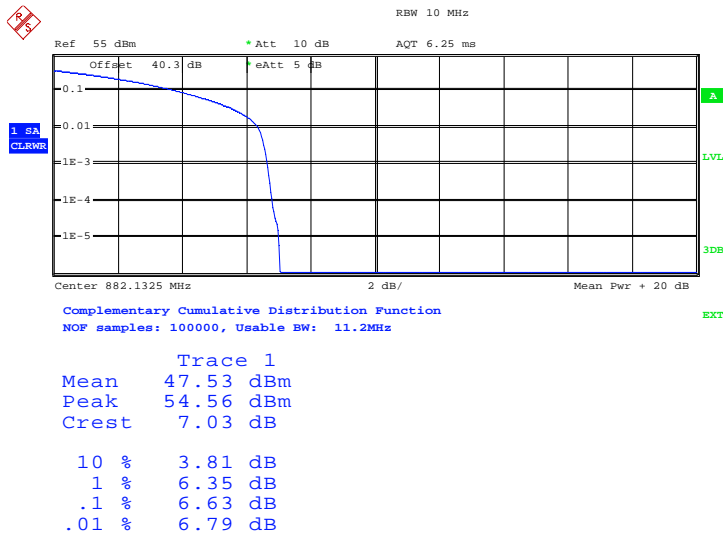
Configuration 1 - Mode 2 - L1.4&C

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



Date: 5.AUG.2013 13:17:38

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

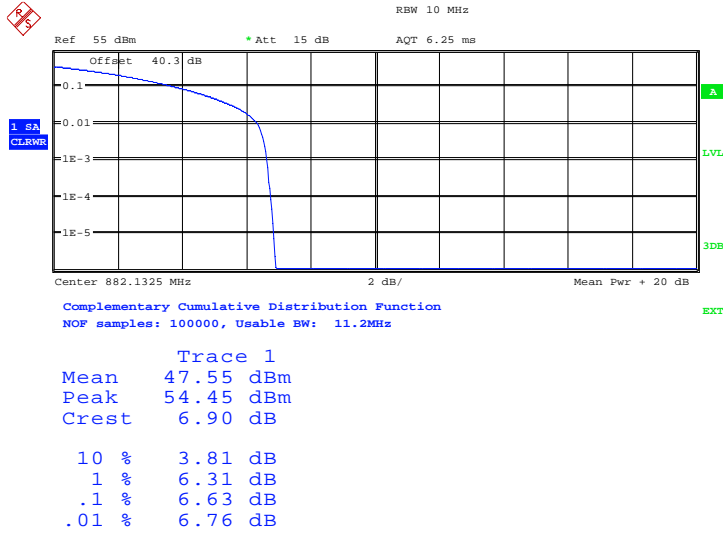


Date: 5.AUG.2013 13:59:30



Product Service

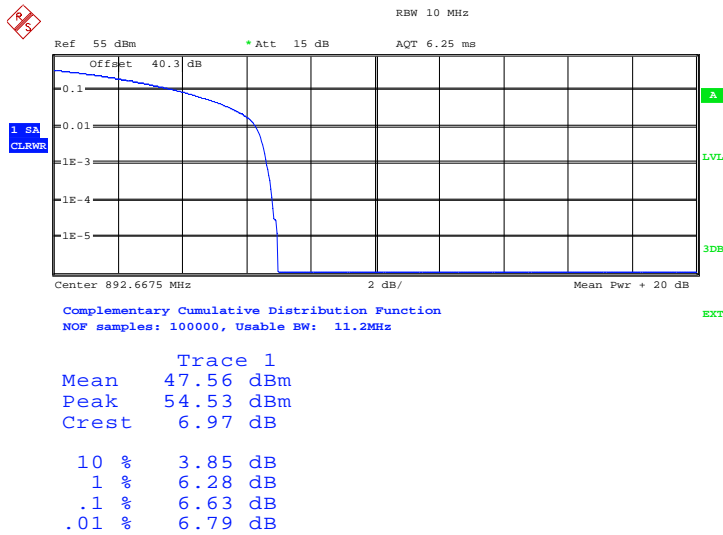
LTE (E-TM3.1) & CDMA (QPSK)



Date: 5.AUG.2013 14:12:35

Configuration 1 - Mode 3 - C&L1.4

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



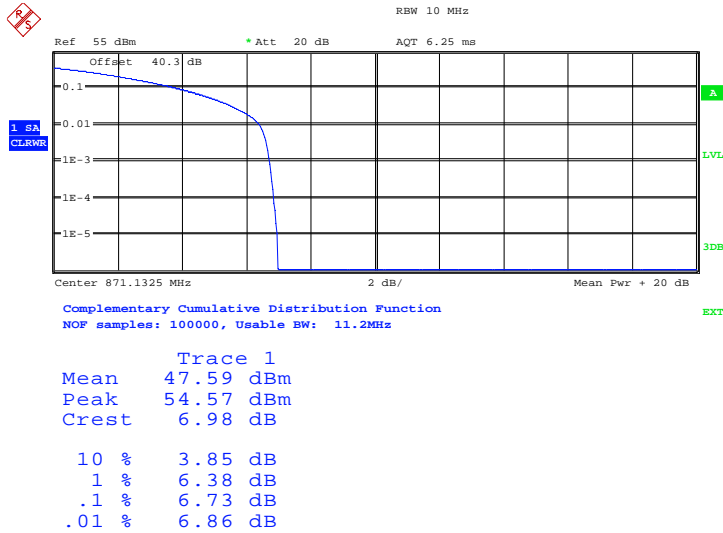
Date: 5.AUG.2013 14:25:20



Product Service

Configuration 1 - Mode 1- L3&C

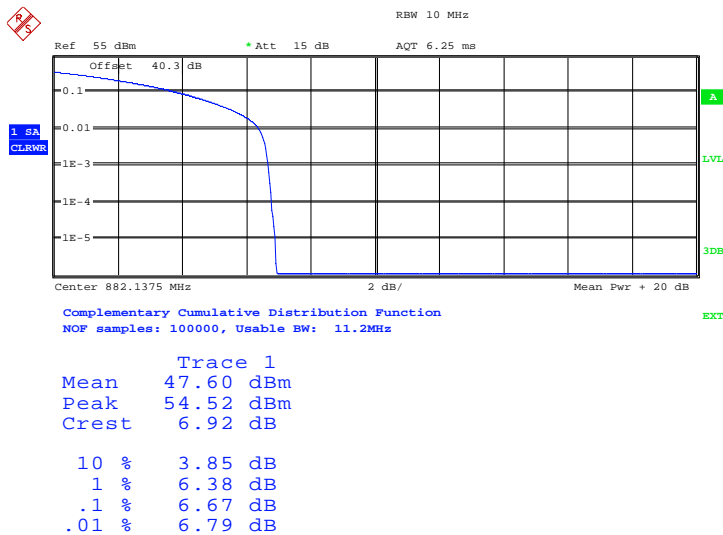
LTE (E-TM1.1) & CDMA (QPSK)



Date: 5.AUG.2013 16:37:17

Configuration 1 - Mode 2 - L3&C

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

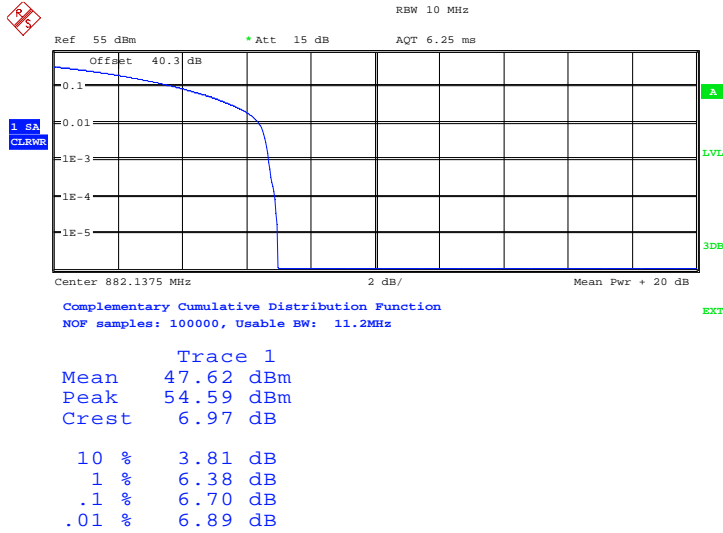


Date: 5.AUG.2013 17:00:59



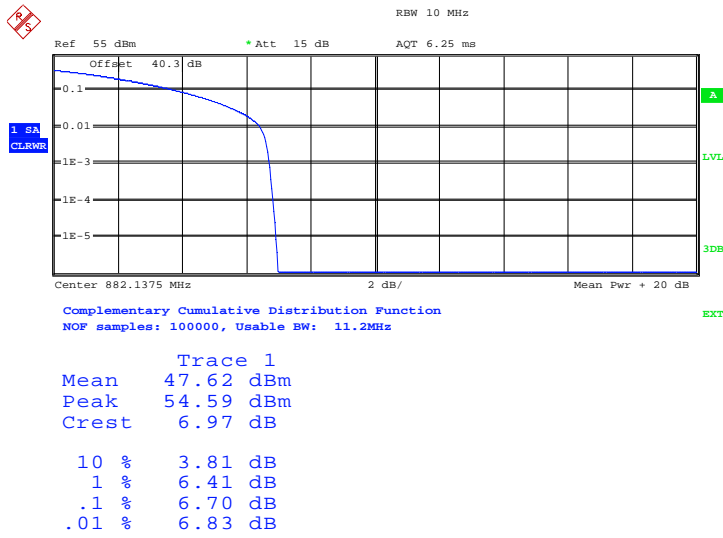
Product Service

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



Date: 5.AUG.2013 17:12:38

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



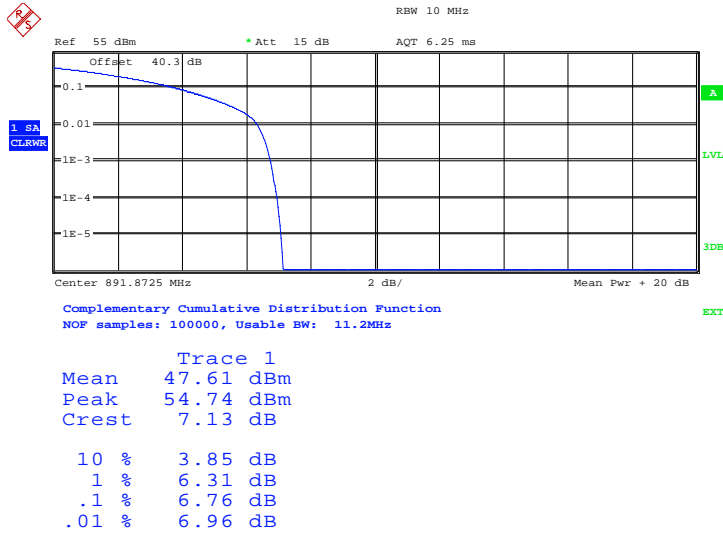
Date: 5.AUG.2013 17:13:24



Product Service

Configuration 1 - Mode 3 - C&L3

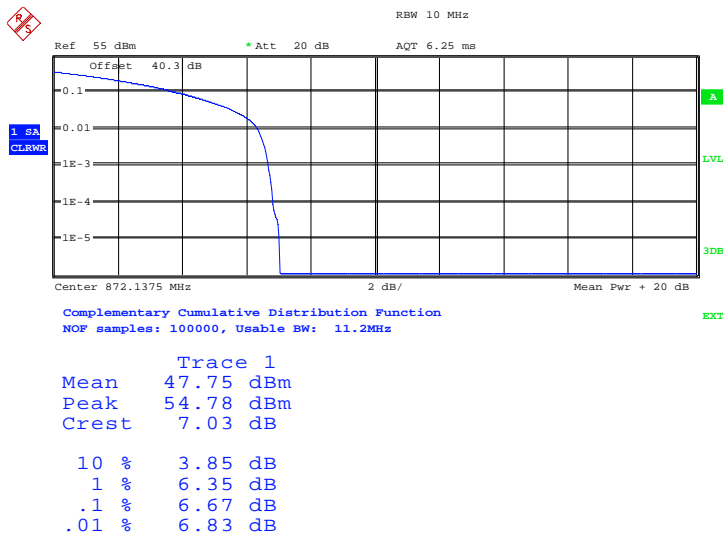
LTE (E-TM1.1) & CDMA (QPSK)



Date: 6.AUG.2013 09:45:46

Configuration 1 - Mode 1 - L5&C

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



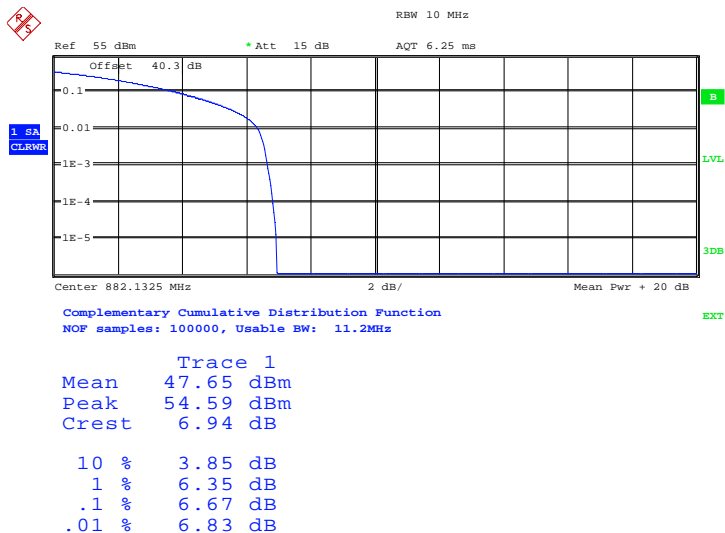
Date: 6.AUG.2013 10:09:23



Product Service

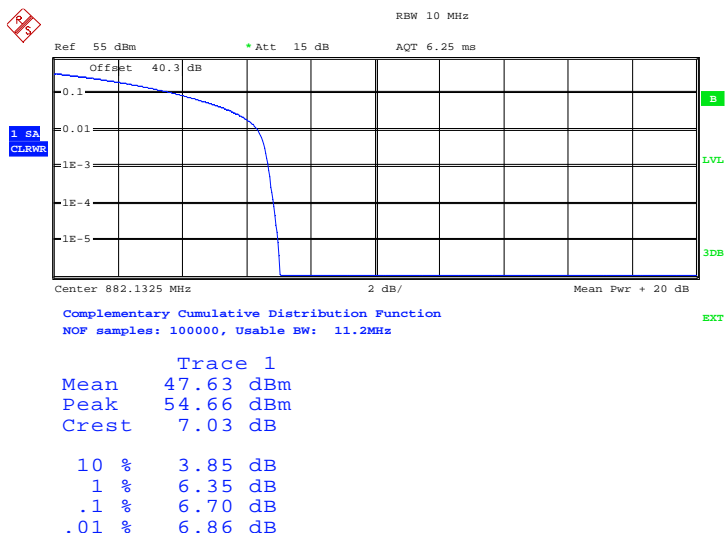
Configuration 1 - Mode 2 - L5&C

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



Date: 6.AUG.2013 10:51:41

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

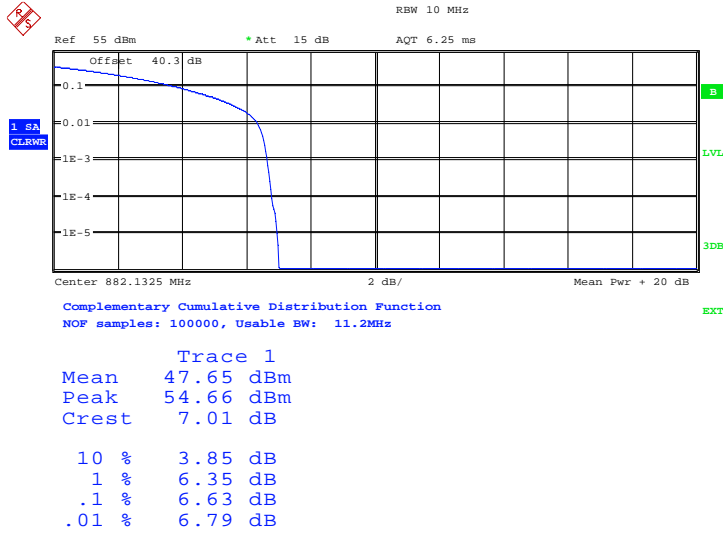


Date: 6.AUG.2013 10:47:00



Product Service

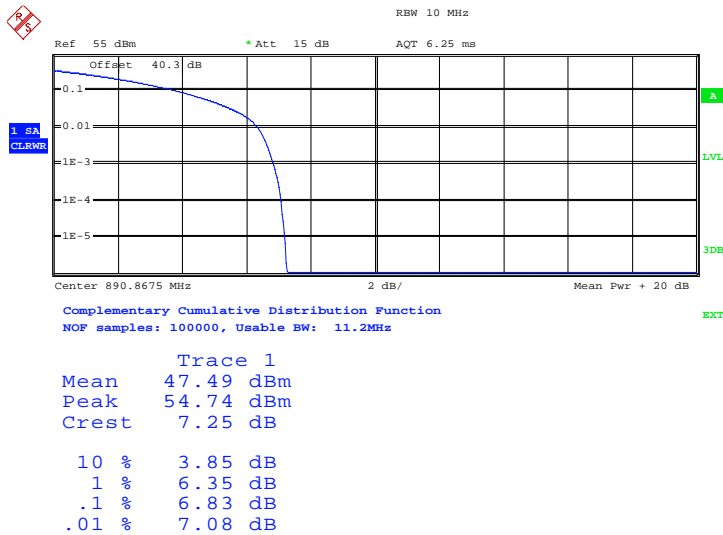
LTE (E-TM3.1) & CDMA (QPSK)



Date: 6.AUG.2013 10:46:15

Configuration 1 - Mode 3 - C&L5

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



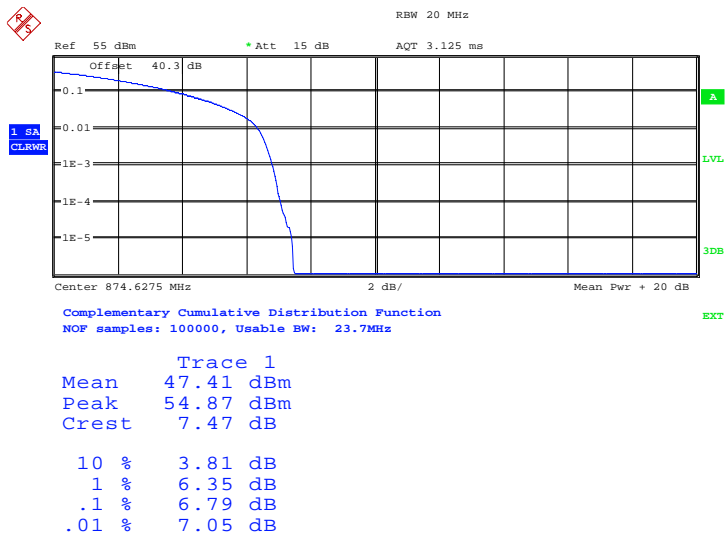
Date: 6.AUG.2013 11:02:31



Product Service

Configuration 1 - Mode 1 - L10&C

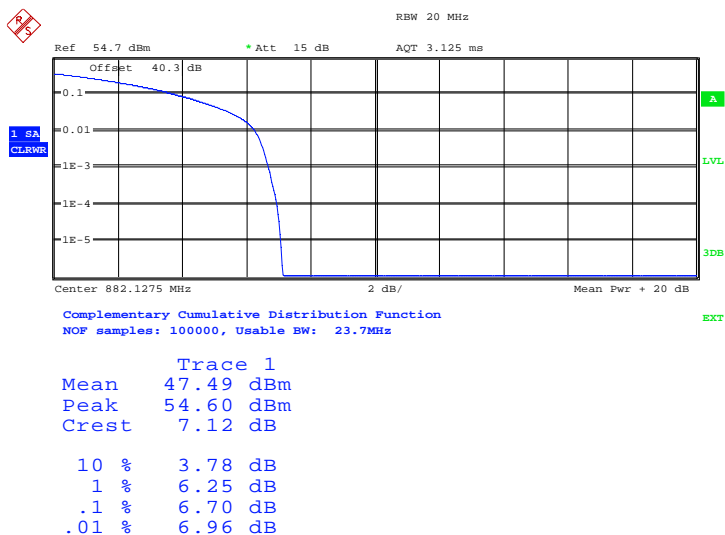
LTE (E-TM1.1) & CDMA (QPSK)



Date: 6.AUG.2013 11:28:48

Configuration 1 - Mode 2 - L10&C

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

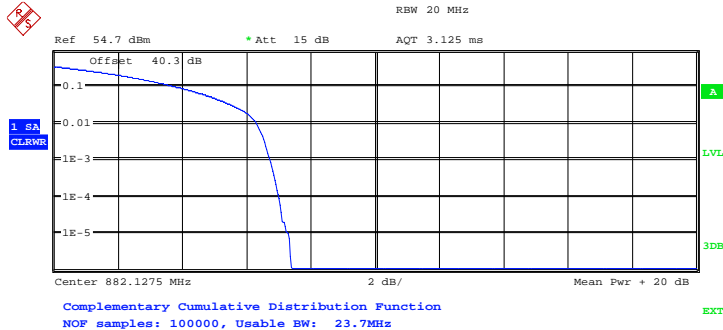


Date: 6.AUG.2013 13:40:28



Product Service

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

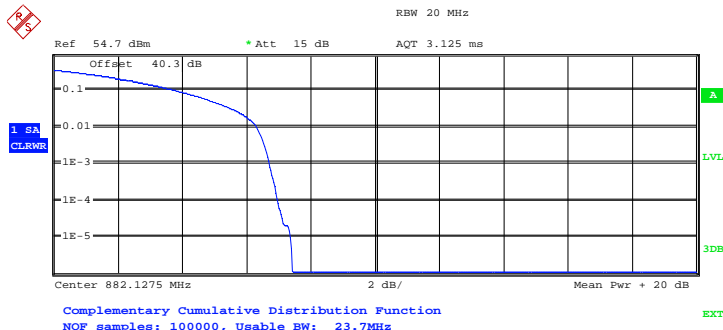


Trace 1
Mean 47.44 dBm
Peak 54.81 dBm
Crest 7.38 dB

10 % 3.85 dB
1 % 6.31 dB
.1 % 6.73 dB
.01 % 6.99 dB

Date: 6.AUG.2013 13:42:07

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



Trace 1
Mean 47.46 dBm
Peak 54.89 dBm
Crest 7.42 dB

10 % 3.81 dB
1 % 6.31 dB
.1 % 6.70 dB
.01 % 6.96 dB

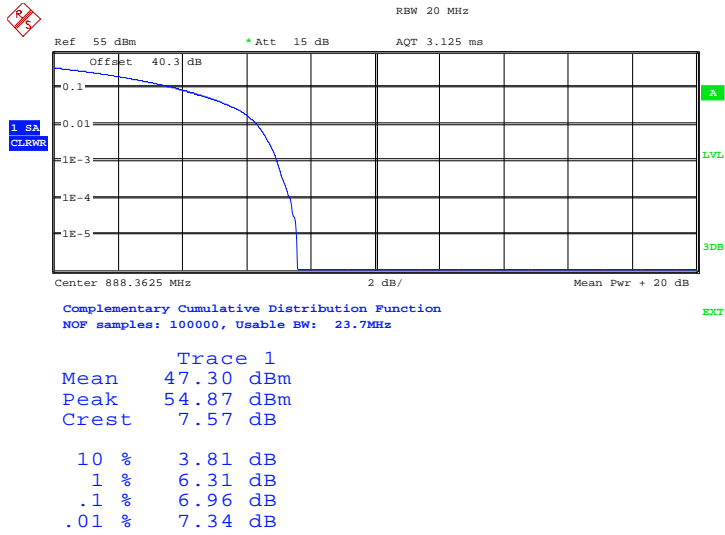
Date: 6.AUG.2013 13:47:16



Product Service

Configuration 1 - Mode 3 - C&L10

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



Date: 6.AUG.2013 13:58:02

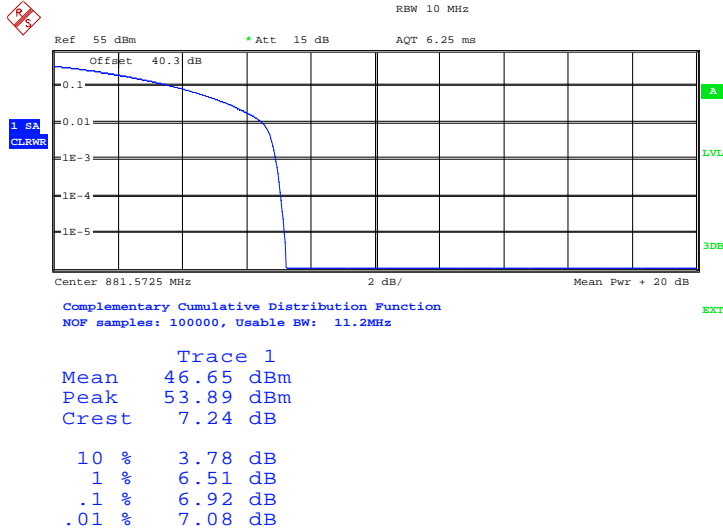


Product Service

Mix Carrier (x3)

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

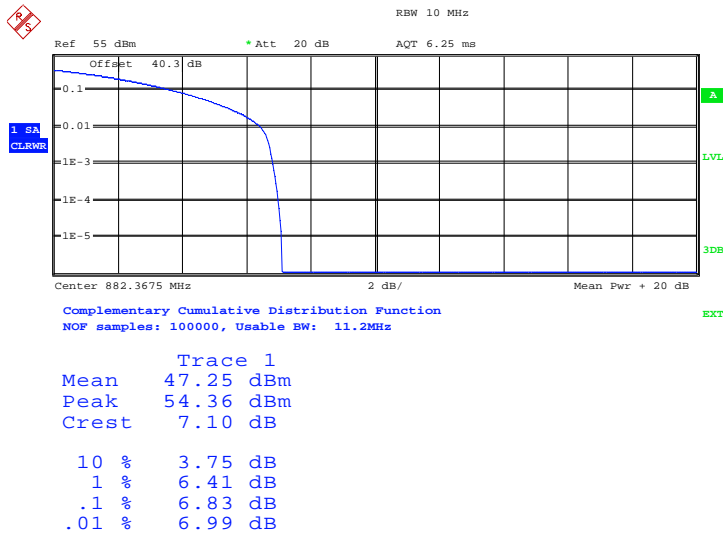
LTE (E-TM1.1) & CDMA (QPSK)



Date: 8.AUG.2013 12:32:28

Configuration 1 - Mode 5 - C&L3&L3

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



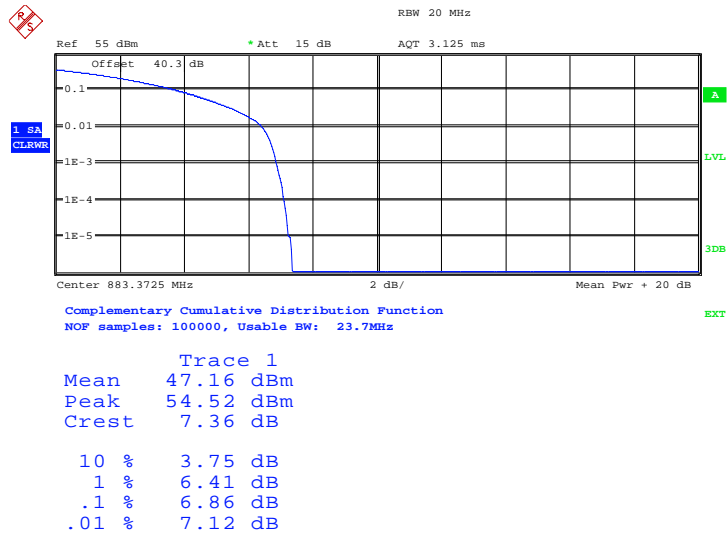
Date: 8.AUG.2013 13:44:17



Product Service

Configuration 1 - Mode 5 - C&L5&L5

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



Date: 8.AUG.2013 15:21:53

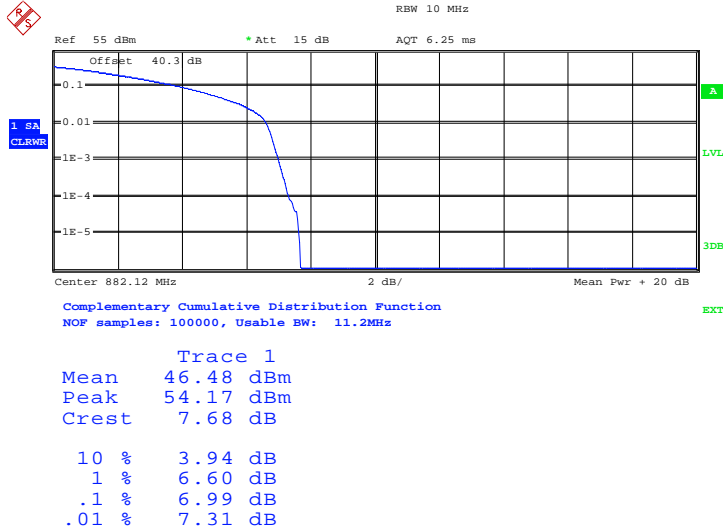


Product Service

Mix Carrier (x4)

Configuration 1 - Mode 7 - C&L1.4&C&C

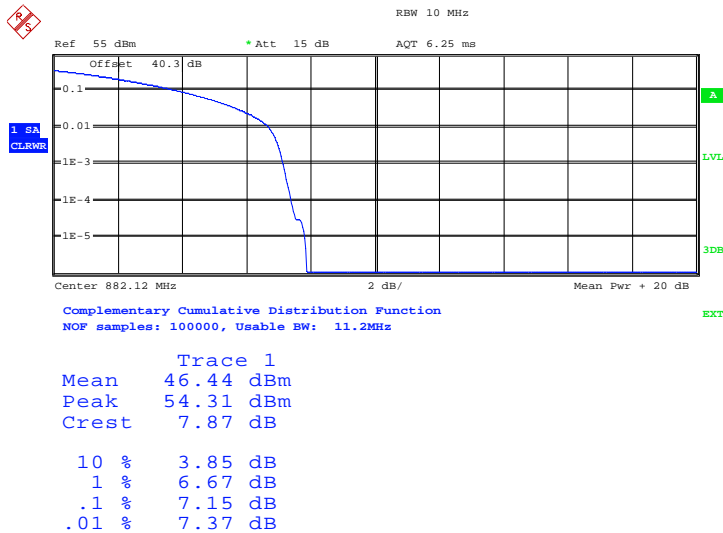
LTE (E-TM1.1) & CDMA (QPSK)



Date: 7.AUG.2013 10:42:50

Configuration 1 - Mode 7 - C&L3&C&C

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



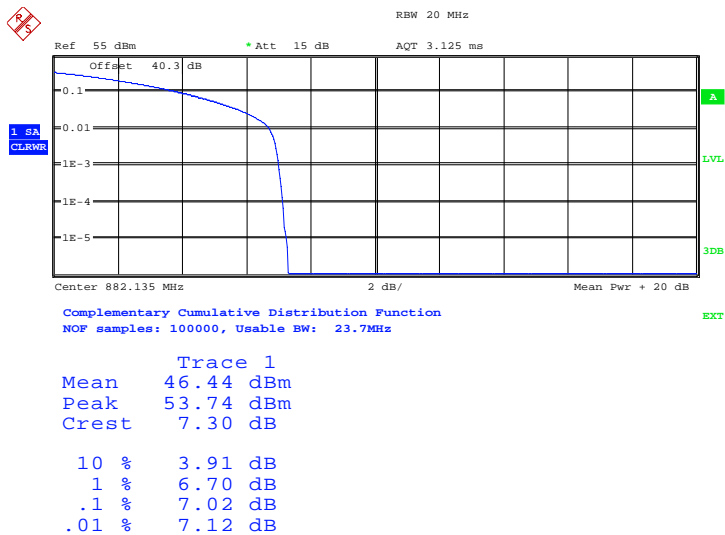
Date: 7.AUG.2013 13:34:56



Product Service

Configuration 1 - Mode 7 - C&L5&C&C

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



Date: 7.AUG.2013 14:27:40

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 (± 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 12 B5 / KRC 161 321/2, S/N: CB26989524

2.3.3 Date of Test and Modification State

05, 06, 07 and 08 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 for the resolution bandwidth 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 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 LTE emission bandwidth of the EUT support are 1.4MHz, 3MHz, 5MHz and 10MHz, the CDMA emission bandwidth is 1.25MHz. Then, 20kHz RBW was used up to 1MHz away from the band edges when the mix carrier of LTE bandwidth is 1.4MHz, 30kHz RBW when the mix carrier of LTE bandwidth is 3MHz, 50kHz RBW when the mix carrier of LTE bandwidth is 5MHz and 100kHz RBW when the mix carrier of LTE bandwidth is 10MHz. Due to LTE transmit in 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. Due to LTE transmit in MIMO in Mix carrier mode and the EUT has Two transmit ports, the limit was adjusted to -16dBm. Spectrum analyser detector was set as RMS.

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

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

Configuration 1 - Mode 1 - L1.4&C, L3&C, L5&C, L10&C
 - Mode 3 - C&L1.4, C&L3, C&L5, C&L10
 - Mode 4 - L1.4&L1.4&C, L3&L3&C
 - Mode 6 - C&L1.4&L1.4, C&L3&L3



2.3.6 Environmental Conditions

	05 August 2013	06 August 2013	07 August 2013	08 August 2013
Ambient Temperature	23.8°C	23.5°C	24.8°C	24.5°C
Relative Humidity	64.0%	67.0%	66.6%	64.2%

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 (± 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)	

Configuration 1 - Mode 1 - L10&C, Mode 3 - C&L10

Band Edge Frequency	Edge Test with LTE at the Bottom and Top Channel	RBW / VBW (Hz)
Bottom 869 MHz	Channel No. 2450 & 321 Frequencies 874.0MHz(L10)+879.63MHz(C)	100k / 1M
Top 894 MHz	Channel No. 445 & 2600 Frequencies 883.35MHz(C)+889.0MHz(L10)	



Product Service

Configuration 1 - Mode 4 - L1.4&L1.4&C, Mode 6 - C&L1.4&L1.4

Band Edge Frequency	Edge Test with CDMA at the Bottom and Top Channel	RBW / VBW (Hz)
Bottom 869 MHz	Channel No. 2407 & 2421 & 81 Frequencies 869.7MHz(L1.4)+871.3MHz(L1.4)+872.43MHz(C)	20k /200k
Top 894 MHz	Channel No. 685 & 2629 & 2643 Frequencies 890.55MHz(C)+891.9MHz(L1.4)+893.3MHz(L1.4)	

Configuration 1 - Mode 4 - L3&L3&C, Mode 6 - C&L3&L3

Band Edge Frequency	Edge Test with CDMA at the Bottom and Top Channel	RBW / VBW (Hz)
Bottom 869 MHz	Channel No. 2415 & 2445 & 188 Frequencies 870.5MHz(L3)+873.5MHz(L3)+875.64MHz(C)	30k /300k
Top 894 MHz	Channel No. 579 & 2605 & 2635 Frequencies 887.37MHz(C)+889.5MHz(L3)+892.5MHz(L3)	

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



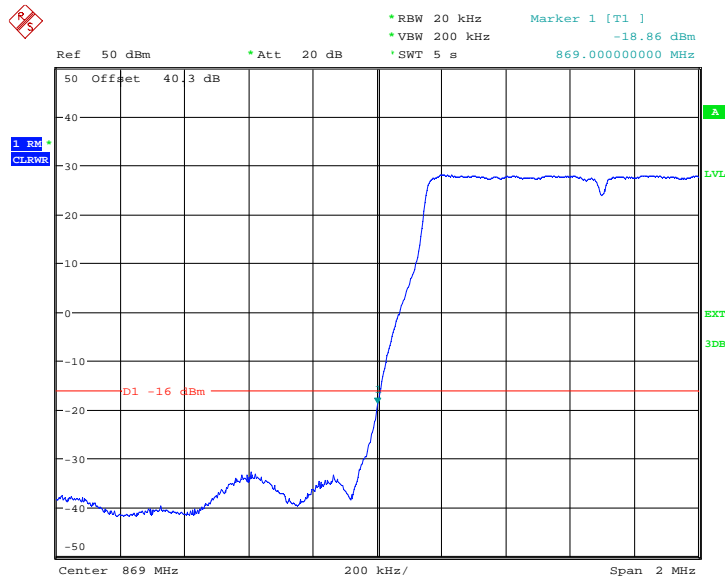
Product Service

The test results are shown below

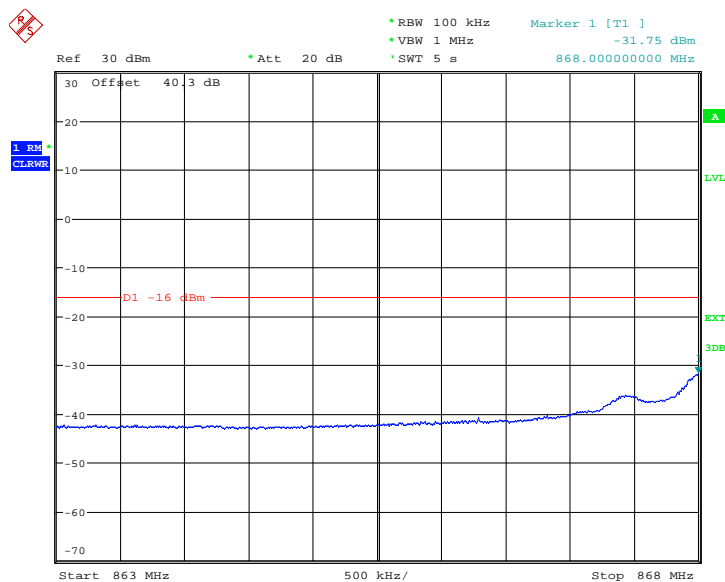
Mix Carrier (x2)

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

Configuration 1 - Mode 1 - L1.4&C



Date: 5.AUG.2013 11:11:09

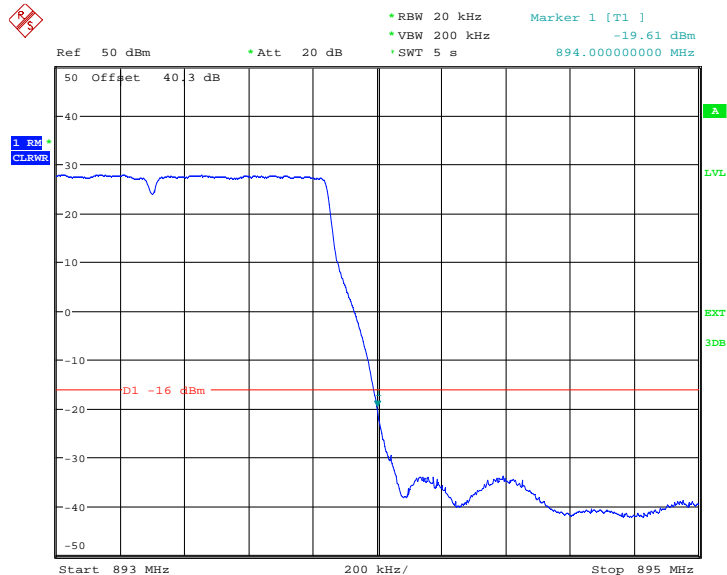


Date: 5.AUG.2013 11:12:13

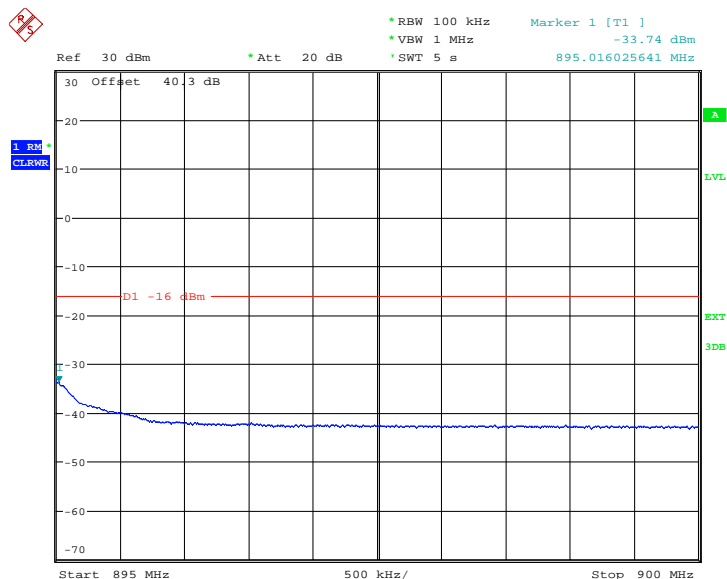


Product Service

Configuration 1 - Mode 3 - C&L1.4



Date: 5.AUG.2013 14:26:59

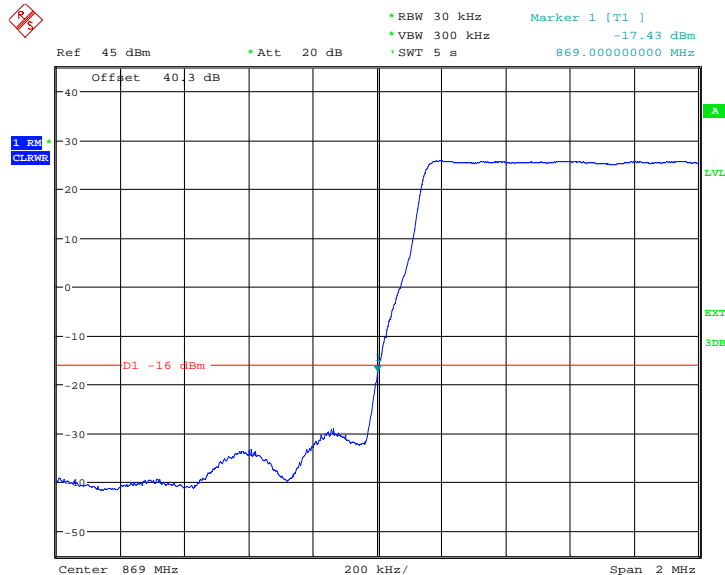


Date: 5.AUG.2013 14:27:49

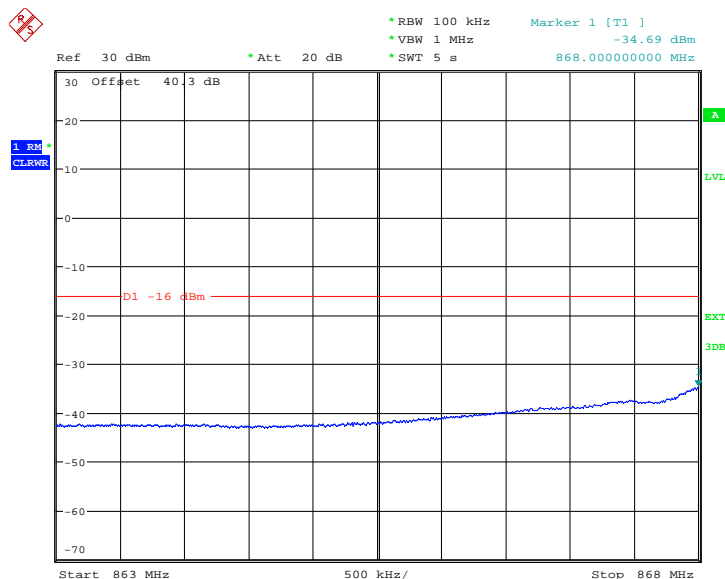


Product Service

Configuration 1 - Mode 1 - L3&C



Date: 6.AUG.2013 14:27:50

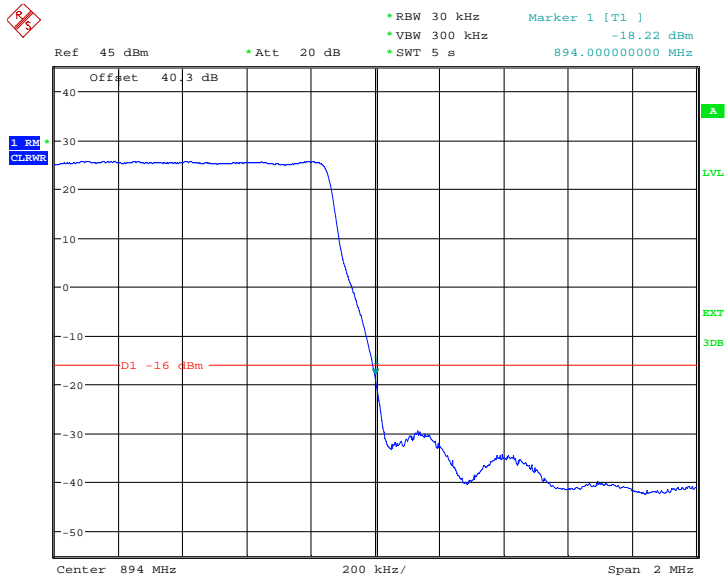


Date: 5.AUG.2013 16:40:29

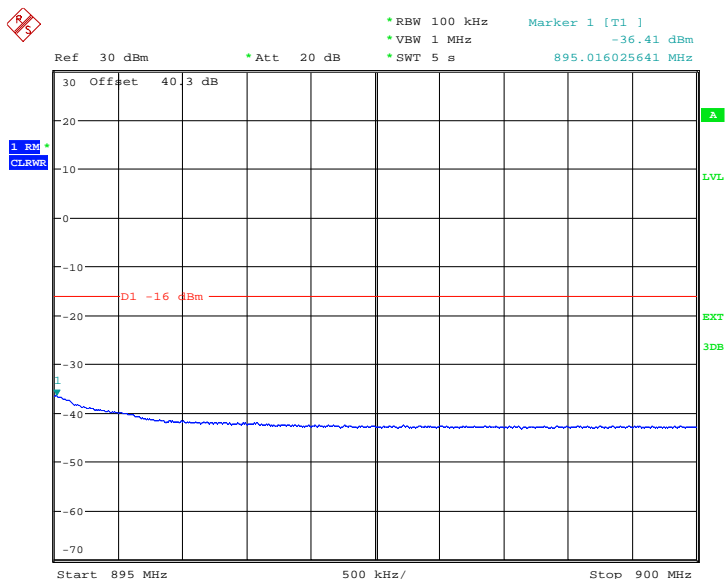


Product Service

Configuration 1 - Mode 3 - C&L3



Date: 6.AUG.2013 14:40:48

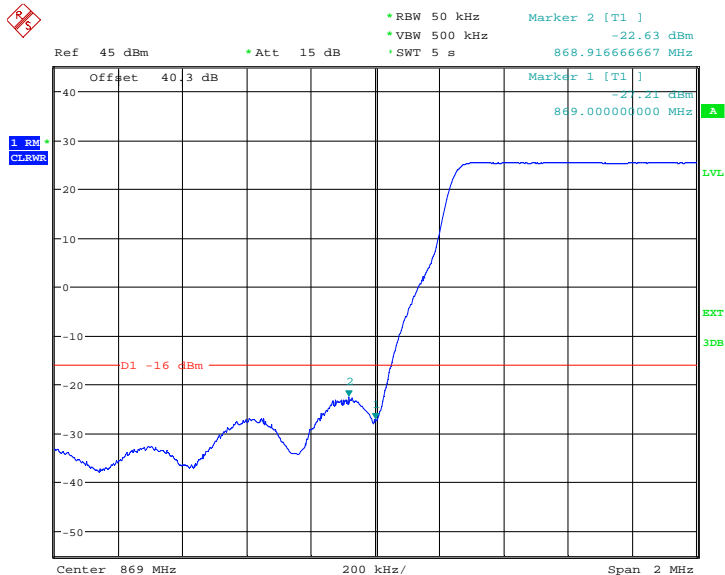


Date: 6.AUG.2013 09:44:52

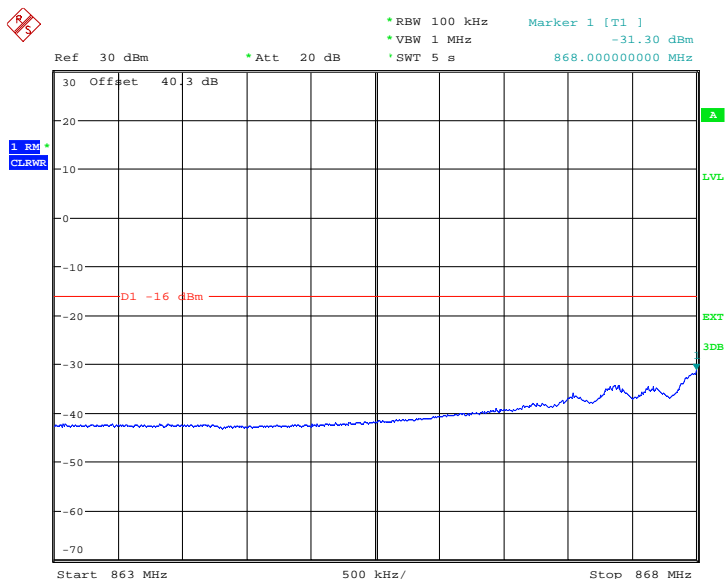


Product Service

Configuration 1 - Mode 1 - L5&C



Date: 6.AUG.2013 10:11:58

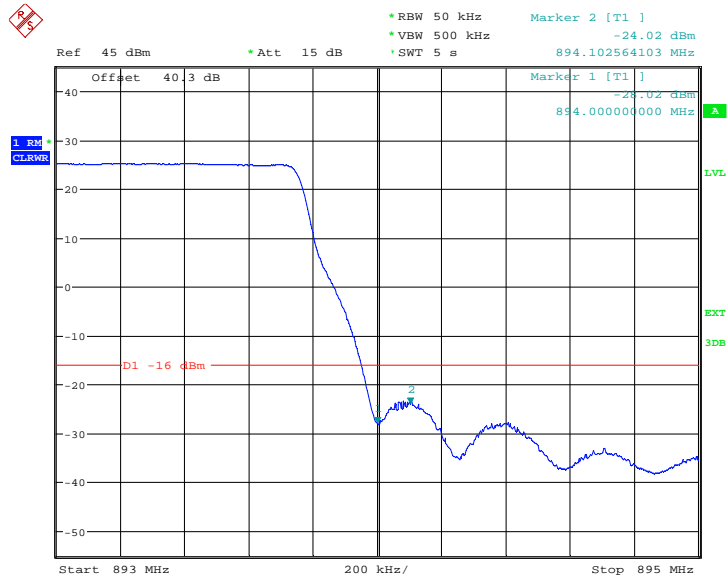


Date: 6.AUG.2013 10:13:05

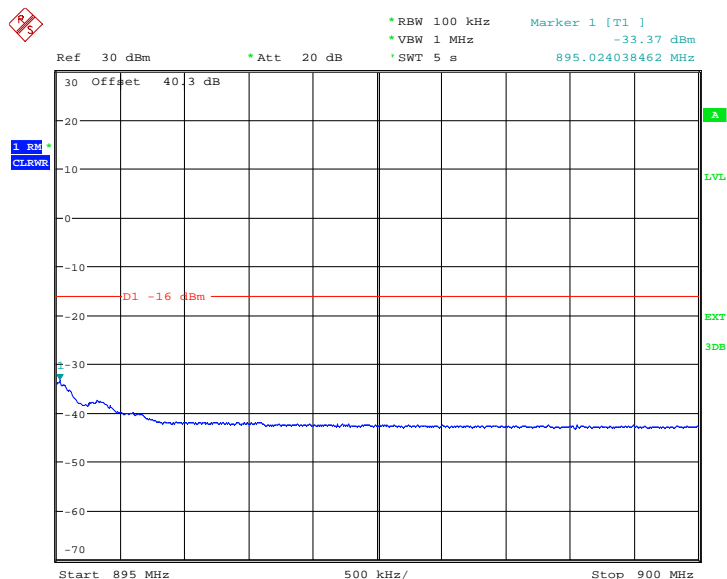


Product Service

Configuration 1 - Mode 3 - C&L5



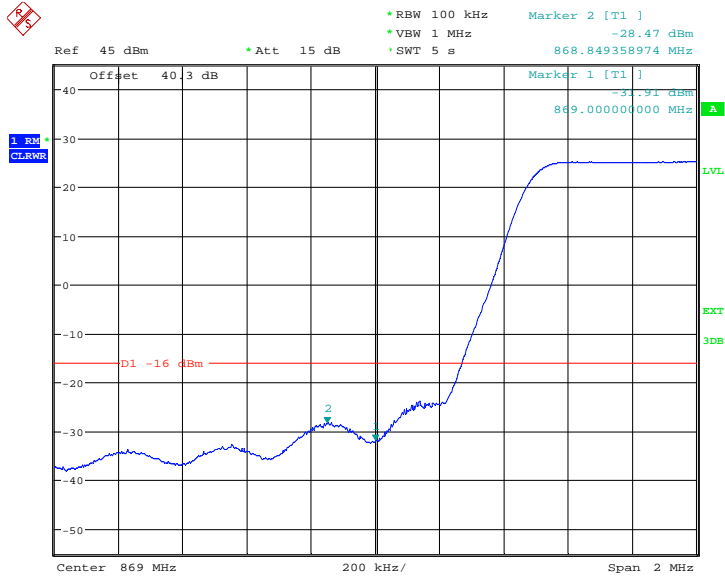
Date: 6.AUG.2013 11:04:16



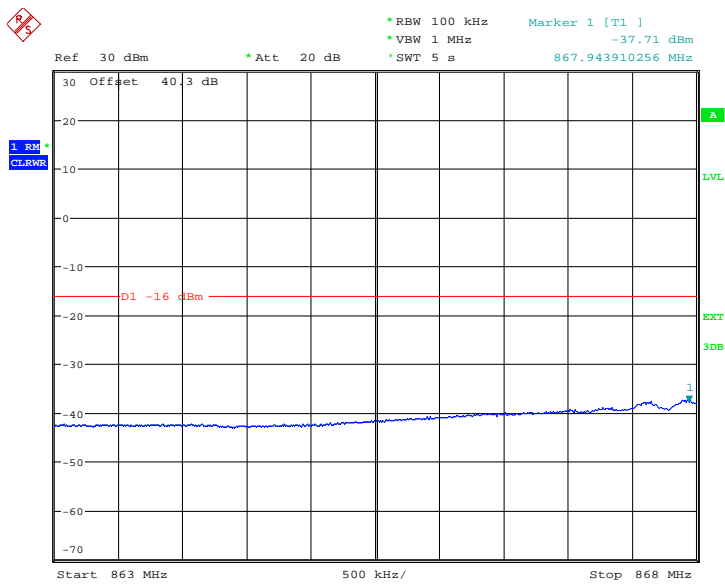
Date: 6.AUG.2013 11:09:30



Configuration 1 - Mode 1 - L10&C



Date: 6.AUG.2013 11:30:31

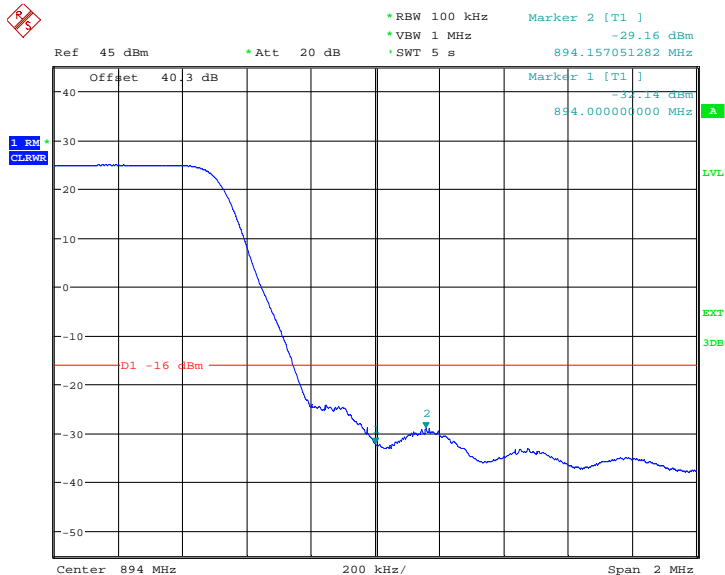


Date: 6.AUG.2013 11:31:01

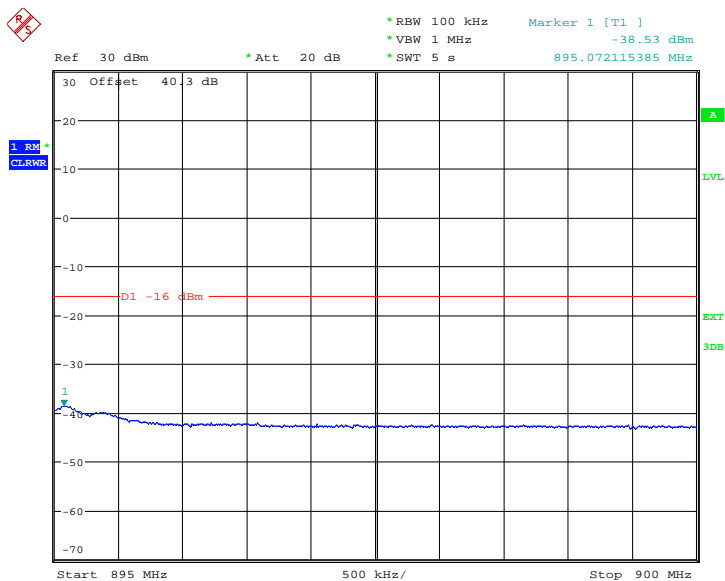


Product Service

Configuration 1 - Mode 3 - C&L10



Date: 6.AUG.2013 13:59:59

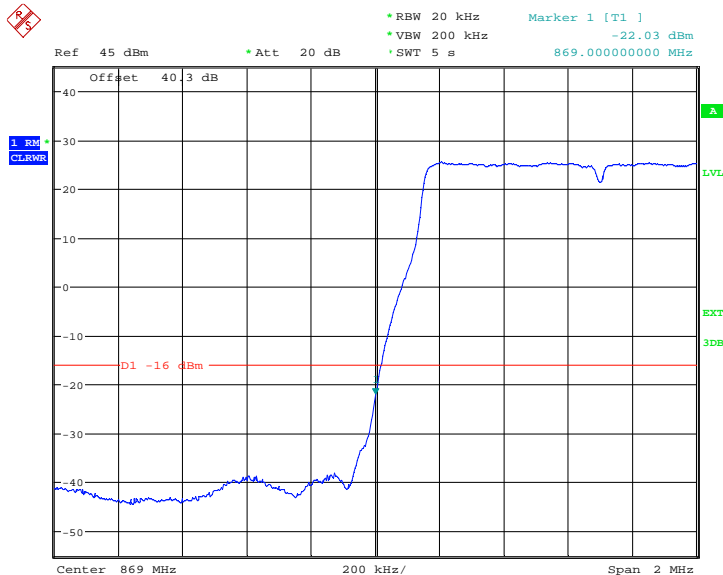


Date: 6.AUG.2013 14:00:38

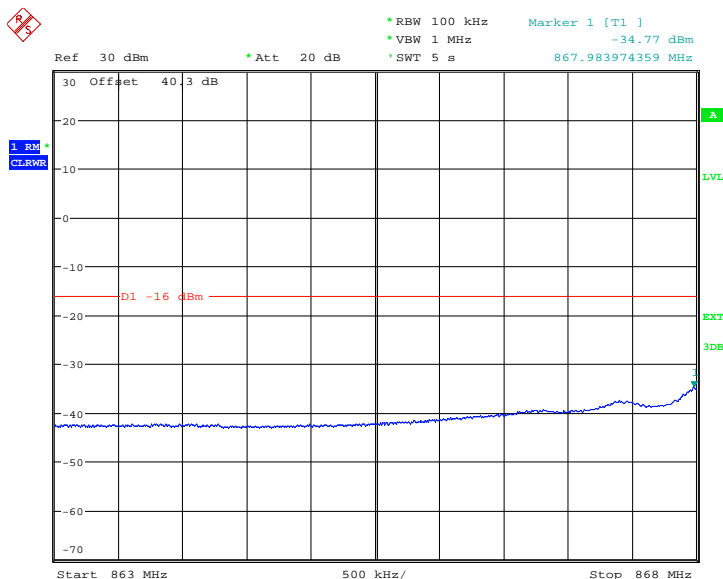


Product Service

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



Date: 8.AUG.2013 13:12:28

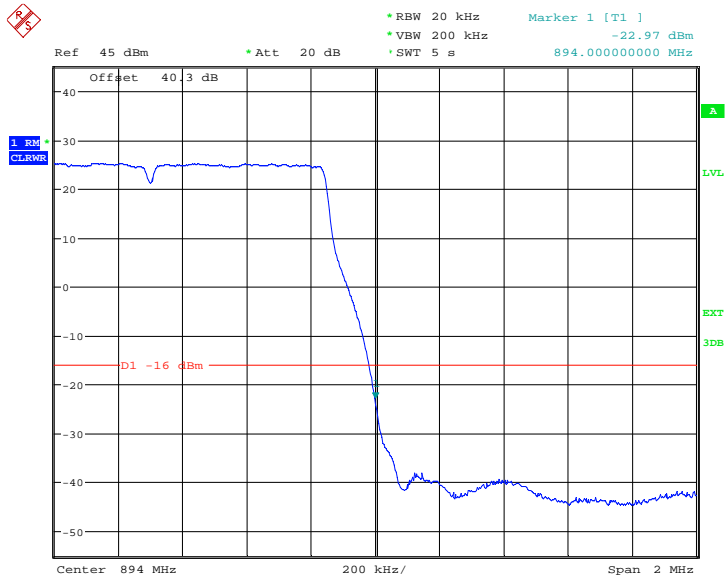


Date: 8.AUG.2013 13:13:05

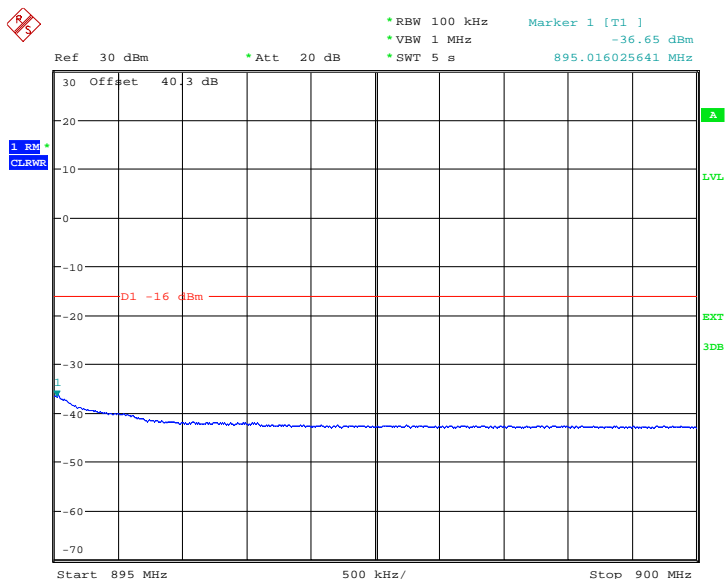


Product Service

Configuration 1 - Mode 6 - C&L1.4&L1.4



Date: 8.AUG.2013 13:29:14

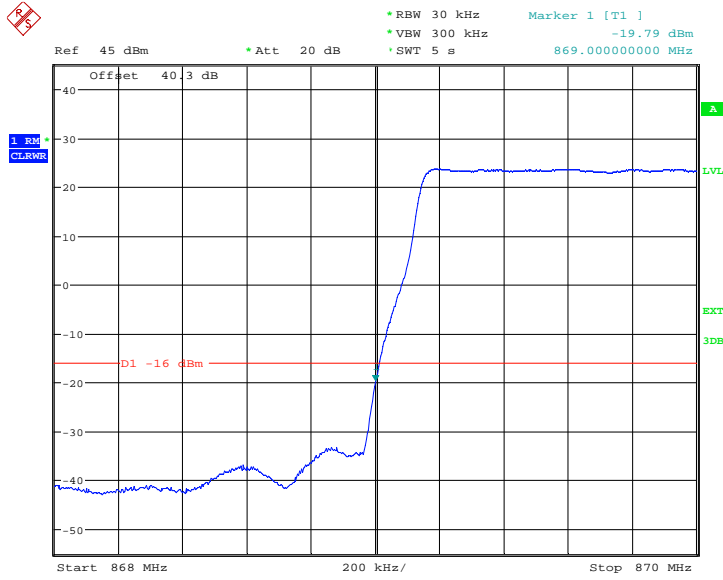


Date: 8.AUG.2013 13:29:45

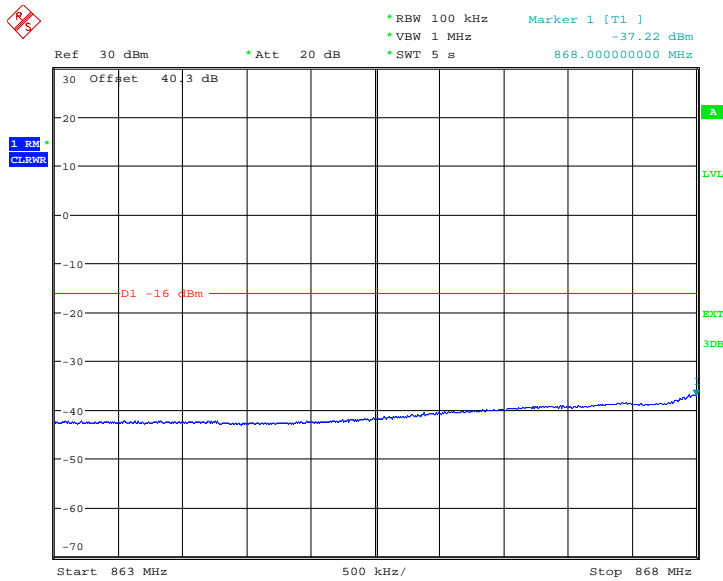


Product Service

Configuration 1 - Mode 4 - L3&L3&C



Date: 8.AUG.2013 14:26:15

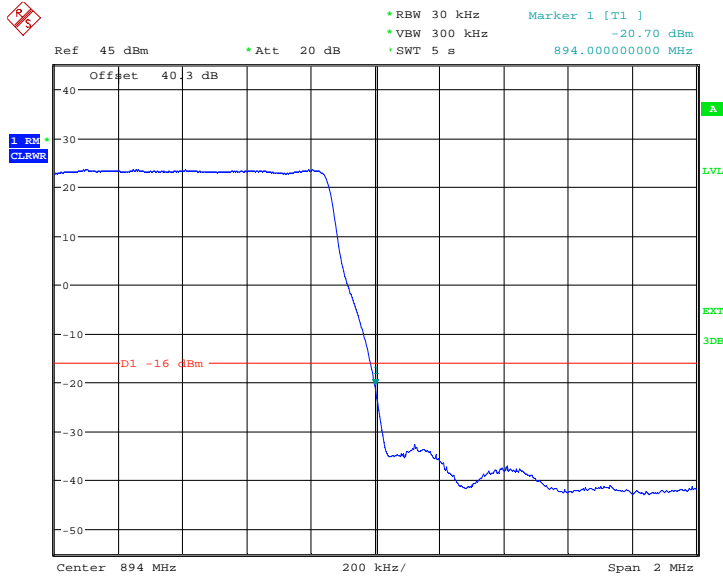


Date: 8.AUG.2013 14:27:24

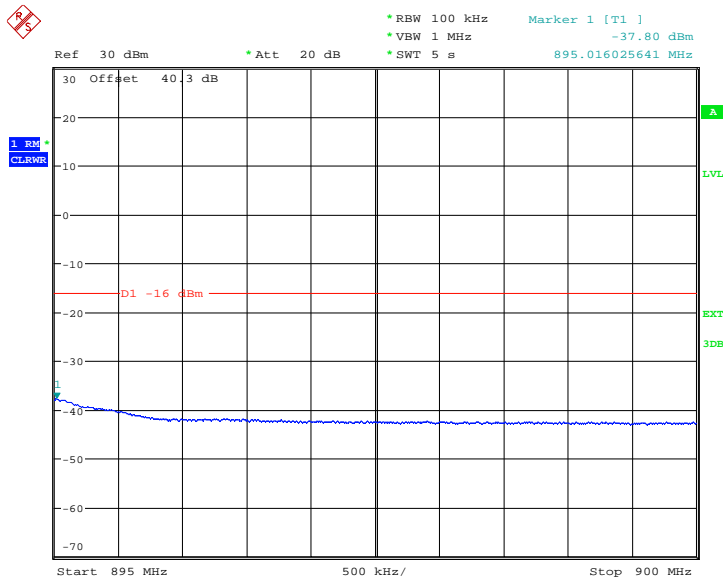


Product Service

Configuration 1 - Mode 6 - C&L3&L3



Date: 8.AUG.2013 14:45:43



Date: 8.AUG.2013 14:46:14

Limit

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



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 12 B5 / KRC 161 321/2, S/N: CB26989524

2.4.3 Date of Test and Modification State

24 and 26 July 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 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:

$$E_{(v/m)} = (30 \times 1.64 \times 46.24)^{0.5} / 3 = 15.899V/m = 144.03dB\mu V/m$$

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

$$43 + 10\log(46.24) = 59.65dB$$

Therefore the limit at 3m measurement distance is:

$$144.03 - 59.65 = 84.4 \text{ dB}\mu V/m$$

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.&C, L3&C, L5&C, L10&C
 - Mode 3 - C&L3
 - Mode 5 - C&L3&L3
 - Mode 7 - C&L3&C&C

2.4.6 Environmental Conditions

	24 July 2013	26 July 2013
Ambient Temperature	29.0°C	28.5°C
Relative Humidity	47.8%	48.0%



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

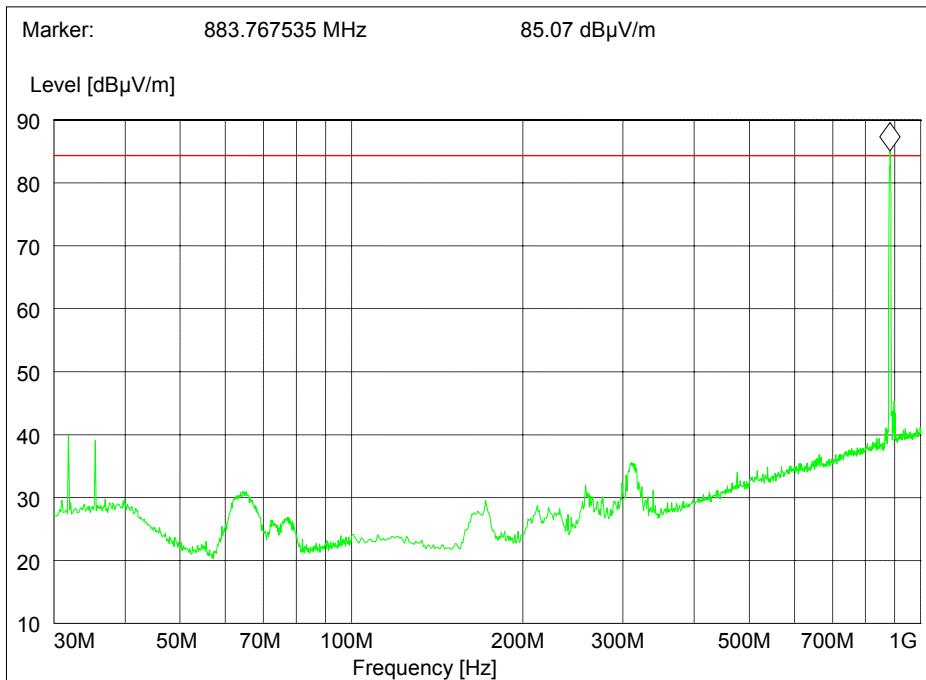
Note: The emission marked is the operating frequency.

Configuration 1 - Mode 1 - L3&C

Note: The emission marked is the operating frequency.

Configuration 1 - Mode 2 - L3&C

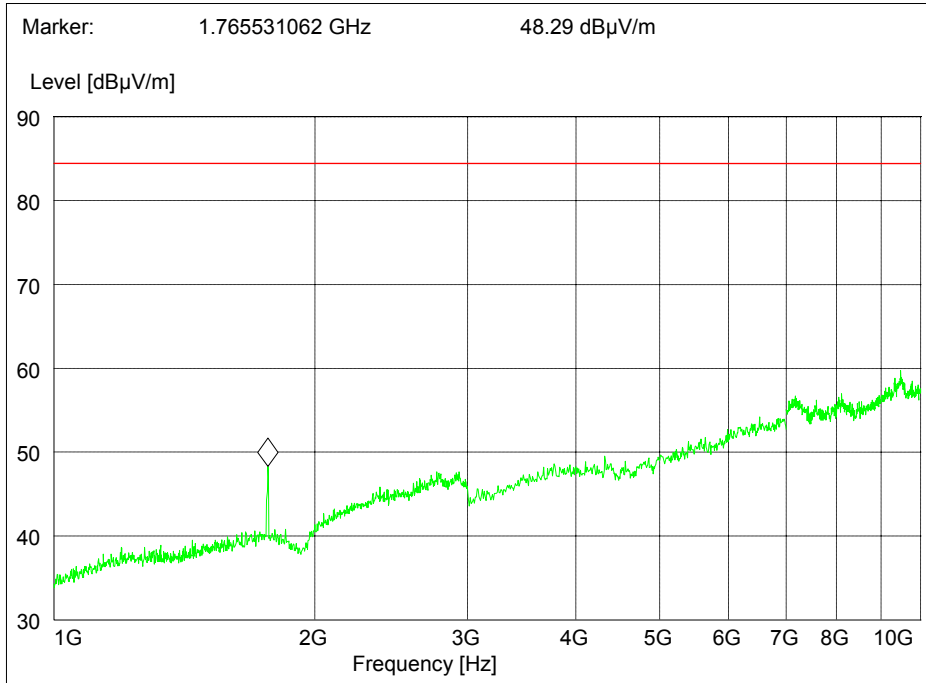
30MHz - 1GHz



Note: The emission beyond the limit is the operating frequency



1GHz - 10GHz



Configuration 1 - Mode 3 - C&L3

Note: The emission marked is the operating frequency.

Configuration 1 - Mode 2 - L5&C

No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 2 - L10&C

No emissions were detected within 20dB of the limit.

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

Configuration 1 - Mode 2 - L3&C

Note: The emission marked is the operating frequency.

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

Configuration 1 - Mode 2 - L3&C

No emissions were detected within 20dB of the limit.



Product Service

Mix Carrier (x3)

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

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

No emissions were detected within 20dB of the limit.

Mix Carrier (x4)

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

Configuration 1 - Mode 7 - C&L3&C&C

No emissions were detected within 20dB of the limit.

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

Remarks

The EUT does not exceed -13dBm / 84.4dB μ 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 12 B5 / KRC 161 321/2, S/N: CB26989524

2.5.3 Date of Test and Modification State

29 July 2013, 05, 06, 07 and 08 March 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 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 100kHz 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 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.

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

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

- Configuration 1 - Mode 1 - L1.4&C
- Mode 2 - L1.4&C, L3&C, L5&C, L10&C
- Mode 3 - C&L1.4
- Mode 5 - C&L1.4&L1.4
- Mode 7 - C&L1.4&C&C



Product Service

2.5.6 Environmental Conditions

	29 July 2013	05 August 2013	06 August 2013	07 August 2013	08 August 2013
Ambient Temperature	23.5°C	23.8°C	23.5°C	24.8°C	24.5°C
Relative Humidity	67.8%	64.0%	67.0%	66.6%	64.2%

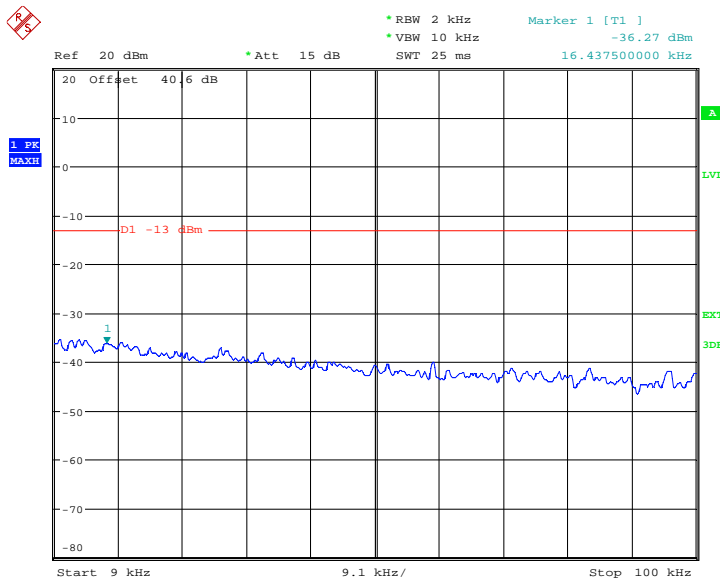
2.5.7 Test Results

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 measurement with a smaller Span showed that it was related to the LO feedthrough.



Date: 29.JUL.2013 17:18:55



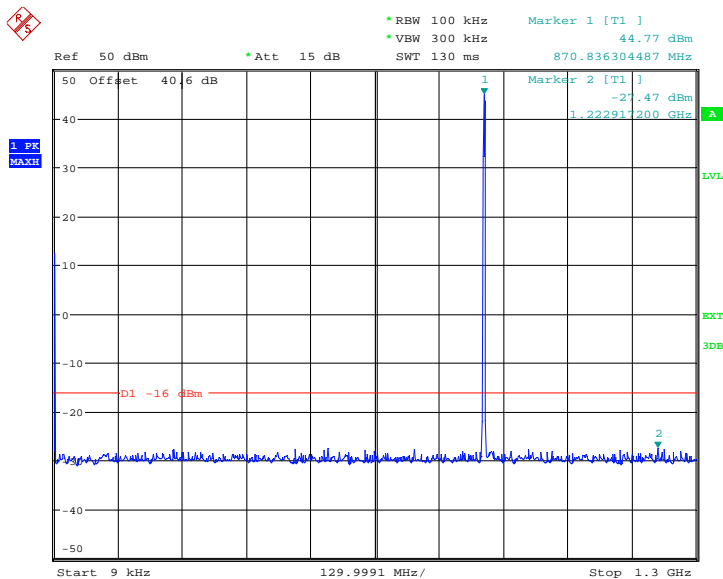
Product Service

Mix Carrier (x2)

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

Configuration 1 - Mode 1 - L1.4&C

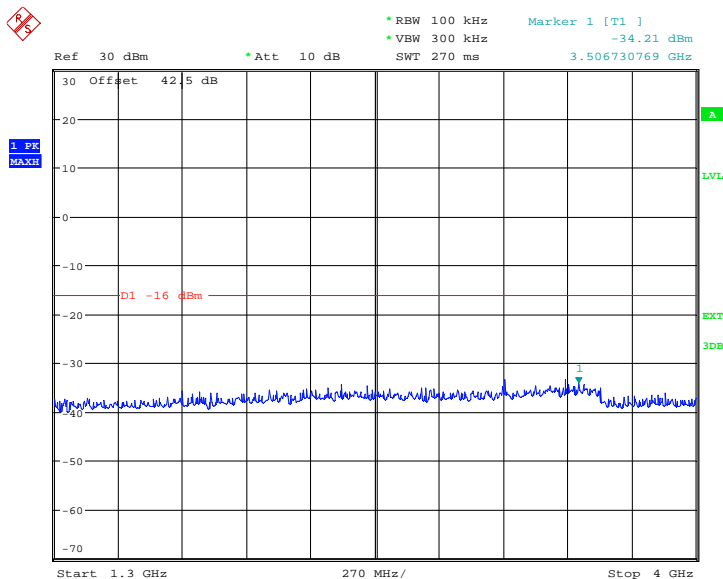
9kHz to 1.3GHz



Date: 5.AUG.2013 11:14:01

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

1.3GHz to 4GHz

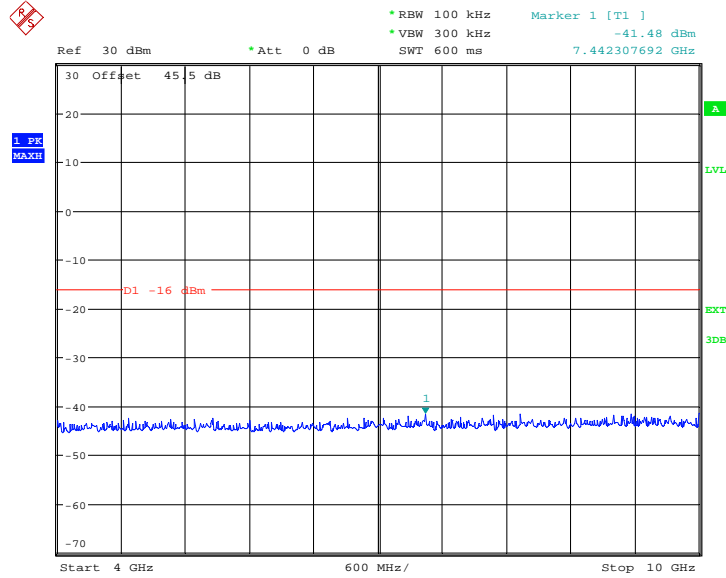


Date: 5.AUG.2013 11:20:11



Product Service

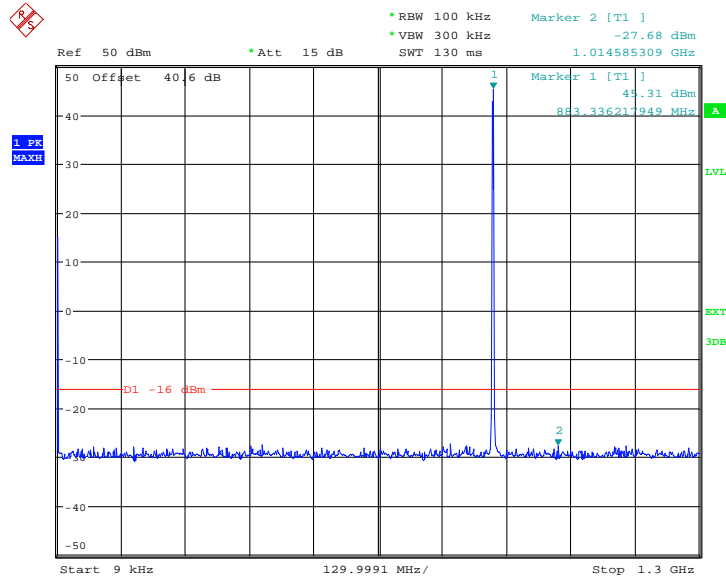
4GHz to 10GHz



Date: 5.AUG.2013 11:16:02

Configuration 1 - Mode 2 - L1.4&C

9kHz to 1.3GHz

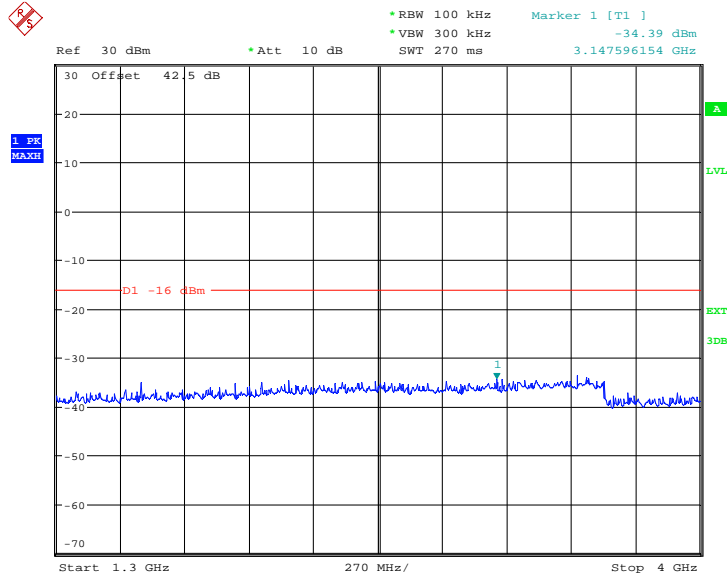


Date: 5.AUG.2013 13:19:07

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

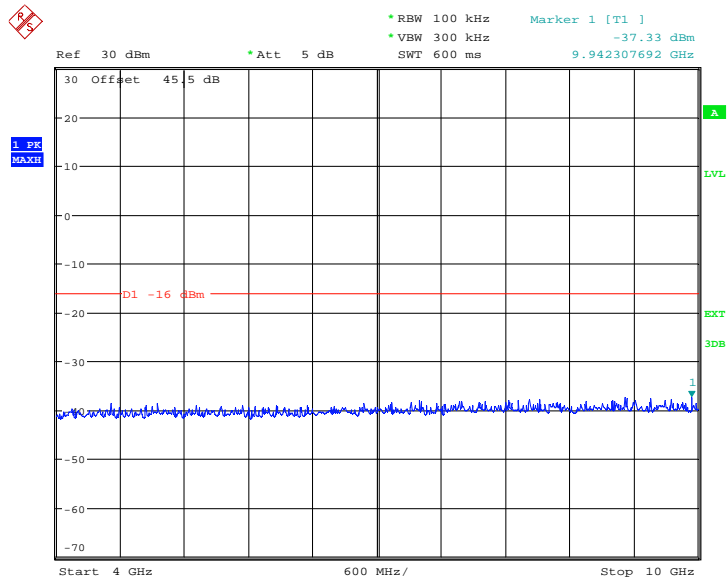


1.3GHz to 4GHz



Date: 5.AUG.2013 13:24:05

4GHz to 10GHz



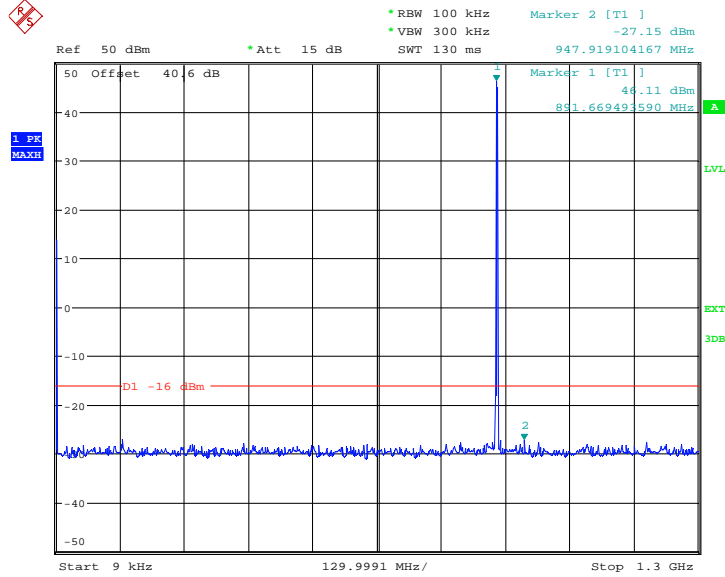
Date: 5.AUG.2013 13:21:06



Product Service

Configuration 1 - Mode 3 - C&L1.4

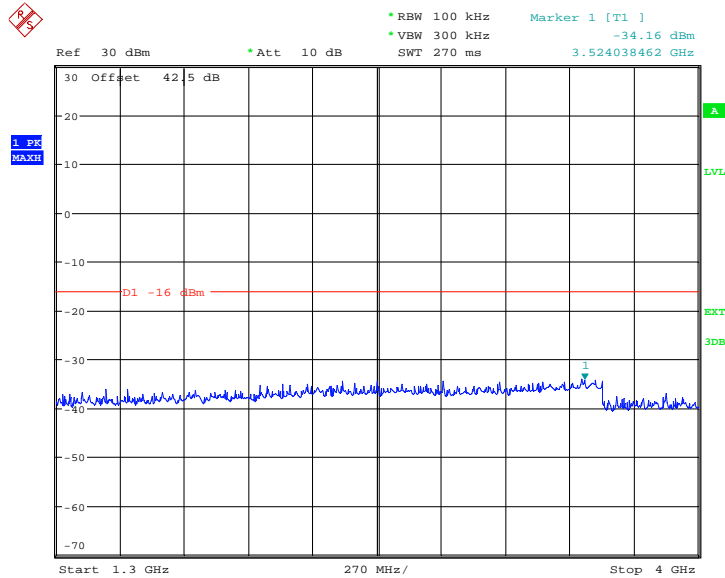
9kHz to 1.3GHz



Date: 5.AUG.2013 14:29:39

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

1.3GHz to 4GHz

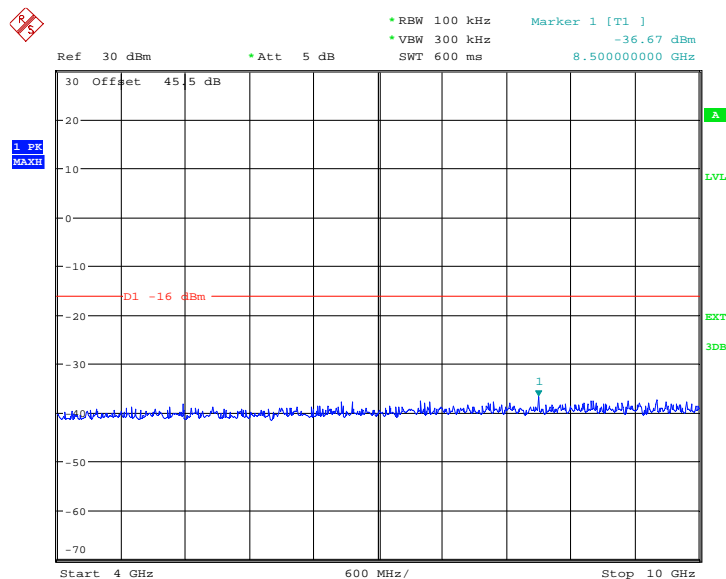


Date: 5.AUG.2013 14:33:32



Product Service

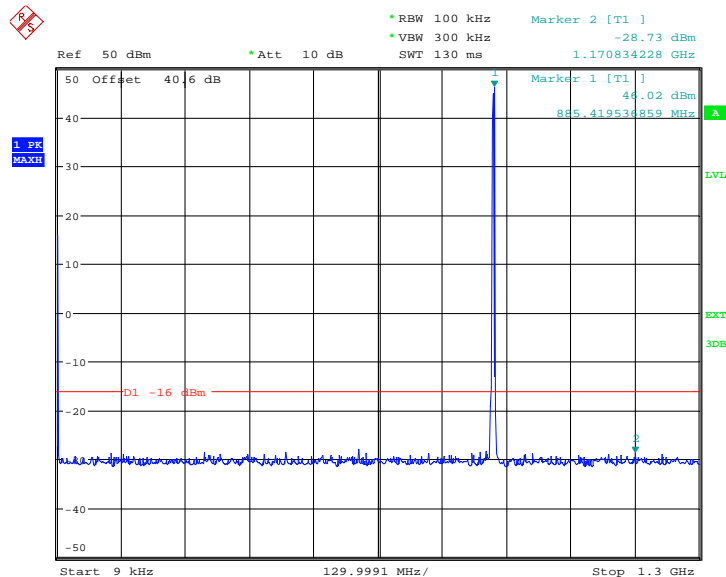
4GHz to 10GHz



Date: 5.AUG.2013 14:30:43

Configuration 1 - Mode 2 - L3&C

9kHz to 1.3GHz



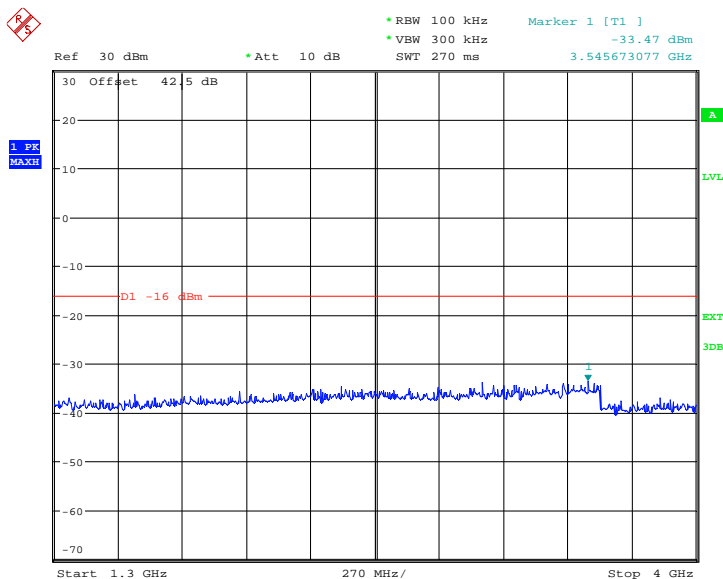
Date: 5.AUG.2013 17:02:32

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



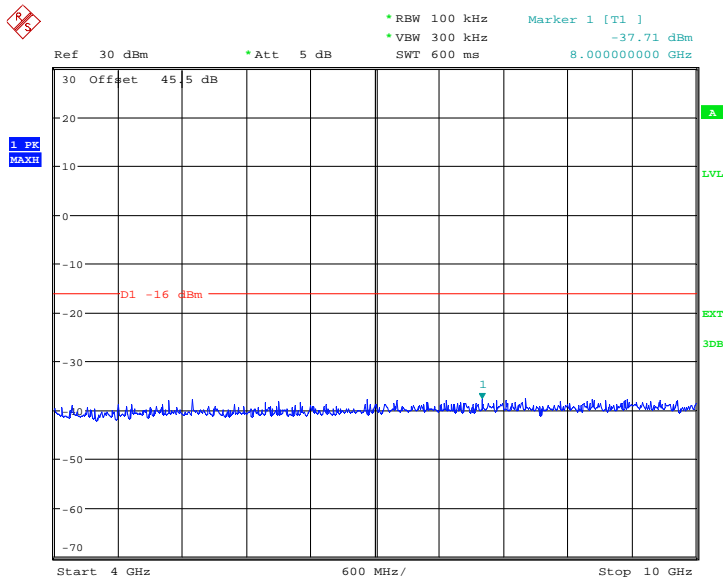
Product Service

1.3GHz to 4GHz



Date: 5.AUG.2013 17:06:13

4GHz to 10GHz



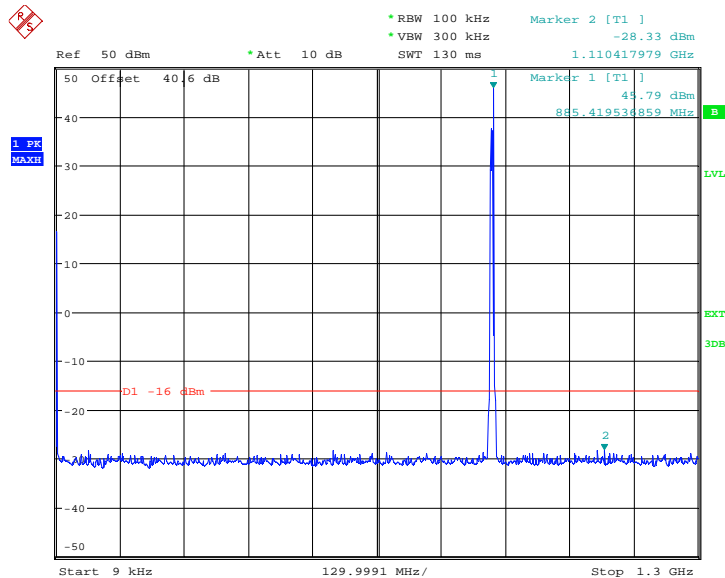
Date: 5.AUG.2013 17:03:16



Product Service

Configuration 1 - Mode 2 - L5&C

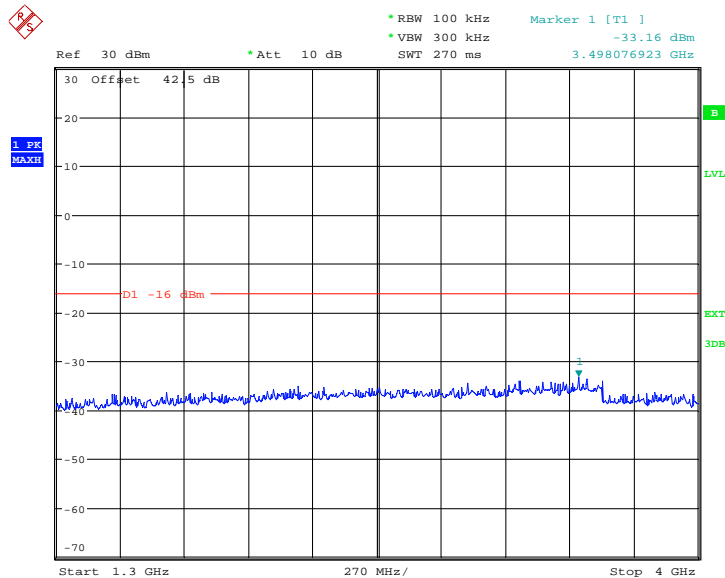
9kHz to 1.3GHz



Date: 6.AUG.2013 10:50:45

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

1.3GHz to 4GHz

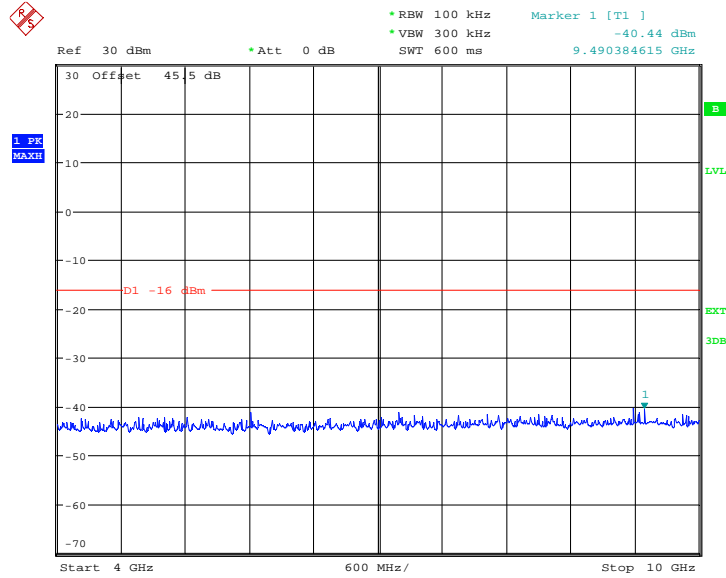


Date: 6.AUG.2013 10:38:40



Product Service

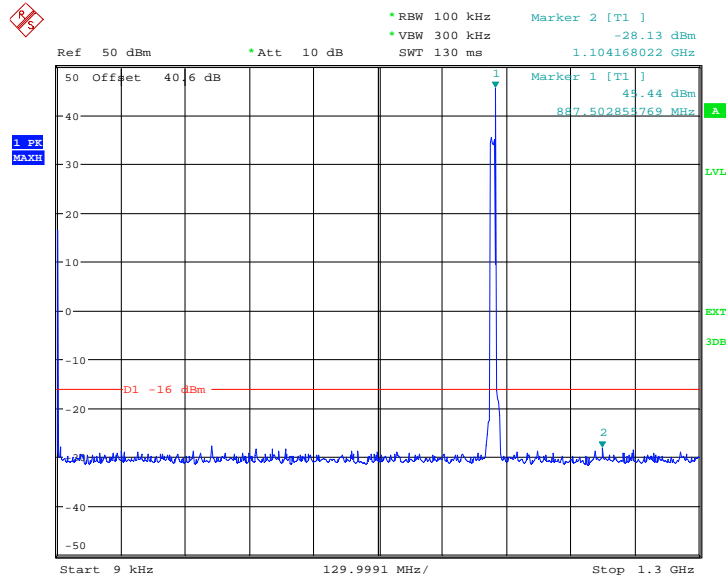
4GHz to 10GHz



Date: 6.AUG.2013 10:49:59

Configuration 1 - Mode 2 - L10&C

9kHz to 1.3GHz



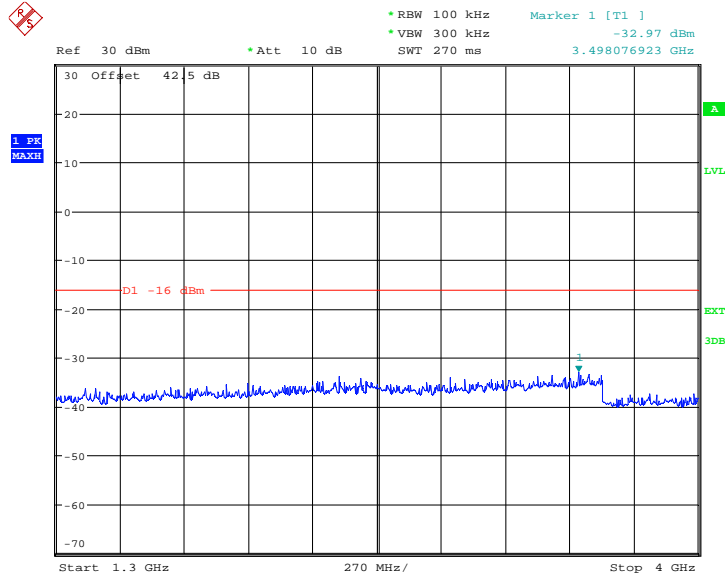
Date: 6.AUG.2013 13:39:44

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



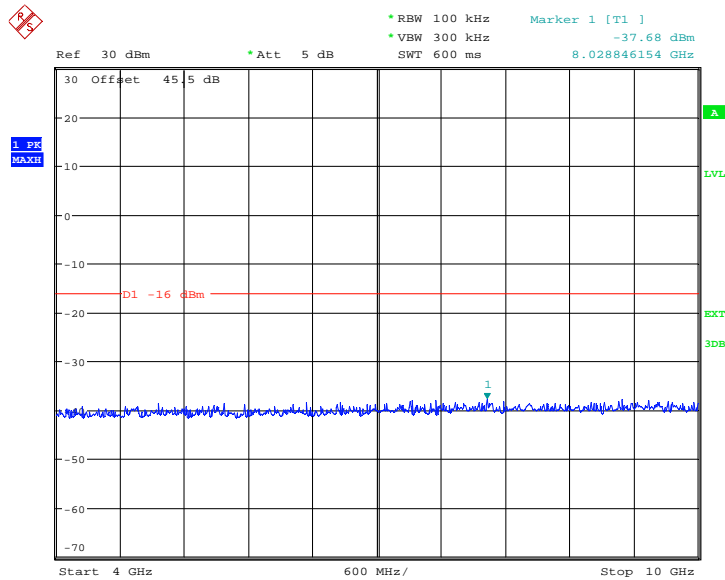
Product Service

1.3GHz to 4GHz



Date: 6.AUG.2013 13:33:12

4GHz to 10GHz



Date: 6.AUG.2013 13:38:41



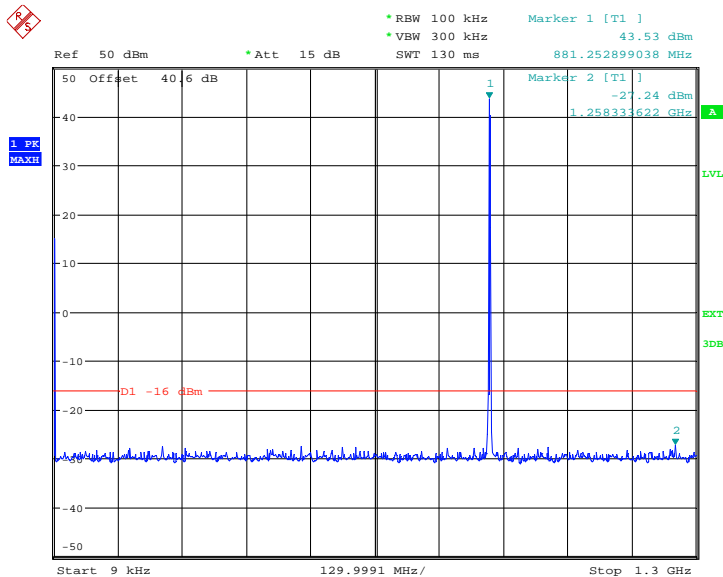
Product Service

Mix Carrier (x3)

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

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

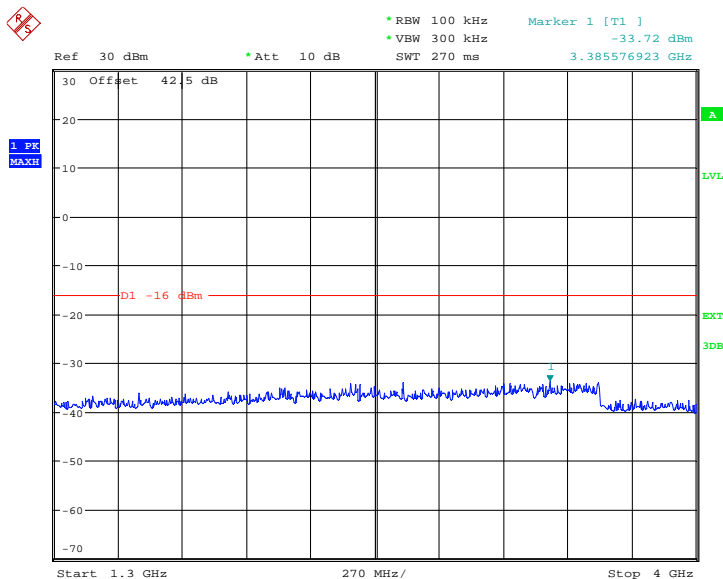
9kHz to 1.3GHz



Date: 8.AUG.2013 12:33:57

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

1.3GHz to 4GHz

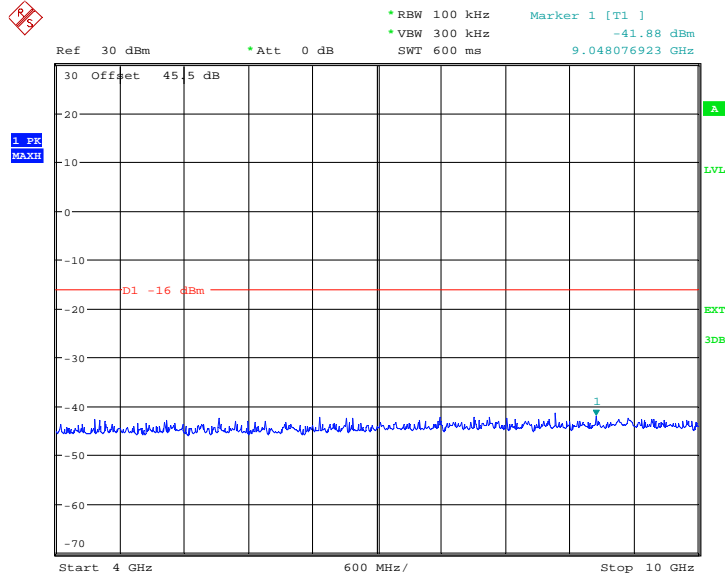


Date: 8.AUG.2013 14:08:16



Product Service

4GHz to 10GHz



Date: 8.AUG.2013 12:34:42



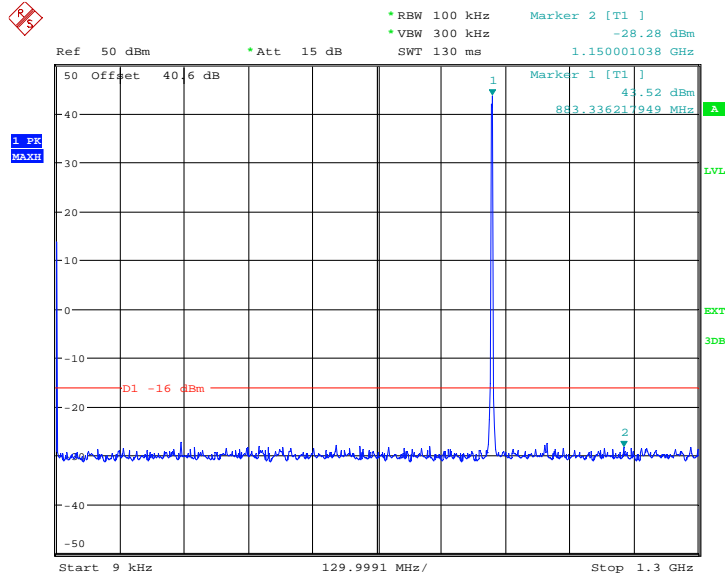
Product Service

Mix Carrier (x4)

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

Configuration 1 - Mode 7 - C&L1.4&C&C

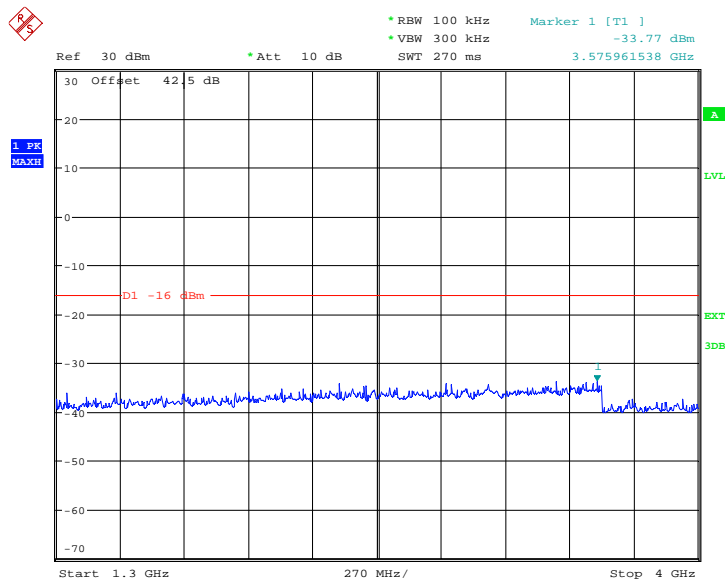
9kHz to 1.3GHz



Date: 7.AUG.2013 10:46:35

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

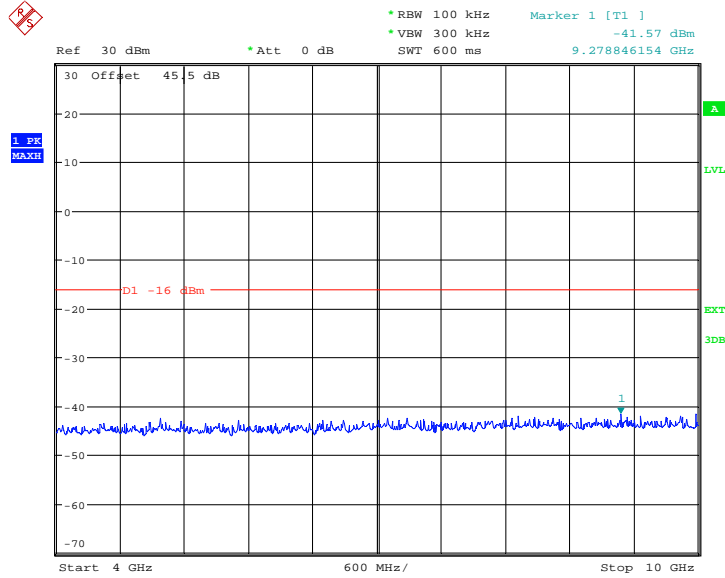
1.3GHz to 4GHz



Date: 7.AUG.2013 10:50:08



4GHz to 10GHz



Date: 7.AUG.2013 10:47:22

Limit	-16dBm
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Remarks

The EUT does not exceed -16dBm 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
Section 2.1, 2.2, 2.3 and 2.5– Maximum Conducted Output Power, Peak – Average Ratio, Spurious Emissions at Antenna Terminals (± 1MHz) and Conducted Spurious Emissions					
Spectrum Analyser	Rohde & Schwarz	FSQ	201122	12	07-Apr-2014
Power Meter	Rohde & Schwarz	NRP	101593	12	12-Aug-2013
Power Sensor	Rohde & Schwarz	NRP Z51	102224	12	16-Jul-2014
Power Sensor	Rohde & Schwarz	NRP Z51	102933	12	16-Jul-2014
Network Analyzer	Hewlett Packard	8720D	US36140166	12	09-Sep-2013
40 dB Attenuator	Aeroflex/Weinschel	66-40-33	CD4019	-	O/P MON
40 dB Attenuator	Aeroflex/Weinschel	48-40-43-LIM	BR5020	-	O/P MON
30 dB Attenuator	Shanghai Huaxiang	DTS100	-	-	O/P MON
10 dB Attenuator	Weinschel Corp	48-10-43	BB8290	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121602	-	O/P MON
Power Supply	Dahua	DH1716A-10	1000303181	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013
Section 2.4 – Radiated Spurious Emissions					
Load	Shanghai Huaxiang	TF100	09121631	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121602	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2013
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2013
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2013
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2013
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	12	19-Aug-2013
Power Supply	Dahua	DH1716A-14	20080401	-	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



Product Service

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



4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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

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

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