

Report On

FCC Testing of the Ericsson RRUS 82 B41 KRC 161 436/1 (2496 MHz - 2690 MHz) Remote Radio Unit in accordance with FCC CFR 47 Part 27

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161436-1

PREPARED BY

**APPROVED BY** 

DATED

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Authorised Signatory

11 February 2015

Document 75929194 Report 01 Issue 1

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**SECTION 1** 

**REPORT INFORMATION** 





# 1.1 **REPORT DETAILS**

The information contained in this report is intended to show verification of the Ericsson RRUS 82 B41 KRC 161 436/1 Remote Radio Unit to the requirements of FCC CFR 47 Part 27

Manufacturer	Ericsson AB
Address	Isafjordsgatan 10 SE-164 80 Stockholm Sweden
Product Name	RRUS 82 B41
Product Number	KRC 161 436/1
Serial Number(s)	D820462482
PIS Version	CXP 9025 219/2 Rev R1D08C
Hardware Version	R1B
Number of Sample Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 27: 2013
Start of Test	27 January 2015
Finish of Test	06 February 2015
Name of Engineer(s)	Guangdi Dong
Related Document(s)	ANSI C63.4: 2009 ANSI/TIA-603-C-2004 FCC CFR 47 Part 2: 2013 KDB 971168 D01 v02 r02 KDB 662911 D01 v02 r01





# 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 2, Part 27 is shown below.

Section	Spec	Clause	Test Description	Result
Section	Part 2	Part 27		Result
2.1	2.1046	27.50 (h) 27.50 (i)	Maximum Peak Output Power and Peak to Average Ratio – Conducted	Pass
	-	27.50 (h)	Equivalent Isotropically Radiated Power (EIRP)	N/A <sup>1</sup>
2.2	2.1049(h)	27.53 (m)	Occupied Bandwidth	Pass
2.3	2.1051	27.53 (m)	Spurious Emissions at Band Edge	Pass
2.4	2.1053	27.53 (m)	Radiated Spurious Emissions	Pass
2.5	2.1051	27.53 (m)	Conducted Spurious Emissions	Pass
2.6	2.1055	27.54	Frequency Stability	Pass
-	-	-	Receiver Spurious Emissions	N/A

N/A – Not Applicable

N/A<sup>1</sup>- Not Applicable, due to no integrated antenna





### 1.3 CONFIGURATION DESCRIPTION

Configuration Code	Carrier(s)	Configuration Description
L-MIMO-SC	1C	LTE MIMO, Single Carrier
L-MIMO-MC 1	2C	LTE MIMO, Multi Carrier x2
L-MIMO-MC 2	3C	LTE MIMO, Multi Carrier x3

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting. The settings below were used for all measurements if not otherwise noted:

LTE:

MIMO mode single carrier: E-TM1.1, E-TM3.2, E-TM3.1 MIMO mode multi carrier (x2): E-TM1.1 MIMO mode multi carrier (x3): E-TM1.1

The complete testing was performed with the EUT transmiting at maximum RF power unless otherwise stated.

The Maximum Output Power was tested on all TX/RX output connector RF 1 to RF 8, all other TX measurements were performed on the combined TX/RX output connector RF 4 of the EUT as the representative port.





# 1.4 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Remote Radio Unit
MANUFACTURER	Ericsson AB
PRODUCT NAME	RRUS 82 B41
PRODUCT NUMBER	KRC 161 436/1
TRANSMITTER OPERATING RANGE	TX/ RX: 2496MHz - 2690MHz
MODULATIONS	QPSK, 16QAM, 64QAM
ITU DESIGNATION OF EMISSION	20M0F9W
SUPPORTED CHANNEL BANDWIDTH CONFIGURATION	20MHz
OUTPUT POWER (RMS) (W or dBm)	MIMO: 8 x 43dBm (8 x 20W)
ANTENNA GAIN	No integrated Antenna
SUPPORTED CONFIGUATION	Single Carrier, Multi Carrier, 8x MIMO
NUMBER OF CARRIERS	Maximum 3 carriers
INSTANTANEOUS BANDWIDTH	60MHz
NUMBER OF ANTENNA PORTS	8 TX/RX ports
FCC ID	TA8AKRC161436-1
POWER SOURCE	-48V DC
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of the TDD- LTE Base Station.

Signature

liang Liaoying

Date D of B S Serial No 06 February 2015 75929194/01

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





### 1.5 **PRODUCT INFORMATION**

#### 1.5.1 Technical Description

The Equipment Under Test (EUT) RRUS 82 B41, KRC 161 436/1 is an Ericsson Remote Radio Unit working in the public mobile service 2496-2690MHz band which provides communication connections to TDD-LTE network network in LTE Modes. The RRUS 82 B41 Remote Radio Unit operates from a -48V DC supply.

The EUT includes eight TX/RX ports and it can be configured to transmit in MIMO mode, and MIMO mode was used for measurements as the worst configuration.

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



Equipment Under Test

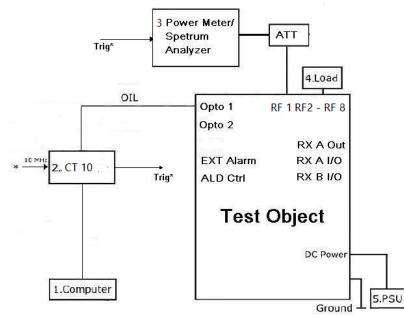




### 1.6 TEST SETUP

Test Setup, Conducted Measurement:

### LTE Configuration setup:



Product Name	Product Number	Version	Serial Number
RRUS 82 B41	KRC 161 436/1	R1B	D820462482

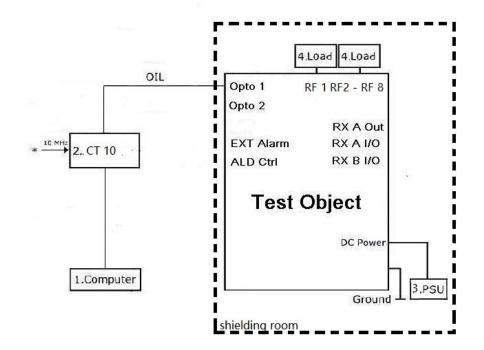
No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	Advantech-610H		ETD/L913
2	CT 10	LPC102487/1	R1C	T01F376487
	Spectrum Analyzer	FSW43		100615
3	Power Meter	NRP		101593
	Power Sensor	NRP-Z21		103607
4		TSG50-3-40-11		1405210012
		TSG50-3-40-11		1405210013
		TSG50-3-40-11		1405210014
	Load	TSG50-3-40-11		1405210015
		TSG50-3-40-11		1405210017
		TSG50-3-40-11		1405210018
		TSG50-3-40-11		1405210019
5	DC Power Supply	DH1716A-10		1000303181





### Test Setup, Radiated Measurement:

LTE Configuration setup:



Product Name	Product Number	Version	Serial Number
RRUS 82 B41	KRC 161 436/1	R1B	D820462482

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	Advantech-610H		ETD/L913
2	CT 10	LPC102487/1	R1C	T01F376487
3	DC Power Supply	DH1716A-10		1000303181
4 Lo:		TSG50-3-40-11		1405210012
	Load	TSG50-3-40-11		1405210013
		TSG50-3-40-11		1405210014
		TSG50-3-40-11		1405210015
		TSG50-3-40-11		1405210017
		TSG50-3-40-11		1405210018
		TSG50-3-40-11		1405210019
		TSG50-3-40-11		1405210016





### 1.7 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 a chamber as appropriate.

All test cases were tested with the EUT supplied with -48V DC by an external power supply.

### 1.8 DEVIATION FROM THE STANDARD

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

### 1.9 MODIFICATION RECORD

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

### 1.10 ALTERNATIVE TEST SITE

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

- Maximum Output Power and Peak to Average Ratio Conducted
- Occupied Bandwidth
- Band Edge
- Conducted Spurious Emissions
- Frequency Stability

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

FCC Accreditation 910917: The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.





**SECTION 2** 

**TEST DETAILS** 





### 2.1 MAXIMUM OUTPUT POWER AND PEAK TO AVERAGE RATIO - CONDUCTED

### 2.1.1 Specification Reference

FCC CFR 47 Part 2.1046 FCC CFR 47 Part 27, Clause 27.50 (h)(1)(i)

### 2.1.2 Equipment Under Test

RRUS 82 B41, KRC 161 436/1, S/N: D820462482

#### 2.1.3 Date of Test and Modification State

27 to 29 January 2015 - 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 Environmental Conditions

Ambient Temperature	22.6 - 23.8°C
Relative Humidity	24.0 - 25.5%

#### 2.1.6 Test Method

The test was applied in accordance with the test method requirements of FCC Part 2 and KDB 971168 D01.

Using a power meter and attenuator(s), the output power of the EUT was measured at the antenna terminal. The path loss between the EUT and the power sensor was measured and recorded for the test band. The path loss was entered as an offset into the Power Meter and Spectrum Analyzer.

The EUT was configured to transmit on maximum power on the configurations defined in the tables below. Since the EUT transmits on eight antennas simultaneously in the same frequency range for MIMO devices, i.e., TX MIMO mode, using the Measure-and-Sum approach, the output power at all antennas were tested, and the total output power were then summed mathematically in linear power units according to FCC KDB 662911 D01.

A peak to average ratio measurement is performed at the conducted ports of the EUT for single carrier for Multiple RAT mode. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) was used and 0.1% probability value recorded.

The RMS Power and Peak to Average Ratio was measured and recorded with the results being compared with the limits.





# 2.1.7 Test Results

# Configuration L-MIMO-SC (1C)

# Maximum Output Power 43.0dBm per port

	Modulation /	RMS Output Power / Peak to Average Ratio (PAR)								
Antenna	Carrier Bandwidth	Channel Position B 2506.0MHz			С	hannel Positi 2593.0MH		Channel Position T 2680.0MHz		
	(MHz)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)
1		42.64	18.37	7.48	42.62	18.28	6.81	42.75	18.84	7.45
2		42.74	18.79	7.37	42.66	18.45	6.78	42.72	18.71	7.41
3		42.72	18.71	7.46	42.69	18.58	6.84	42.78	18.97	7.32
4	QPSK /	42.77	18.92	7.41	42.51	17.82	6.80	42.62	18.28	7.33
5	20.0 MHz	42.68	18.54	7.51	42.46	17.62	6.81	42.61	18.24	7.28
6		42.72	18.71	7.33	42.63	18.32	6.80	42.76	18.88	7.39
7		42.70	18.62	7.67	42.56	18.03	6.85	42.79	19.01	7.33
8		42.74	18.79	7.39	42.64	18.37	6.83	42.71	18.66	7.26
Total	Total(dBW) 21.74			21.63 21.75			_			

	Modulation /	/ RMS Output Power / Peak to Average Ratio (PAR)								
Antenna	Carrier Bandwidth	Channel Position B 2506.0MHz		С	hannel Positi 2593.0MH	-	Channel Position T 2680.0MHz			
	(MHz)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)
1		-	-	-	42.62	18.28	6.81	-	-	-
2		-	-	-	42.71	18.66	6.80	-	-	-
3		-	-	-	42.77	18.92	6.82	-	-	-
4	16QAM /	-	-	-	42.67	18.49	6.80	-	-	-
5	20.0 MHz	-	-	-	42.66	18.45	6.83	-	-	-
6		-	-	-	42.78	18.97	6.81	-	-	-
7		-	-	-	42.71	18.66	6.85	-	-	-
8		-	-	-	42.75	18.84	6.81	-	-	-
Total	(dBW)		-			21.74			-	

	Modulation /	RMS Output Power / Peak to Average Ratio (PAR)								
Antenna	Carrier Bandwidth	Channel Position B 2506.0MHz		С	Channel Position M 2593.0MHz			Channel Position T 2680.0MHz		
	(MHz)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)
1		-	-	-	42.53	17.91	6.81	-	-	-
2		-	-	-	42.63	18.32	6.80	-	-	-
3		-	-	-	42.57	18.07	6.84	-	-	-
4	64QAM /	-	-	-	42.55	17.99	6.81	-	-	-
5	20.0 MHz	-	-	-	42.45	17.58	6.81	-	-	-
6		-	-	-	42.53	17.91	6.79	-	-	-
7		-	-	-	42.45	17.58	6.85	-	-	-
8		-	-	-	42.76	18.88	6.82	-	-	-
Total	(dBW)	3W) -			21.59			-		





# Configuration L-MIMO-MC 1 (2C)

# Maximum Output Power 43.0dBm per port

	Modulation /	RMS Output Power / Peak to Average Ratio (PAR)									
Antenna	Carrier Bandwidth	Channel Position B <sub>RFBW</sub> 2506.0MHz + 2546.0MHz				Channel Position M <sub>RFBW</sub> 2573.0MHz+ 2613.0MHz			Channel Position T <sub>RFBW</sub> 2640.0MHz+ 2680.0MHz		
	(MHz)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	
1		42.41	17.42	-	42.45	17.58	-	42.31	17.02	-	
2		42.47	17.66	-	42.44	17.54	-	42.35	17.18	-	
3		42.38	17.30	-	42.57	18.07	-	42.42	17.46	-	
4	QPSK /	42.45	17.58	-	42.48	17.70	-	42.31	17.02	-	
5	20.0 MHz	42.62	18.28	-	42.64	18.37	-	42.53	17.91	-	
6		42.54	17.95	-	42.47	17.66	-	42.41	17.42	-	
7		42.33	17.10	-	42.54	17.95	-	42.41	17.42	-	
8		42.54	17.95	-	42.63	18.32	-	42.43	17.50	-	
Total	(dBW)	21.50		21.56			21.43				

	Modulation /	RMS Output Power / Peak to Average Ratio (PAR)								
Antenna	Carrier Bandwidth	Channel Position B <sub>RFBW</sub> 2506.0MHz + 2546.0MHz			Channel Position M <sub>RFBW</sub> 2573.0MHz+ 2613.0MHz			Channel Position T <sub>RFBW</sub> 2640.0MHz+ 2680.0MHz		
	(MHz)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)
1		-	-	-	42.49	17.74	-	-	-	-
2		-	-	-	42.43	17.50	-	-	-	-
3		-	-	-	42.42	17.46	-	-	-	-
4	16QAM /	-	-	-	42.33	17.10	-	-	-	-
5	20.0 MHz	-	-	-	42.48	17.70	-	-	-	-
6		-	-	-	42.39	17.34	-	-	-	-
7		-	-	-	42.43	17.50	-	-	-	-
8		-	-	-	42.47	17.66	-	-	-	-
Total	(dBW)	-			21.46				-	

	Modulation /	_	RMS Output Power / Peak to Average Ratio (PAR)								
Antenna	Carrier Bandwidth	Channel Position B <sub>RFBW</sub> 2506.0MHz + 2546.0MHz			Channel Position M <sub>RFBW</sub> 2573.0MHz+ 2613.0MHz			Channel Position T <sub>RFBW</sub> 2640.0MHz+ 2680.0MHz			
	(MHz)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	
1		-	-	-	42.55	17.99	-	-	-	-	
2		-	-	-	42.45	17.58	-	-	-	-	
3		-	-	-	42.58	18.11	-	-	-	-	
4	64QAM /	-	-	-	42.42	17.46	-	-	-	-	
5	20.0 MHz	-	-	-	42.52	17.86	-	-	-	-	
6		-	-	-	42.50	17.78	-	-	-	-	
7		-	-	-	42.45	17.58	-	-	-	-	
8		-	-	-	42.65	18.41	-	-	-	-	
Total	(dBW)		-			21.55			-		





# Configuration L-MIMO-MC 2 (3C)

# Maximum Output Power 43.0dBm per port

		-		RMS O	utput Pov	ver / Peak to	Average Rati	o (PAR)		RMS Output Power / Peak to Average Ratio (PAR)								
Antenna	Modulation / Carrier Bandwidth (MHz)	Channel Position B <sub>RFB\</sub> 2506.0MHz + 2526.0MH 2546.0MHz		.0MHz +	Channel Position M <sub>RFBW</sub> 2573.0MHz + 2593.0MHz + 2613.0MHz			Channel Position T <sub>RFBW</sub> 2640.0MHz + 2660.0MHz + 2680.0MHz										
	(1011 12)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)								
1		42.38	17.30	-	42.46	17.62	-	42.35	17.18	-								
2		42.38	17.30	-	42.35	17.18	-	42.34	17.14	-								
3		42.48	17.70	-	42.46	17.62	-	42.43	17.50	-								
4	QPSK /	42.44	17.54	-	42.44	17.54	-	42.39	17.34	-								
5	20.0 MHz	42.63	18.32	-	42.62	18.28	-	42.45	17.58	-								
6		42.56	18.03	-	42.51	17.82	-	42.39	17.34	-								
7		42.52	17.86	-	42.48	17.70	-	42.47	17.66	-								
8	42.	42.54	17.95	-	42.65	18.41	-	42.43	17.50	-								
Total	(dBW)	W) 21.52		21.53			21.44											

		RMS Output Power / Peak to Average Ratio (PAR)									
Antenna	Modulation / Carrier Bandwidth (MHz)		Channel Position B <sub>RFBW</sub> 2506.0MHz + 2526.0MHz + 2546.0MHz			Channel Position M <sub>RFBW</sub> 2573.0MHz + 2593.0MHz + 2613.0MHz			Channel Position T <sub>RFBW</sub> 2640.0MHz + 2660.0MHz + 2680.0MHz		
	(10112)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	
1		-	-	-	42.38	17.30	-	-	-	-	
2		-	-	-	42.35	17.18	-	-	-	-	
3		-	-	-	42.41	17.42	-	-	-	-	
4	16QAM /	-	-	-	42.34	17.14	-	-	-	-	
5	20.0 MHz	-	-	-	42.54	17.95	-	-	-	-	
6		-	-	-	42.38	17.30	-	-	-	-	
7		-	-	-	42.33	17.10	-	-	-	-	
8		-	-	-	42.40	17.38	-	-	-	-	
Total	(dBW)	V) -			21.42			-			

			RMS Output Power / Peak to Average Ratio (PAR)								
Antenna	Modulation / Carrier Bandwidth (MHz)	Channel Position B <sub>RFBW</sub> 2506.0MHz + 2526.0MHz + 2546.0MHz		Channel Position M <sub>RFBW</sub> 2573.0MHz + 2593.0MHz + 2613.0MHz			Channel Position T <sub>RFBW</sub> 2640.0MHz + 2660.0MHz + 2680.0MHz				
	(10112)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	dBm	W	PAR (dB)	
1		-	-	-	42.44	17.54	-	-	-	-	
2		-	-	-	42.43	17.50	-	-	-	-	
3		-	-	-	42.32	17.06	-	-	-	-	
4	64QAM /	-	-	-	42.36	17.22	-	-	-	-	
5	20.0 MHz	-	-	-	42.40	17.38	-	-	-	-	
6		-	-	-	42.48	17.70	-	-	-	-	
7		-	-	-	42.42	17.46	-	-	-	-	
8	-	-	-	-	42.62	18.28	-	-	-	-	
Total(	(dBW)		-			21.47			-		





Limit	
33 dBW+10log(X/Y) dBW	Where X is the actual channel width and Y is 6MHz. X=18.58, Limit=37.91dBW
Peak to Average Ratio	13 dB

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





#### 2.2 OCCUPIED BANDWIDTH

#### 2.2.1 Specification Reference

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

### 2.2.2 Equipment Under Test

RRUS 82 B41, KRC 161 436/1, S/N: D820462482

#### 2.2.3 Date of Test and Modification State

28 January and 06 February 2015 - 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 Environmental Conditions

Ambient Temperature	23.6 - 24.5°C
Relative Humidity	25.9 - 28.5%

#### 2.2.6 Test Method

The test was applied in accordance with the test method requirements of FCC Part 2 and KDB 971168 D01.

The EUT was set to transmit at maximum power and testing was carried out on Bottom, Middle and Top Channels. Using the Occupied Bandwidth measurement function in the Spectrum Analyser, the Occupied Bandwidth is defined as the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre frequency.

For FCC requirement, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26. The -26dBc Bandwidth was measured in accordance with FCC KDB 971168 D01 Clause 4.2.

The results are shown in the plots below.





# 2.2.7 Test Results

Configuration L-MIMO-SC (1C)

Maximum Output Power 43.0dBm per port

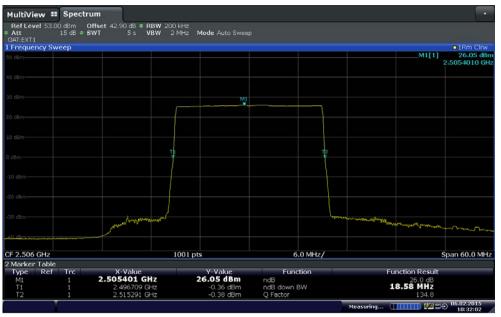
-26dBc Occupied Bandwidth for FCC requirement

	Occupied Bandwidth (MHz)					
Modulation / Bandwidth	Channel Position B	Channel Position M	Channel Position T			
	2506.0MHz	2593.0MHz	2680.0MHz			
QPSK / 20.0 MHz	18.58	18.58	18.58			
16QAM / 20.0 MHz	-	18.58	-			
64QAM / 20.0 MHz	-	18.58	-			



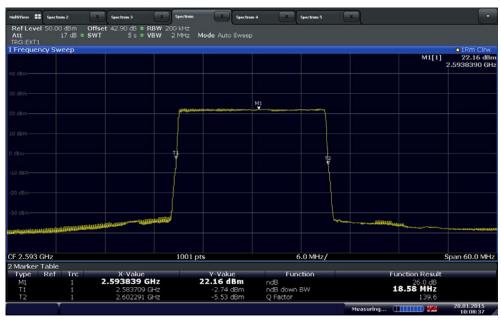


### Channel Position B - QPSK / Bandwidth 20.0 MHz



Date: 6.FEB.2015 10:32:03

### Channel Position M - QPSK / Bandwidth 20.0 MHz

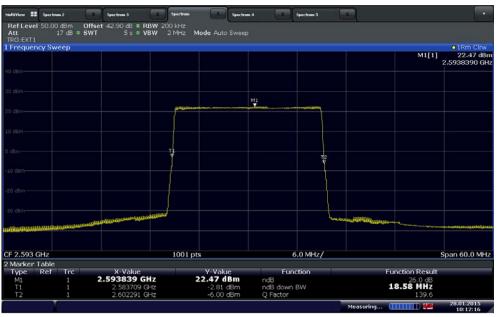


Date: 28.JAN.2015 10:08:37



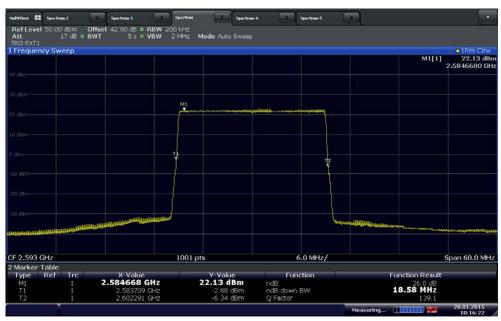


### Channel Position M - 16QAM / Bandwidth 20.0 MHz



Date: 28.JAN.2015 10:12:16

### Channel Position M - 64QAM / Bandwidth 20.0 MHz

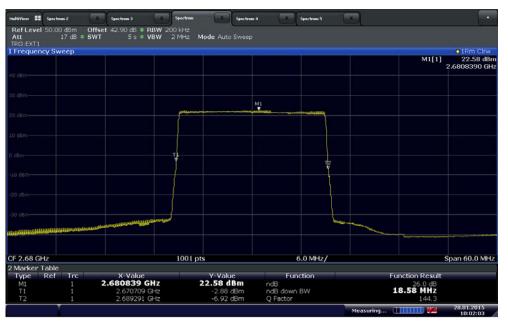


Date: 28.JAN.2015 10:16:22





### Channel Position T - QPSK / Bandwidth 20.0 MHz



Date: 28.JAN.2015 10:02:03





### 2.3 SPURIOUS EMISSION AT BAND EDGE

#### 2.3.1 Specification Reference

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

### 2.3.2 Equipment Under Test

RRUS 82 B41, KRC 161 436/1, S/N: D820462482

#### 2.3.3 Date of Test and Modification State

02 February 2015 - 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 Environmental Conditions

Ambient Temperature	25.5°C
Relative Humidity	28.6%

#### 2.3.6 Test Method

In accordance with FCC CFR 47 Part 27, Clause 27.53 (m) and Part 2, Clause 2.1051, any emissions outside of the block edges shall be attenuated by at least 43 + 10 log (P). In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1% of the emission bandwith should be used.

For measurements of emissions > 1MHz away from the band edges, an RBW of 1MHz or greater should be used. A resolution bandwidth of 50kHz was used between 1MHz to 6MHz from the band edge. to compensate for the reduced mesurement bandwidth, the limit was adjusted with

-13dB to -26dBm.

For MIMO mode configurations, the limit was adjusted with a correction of -9dB [10Log(8)] by using the Measure and Add 10Log(N) dB technique according to FCC KDB662911 D01 accounting for simultaneous transmission from antennas port RF 1 to RF 8.

The path loss was measured and entered as a reference level offset. The EUT was set to transmit at its maximum rated output power in the configurations described in the tables below. Measurements were made at the Top and Bottom of the band.

The results are shown in the plots below.





### 2.3.7 Test Results

Configuration L-MIMO-SC (1C)

Maximum Output Power 43.0dBm per port

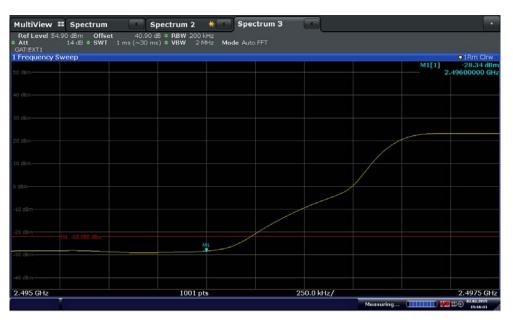
Band Edge Frequency	Channel Bandwidth	Edge Test with modulation QPSK Channel Frequencies
Channel Position B 2496.0 MHz	20.0 MHz	2506.0 MHz
Channel Position T 2690.0 MHz	20.0 MHz	2680.0 MHz

Note: 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 the ranges shown in the above tables shall not be made available to the end user.





### Channel Position B - QPSK / Bandwidth 20.0 MHz

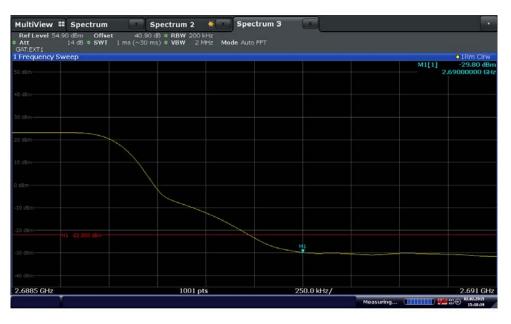


	Offset 40.90 dB	Spectrum 2 RBW 50 kHz					
Att 15 dB = 5 GAT:EXT1	5WT 10 s ≕	VBW 500 kHz Mod	le Auto Sweep				
Frequency Sweep							• 1Rm Cir
						M1[1]	-36.12 d 2.49466280 (
111 -35 000 d	in	and the second		n - manager she	······································	Non-mana	min the second
2.4925 GHz		1001 pts		500.0 kHz/			Span 5.0 M





### Channel Position T - QPSK / Bandwidth 20.0 MHz



MultiView	# Spectrum		Spectrum 2	*	Spectrum 3				
RefLevel 10 • Att GAT:EXT1	0.00 dBm Offset 20 dB = SWT		RBW 50 kHz VBW 500 kHz	Mode Auto	Sweep				
1 Frequency	Sweep								IRm Clrw
								M1[1] 2	-37.22 dBn 69120980 GH
Marine Marine		ومديق مرور ومعرود والمعدد الماريس والمعرود	موديني ورمان <sup>ير رو</sup> مركز مرور <sup>رو رو</sup> الم				and a second		and the second second second
2.691 GHz			1001 p	ts		400.0 kHz/			2.695 GHz
	¥.						Measuring		





# Configuration L-MIMO-MC 1 (2C)

Maximum Output Power 43.0dBm per port

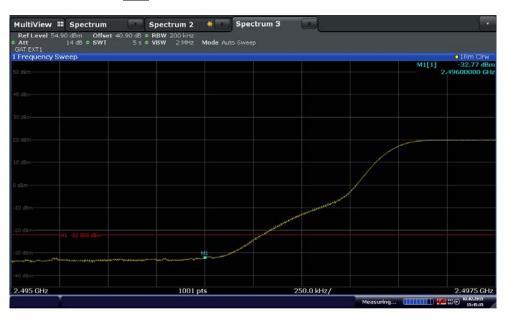
Band Edge Frequency	Channel Bandwidth	Edge Test with modulation QPSK Channel Frequencies
Channel Position B <sub>RFBW</sub> 2496.0 MHz	20.0 MHz	2506.0 MHz + 2526.0 MHz
Channel Position T <sub>RFBW</sub> 2690.0 MHz	20.0 MHz	2660.0 MHz + 2680.0 MHz

Note: 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 the ranges shown in the above tables shall not be made available to the end user.





# Channel Position B<sub>RFBW</sub> - QPSK / Bandwidth 20.0 MHz

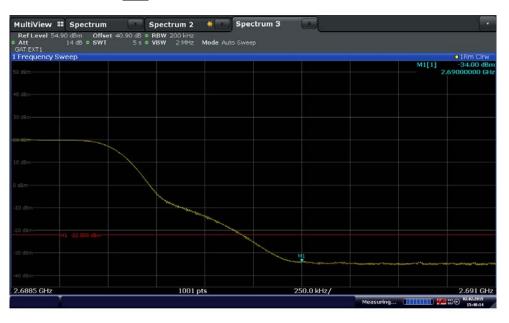


MultiView	# Spectrum	Spectrum 2	*	Spectrum 3	×.)			
RefLevel 10 Att GAT:EXT1	0.00 dBm Offset 15 dB = SWT		Mode Auto	o Sweep				
Frequency S	Sweep							IRm Clrw
							M1[1] 2.	-38.03 dBr 49321430 GH
40.45m	H1 -35.000 dem	 		مىلىدۇرىيەللارىيىتىنى مەلەرىيەر مەلىيى	M1 Response		and the start and the second	and the second second
2.49 GHz		1001 p	ots		500.0 kHz/			2.495 GH
	AUC:					Measuring		





# Channel Position T<sub>RFBW</sub> - QPSK / Bandwidth 20.0 MHz



MultiView 🎫 Sp	ectrum 🚺 🕷	Spectrum 2	👬 👘 Spectrum 3				
RefLevel 10.00 dBn Att 15 dt GAT:EXT1			Mode Auto Sweep				
Frequency Sweep							IRm Clrw
						M1[1] 2.	-40.74 dBn 59105000 GH
H1 -35.							
and a trickly the property the second second	fe-ran ysyn yfrifianai yn <sup>fr</sup> lo.	ree-standfande-gedintstegen <sup>ern</sup> -ny			monney showene	and a state of the	
2.691 GHz		1001 p	ts	400.0 kHz/			2.695 GHz





### Configuration L-MIMO-MC 2 (3C)

Maximum Output Power 43.0dBm per port

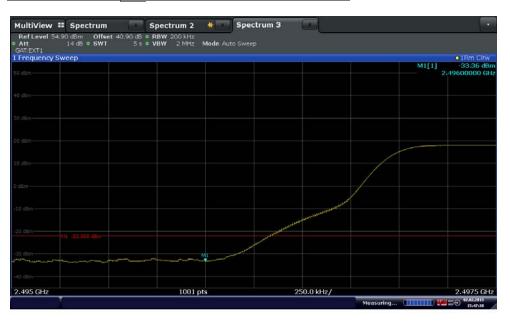
Band Edge Frequency	Channel Bandwidth	Edge Test with modulation QPSK Channel Frequencies
Channel Position B <sub>RFBW</sub> 2496.0 MHz	20.0 MHz	2506.0 MHz + 2526.0 MHz + 2546.0 MHz
Channel Position T <sub>RFBW</sub> 2690.0 MHz	20.0 MHz	2640.0 MHz + 2660.0 MHz + 2680.0 MHz

Note: 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 the ranges shown in the above tables shall not be made available to the end user.





# Channel Position B<sub>RFBW</sub> - LTE QPSK: Bandwidth 20.0MHz

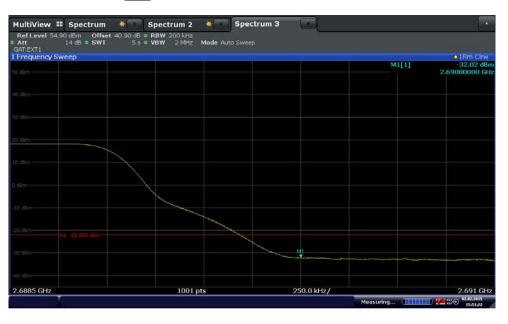


MultiView	# Spectrum		Spectrum 2	*	Spectrum 3	x.)			
Ref Level 1 Att GAT:EXT1	0.00 dBm Offset 15 dB = SWT		RBW 50 kHz VBW 500 kHz	Mode Auto	Sweep				
1 Frequency	Sweep								IRm Clrw
								M1[1] 2	-38.12 dBn 49425820 GH
And Barrows	41 -35.000 dani	س <sup>رور</sup> اور محمد روم	and the second second		and the second s	and the stand and a stand a	Course and the second second	Man Marine Marine	an i a share a far a she an
2.49 GHz			1001 p	)te		500.0 kHz/			2.495 GH
	¥		1001			500.0 KHZ/	Measuring		





# Channel Position T<sub>RFBW</sub> - LTE QPSK: Bandwidth 20.0MHz



MultiView 📰 Spectrum		Spectrum 3	
Ref Level         10.00 dBm         Offset           Att         15 dB • SWT           GAT:EXT1	t 40.90 dB ● <b>RBW</b> 50 kHz 5 s ● <b>VBW</b> 500 kHz <b>Mode</b> Auto		
Frequency Sweep			1Rm Clrw
			M1[1] -40.10 dB 2.69150700 G
141 -35,000 dan M1 مىمىرىدىرىمىسىمىرىدىنى مىكتىرى بىلا			
		the set of	and a second and a second and a second s
2.691 GHz	1001 pts	500.0 kHz/	2.696 GH
N.	1001 010	booto tatey	Measuring 1553,18

### <u>Limit</u>

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





#### 2.4 RADIATED SPURIOUS EMISSIONS

#### 2.4.1 Specification Reference

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

### 2.4.2 Equipment Under Test

RRUS 82 B41, KRC 161 436/1, S/N: D820462482

#### 2.4.3 Date of Test and Modification State

30 January 2015 - 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 Environmental Conditions

Ambient Temperature	23.5°C
Relative Humidity	32.5%

#### 2.4.6 Test Method

The test was applied in accordance with test method requirements of ANSI/TIA-603-C-2004.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations.

Emissions identified within the range 30MHz - 27GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz - 27GHz, 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 + 10Log (P)) dB

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





### **Determination of Spurious Emission Limit**

As the EUT does not have an integral antenna, the field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipole as per 2.1053 (a).

 $E_{(v/m)} = (30 \times G_i \times P_o)^{0.5} / d$ 

Where G<sub>i</sub> is the antenna gain of an ideal half-wave dipole,

 $\mathsf{P}_{o}$  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 x 1.64 x 17.02)<sup>0.5</sup>/3 = 9.65V/m = 139.71dBµV/m

As per 24.238(a) the spurious emission must be attenuated by  $43 + 10\log (P_o) dB$  this gives:

43 + 10log(17.02) = 55.31dB

Therefore the limit at 3m measurement distance is:

139.71 - 55.31 = 84.4 dBµV/m

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

The results are shown in the plots below.





### 2.4.7 Test Results

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.

Configuration L-MIMO-SC (1C)

Maximum Output Power 43.0dBm per port, LTE Bandwidth 20.0MHz

Channel Position	Channel Frequencies
Channel Position B	2506.0MHz
Channel Position M	2593.0MHz
Channel Position T	2680.0MHz

#### Channel Position B - 16QAM

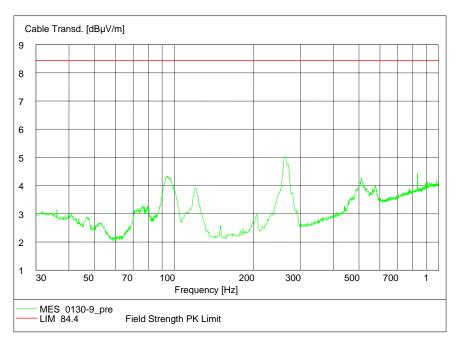
No emissions were detected within 20dB of the limit.

Channel Position M - 16QAM

No emissions were detected within 20dB of the limit.

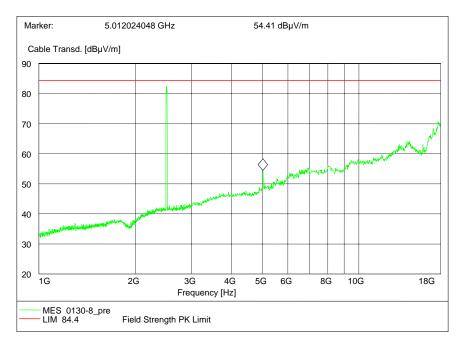
Channel Position T - 16QAM

### Channel Position T – 16QAM / Bandwidth 20.0MHz – 30MHz – 1GHz



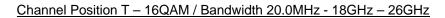


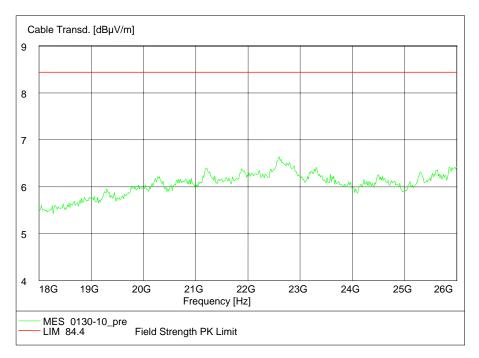




# Channel Position T - 16QAM / Bandwidth 20.0MHz - 1GHz - 18GHz

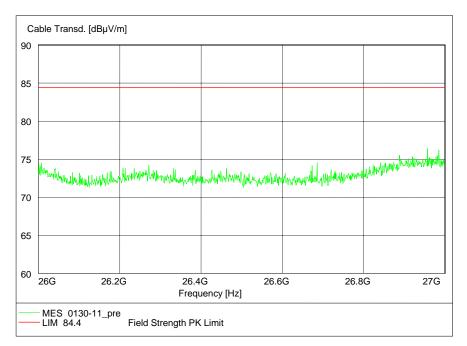
Note: The frequency marked is the harmonic.











Channel Position T – 16QAM / Bandwidth 20.0MHz - 26GHz – 27GHz

#### Configuration L-MIMO-SC (1C)

#### Maximum Output Power 43.0dBm per port, LTE Bandwidth 20.0MHz

Channel Position	Channel Frequencies
Channel Position M	2593.0MHz

#### Channel Position M – QPSK

No emissions were detected within 20dB of the limit.

Channel Position M - 64QAM

No emissions were detected within 20dB of the limit.

#### Configuration L-MIMO-MC 1 (2C)

Maximum Output Power 43.0dBm per port, LTE Bandwidth 20.0MHz

Channel Position	Channel Frequencies
Channel Position T <sub>RFBW</sub>	2660.0MHz + 2680.0MHz

#### Channel Position T<sub>RFBW</sub> – QPSK

No emissions were detected within 20dB of the limit.





#### Configuration L-MIMO-MC 2 (3C)

#### Maximum Output Power 43.0dBm per port, LTE Bandwidth 20.0MHz

Channel Position	Channel Frequencies
Channel Position T <sub>RFBW</sub>	2640.0MHz + 2660.0MHz + 2680.0MHz

## Channel Position T<sub>RFBW</sub> – QPSK

No emissions were detected within 20dB of the limit.

## <u>Remarks</u>

Limit	-13dBm / 84.4dBµV/m
-------	---------------------

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 27, Clause 27.53 (m)

#### 2.5.2 Equipment Under Test

RRUS 82 B41, KRC 161 436/1, S/N: D820462482

#### 2.5.3 Date of Test and Modification State

02 and 06 February 2015 - 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 Environmental Conditions

Ambient Temperature	24.7 - 25.5 °C
Relative Humidity	26.8 - 28.6 %

#### 2.5.6 Test Method

The test was applied in accordance with test method requirements of FCC Part 2 and KDB 971168 D01.

In accordance with FCC CFR 47 Part 2, Clause 2.1051, the spurious emissions from the antenna terminal were measured. In accordance with FCC CFR 47 Part 27, Clause 27.53 (m) , any emissions outside of the block edges shall be attenuated by at least 43 + 10 log (P).

The EUT was set to transmit at its maximum rated output power. The path loss between the Spectrum Analyser and the EUT was measured with the worst case level being entered as a Reference Level Offset. In accordance with 27.53 (m), the RBW was set to 1MHz and a Peak detector with the trace set to Max Hold was used. The frequency spectrum was then investigated between 9 kHz and 27GHz. Testing was carried out on the Bottom, Middle and Top channels.

For MIMO mode configurations, the limit was adjusted with a correction of -9dB [10Log(8)] by using the Measure and Add 10Log(N) dB technique according to FCC KDB662911 D01 accounting for simultaneous transmission from antenna ports RF 1 to RF 8.

The measurements were performed on the output connector RF 4. Limited complementary measurement were done at other output conectors to verify identical performance for all transmitter chains in MIMO mode.

The results are shown in the plots below.





#### 2.5.7 Test Results

Configuration L-MIMO-SC (1C)

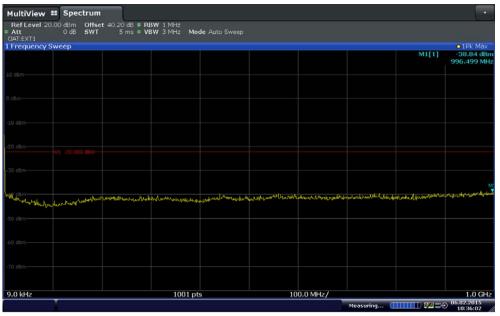
Maximum Output Power 43.0dBm per port

Channel Position	Bandwidth	Channel Frequency
Channel Position B	20.0MHz	2506.0MHz
Channel Position M	20.0MHz	2593.0MHz
Channel Position T	20.0MHz	2680.0MHz



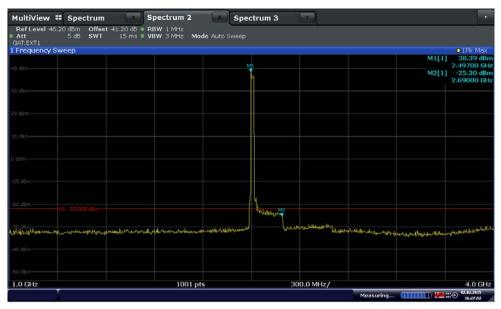


#### Channel Position B - QPSK / Bandwidth 20.0MHz - 9kHz - 1GHz



Date: 6.FEB.2015 10:36:02

#### Channel Position B - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz



#### Note: The emission beyond the limit is within the operating frequency





## Channel Position B - QPSK / Bandwidth 20.0MHz - 4GHz - 27GHz

	ctrum	Spectrum 2		rum 3 🛛 🔍	۹		
RefLevel 13.00 d8m Att 0 d8 RG:EXT1			de Auto Sweep				
Frequency Sweep							O1Pk Max
						M1[1]	-27.00 dB
							24.7830 6
						811	
						dh.	myereday.
workey would are any	- All	man man bernelan	معر ور روروه الموادية للعان	will phylichard and	hternesisers and the second	algo hidress ad a los of the state	
40 diim	along and for the second	and the second s	Aby a contribut.				
0 dBm							

Channel Position M - QPSK / Bandwidth 20.0MHz - 9kHz - 1GHz

MultiView #	Spectrum								
Ref Level 20.0 Att GAT:EXT1	00 dBm Offset 0 dB SWT	40.20 dB = RE 5 ms = VE	W 1 MHz W 3 MHz Moo	le Auto Sweep					
1 Frequency Sv	veep								• 1Pk Max
								M1[1]	-39.91 dBn 961.539 MH
									M1
and reminister maximum	ordrestadourship	moundigraph	سؤدمه كالمغارطي الرياب	white and	لكلاس أراكانه محرفة وتاريط الرماية	Maharamata	rhelingue 119-2-leadurida	alkaneyersenere	Landryrandl Confer
9.0 kHz			1001 pt		10	0.0 MHz/			1.0 GHz
			1001 pt		10		Measuring	<b>44</b> #4	

Date: 6.FEB.2015 10:36:43





#### Channel Position M - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz

Ref Level 46.2	o do en olleret d	1.20 dB . RBW 1 MH	SY ST CONTRACTOR	trum 3 👘 👘		
Att SAT:EXT1	5 dB SW1	15 ms • VBW 3 MH				
Frequency Sw	eep					O1Pk Max
					M3[1]	-16.26 dB 2.61690 G
				Ň	M1[1]	36.96 dB
						2.59890 G
				113		
				_/\		
M2			J	we have		
	المريقون ومعرارا وميود الأليمان	mon al walnut	anouse and a state of the second	Lauranananan	the man manus he and marked and	A generalized
.0 GHz		1	001 pts	300.0 MHz/		4.0 GH
Marker Table	A GAL MAT					
Type Ref MI	Trc 2	X-Value 5989 GHz	Y-Value 36.96 dBm	Function	Function Result	
M2		2544 GHz	-30.10 dBm -16.26 dBm			

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

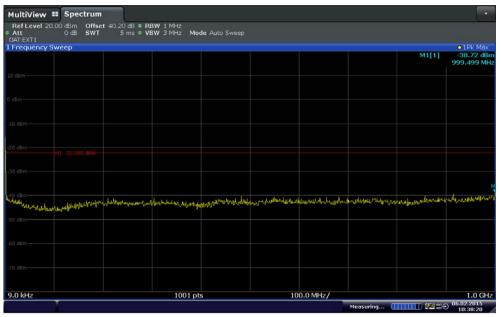
MultiView 🗄		Same and the second	Spectrum 2	Spec	trum 3				
RefLevel 13: Att TRG:EXT1	00 dBm Offse 0 dB SWT	et 46.80 dB ⊂ 1 92 ms ⊂ 1		de Auto Sweep					
Frequency St	weep								O 1Pk Max
10 däm-								M1[1]	
									25.2420 GH
									ML
									white makes
	and and and and			n k a se		where evention	and an and a star	فمغناه جملائكم ودرالطالعما	10. 4. 10
- Washing and	Tadk	mar mon she	An all bad bad and and and and an and	the law where why wer	the second				
		-							
4.0 GHz			1001 pt			2.3 GHz/			27.0 GH
			1001 p	the second se		care come /			92.02.2015

Channel Position M - QPSK / Bandwidth 20.0MHz - 4GHz - 27GHz



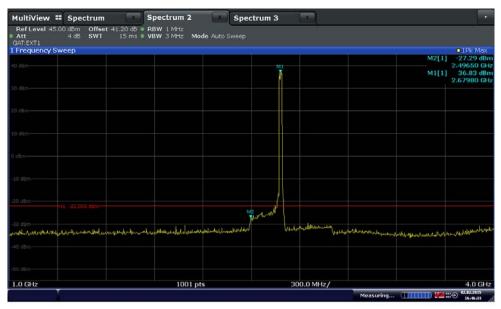


#### Channel Position T - QPSK / Bandwidth 20.0MHz - 9kHz - 1GHz



Date: 6.FEB.2015 10:38:19

#### Channel Position T - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz

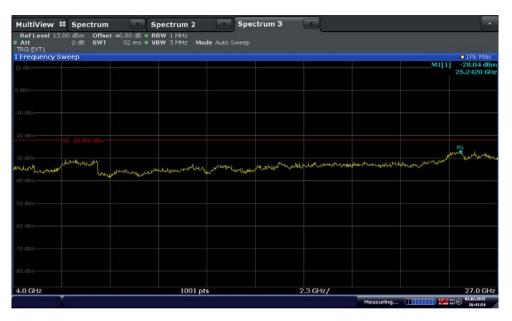


#### Note: The emission beyond the limit is within the operating frequency





#### Channel Position T - QPSK / Bandwidth 20.0MHz - 4GHz - 27GHz







## Configuration L-MIMO-MC 1 (2C)

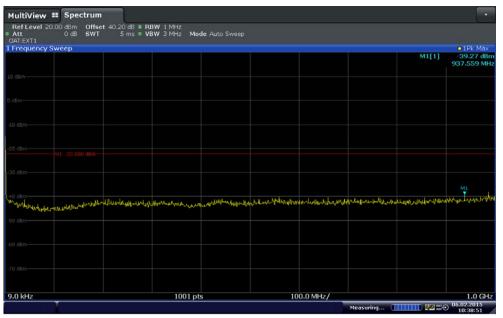
## Maximum Output Power 43.0dBm per port

Channel Position	Bandwidth	Channel Frequency
Channel Position BRFBW	20.0MHz	2506.0MHz + 2546.0MHz
Channel Position M <sub>RFBW</sub>	20.0MHz	2573.0MHz + 2613.0MHz
Channel Position T <sub>RFBW</sub>	20.0MHz	2640.0MHz + 2680.0MHz



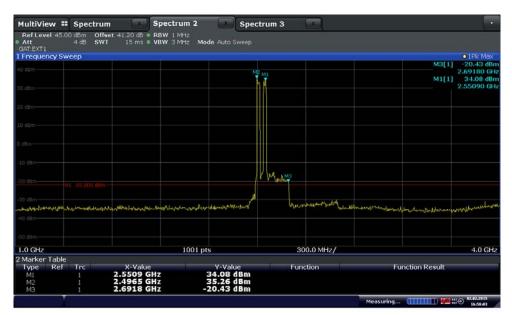


## Channel Position B<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 9kHz - 1GHz



Date: 6.FEB.2015 10:38:52

#### Channel Position B<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz







Frank states and an a frank	and the second se							• 1Rm Clrw
Frequency Sw	/eep						M3[1]	<ul> <li>1Rm Cirw</li> <li>-27.65 dB</li> </ul>
0 đãm							Ma[1]	2.691810 G
							M1[1]	
		$\square$		5				2.000 000 0
		MR						
			And			M3		
o history								
2.6 GHz			1001	nte	40.0 MHz/		St	oan 400.0 MH
Marker Table			1001	i pra	40.0 141127			
Type Ref				Y-Value	Function	Fu	nction Result	
M1		2.55095 GH	z	27.52 dBm				
M2 M3		2.4965 GH 2.69181 GH	z	18.32 dBm -27.65 dBm				

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

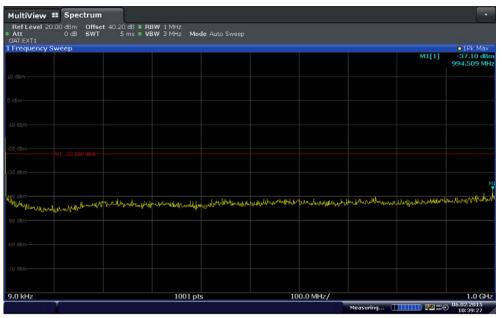
MultiView	# Spectrum	Spectrum 2	Spectrum 3	انتقار		
RefLevel : Att TRG:EXT1		80 dB ● RBW 1 MHz 92 ms ● VBW 3 MHz Mode A	uto Sweep	_		
Frequency	Sweep					O 1Pk Max
					M1[1]	-28.16 dBr
						25.2420 GH
					h	- Aune
-So doin	summerlet	hand the second and the second s	an Ann	april of the second stranger and and	mal aller mar and a second and a second	W arres
stantelynam	" Welens week	have not and an advertise and the	man walk have and			
-40 dām						
4.0 GHz		1001 pts		2.3 GHz/		27.0 GH

 $\underline{Channel\ Position\ B_{RFBW}} - \underline{QPSK} / \underline{Bandwidth\ 20.0MHz} - \underline{4GHz} - \underline{27GHz}$ 



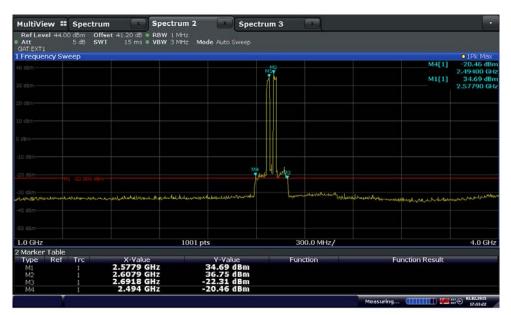


## Channel Position M<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 9kHz - 1GHz



Date: 6.FEB.2015 10:39:27

#### Channel Position M<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz







GAT:EXT1 Frequency S	weep					• 1Rm Clrw
	and particular in the					M4[1] -31.75 dB
						2.494010 G M1[1] 27.19 dB
						2.577920 G
		M4		1		
		American	and a start		June	
.4 GHz			1001 pts	40.0 MHz/		2.8 GH
Marker Tabl						
Type Re	f Trc	X-Value	Y-Value	Function	Function F	Result
M1 M2	1	2.57792 GHz 2.60789 GHz	27.19 dBm 27.31 dBm			
M3		2.69181 GHz	-30.40 dBm			

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

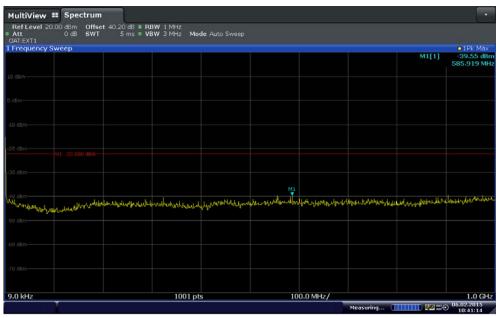
MultiView	# Spectru	<b>n</b>	Spectrum 2	Spectrum 3	×)			
RefLevel 1. Att TRG:EXT1	3.00 dBm Off 0 dB SW		RBW 1 MHz VBW 3 MHz Mod	e Auto Sweep				
Frequency	Sweep							• 1Pk Max
							M1[1]	-27.25 dB
								25.8400 G
	+11 -22.000 dBm	_						
								A T
	and the second sec						1 It month	- Cartorna
threader in a	March Bellenver	a des	and makes malanumer.	and the marker that the state of the state o	and high readened	is it was all and a second should be	1 marthage so	
40 dim-	6	Warneran	4	M				
4.0 GHz			1001 pts		2.3 GHz/			27.0 Gł
and a complete			1001 pta			Measuring		

 $\underline{Channel\ Position\ M_{RFBW}} - \underline{QPSK} / \underline{Bandwidth\ 20.0MHz} - \underline{4GHz} - \underline{27GHz}$ 



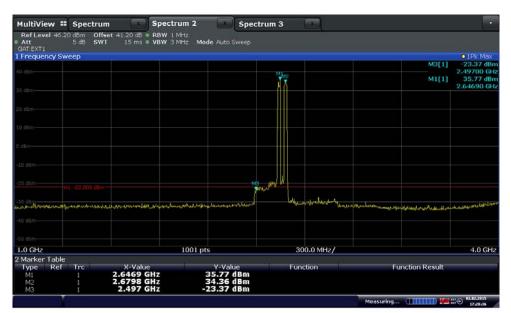


## Channel Position T<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 9kHz - 1GHz



Date: 6.FEB.2015 10:41:14

### Channel Position T<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz







GAT:EXT1 Frequency S	weep					• 1Rm Clrv
						M3[1] -32.89 dE
						2.497000 G M1[1] 27.36 dB
				M1 M		2.646850 G
					-	
		M3	ىدىرىيە ي <del>ەم</del> ىغۇرى	- Jula	4	
		(				
0 d8m						
.4 GHz			1001 pts	40.0 MHz/		2.8 Gł
Marker Tabl Type Rel		X-Value	Y-Value	Function	E.	nction Result
Mi Ke	1	2.64685 GHz	27.36 dBm	rancaon	Fu	icoon Acsult
M2 M3		2.67982 GHz 2.497 GHz	27.09 dBm -32.89 dBm			

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

MultiView =	Spectrum	Spectrum 2	Spectrum 3			
RefLevel 13. Att TRG:EXT1		)dB ● RBW 1 MHz ms ● VBW 3 MHz Mode Au	ito Sweep			
1 Frequency Sv	weep					IPk Max
					M1[1	
						24.7140 GH
						finder working
	mudentilly				A HAR HAR HAR AND	man Cardon and
When all all and	an and the	Muser and the man	all way and a man when the	and a star and a star and the start of the s	and a start of the	
	Carry and	where and the				
4.0 GHz		1001 pts		2.3 GHz/		27.0 GH
3	0				Measuring	BO 02.02.2015 17:05:18

 $\underline{Channel\ Position\ T_{RFBW}} - \underline{QPSK} / \underline{Bandwidth\ 20.0MHz} - \underline{4GHz} - \underline{27GHz}$ 





## Configuration L-MIMO-MC 2 (3C)

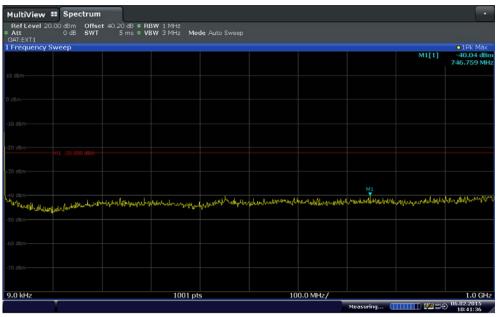
## Maximum Output Power 43.0dBm per port

Channel Position	Bandwidth	Channel Frequency
Channel Position BRFBW	20.0MHz	2506.0MHz + 2526.0MHz + 2546.0MHz
Channel Position M <sub>RFBW</sub>	20.0MHz	2573.0MHz + 2593.0MHz + 2613.0MHz
Channel Position T <sub>RFBW</sub>	20.0MHz	2640.0MHz + 2660.0MHz + 2680.0MHz



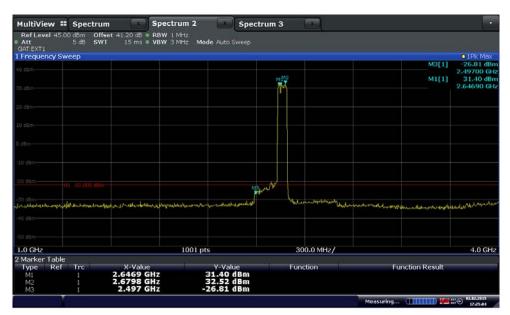


## Channel Position B<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 9kHz - 1GHz



Date: 6.FEB.2015 10:41:37

## Channel Position B<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz



#### Note: The emission beyond the limit is within the operating frequency





## Channel Position B<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 4GHz - 27GHz

Ref Level 13.00 dBm Offset 46.80 d				
	dB = RBW 1 MHz ns = VBW 3 MHz Mode Au	uto Sweep		
Frequency Sweep				<ul> <li>1Pk Max</li> </ul>
				M1[1] -27.23 dBr 25.1500 GH
a dam	ward and and a service of a service of the service	Museus La service marging	an far the address of the share the open	and the second s
dam- (www.warwarwarwarwarwarwarwarwarwarwarwarwarw	1 - Martin and a second and			

 $\underline{Channel\ Position\ M_{RFBW}} - \underline{QPSK} / \underline{Bandwidth\ 20.0MHz} - \underline{9kHz} - \underline{1GHz}$ 

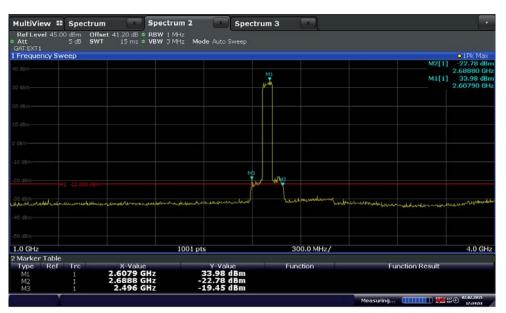
Ref Level 20.00 dB	1997년 1992년 - Hannes Hannes							_
Att 0 c GAT:EXT1	JB SWT 5 n	ns • VBW 3 MHz	Mode Auto Swee					
Frequency Sweep								01Pk Max
							M1[1]	-40.09 dBr 725.779 MH
						MI		
40 dam <sup>Alin</sup> lithe and the and the farm	an man and and and and	tooloon March March Margare	ungurun hing ward	والدعا فالمركبي والمتهار والمعالي وروار والروان	where have been a	wader de sall find the same	p. Khangewartstart	Nadio-Alton
9.0 kHz		100	1 pts	1	00.0 MHz/			1.0 GH

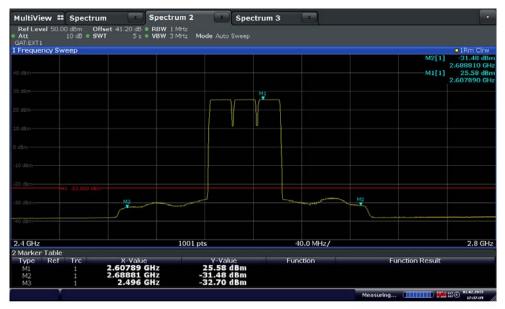
Date: 6.FEB.2015 10:41:58





## Channel Position M<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz





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





## Channel Position M<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 4GHz - 27GHz

lultiView 🎫 Spec		Spectrum 2	Spectrun	Contraction Contra			
	Offset 46.80 dB SWT 92 ms	<ul> <li>RBW 1 MHz</li> <li>VBW 3 MHz</li> <li>Model</li> </ul>	de Auto Sweep				
Frequency Sweep							IPk Max
2 düm						M1[1]	-27.58 dB 25.9320 G
1 dêm	A					Ball	myohn
) d6m	Mundardance	الإرباطين والمتحادية والمتعادين	beline and the service of the servic	ي المستعمل ا	مسارية والمترجمة والمحالين والمعالية والمحالية والمسارية والمسارية والمسارية والمسارية والمسارية والمسارية والم	hilo og Belenger af an de af de ar de ar	myum
المرول بالأرديوما (And dem	University	¢ر,فلهماريا <sub>ت</sub> وررد،ماماي <sub>وارا</sub>	below the sed back the second	and the second	سار و و و و و و و و و و و و و و و و و و و	high - with the spectrum of the spectrum of the	ny din
) c8m	Media derritan er	الكرد المايه ساو توضرون به <sup>م</sup> عاميل <sub>الم</sub>	below the set of the s	and the second	الموريل الاروم مرقوب الريب		ny on
) (8m	Meles Anna a	And Strategic Constraints	beller the tradition of the second	and the antideserves prove the other	ال اور شروه مرد و محمد اور سار ب	high you for the form	the the the test of te
) dBm	John man	ng alama ang ang ang ang ang ang ang ang ang an	ader the stand of the second	and the constant of the second s	الى ئى ئەدەرەمەرىمەر بەرى بىلى ب		the second se
المرول الأرديوما الأماري) dem	Autor dans ten a	الاربانية من المربي المربي المربي المربي	ad a shared and a shared a sha	en film en freez de contracteur de contracteur de contracteur de contracteur de contracteur de contracteur de c	ال <sub>الم</sub> ريديندين معيناي راريد		the second se

 $\underline{Channel\ Position\ T_{RFBW}\ -\ QPSK\ /\ Bandwidth\ 20.0MHz\ -\ 9kHz\ -\ 1GHz}$ 

MultiView 🎞	201000 SHOW DO BORDER								
Ref Level 20.0 Att GAT:EXT1	0dBm Offset 0dB SWT	: 40.20 dB = RE 5 ms = VB	W 1 MHz W 3 MHz Moo	le Auto Sweep					
Frequency Sw	eep								• 1Pk Max
								M1[1]	-38.09 dBr 995.509 MH
in dem	مورسيلي ومراجع المريان	or all advantages	الهديد والفاط سرطوالويا	ulpermond	makallmann	meriditalistications	anna gunad	alignit Maria	millionterror
9.0 kHz			1001 pt	3	10	0.0 MHz/			1.0 GH
							Measuring	<b>40</b>	06.02.2015

Date: 6.FEB.2015 10:42:38





## Channel Position T<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 1GHz - 4GHz

Ref Level 45	.00 dBm Offse	t 41.20 dB . RBW 1 MH	tz			
Att AT:EXT1	5 dB SWT		Iz Mode Auto Sweep			
Frequency S	weep					<ul> <li>1Pk Max</li> </ul>
					M3[1]	-24.29 dB
				- 142		2.49700 G 31.25 dB
				MM2	M1[1]	2.64690 G
				(T)		2104030 0
			MD	10		
			Jer			
dim .		المعادر والقلدام والجدر بالمهيو يسوساني سرالي والحاصر والماقعو	and the property have been been the standing	he was marched	alane trade and an an and freeze and the set of the set	ومقاموه فلرو سيرولسه
age ge ge de de la constante	eligenter an a frankjerter je re	,	and a contact to set the		and a second and a second s	- Company
.0 GHz			1001 pts	300.0 MHz/		4.0 GH
Marker Tabl	0		toor pla	Boold Miley		no or
	Trc	X-Value	Y-Value	Function	Function Result	
M1	1	2.6469 GHz	31.25 dBm			
M2 M3		2.6798 GHz 2.497 GHz	32.21 dBm -24.29 dBm			

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

	Spectrum		Spectrum 2		trum 3:	Carrier Carrier			
Ref Level 13 Att TRG:EXT1	3.00 dBm Offse 0 dB SWT		RBW 1 MHz VBW 3 MHz Mo	de Auto Sweep					
Frequency S	Sweep								• 1Pk Ma
10 d9m								M1[1]	
									25.1730 6
0 d8m	411 - 22:000 dam-								
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and be a second	and a granter		ارور بالمعنور به مراجع المعني مساحد معني م	14.1.1	Lak Male	a Another washingt	understander	And washington and	
all hand had been a start	hive	he which all all	and and the second when	- I the property postilities of	and alter the				
1.0 GHz			1001 pt	c		2.3 GHz/			27.0 G

Channel Position T<sub>RFBW</sub> - QPSK / Bandwidth 20.0MHz - 4GHz - 27GHz

Limit	-22dBm
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Remarks

The EUT does not exceed -22dBm (-13dBm - 10log8) at the frequency range of 9kHz to 27GHz.





#### 2.6 FREQUENCY STABILITY

#### 2.6.1 Specification Reference

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

#### 2.6.2 Equipment Under Test

RRUS 82 B41, KRC 161 436/1, S/N: D820462482

#### 2.6.3 Date of Test and Modification State

03 and 04 January 2015 - 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 Environmental Conditions

Ambient Temperature	25.3 - 25.8°C
Relative Humidity	25.8 - 23.7%

#### 2.6.6 Test Method

Frequency Error – Temperature Variation

The EUT was tested over the temperature range -30°C to +50°C in 10°C steps with -48 VDC Power Supply. At each temperature step, the RRUS was configured to transmit an [RAT]\* at maximum power on the middle channel of the operating band. After achieving thermal balance, the averages of 200 transmission bursts were measured and the result recorded.

Frequency Error - Voltage Variation

The EUT was tested at the supplied voltages varied from 85 to 115 percent of the nominal values of both -48 VDC power supplies. At +20°C, the RRUS was configured to transmit an [RAT]\* at maximum power on the middle channel of the operating band. The average of 200 transmission bursts was measured and the result recorded.

[RAT]\* LTE (20.0 MHz OBW) – Single Carrier with QPSK modulation





## **Test Results**

Configuration L-MIMO-SC (1C)

#### Maximum Output Power 43.0dBm per port

Supply Voltage Tomporature		Frequency Stability (Hz)
DC (V)		Channel Position M (2593.0MHz)
	-30°C	-6.90
	-20°C	-6.25
	-10°C	-7.34
	0°C	-8.30
-48.0	+10°C	-7.24
	+20°C	-4.22
	+30°C	-3.72
	+40°C	-2.14
	+50°C	-5.39

Supply Voltage		Frequency Stability (Hz)
DC (V)	Temperature	Channel Position M (2593.0MHz)
-40.8 V		-4.56
-48.0 V	+20°C	-4.22
-55.2 V		-5.21

## <u>Remarks</u>

bands of operation.	Limit	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.
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**SECTION 3** 

**TEST EQUIPMENT USED** 





## 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Туре No.	TE No.	Calibration Period (months)	Calibration Due
Maximum Average C	utput Power and Peak to	o Average Ratio - Cond	lucted	_	-
Network Analyzer	Agilent	8720D	US36140166	12	17-Nov-2015
Power Meter	Rohde & Schwarz	NRP	101593	12	10-Aug-2015
Power Sensor	Rohde & Schwarz	NRP-Z21	103607	12	15-Apr-2015
Spectrum Analyser	Rohde & Schwarz	FSW43	100615	12	10-Aug-2015
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	Dahua	DH1716A-10	1000303181	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Occupied Bandwidth	1				
Network Analyzer	Agilent	8720D	US36140166	12	17-Nov-2015
Spectrum Analyser	Rohde & Schwarz	FSW43	100615	12	10-Aug-2015
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	Dahua	DH1716A-10	1000303181	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Band Edge	-				-
Network Analyzer	Agilent	8720D	US36140166	12	17-Nov-2015
Spectrum Analyser	Rohde & Schwarz	FSW43	100615	12	10-Aug-2015
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
DC Power Supply	Dahua	DH1716A-10	1000303181	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015
Conducted Spurious	Emission				
Network Analyzer	Agilent	8720D	US36140166	12	17-Nov-2015
Spectrum Analyser	Rohde & Schwarz	FSW43	100615	12	10-Aug-2015
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
Pass Filter	K&L	ULK 904 240/n	23	-	O/P MON
DC Power Supply	Dahua	DH1716A-10	1000303181	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015





Radiated Spurious E	missions				
EMI Receiver	Rohde & Schwarz	ESIB26	100301	12	20-Aug-2015
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	20-Aug-2015
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	20-Aug-2015
Pyramidal Horn Antenna	EMCO	3160-09	760840	12	20-Aug-2015
Pyramidal Horn Antenna	EMCO	3160-10	808234	12	20-Aug-2015
Semi Anechoic Chamber	ETS-Lindgren	9.6m×6.72m×5.98m	-	12	20-Mar-2015
30MHz~3GHz Pre- amplifier	Rohde & Schwarz	SCU03	10005	-	O/P MON
3GHz~18GHz Pre- amplifier	Rohde & Schwarz	AFS42-00101800-25-S-42	1078388		O/P MON
Filters Array	Rohde & Schwarz	TS-Filt	-	-	O/P MON
Switches Array	Rohde & Schwarz	TS-RSP	100241	-	O/P MON
Multi-Device Controller	ETS-Lindgren	2090	00049393	-	O/P MON
Viedo monitoring system	ETS-Lindgren	Y21953A	2501103	-	O/P MON
DC Power Supply	Dahua	DH1716-5D	2007060032	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	14-Dec-2015
Thermo-hygrometer	AZ Instruments	8705	9151665	12	10-Dec-2015

N/A – Not Applicable OP MON – Output Monitored with Calibrated Equipment





## 3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline         Frequency / Parameter         MU			
Conducted Maximum Peak Output Power	30MHz to 10GHz Amplitude	0.5dB*	
Conducted Emissions	30MHz to 40GHz Amplitude	3.0dB*	
Frequency stability	30MHz to 2GHz	<±1x10 <sup>-7</sup>	
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





**SECTION 5** 

# ACCREDITATION, DISCLAIMERS AND COPYRIGHT





## 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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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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