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Permissive change measurements on WCDMA 850 MHz Transceiver unit with FCC ID: TA8AKRC11822-4 (7 appendices)

Test object

Radio Unit KRC 118 22/4, rev. R1B, S/N AE55512431

Appendix 1 provides information about the test object and the test set-up.
Appendix 7 provides external photos of the test object.

Summary

This report is a justification of a Class II permissive change for the equipment grant to also comprise use of 64QAM modulation.

Standard	Compliant	Appendix
FCC CFR 47		
2.1046 RF power output	Yes	2
2.1049 Occupied bandwidth	Yes	3
2.1051 Band edge	Yes	4
2.1051 Spurious emission at antenna terminals	Yes	5
2.1053 Field strength of spurious radiation	Yes	6

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Appendix 1

Description – Test object

Equipment: WCDMA Transceiver unit (RU) 850 MHz, single and multi carrier

Tx Frequency range: 871.4 – 891.6 MHz

Modulations: QPSK, 16QAM and 64QAM

Maximum output power: Single carrier: 1x46 dBm (1x40 W)
Multi carrier: 2x43 dBm (2x20 W)

Nominal power voltage: -48 VDC

Tested channel

UARFCN Frequency
4357 871.4 MHz

Operation mode during measurements**Test models**

All measurements were performed with the test object configured with the Test models 1 and 6 as defined in 3GPP TS 25.141. Test model 1 uses the QPSK modulation only, and Test model 6 includes the 64QAM modulation as follows:

Test model 1 (TM1): 64 DPCCHs with at 30 ksps (SF=128) with QPSK modulation

Test model 6 (TM6): 30 DPCCHs at 30 ksps (SF=128) with QPSK modulation and
8 HS-PDSCHs at 240 ksps (SF=16) with 64QAM modulation

Conducted measurements

All RF conducted measurements were performed with the test object configured for single carrier, installed in a wooden frame and powered with -48 VDC. All measurements were done at the output connector (Ant A) of the Filter Unit (FU) KRC 118 21/1. The measurements were performed at maximum output power with both Test model 1 and Test model 6.

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Appendix 1

Radiated measurements

All radiated measurements were performed with the test object configured for single carrier, installed in a wooden rack without EMC shielding. This configuration represents worst case for radiated spurious emission measurements. The test object was powered with -48 VDC.

The test object was activated at maximum output power (46 dBm). The RF output power port was via a RF attenuator connected to functional test equipment for supervision.

The test object was allocated to the following UARFCN:

Cell	1	1
Downlink	4357 (871,4 MHz)	4357 (871,4 MHz)
Uplink	4132 (826,4 MHz)	4132 (826,4 MHz)
Test model	1	6

Purpose of test

The purpose of this test is to justify a Class II permissive change of the test object to include the use of 64QAM modulation. This report verifies maintained performance characteristics of affected items according FCC CFR47 by re-testing the updated equipment with QPSK, using Test model 1, and with a combination of QPSK and 64QAM, using Test model 6.

Summary of results

Measurement results for both set-ups are near identical and Test model 1 can be considered a worst case set-up.

References

Measurements were done according to relevant parts of the following standards:

ANSI 63.4-2003
ANSI/TIA/EIA-603-B-2002
3GPP TS 25.141

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test object

The test object was delivered: 2008-10-21

Manufacturer's representative

Jan Rimming, Ericsson AB

Test engineers

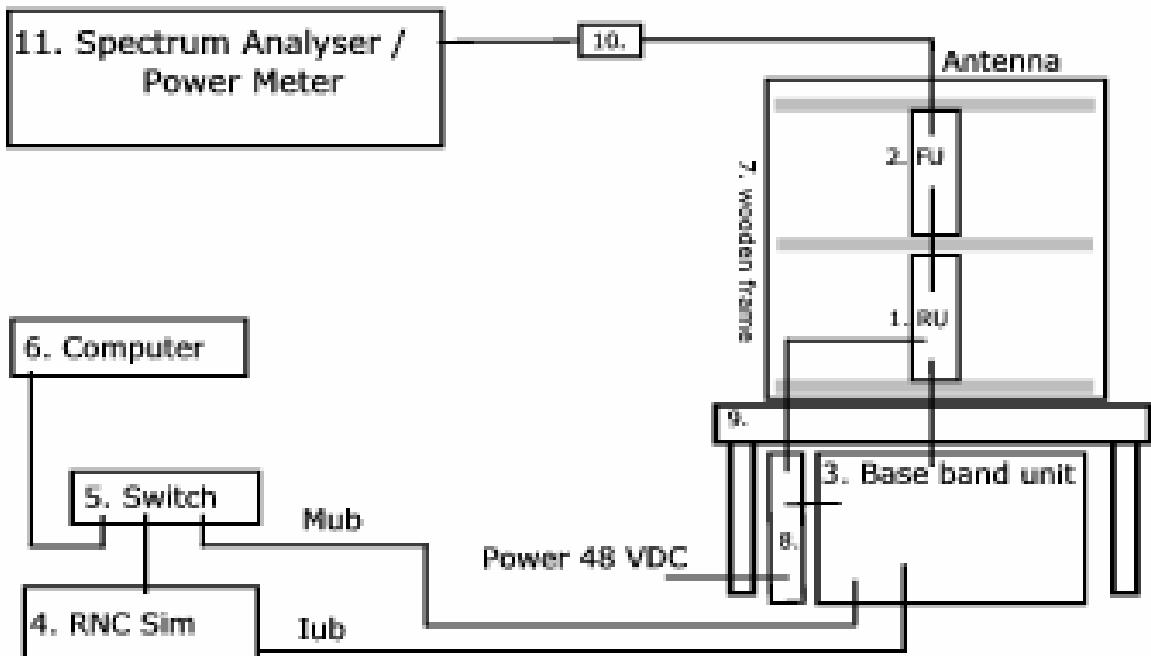
Jörgen Wassholm, Andreas Johnson, Stefan Larsson, Jonas Bremholt and Reinhold Reul

Test witness

Samir Catic, Ericsson AB

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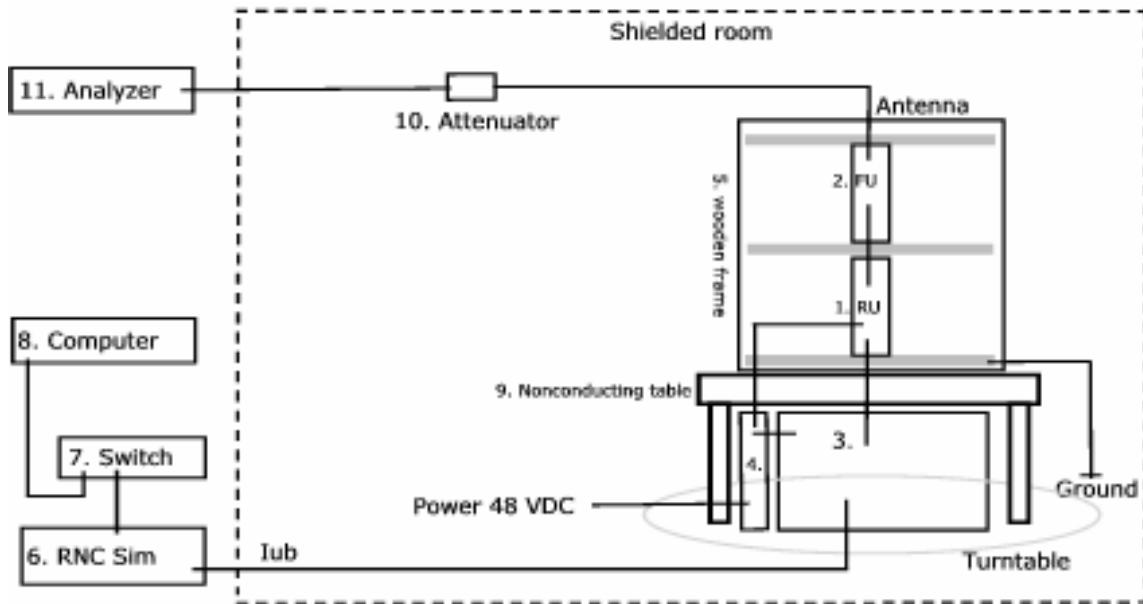
Appendix 1

Test set-up, conducted measurements**Test object**

1. RU KRC 118 22/4, rev. R1B, S/N AE55512431
(FCC ID: TA8AKRC11822-4)
2. FU KRC 118 21/1, rev. R1E, S/N: TU8F196320

Functional test equipment

3. Base band unit S/N AB20215079 with SW CXP 901 2959, rev. R6T/9
4. RNC: Mini-sim #51 4780 DA S/N 0205 REV BAA
5. Switch: HP ProCurve 2810-24G, BAMS 1000552539
6. Computer: SunBlade 2500 BAMS 0000015231
7. Wooden frame
8. PDU 02, product BMG 980 33/02, rev. R1A, S/N (S)T671498775
9. Non conductive table
10. RF attenuator (SP 504 159)
11. Measurement equipment

Test set-up, radiated measurements**Test object**

1. RU KRC 118 22/4, rev. R1B, S/N AE55512431
(FCC ID: TA8AKRC11822-4)
2. FU KRC 118 21/1, rev. R1E, S/N: TU8F196320

Functional test equipment

3. Base band sub rack S/N AB20215079 with SW CXP 901 2959, rev. R6T/9
4. PDU 02, product BMG 980 33/02, rev. R1A, S/N (S)T671498775
5. Wooden frame
6. RNC: Mini-sim #51 4780 DA S/N 0205 REV BAA
7. Switch: HP ProCurve Networking HP innovation S/N CN629XI3T2
8. Computer: SunBlade 2500 BAMS 0000015231
9. Non conductive table
10. Attenuator, Weinschel model 49-40-33 , S/N 656
11. Anritsu Signal Analyzer, MS2691A, SN 6200750255



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Appendix 2

RF power output measurements according to 47 CFR 2.1046

Date	Temperature	Humidity
2008-10-24	22 °C ± 3 °C	40 % ± 5 %

Test set-up and procedure

The output was connected to a Peak power analyzer. The transmitter was set up according to Test model 1 and Test model 6 during the measurements.

Measurement equipment	Calibration Due	SP number
Boonton RF Peak power meter/analyzer	2009-09	503 144
Boonton Power sensor 56518-S/4	2009-09	503 145
Multimeter Fluke 87	2009-01	502 190
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 0.5 dB

Results

Maximum rated output power level after FU unit: 46.0 dBm

Test conditions	Transmitter power (dBm)
	RMS
T_{nom} 22 °C V_{nom} -48 V DC	Frequency 871.4 MHz
TM1 with only QPSK	46.2
TM6 incl. 64QAM	46.2

Limit

According to CFR § 22 there are no conducted limits at the antenna connector.

CFR § 22.913: The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts (57 dBm).

Complies?	Yes
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Appendix 3

Occupied bandwidth measurements according to 47 CFR 2.1049

Date	Temperature	Humidity
2008-10-24	22 °C ± 3 °C	40 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §2.1049. The output was connected to a spectrum analyzer. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. The transmitter was set up according to Test model 1 and Test model 6 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2009-08	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 3.7 dB**Results**

The results are shown in appendix 3.1

TM1 with only QPSK

Frequency	OBW
Diagram 1: 871.4 MHz	4.2 MHz

TM6 incl. 64QAM

Frequency	OBW
Diagram 2: 871.4 MHz	4.2 MHz

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Appendix 3.1

Diagram 1

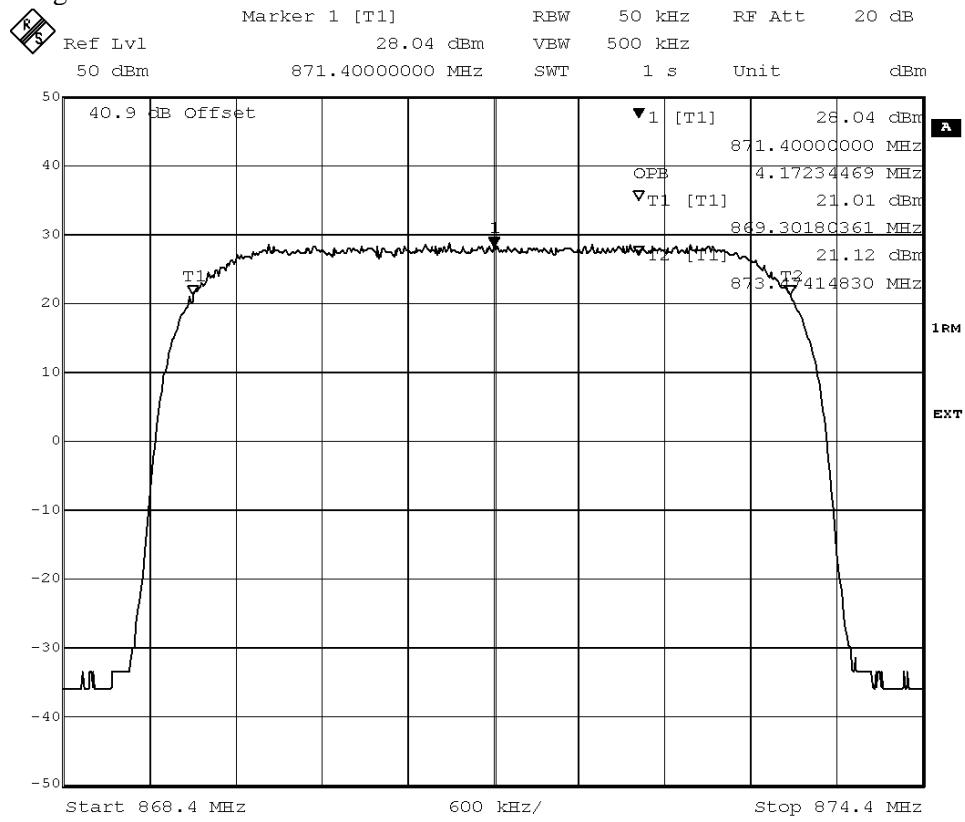
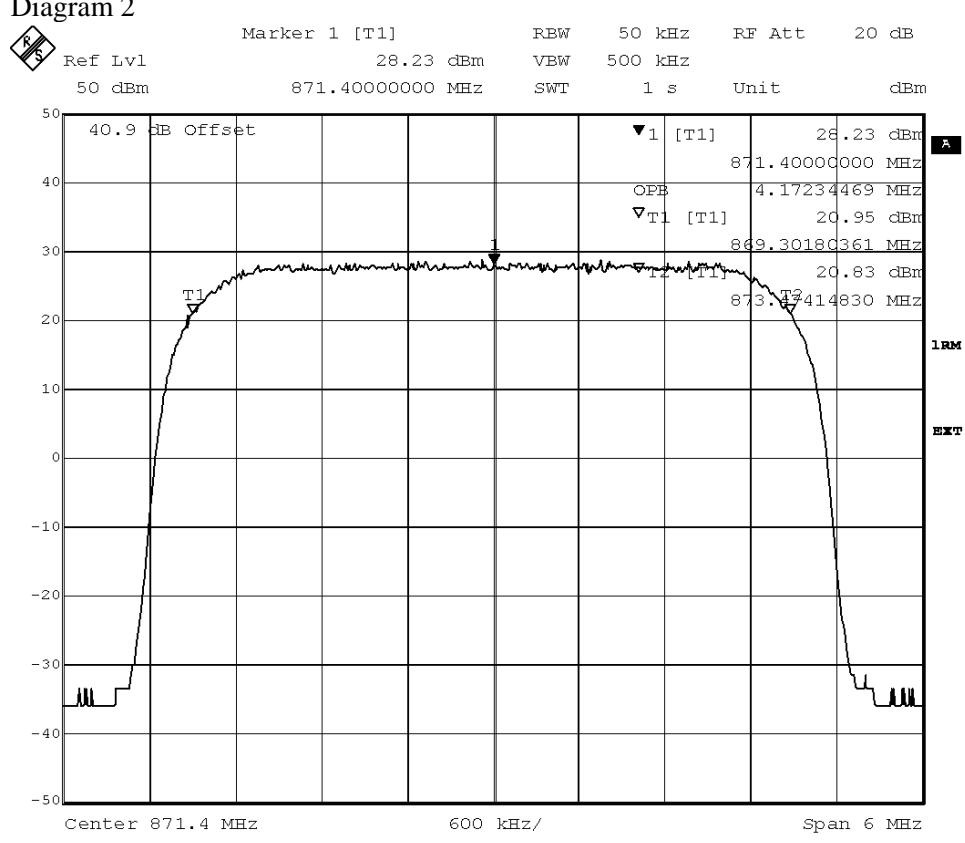


Diagram 2





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Appendix 4

Band edge measurements according to 47 CFR 2.1051

Date	Temperature	Humidity
2008-10-24	22 °C \pm 3 °C	40 % \pm 5 %

Test set-up and procedure

The measurements were made per definition in §22.917. The output was connected to a spectrum analyzer with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. A resolution bandwidth of 30 kHz was used up to 3.25 MHz away from the band edges. 30 kHz is <1% of the Emission BW(4.25 MHz between the 26 dB points). To compensate for the reduced measurement band width, the limit was adjusted with 1.5 dB to -14.5 dBm up to 1 MHz away from the band edges and with 15.2 dB to -28.2 dBm between 1 MHz to 3.25 MHz away from the band edges. The transmitter was set up according to Test model 1 and Test model 6 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2009-08	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1.

Diagram 1: 871.4 MHz

Diagram 2: 871.4 MHz

Limits

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.

Complies?	Yes
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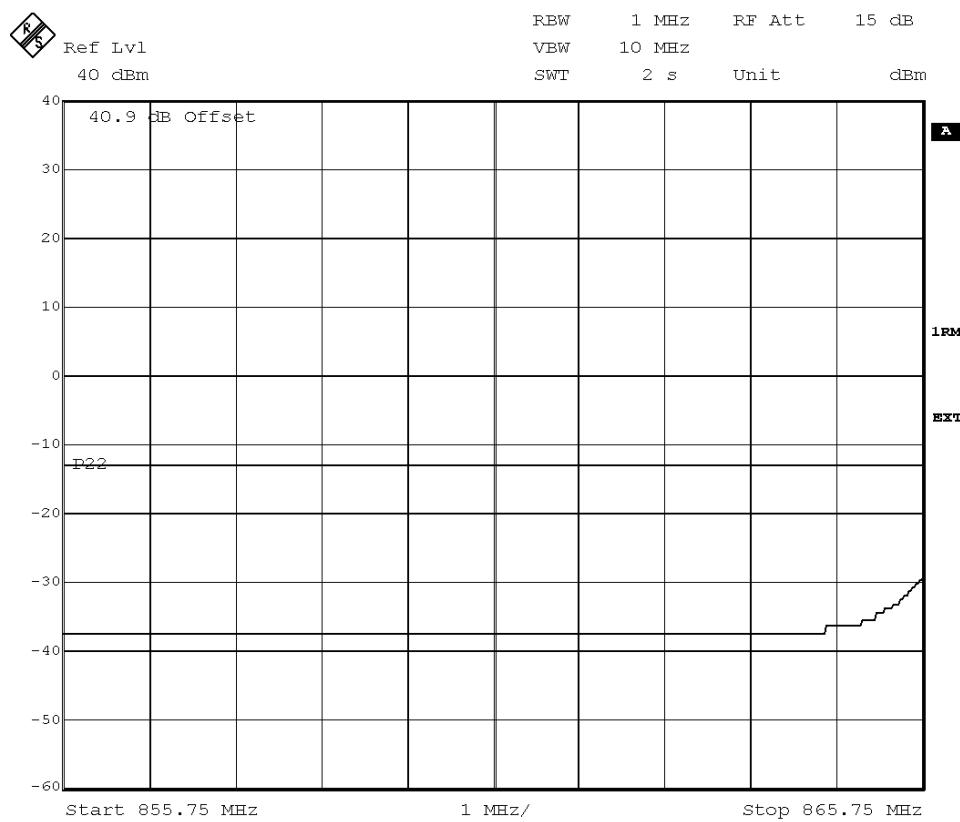
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Appendix 4.1

Diagram 1



Date: 24.OCT.2008 11:46:59



Date: 24.OCT.2008 11:48:15

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Appendix 4.1

Diagram 2



Date: 24.OCT.2008 10:39:44



Date: 24.OCT.2008 10:39:12

**Conducted spurious emission measurements according to 47 CFR 2.1051**

Date	Temperature	Humidity
2008-10-24	22 °C ± 3 °C	40 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §22.917, with a RBW of 1 MHz. The output was connected to a spectrum analyzer. A pre-measurement was performed with the PEAK detector activated. Emission above the limit with the PEAK detector is re-measured with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. The transmitter was set up according to Test model 1 and Test model 6 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2009-08	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 3.7 dB**Results**

The results are shown in appendix 5.1

Diagram 1: **TM1 with only QPSK** Diagram 2: **TM6 incl. 64QAM**
1: 871.4 MHz 2: 871.4 MHz

Remark

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

Limits

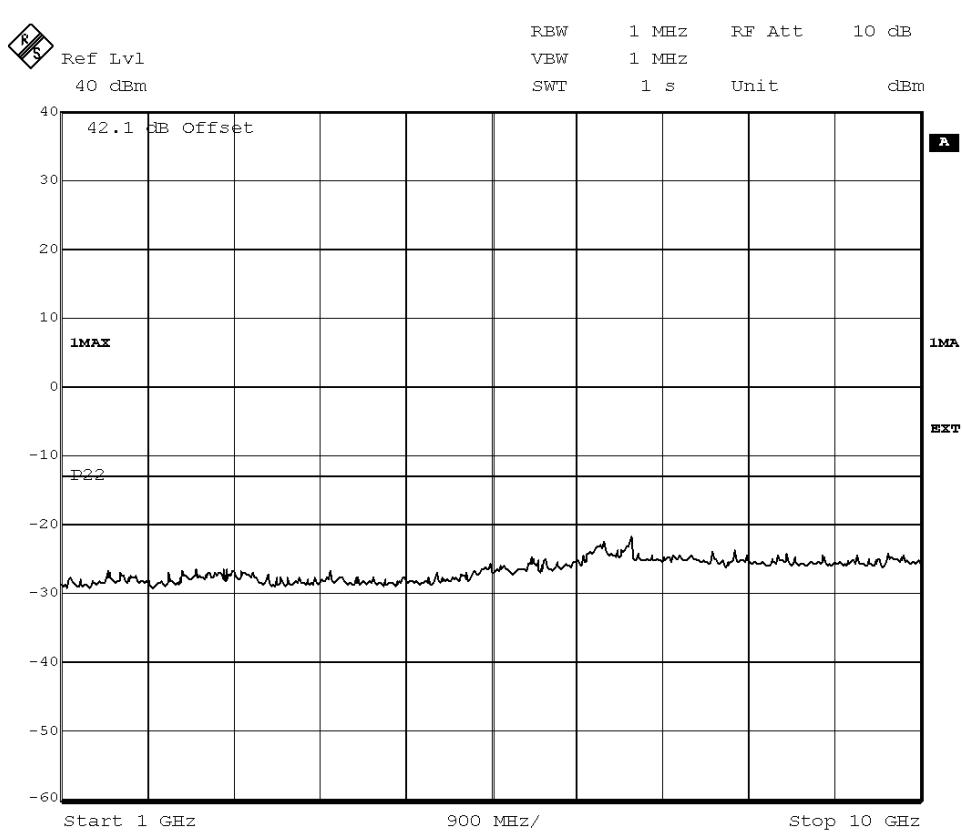
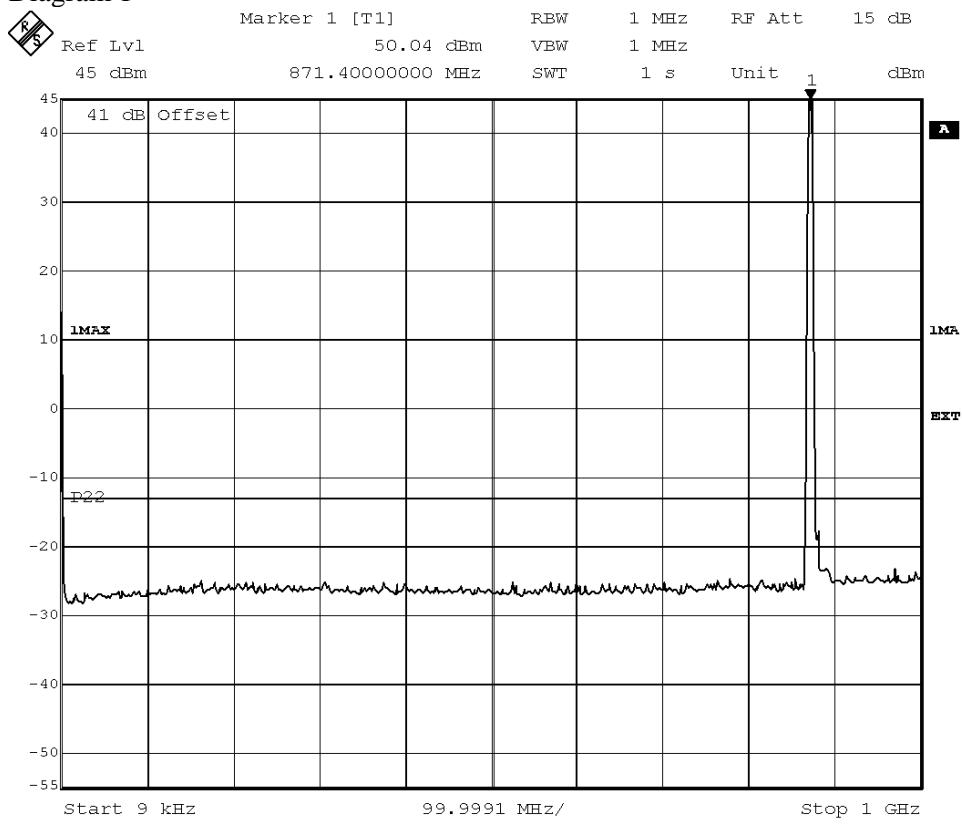
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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Appendix 5.1

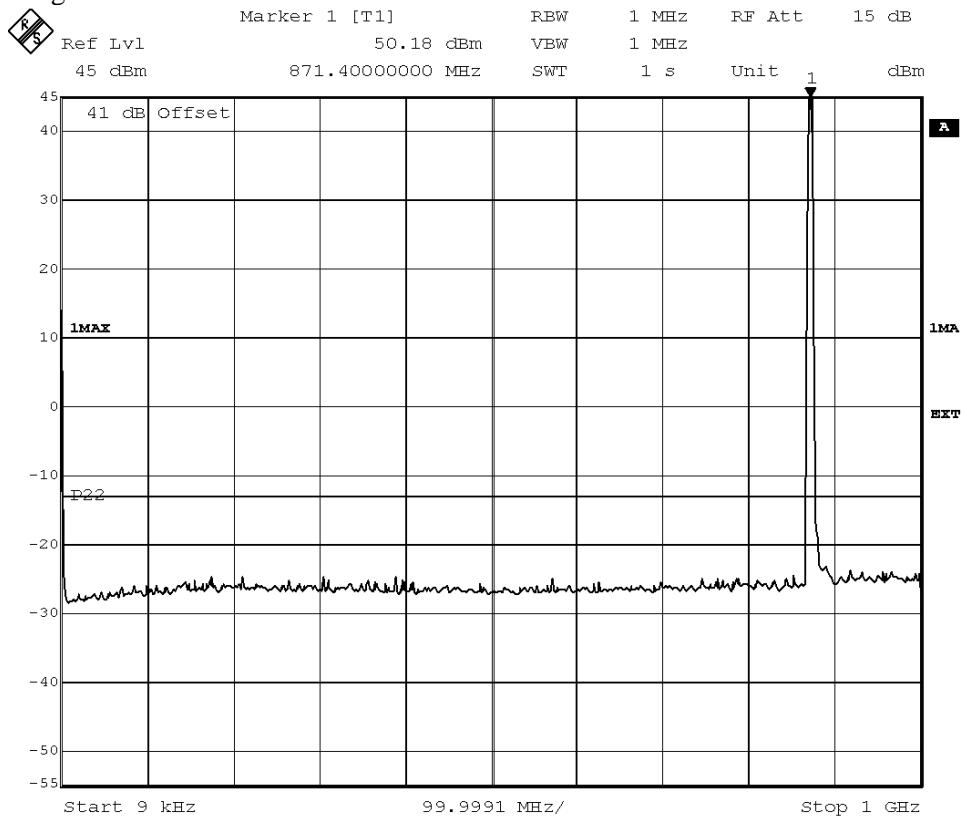
Diagram 1



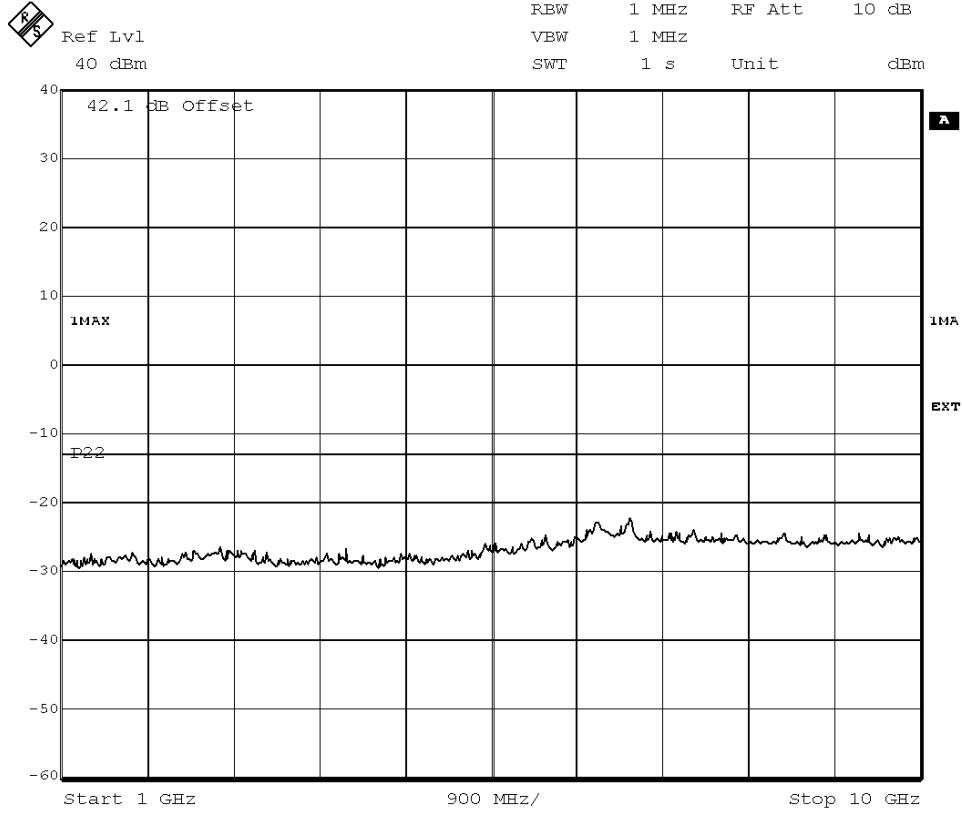
FCC ID: TA8AKRC11822-4

Appendix 5.1

Diagram 2



Date: 24.OCT.2008 10:46:01



Date: 24.OCT.2008 11:29:38

Field strength of spurious radiation measurements according to 47 CFR 2.1053

Date	Temperature	Humidity
2008-10-21 to 2008-10-22	22-23 °C ± 3 °C	34 – 40 % ± 5 %

Test set-up and procedure

The test site is listed at FCC, Columbia with registration number: 93866. The test site also complies with RSS-Gen, Industry Canada file no.:IC 3482.

The transmitter was set up according to Test model 1 and Test model 6 during the measurements. The antenna port was terminated into functional test equipment with 50 ohm load impedance.

The measurements were performed with both horizontal and vertical polarisation of the antenna. The antenna distance was 3 m.

A pre-measurement was first performed:

In the frequency range 30 MHz-10 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was,

$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right), \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

The measurement procedure was as the following:

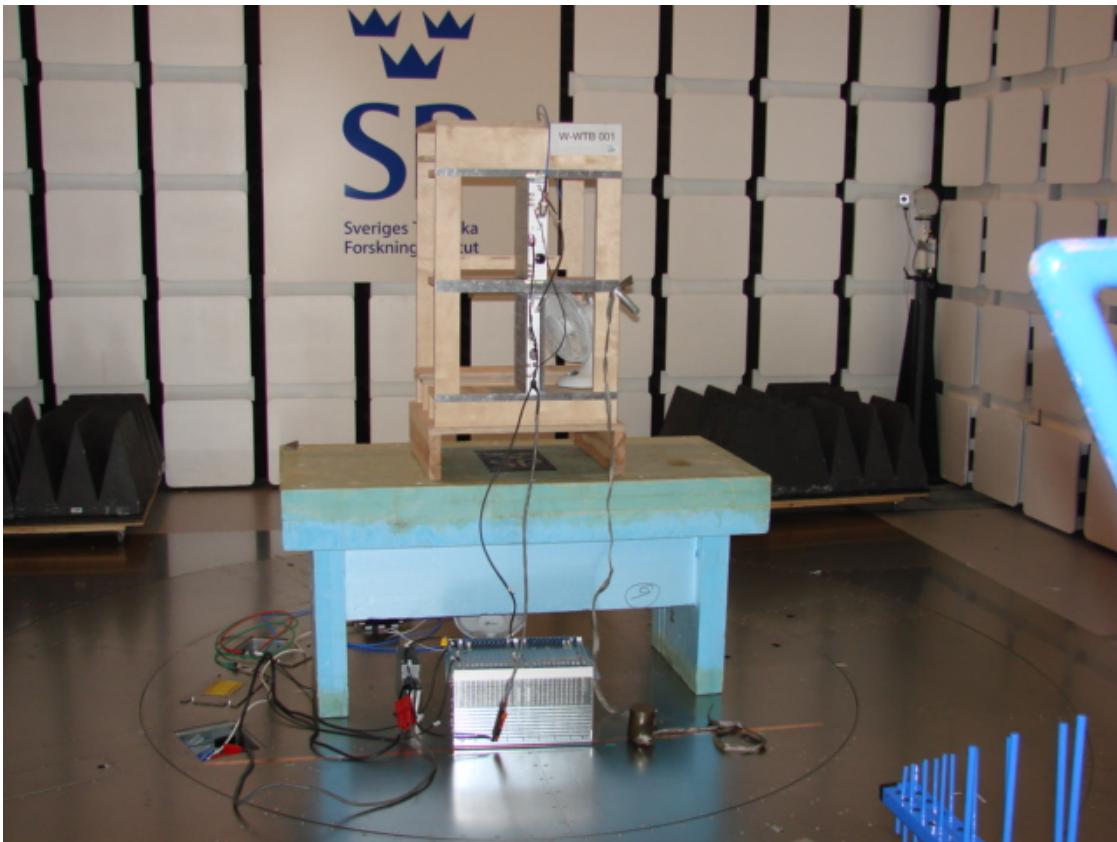
1. The pre-measurement was first performed with peak detector. The EUT was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. Spurious radiation on frequencies closer than 20 dB to the limit is scanned 0-360 degrees and the antenna is scanned 1-4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported, frequencies closer than 10 dB to the limit measured with the RMS detector were measured with the substitution method according to the standard

Measurement equipment	Calibration Due	SP number
Test site Tesla	2010-10	503 881
R&S ESI 26	2009-07	503 292
Control computer	-	A700307
Software: R&S EMC32, Ver. 6.30	-	-
Chase Bilog antenna CBL 6111A	2008-11	503 182
EMCO Horn Antenna 3115	2011-01	502 175
MITEQ Low Noise Amplifier	2009-06	503 285
Testo 610, Temperature and humidity meter	2009-04	502 658

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Appendix 6

The test set-up during the spurious radiation measurements is shown in the picture below.



Results**TM1 with only QPSK**

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-10 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		
4.7 dB		

TM6 incl. 64QAM

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-10 000	All emission > 20 dB below limit	All emission > 20 dB below limit
Measurement uncertainty		
4.7 dB		

Limits

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.

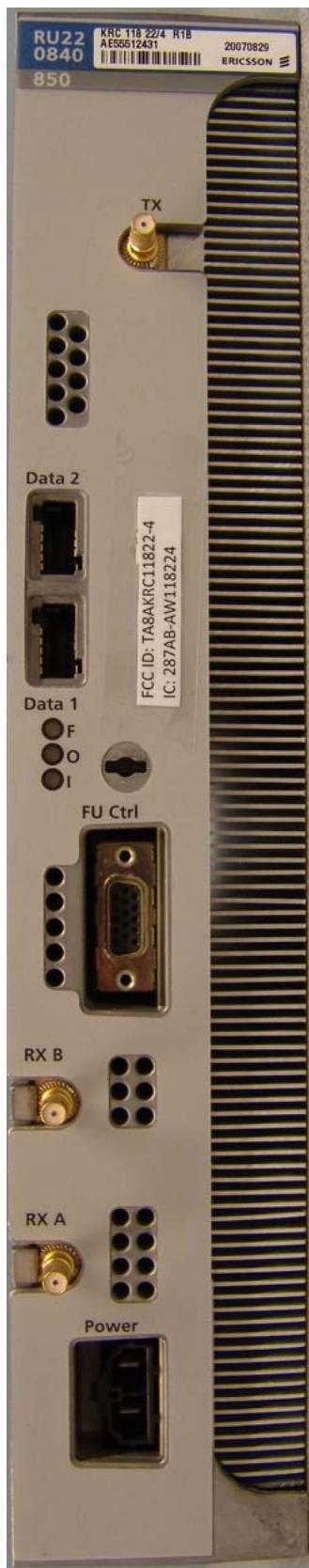
Complies?	Yes
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Appendix 7

Photos
Radio Unit KRC 118 22/4

Front side



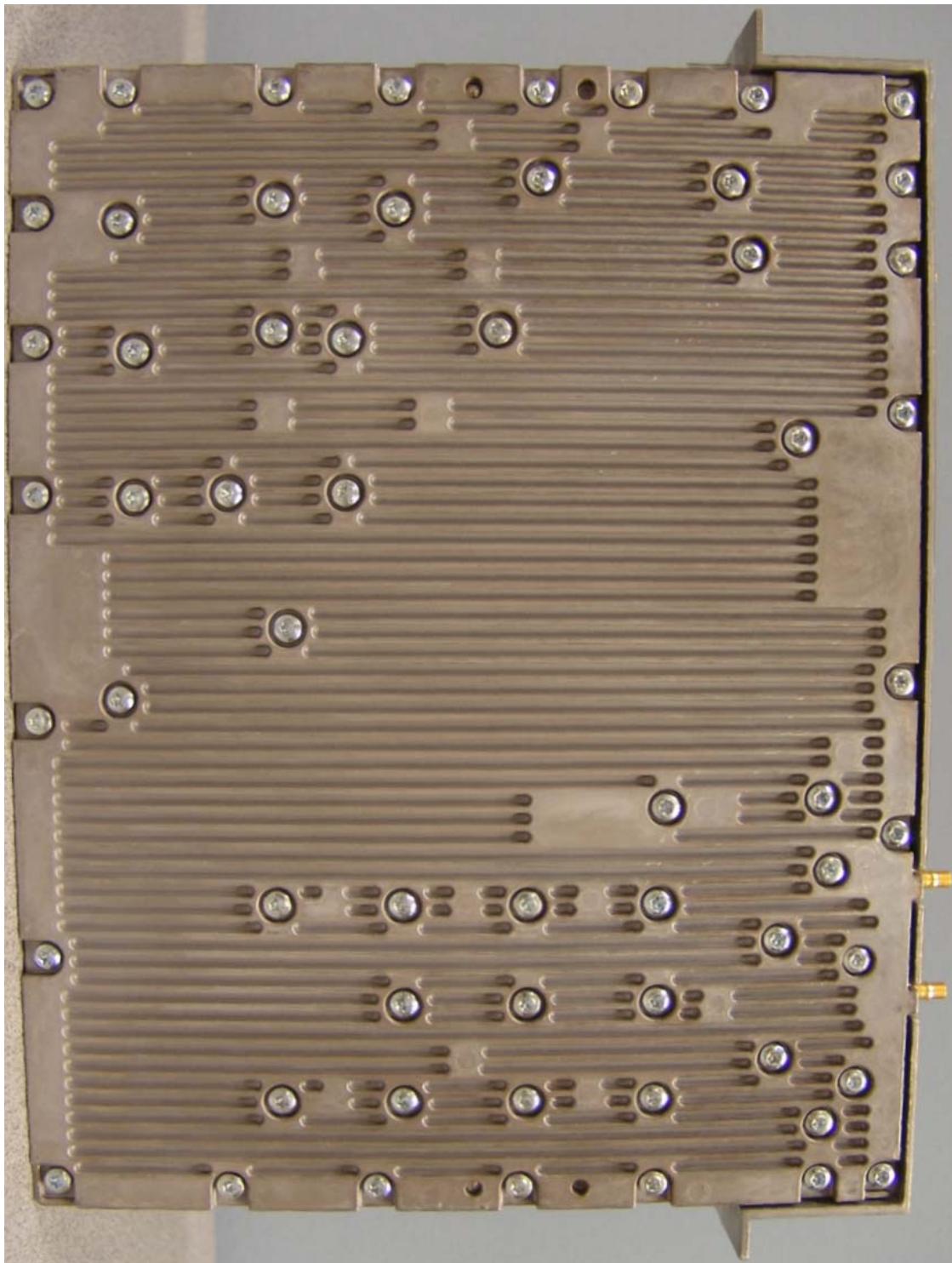
Rear side



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Appendix 7

Left side





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Right side

