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Radio measurements on WCDMA 850 MHz Transceiver unit with FCC ID: TA8AKRC11822-6 and IC: 287AB-AW118226

(9 appendices)

Test object

Radio Unit KRC 118 22/6 rev R1A

Appendix 1 provides information about the test object and the test set-up.
Appendix 9 provides external photos of the test object.

Summary

Standard	Compliant	Appendix
FCC CFR 47 / IC RSS-132 Issue 2		
2.1046 / RSS-132 4.4 RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1 Occupied bandwidth	Yes	3
2.1051 / RSS-132 4.5 Band edge	Yes	4
2.1051 / RSS-132 4.5 Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-132 4.5 Field strength of spurious radiation	Yes	6
2.1055 / RSS-132 4.3 Frequency stability	Yes	7
FCC CRF 47 / Industry Canada RSS-132 Issue 2		
15.111 / RSS-132 4.6 Receiver spurious emissions	Yes	8

Note: Above RSS-132 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

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FCC ID: TA8AKRC11822-6
IC: 287AB-AW118226

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Appendix 1

Description – Test object

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

Frequency range: Tx: 871.4 – 891.6 MHz
Rx: 826.4 – 846.6 MHz

Modulations: QPSK, 16QAM and 64QAM

Maximum output power: Single carrier: 1x 46 dBm (1x 40W)
Multi carrier: 2x 43 dBm (2x 20W)

Channel bandwidth: 4.2 to 5 MHz (configurable in steps of 100/200 kHz)

Channel spacing: 4.4 to 5 MHz (configurable in steps of 100/200 kHz)

Nominal power voltage: -48 VDC

Tested channels

UARFCN	Tx Frequency
4357	871.4 MHz
4382	876.4 MHz
4407	881.4 MHz
4408	881.6 MHz
4433	886.6 MHz
4458	891.6 MHz

Operation mode during measurements

Measurements were performed with the test object transmitting the Test models which are defined in 3GPP TS 25.141. Test model 1(TM1) uses the QPSK modulation only, Test model 5(TM5) includes the 16QAM modulation and Test model 6(TM6) includes the 64QAM modulation.

The settings below were found to be representative for all traffic scenarios when several settings with the different modulations and channel bandwidths were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted.

Single carrier TM1: 64 DPCH:s at 30 ksps (SF=128)
Multi carrier TM1: 32 DPCH:s at 30 ksps (SF=128) in each carrier
Channel bandwidth 5 MHz

Conducted measurements

The test object was powered with -48 VDC. All RF conducted measurements were performed with the test object configured for maximum transmit power. All TX measurements were done at the Ant A connector and the RX measurements were done on the Ant B connector of the Filter Unit (FU) KRC 118 21/1.



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Appendix 1

Radiated measurements

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

The RF output power port was via a RF attenuator connected to functional test equipment for supervision.

The RU unit were allocated to the following UARFCN:

Single Carrier:

Downlink	4357 (871.4 MHz)	4407 (881.4 MHz)	4458 (891.6 MHz)
Uplink	4132 (826.4 MHz)	4182 (836.4 MHz)	4233 (846.6 MHz)

Multi Carrier:

Cell	1	2
Downlink	4357 (871.4 MHz)	4407 (881.4 MHz)
Uplink	4132 (826.4 MHz)	4182 (836.4 MHz)

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-132.

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
RSS-Gen Issue 2
RSS-132 Issue 2

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Appendix 1

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2010-10	503 881
R&S FSIQ	2009-08	503 738
R&S ESI 26	2009-07	503 292
High pass filter	2010-06	503 739
Boonton RF Peak power meter/analyizer	2009-08	503 144
Boonton Power sensor 56518-S/4	2010-02	503 146
Chase Bilog antenna CBL 6111A	2011-11	502 181
EMCO Horn Antenna 3115	2011-01	502 175
Flann Standard gain horn 16240-25	-	503 939
Flann Standard gain horn 18240-25	-	503 900
Flann Standard gain horn 20240-20	-	503 674
MITEQ Low Noise Amplifier	2009-06	503 285
Climate chamber 3	2009-05	503 546
Multimeter Fluke 87	2010-01	502 190
Testo 635, Temperature and humidity meter	2011-03	504 203
Testo 615, Temperature and humidity meter	2009-11	503 505

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: 2009-02-16

Manufacturer's representative

Christer Gustavsson, Ericsson AB.

Test engineers

Andreas Johnson, Jonas Bremholt and Jörgen Wassholm

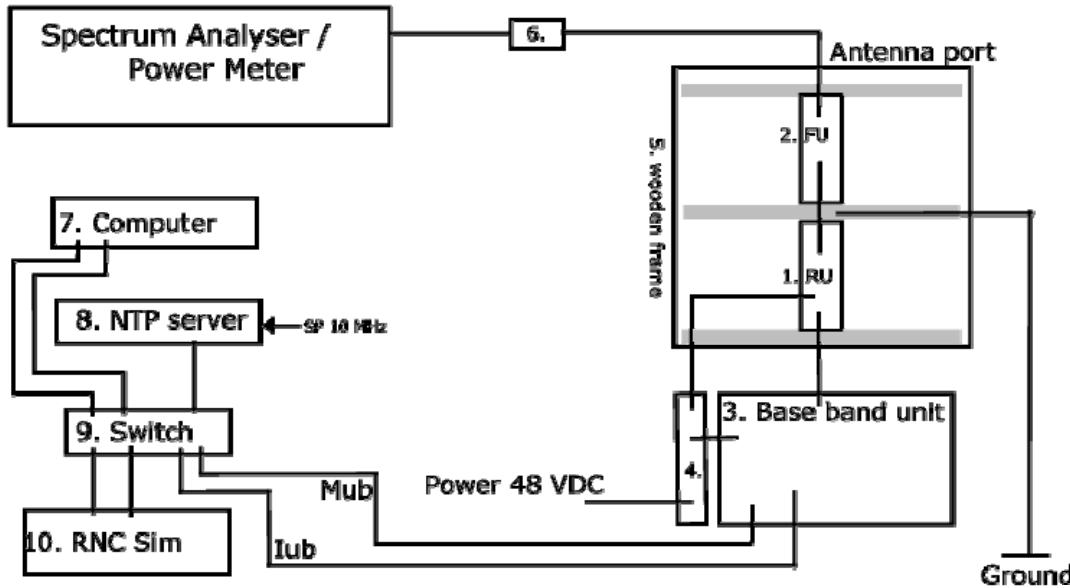
Test witness

Christer Hjorth and Ove Nilsson, Ericsson AB.

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Appendix 1

Test set-up, conducted measurements



Test object

1. RU KRC 118 22/6, Rev. R1A, S/N C821753379
 (FCC ID: TA8AKRC11822-6)

Functional test equipment

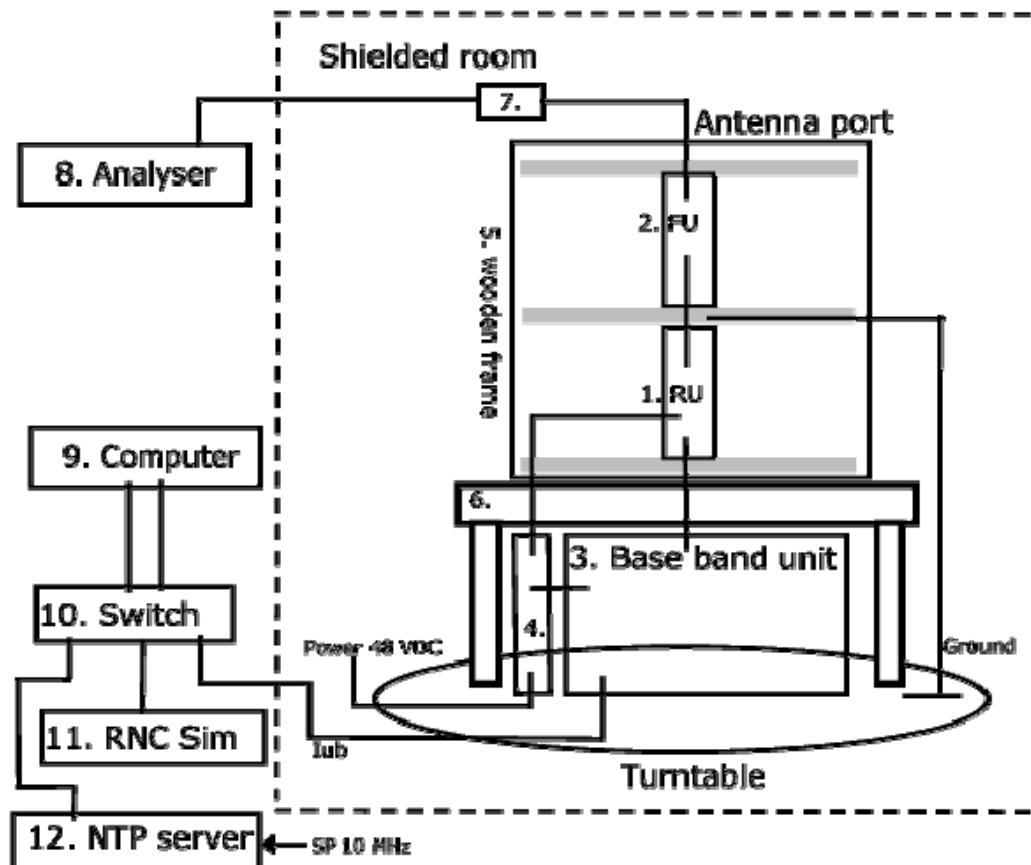
2. FU KRC 118 21/1, Rev. R2A, S/N: TU8F575189
3. Base band sub rack:
 BFX 901 36/1, Rev. R1C, S/N AB20199733 with Software CXP 901 3008, rev. R9J06
4. PDU 02, product BMG 980 33/1, Rev. R1D, S/N (s)T671498775
5. Wooden frame
6. RF attenuator
7. Computer: SunBlade 2500 BAMS 0000015235
8. NTP server, Symmetricom, BAMS 1000368818
9. Switch, Procurve 2810-24G, BAMS1000621796
10. RNC: CES 4780DA Mini-sim #53, BAMS1000134363

Note The test object was installed in a RBS 3206 during the frequency error measurements.

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Appendix 1

Test set-up, radiated measurements



Test object

1. RU KRC 118 22/6, Rev. R1A, S/N C821753379
(FCC ID: TA8AKRC11822-6)

Functional test equipment

2. FU KRC 118 21/1, Rev. R2A, S/N: TU8F575189
3. Base band sub rack:
BFX 901 36/1, Rev. R1C, S/N AB20199733 with Software CXP 901 3008, rev. R9J06
4. PDU 02, product BMG 980 33/1, Rev. R1D, S/N (s)T671498775
5. Wooden frame
6. Non conductive table
7. RF Attenuator
8. Anritsu Signal Analyzer, MS2691A, EAB 2800 ID:4021831, EAB 2800 ID: 4021819
9. Computer: SunBlade 2500 BAMS 0000015235
10. Switch, Procurve 2810-24G, BAMS1000621796
11. RNC: CES 4780DA Mini-sim #53, BAMS1000134363
12. NTP server, Symmetricom, BAMS 1000368818

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Appendix 2

RF power output measurements according to 47 CFR 2.1046/ RSS-132 4.4

Date	Temperature	Humidity
2009-04-08	23 °C ± 3 °C	32 % ± 5 %

Test set-up and procedure

The output was connected to a peak power analyzer with the CDF mode activated.

Measurement equipment	SP number
Boonton RF Peak power meter/analyzer	503 144
Boonton Power sensor 56518-S/4	503 146
Multimeter Fluke 87	502 190
Testo 635, Temperature and humidity meter	504 203

Measurement uncertainty: 0.5 dB

Results

Single carrier: Rated output power level at Ant A connector (maximum): 1x 46 dBm

Transmitter power (dBm/ dB) RMS/ PAR		
Frequency 871.4 MHz	Frequency 881.4 MHz	Frequency 891.6 MHz
45.6/ 6.4	45.4/ 6.5	45.4/ 6.7

Multi carrier: Rated output power level at Ant A connector (maximum): 2x 43 dBm

Transmitter combined power (dBm/ dB) RMS/ PAR	
Frequencies 871.4 MHz 881.4 MHz	Frequencies 881.6 MHz 891.6 MHz
45.4/ 6.7	45.4/ 6.9

Limit

According to CFR 47/ RSS there are no conducted limits at the antenna connector.

CFR § 22.913/ SRSP-503 5.1: The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts (57 dBm).

RSS-132: The transmitter output power shall not exceed the limits given in SRSP-503

Complies?	Yes
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Appendix 3

Occupied bandwidth measurements according to 47 CFR 2.1049/ RSS-Gen 4.6.1

Date	Temperature	Humidity
2009-04-08	23 °C ± 3 °C	32 % ± 5 %
2009-04-09	23 °C ± 3 °C	30 % ± 5 %
2009-04-17	23 °C ± 3 °C	27 % ± 5 %

Test set-up and procedure

The measurements were made as defined 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.

Measurement equipment	SP number
R&S FSIQ	503 738
Testo 635, Temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 3.1

Channel Bandwidth 5.0 MHz

	Frequency	OBW
Diagram 1	871.4 MHz	4.18 MHz
Diagram 2	881.4 MHz	4.18 MHz
Diagram 3	891.6 MHz	4.18 MHz

Channel Bandwidth 4.2 MHz

	Frequency	OBW
Diagram 4	871.4 MHz	3.86 MHz
Diagram 5	881.4 MHz	3.86 MHz
Diagram 6	891.6 MHz	3.86 MHz

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Appendix 3.1

Diagram 1

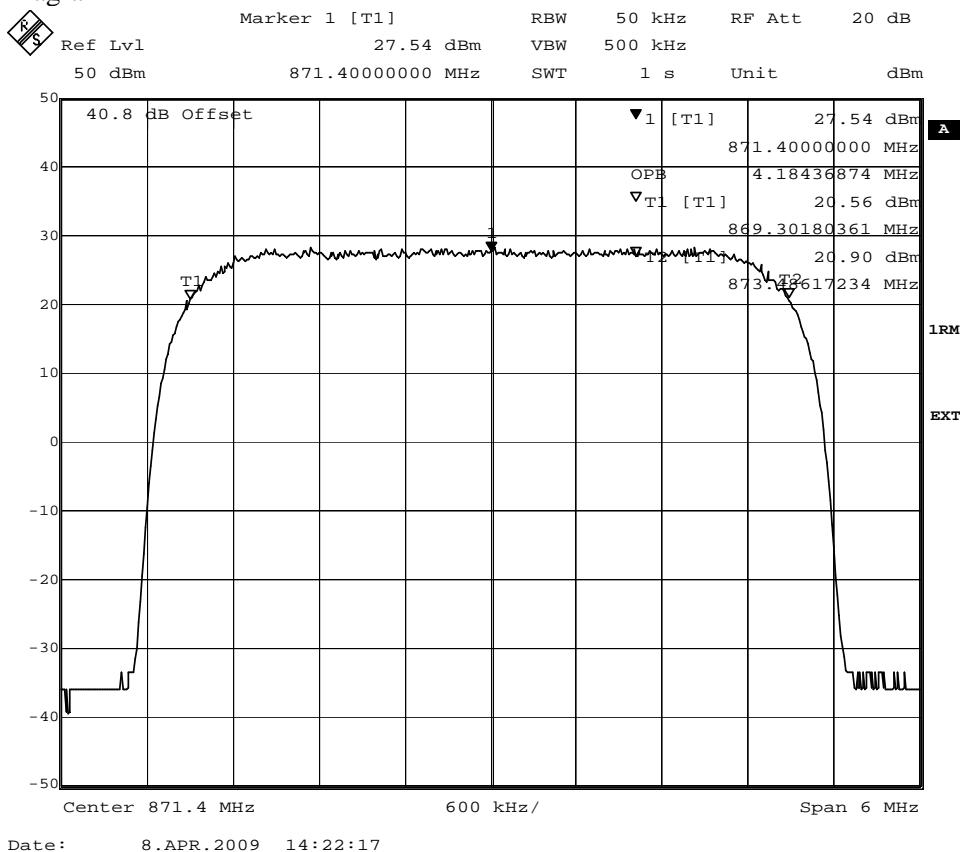
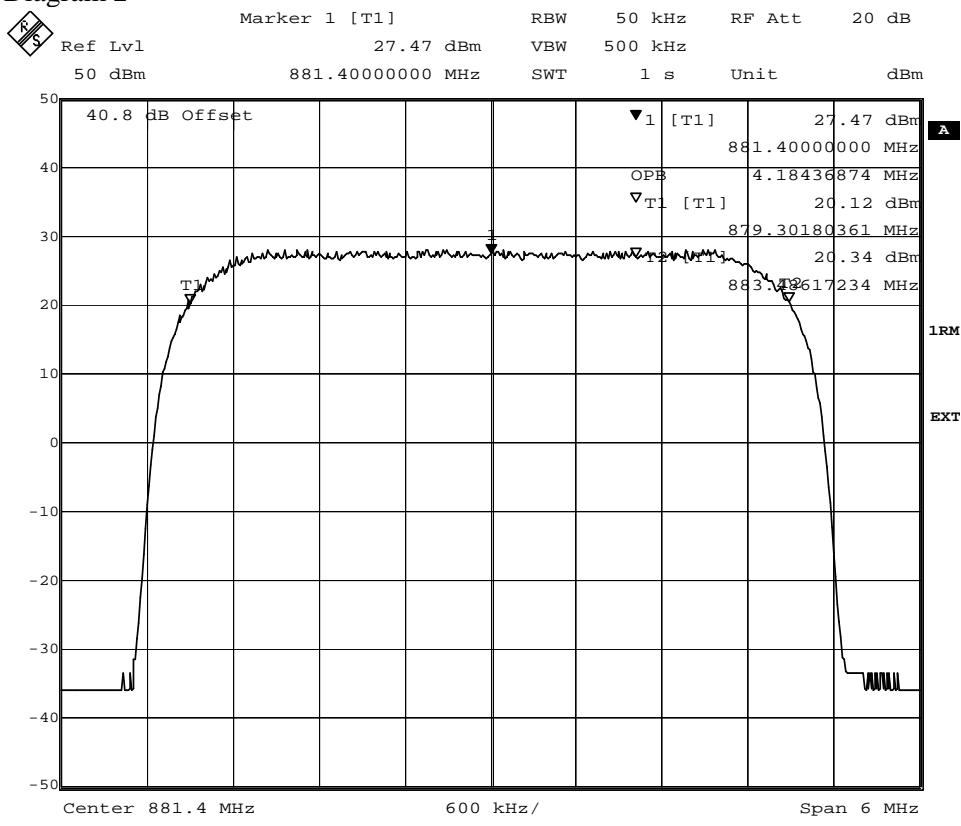


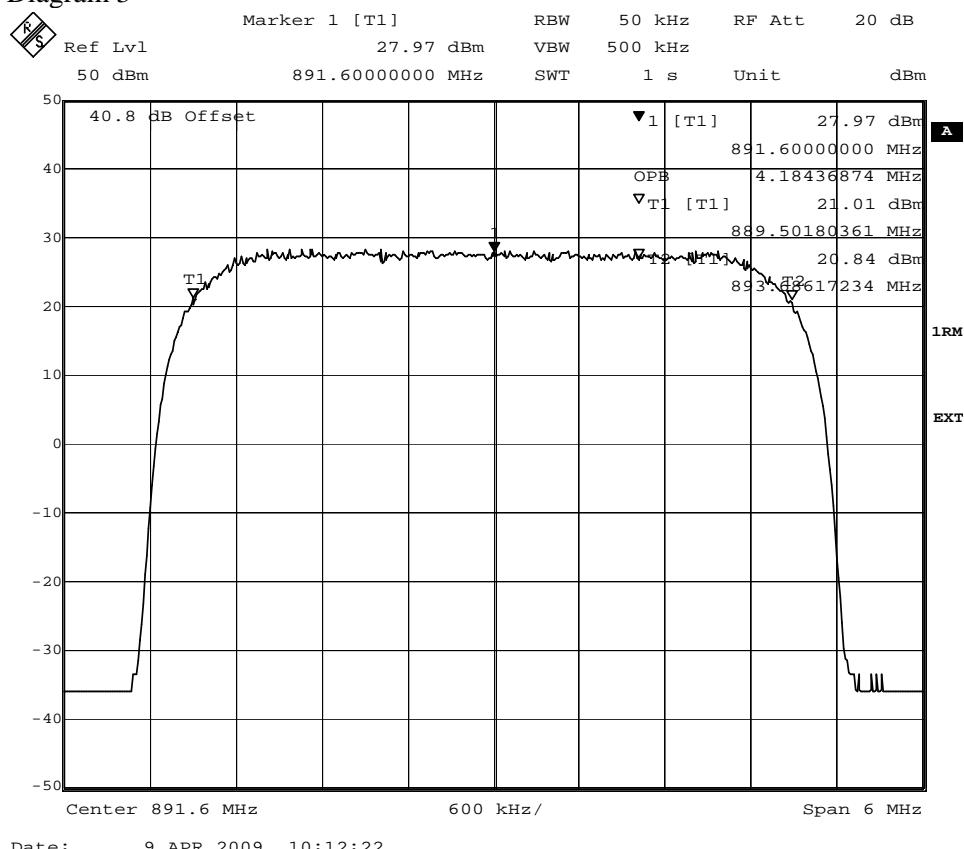
Diagram 2



FCC ID: TA8AKRC11822-6

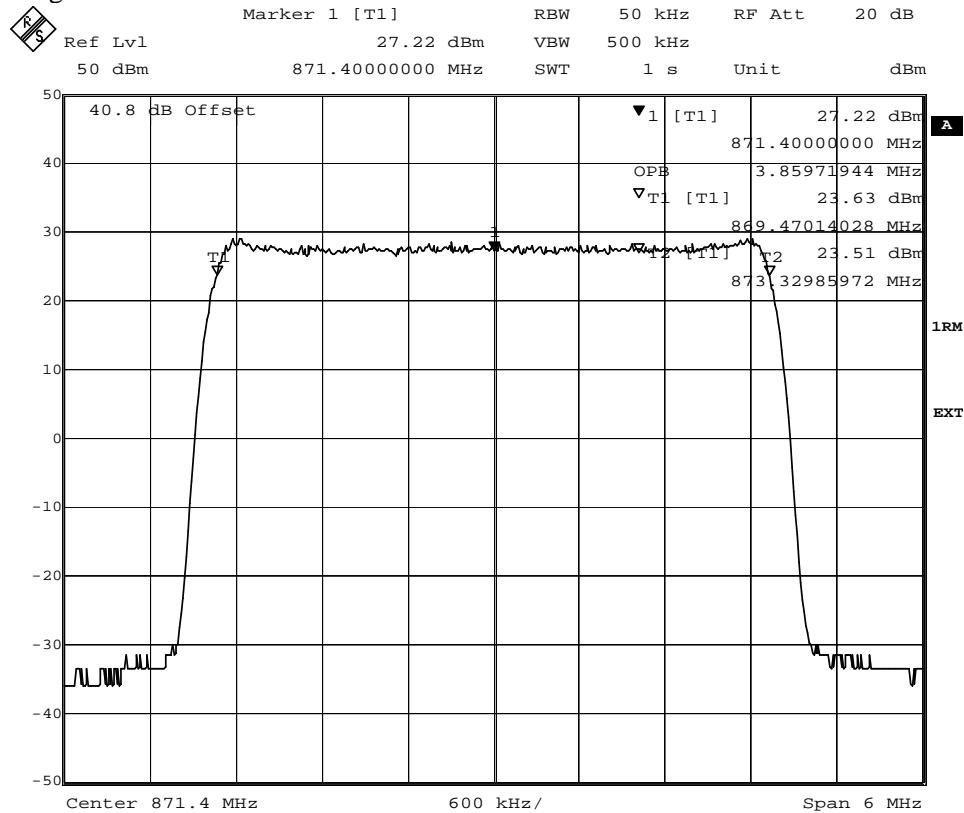
Appendix 3.1

Diagram 3



Date: 9.APR.2009 10:12:22

Diagram 4



Date: 17.APR.2009 11:51:42

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Appendix 3.1

Diagram 5

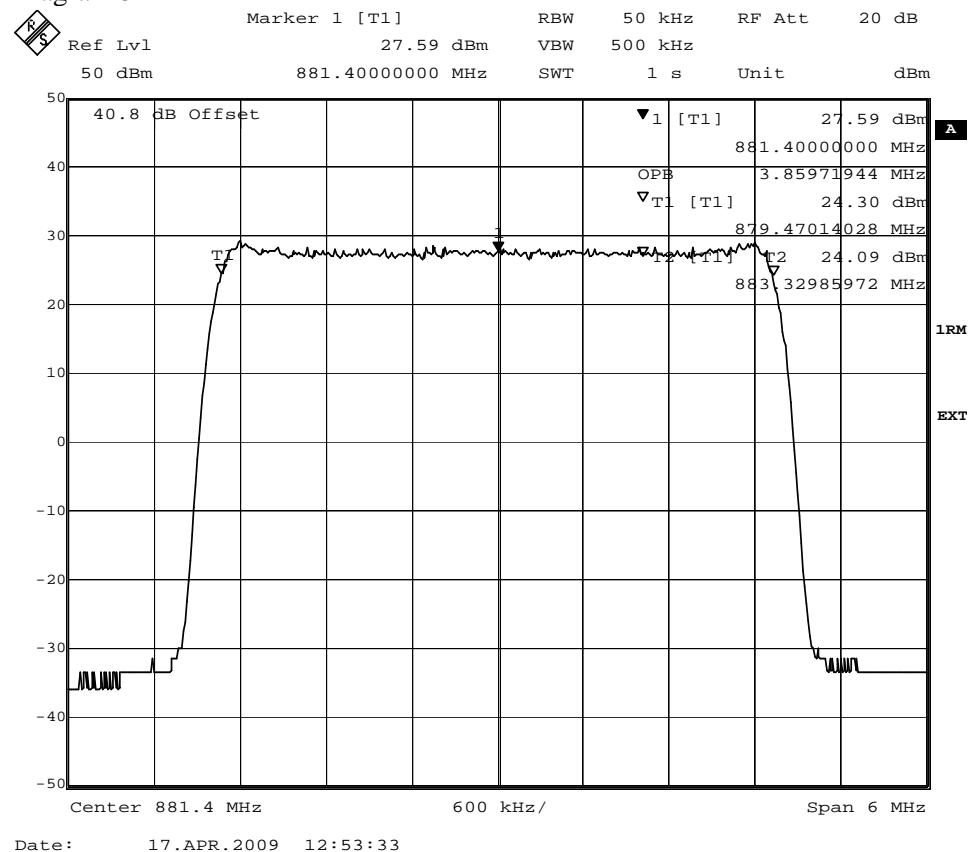
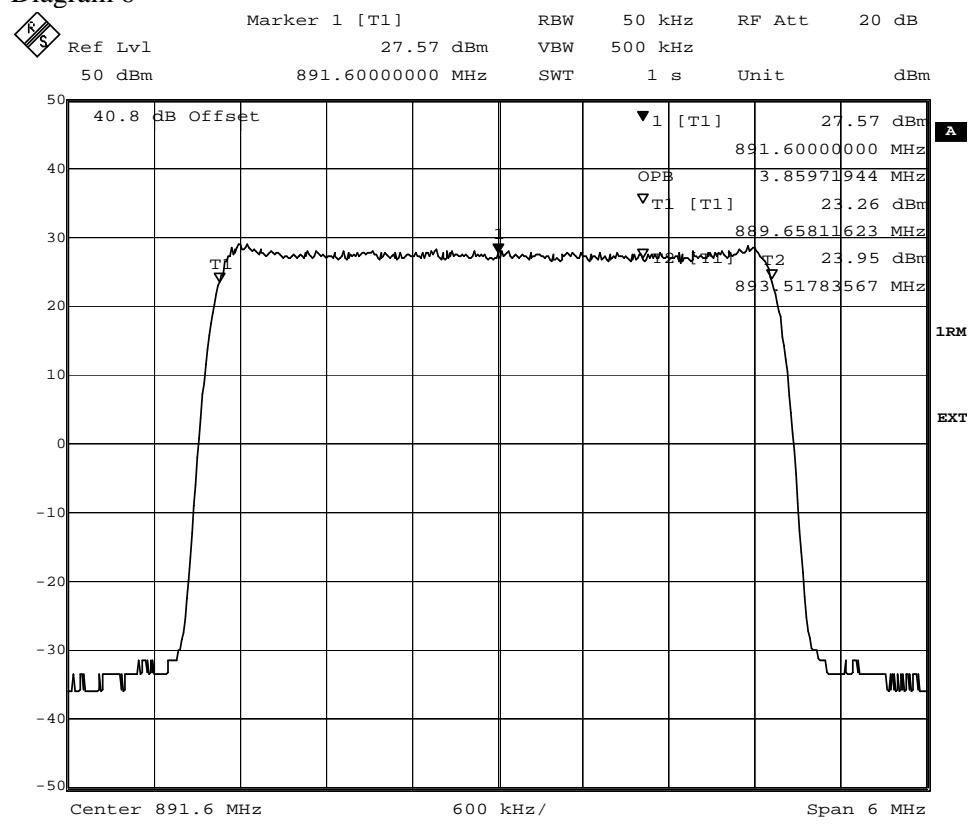


Diagram 6



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Appendix 4

Band edge measurements according to 47 CFR 2.1051/ RSS-132 4.5

Date	Temperature	Humidity
2009-04-08	23 °C ± 3 °C	32 % ± 5 %
2009-04-09	23 °C ± 3 °C	30 % ± 5 %
2009-04-14	23 °C ± 3 °C	31 % ± 5 %

Test set-up and procedure

The measurements were made as defined 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 bandwidth, 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 from 1 MHz to 3.25 MHz away from the band edges.

Measurement equipment	SP number
R&S FSIQ	503 738
Testo 635, Temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1

Single carrier:

Diagram 1: 871.4 MHz

Diagram 2: 891.6 MHz

Multi carrier:

Diagram 3: 871.4+876.4 MHz

Diagram 4: 891.6+886.6 MHz

Limits

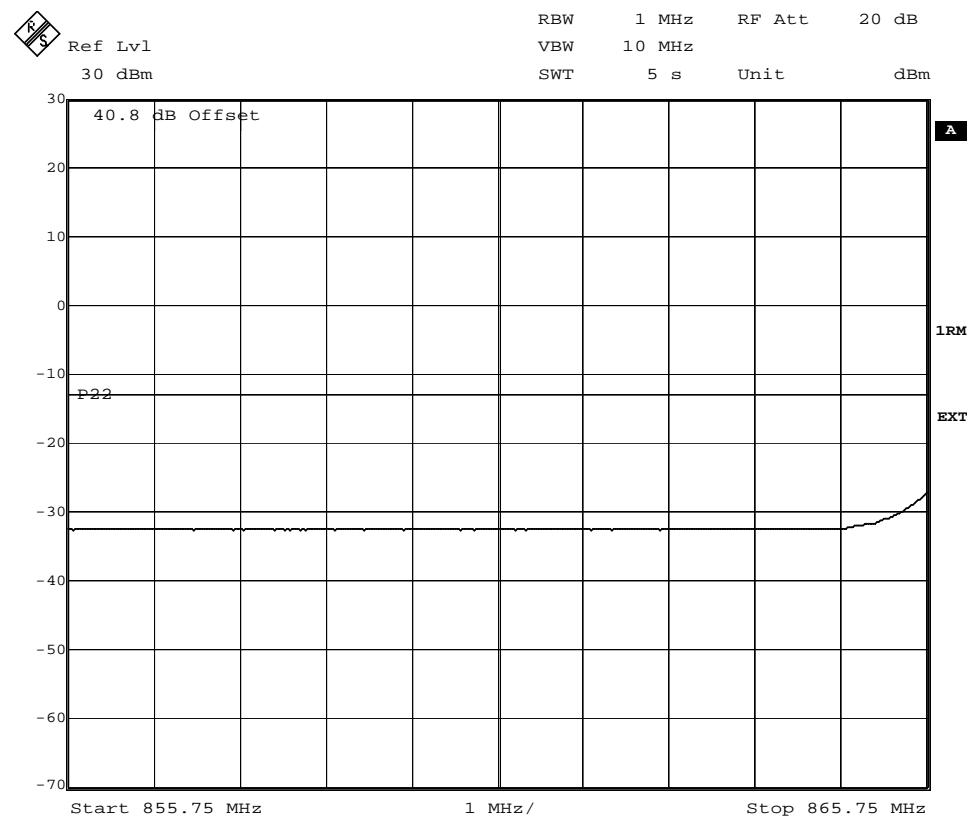
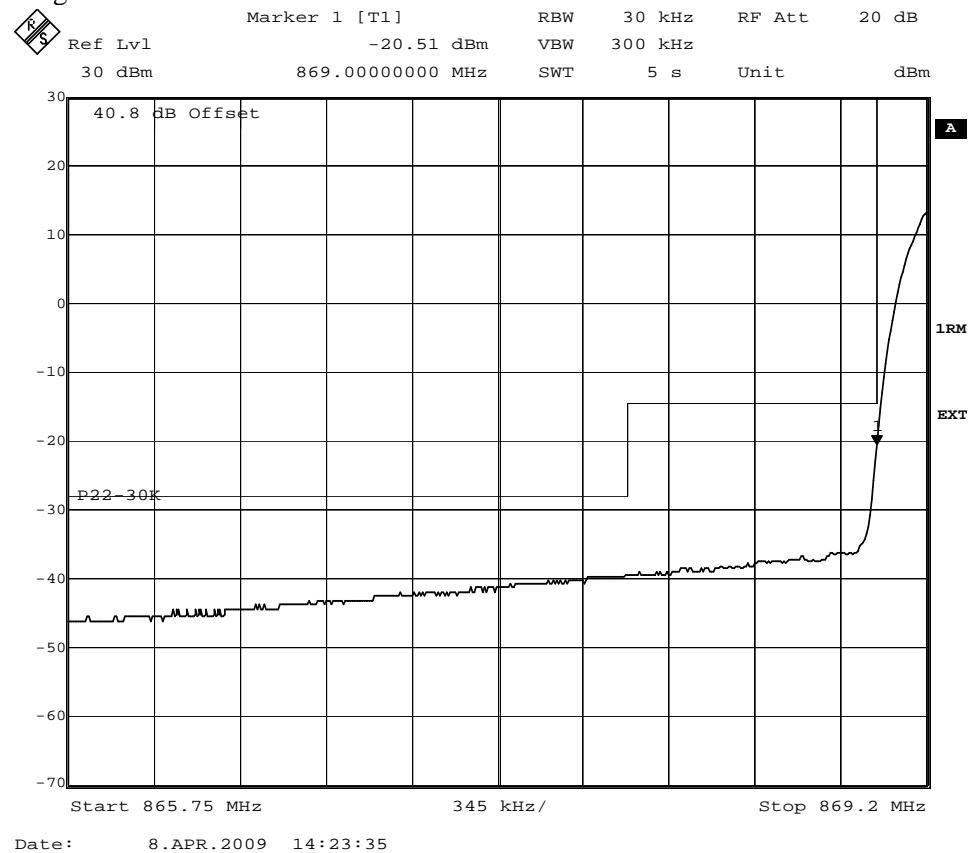
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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Appendix 4.1

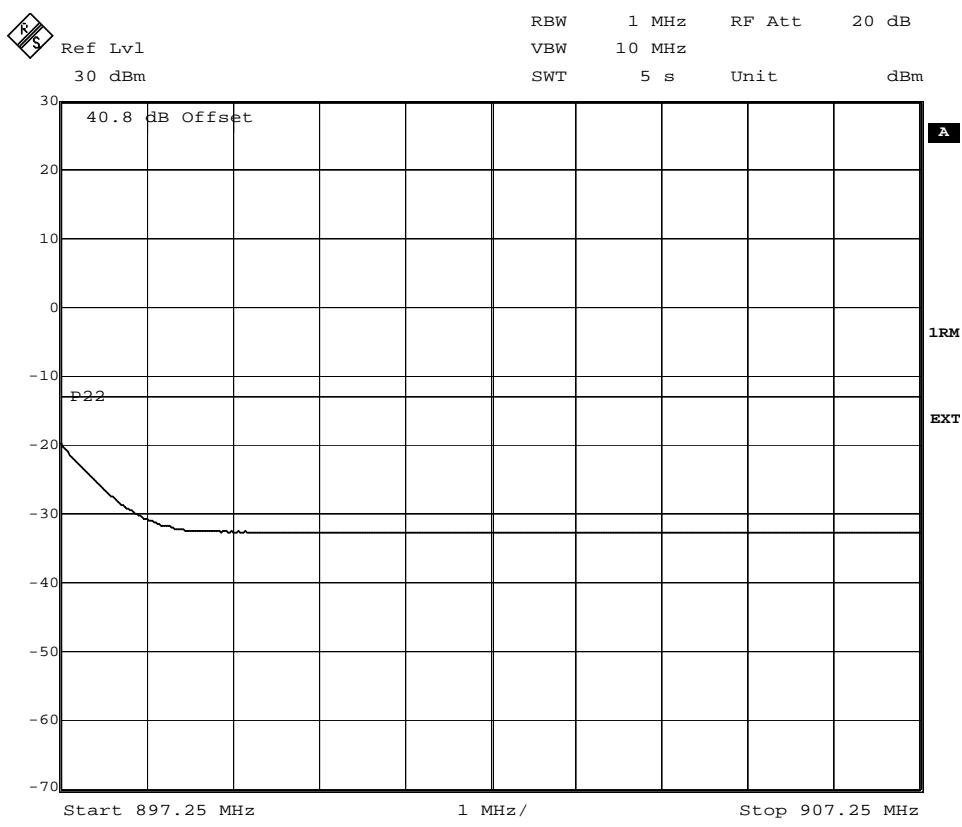
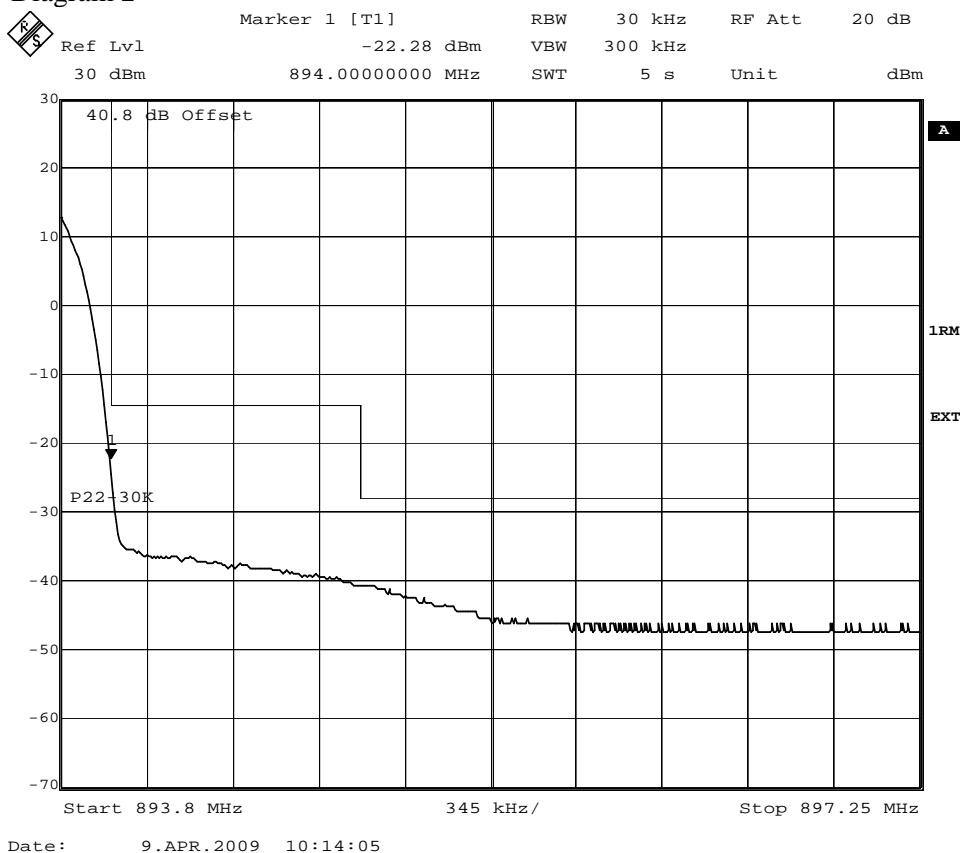
Diagram 1



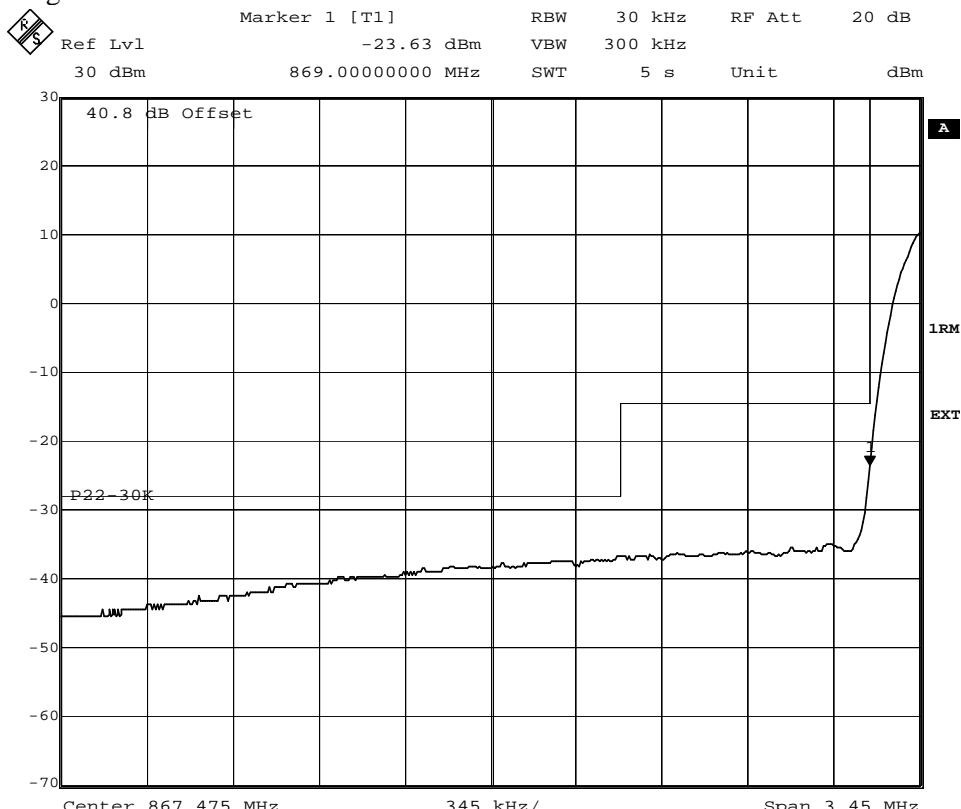
FCC ID: TA8AKRC11822-6
 IC: 287AB-AW118226

Appendix 4.1

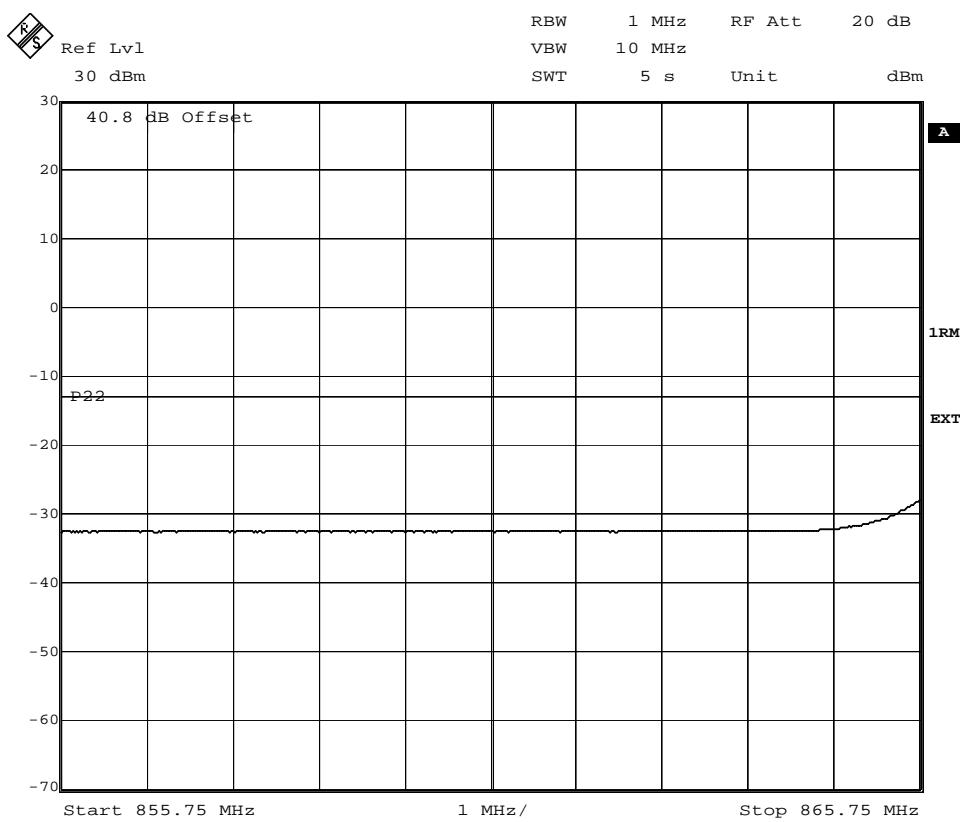
Diagram 2



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Appendix 4.1
Diagram 3


Date: 14.APR.2009 12:27:59



Date: 14.APR.2009 12:29:19

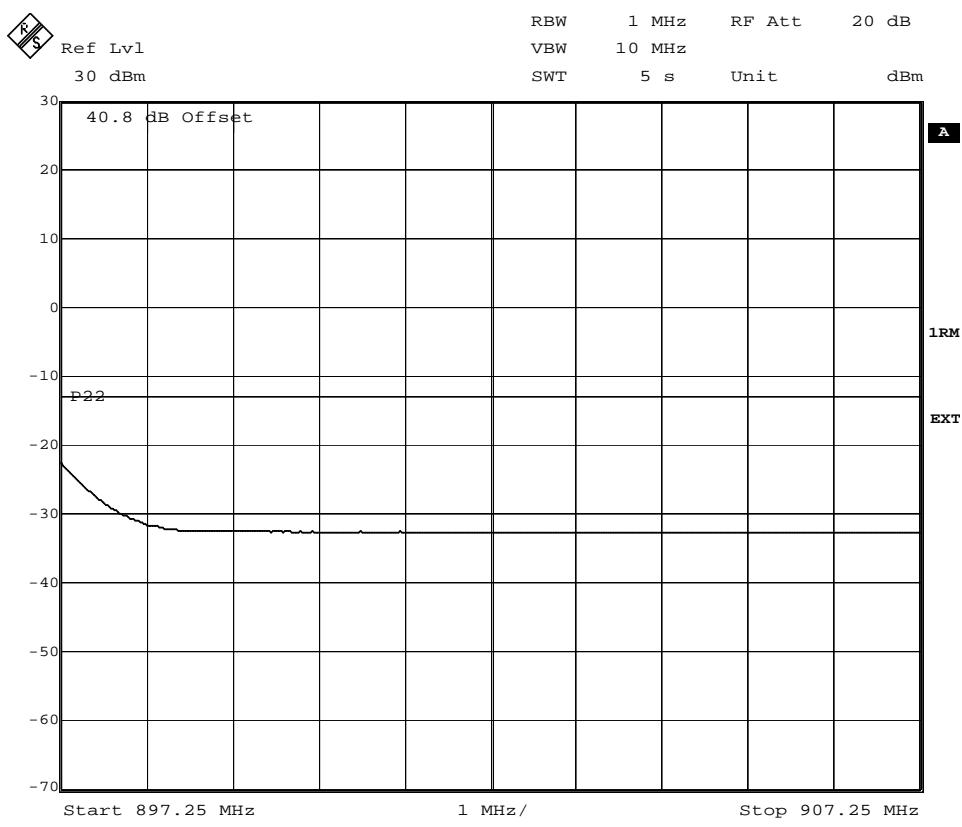
FCC ID: TA8AKRC11822-6
 IC: 287AB-AW118226

Appendix 4.1

Diagram 4



Date: 14.APR.2009 18:17:15



Date: 14.APR.2009 18:18:24

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Appendix 5

Conducted spurious emission measurements according to 47 CFR 2.1051/ RSS-132 4.5

Date	Temperature	Humidity
2009-04-08	23 °C ± 3 °C	32 % ± 5 %
2009-04-09	23 °C ± 3 °C	30 % ± 5 %
2009-04-14	23 °C ± 3 °C	31 % ± 5 %

Test set-up and procedure

The measurements were made with a resolution bandwidth of 1 MHz instead of 100 kHz as RSS-132 specify 1 MHz for equipment with an emission bandwidth of ≥ 4 MHz. The output was connected to a spectrum analyzer. First a pre-measurement with activated peak detector was performed. Emissions close to or above the limit is measured with activated RMS detector and the RMS measurement result is noted. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
R&S FSIQ	503 738
High pass filter	503 739
Testo 635, Temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 5.1

Single carrier:

Diagram 1: 871.4 MHz

Diagram 2: 881.4 MHz

Diagram 3: 891.6 MHz

Multi carrier:

Diagram 4: 871.4+881.4 MHz

Diagram 5: 881.6+891.6 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

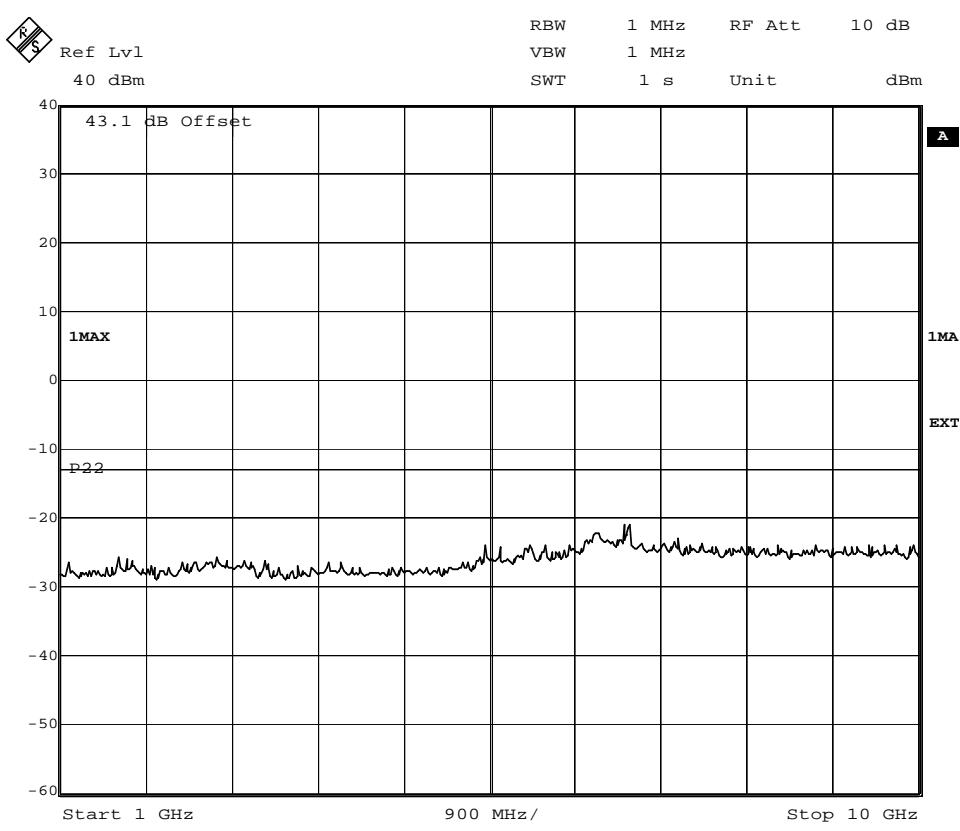
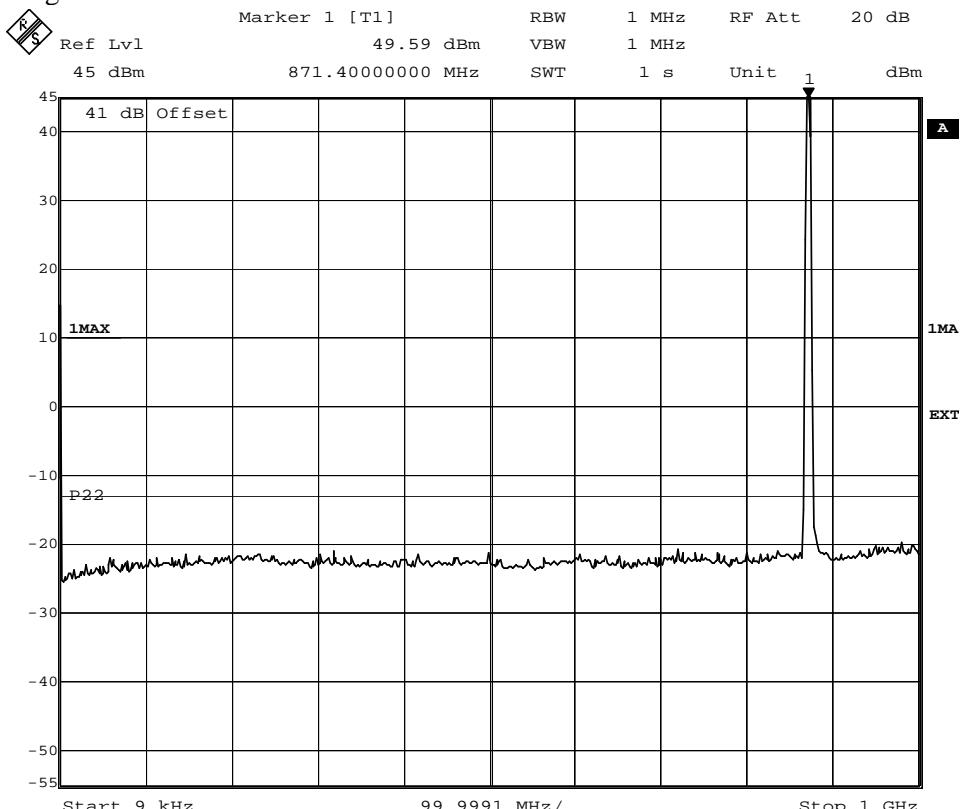
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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FCC ID: TA8AKRC11822-6
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Appendix 5.1

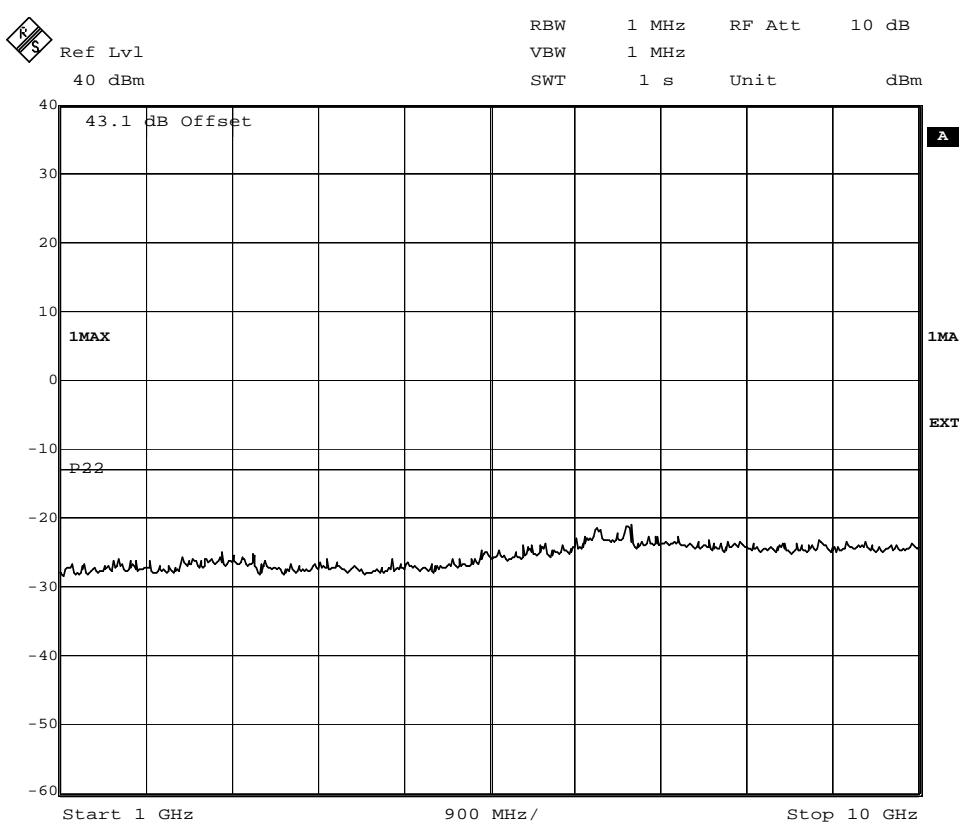
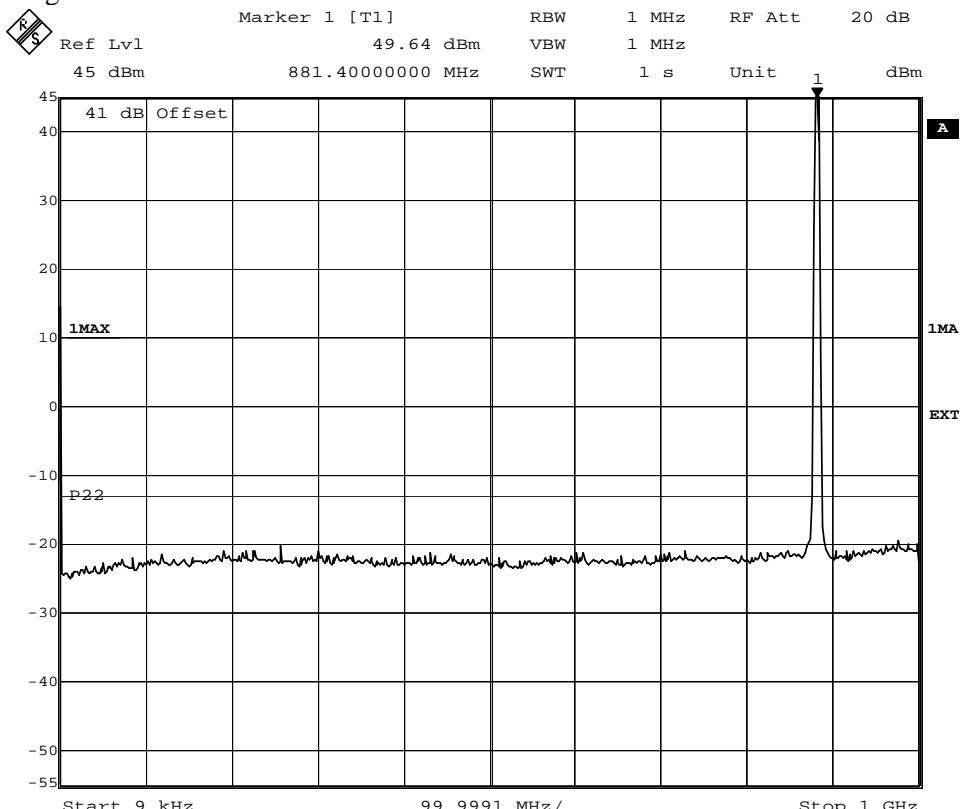
Diagram 1



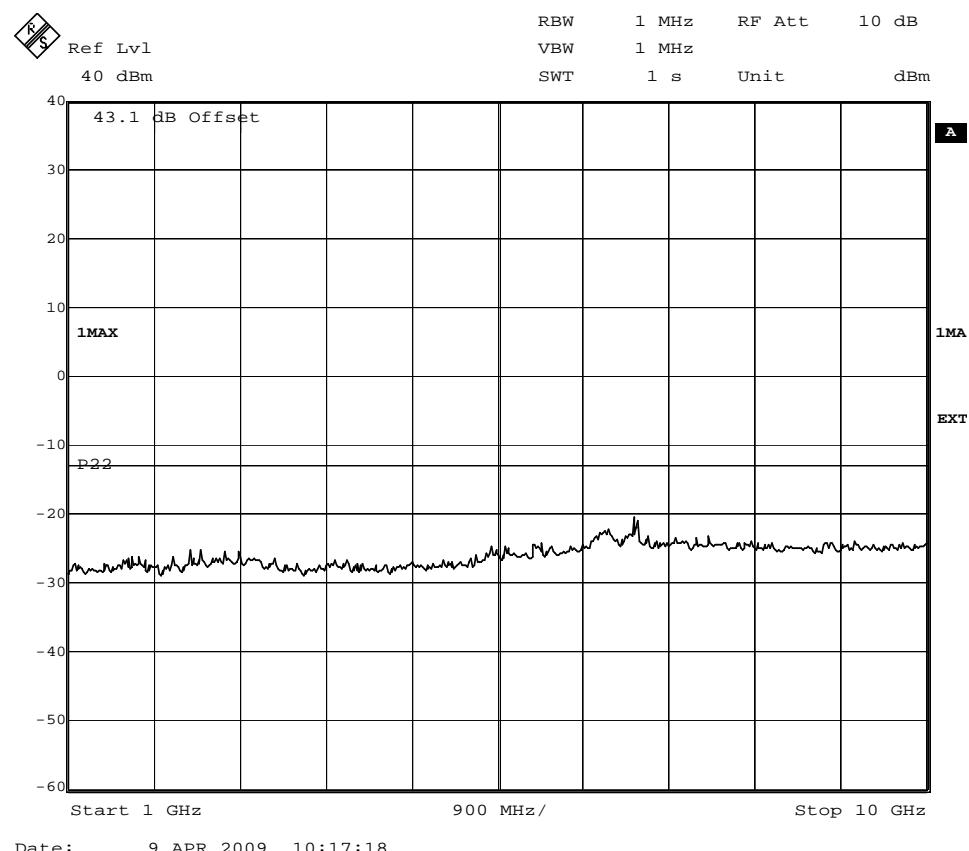
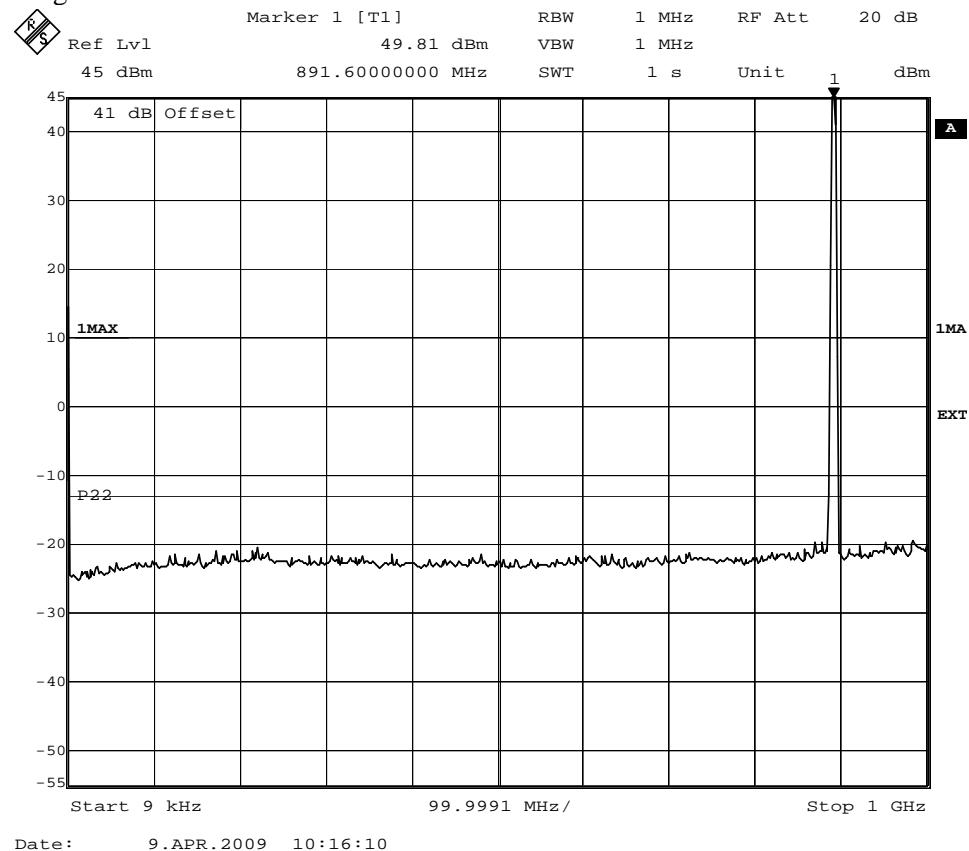
FCC ID: TA8AKRC11822-6
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Appendix 5.1

Diagram 2



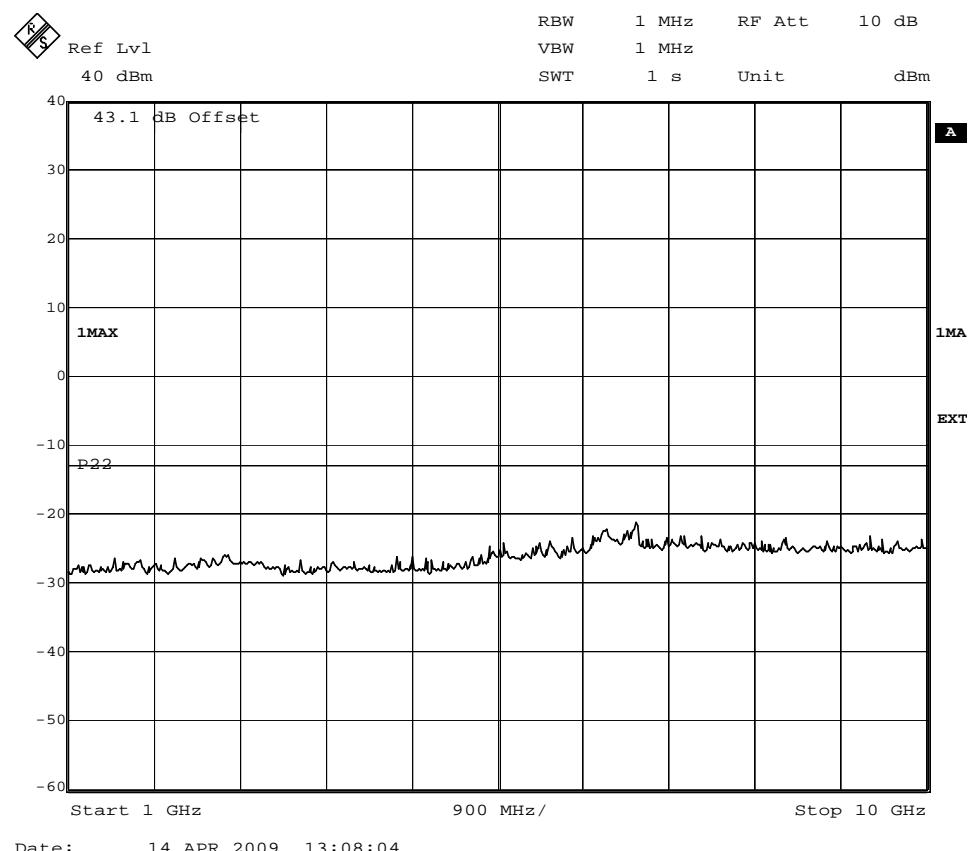
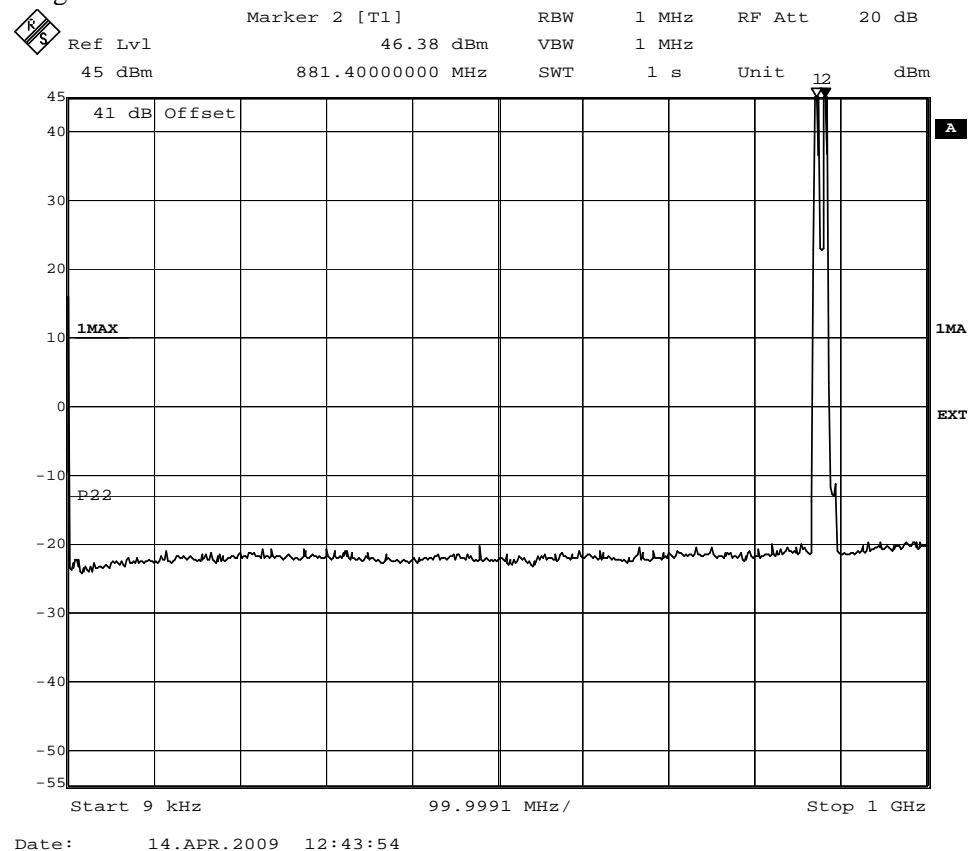
FCC ID: TA8AKRC11822-6
 IC: 287AB-AW118226

Appendix 5.1
Diagram 3


FCC ID: TA8AKRC11822-6
 IC: 287AB-AW118226

Appendix 5.1

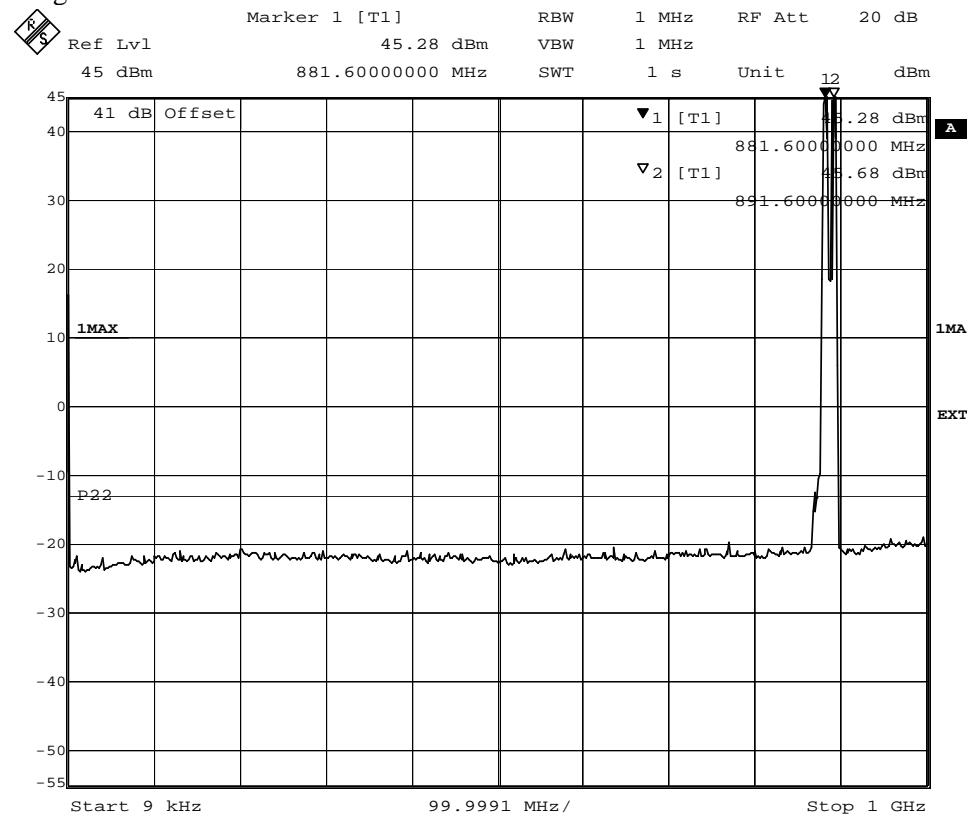
Diagram 4



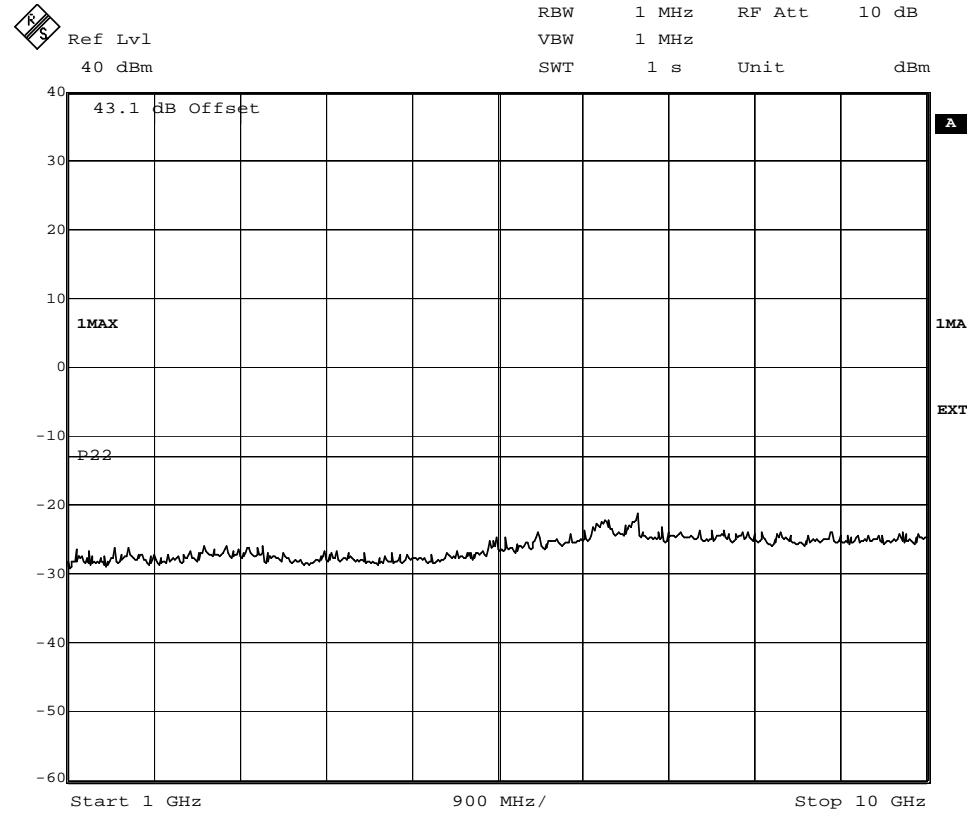
FCC ID: TA8AKRC11822-6
 IC: 287AB-AW118226

Appendix 5.1

Diagram 5



Date: 14.APR.2009 14:24:55



Date: 14.APR.2009 14:26:31

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Appendix 6

**Field strength of spurious radiation measurements according to 47 CFR 2.1053/
RSS-132 4.5**

Date	Temperature	Humidity
2009-02-25 to 2009-02-26	23 °C ± 3 °C	23-25 % ± 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 modulated with pseudorandom data during the measurements. The antenna ports were terminated with 50 ohm loads.

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

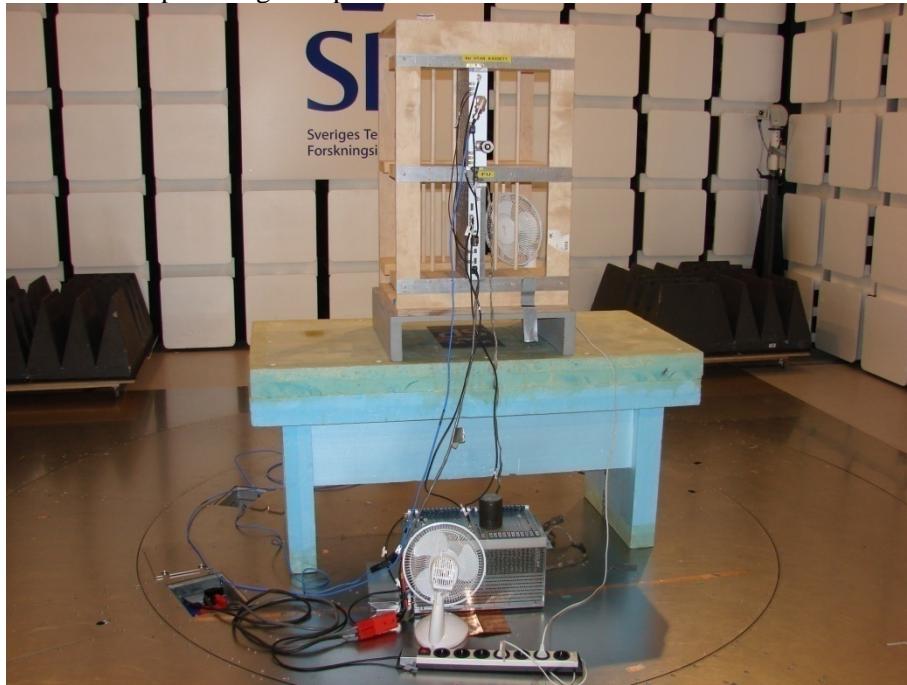
1. A pre-measurement was first performed:
2. In the frequency range 30 MHz-10 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was,
$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right)$$
, γ is the propagation loss and D is the antenna distance.
3. The measurement procedure was as the following:
4. 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.
5. 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	SP number
Test site Tesla	503 881
R&S ESI 26	503 292
R&S FSIQ	503 738
Control computer	503 479
Software: R&S EMC32, ver. 6.30.10	-
Chase Bilog antenna CBL 6111A	502 182
EMCO Horn Antenna 3115	502 175
MITEQ Low Noise Amplifier	503 285
Testo 615, Temperature and humidity meter	503 505

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Appendix 6

The test set-ups during the spurious radiation measurements are shown in the picture below:



Results

Single carrier

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		

Multi carrier

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

Frequency stability according to 47 CFR 2.1055/ RSS-132 4.3

Date	Temperature (test equipment)	Humidity (test equipment)
2009-03-09 to 2009-03-11	22-23 °C ± 3 °C	24-33 % ± 5 %

Test set-up and procedure

The measurement was made per 3GPP TS 25.141 with the test object installed in a RBS 3206E. The output was connected to a spectrum analyzer. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
R&S FSIQ	503 738
Testo 635, Temperature and humidity meter	504 203
Climate chamber 3	503 546

Results

Nominal Voltage -48 V DC
Maximum output power at 881.4 MHz

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	
-48.0	+20	-10
-55.2	+20	+12
-40.8	+20	-9
-48.0	+30	+9
-48.0	+40	+13
-48.0	+50	+10
-48.0	+10	-11
-48.0	0	-14
Maximum freq. error (Hz)		13
Measurement uncertainty		< ± 1 x 10 ⁻⁷

Note: At -10°C it was not possible to enable the transmitter, the cell was not available due to out of temperature range.

Limits (according to 3GPP TS 25.141)

The frequency error shall be within ± 0.05 PPM ± 12 Hz (56.1 Hz).

Complies?	Yes
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Appendix 8

**Receiver spurious emissions measurements according to 47 CFR 15.111/
IC RSS-132, section 4.6.**

Date 2009-04-17	Temperature 23 °C ± 3 °C	Humidity 22 % ± 5 %
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Test set-up and procedure

The measurements were performed according to ANSI C63.4.

The measurements were performed on the RX antenna port (Ant B). The measurement is first performed with peak detector. Emission on frequencies close to or above the limit is re-measured with quasi-peak detector (average detector above 1000 MHz).

Measurement equipment	SP number
R&S FSIQ 40	503 738
Testo 635, Temperature and humidity meter	504 203

Result

The results are shown in appendix 8.1:

Rx frequency
Diagram 1 826.4 MHz
Diagram 2 836.4 MHz
Diagram 3 846.6 MHz

Note: During the measurement on the RX antenna port (Ant B) the combined TX/RX port (Ant A) was terminated with 50 ohm, the TX was activated in single carrier mode transmitting TM1.

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.

Limit

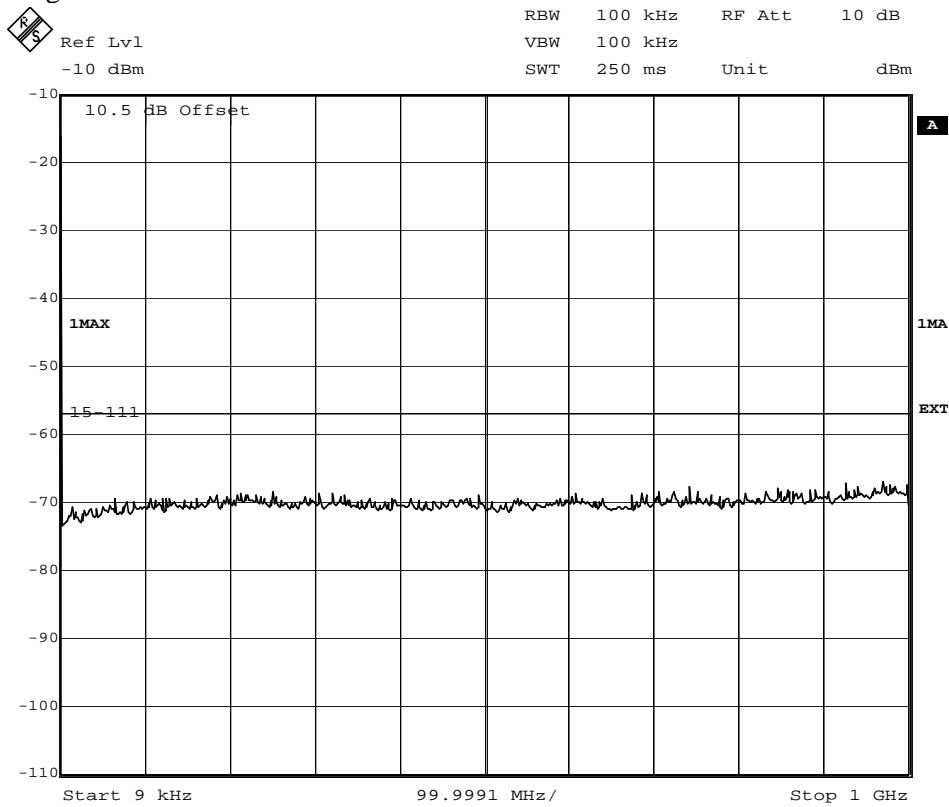
The power of any spurious output signals appearing at the antenna terminals must not exceed -57 dBm (2 nanowatts).

Emission below limit?	Yes
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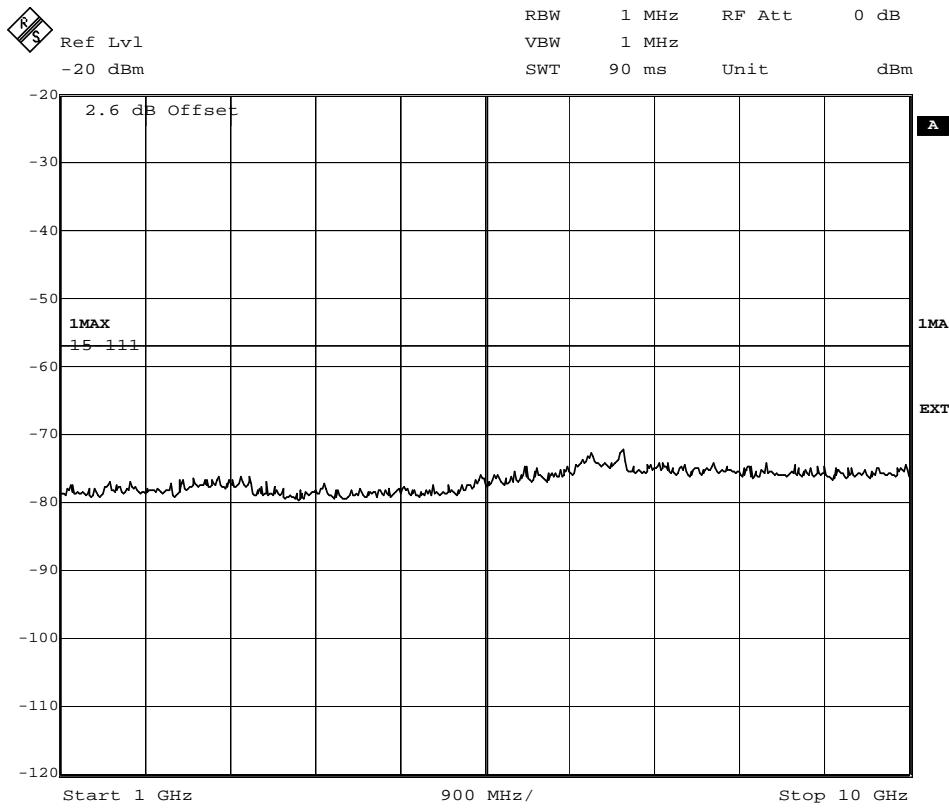
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Appendix 8.1

Diagram 1



Date: 17.APR.2009 15:56:19

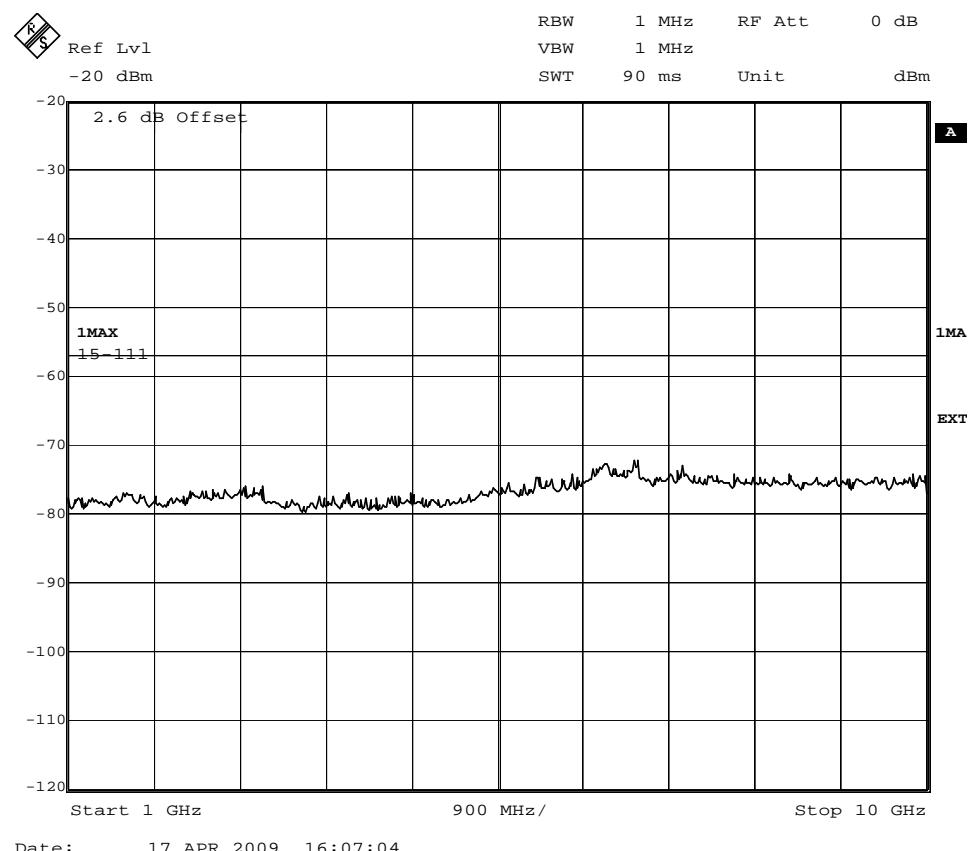
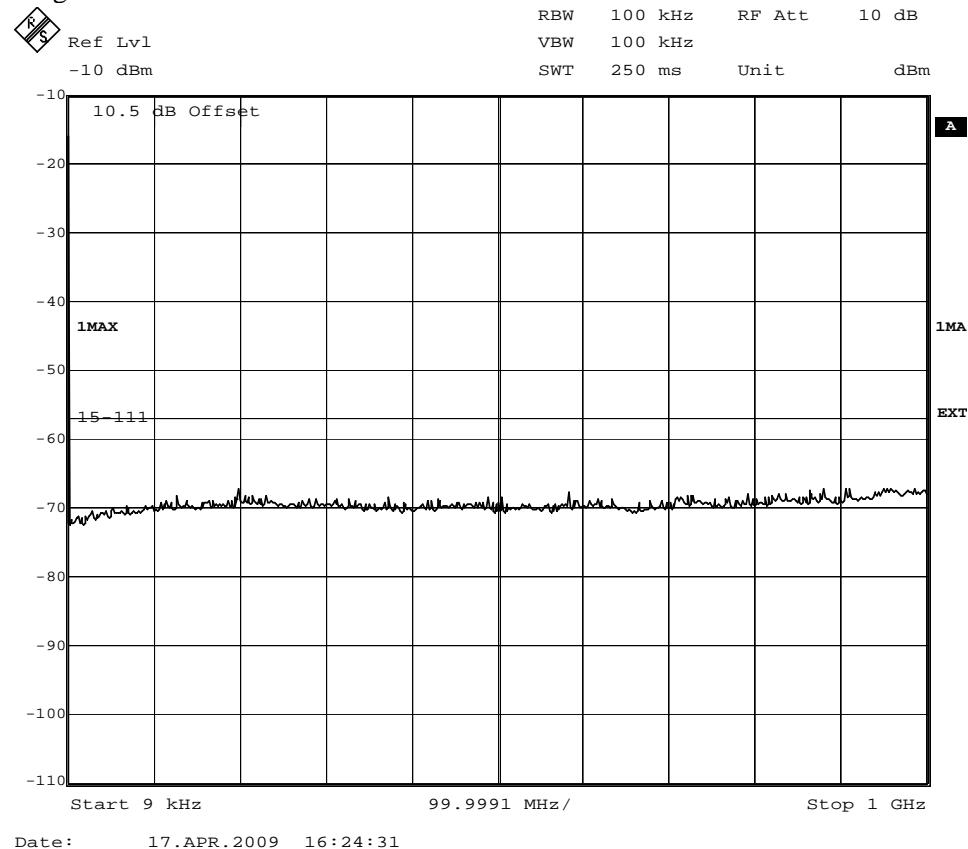


Date: 17.APR.2009 15:58:46

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Appendix 8.1

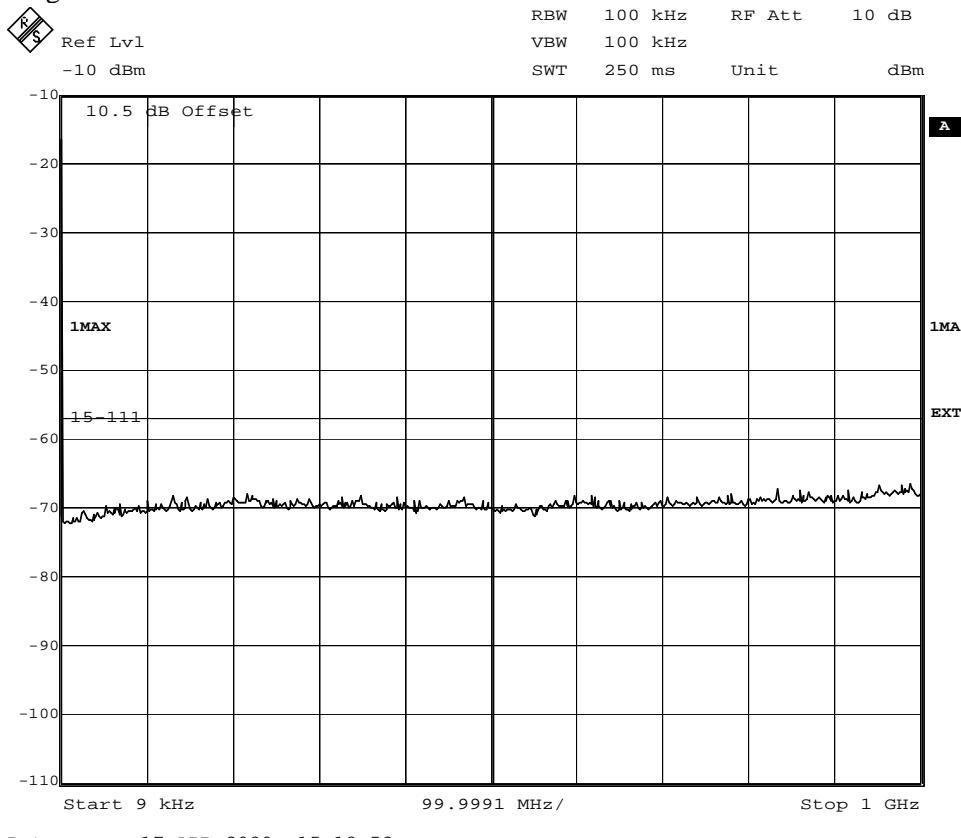
Diagram 2



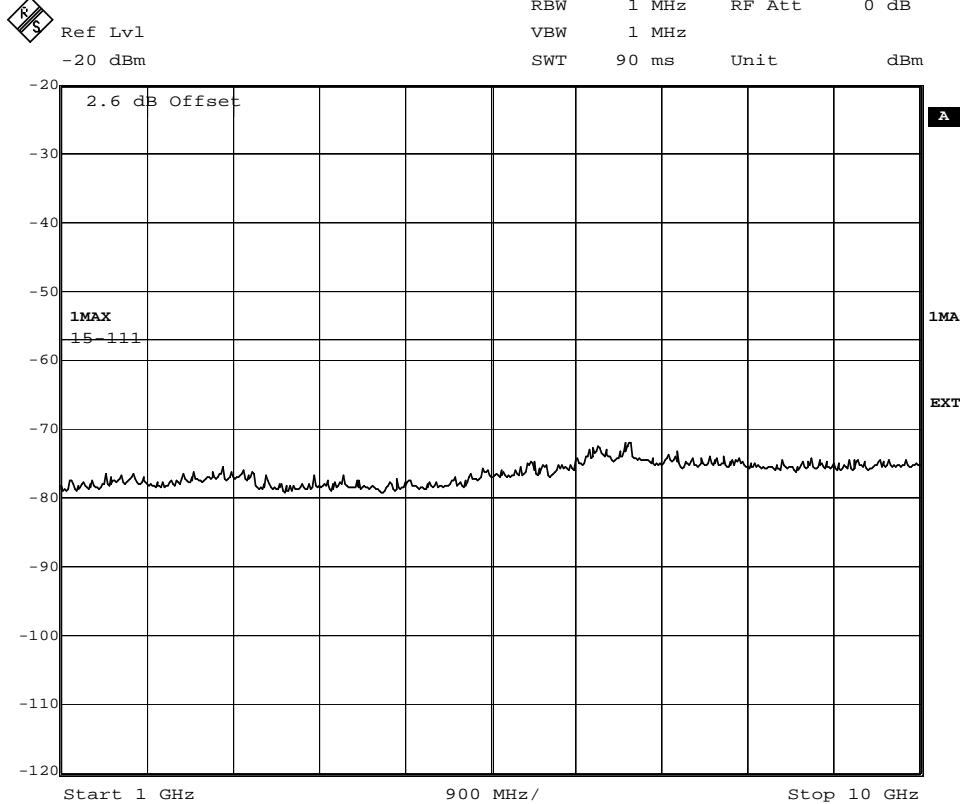
FCC ID: TA8AKRC11822-6
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Appendix 8.1

Diagram 3



Date: 17.APR.2009 15:18:52



Date: 17.APR.2009 15:23:32

FCC ID: TA8AKRC11822-6
IC: 287AB-AW118226

Date
2009-05-05

Reference
F902484-F22

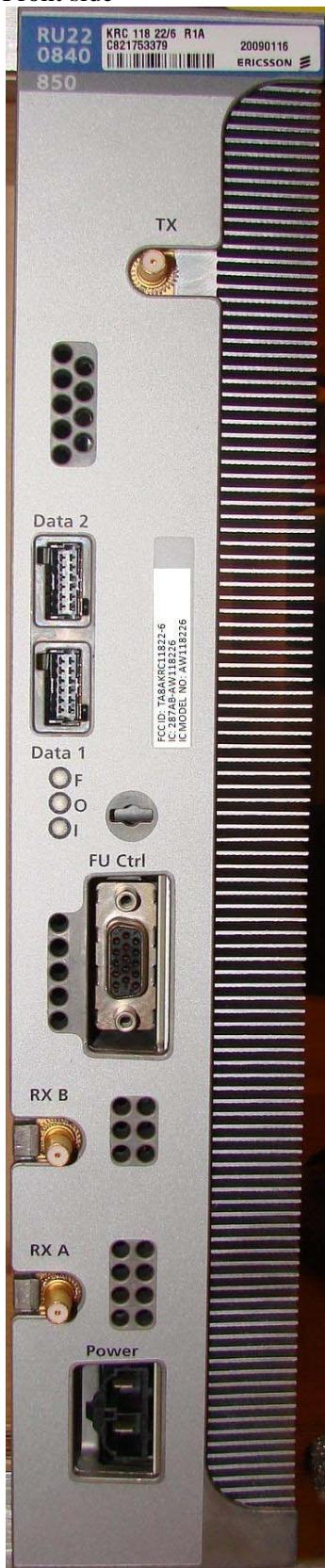
Page
1 (2)

Appendix 9

Photos

RU KRC 118 22/6

Front side



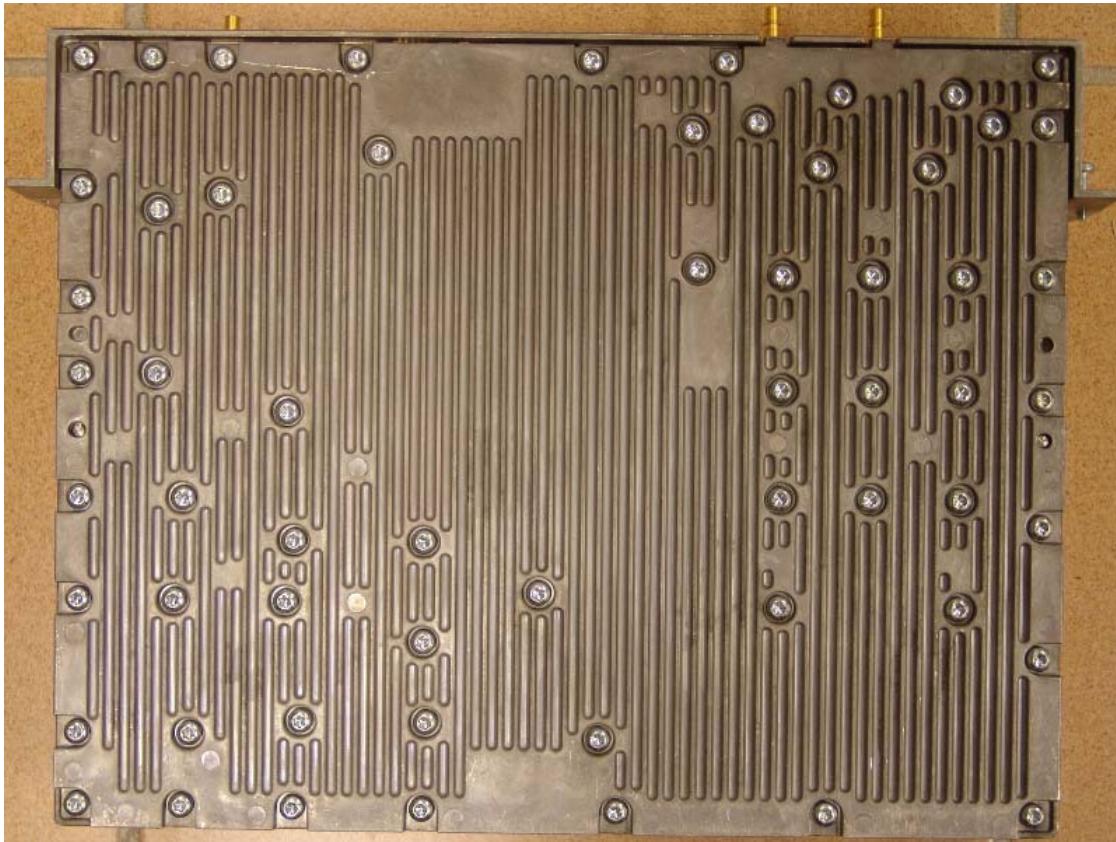
Rear side



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Appendix 9

Left side



Right side

