REPORT

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The test site complies with RSS-Gen, file no: IC 3482

Date	Reference	Page
2007-11-12	F719449-F22	1 (2)

1002
ISO/IEC 17025

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Radio measurements on WCDMA 850 MHz Transceiver unit with FCC ID: TA8AKRC11822-3 and IC: 287AB-AW118223

(9 appendices)

Test object

Radio Unit KRC 118 22/3 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			
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			
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.

SP Sveriges Tekniska Forskningsinstitut
Electronics - EMC

Bengt Andersson
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FCC ID: TA8AKRC11822-3 Appendix 1
IC: 287AB-AW118223

Description – Test object

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

Tx Frequency range: 871.4 – 891.6 MHz

Modulations: QPSK and 16QAM

Maximum output power: Single carrier: 1x43 dBm (1x20W)
Multi carrier: 2x40 dBm (2x10W)

Nominal power voltage: -48 VDC

Tested channels

UARFCN	Frequency
4357	871.4 MHz
4407	881.4 MHz
4408	881.6 MHz
4458	891.6 MHz

Operation mode during measurements

Test models

All measurements were performed with the test object configured with the test models 1 and 5 as defined in 3GPP TS 25.141. Test model 1 uses the QPSK modulation only, and test model 5 includes the 16QAM modulation.

Conducted measurements

All RF conducted measurements were performed with the test object installed in a RBS 3308 cabinet 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 modulations.

The settings below were found to be representative for all traffic scenarios when several settings were tested to find the setting for worst case.

Single carrier
Test model 1: 64 DPCHs at 30 ksps (SF=128)
Test model 5: 30 DHCPs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

Multi carrier
Test model 1: 32 DPCHs at 30 ksps (SF=128)
Test model 5: 30 DHCPs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

FCC ID: TA8AKRC11822-3
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Appendix 1

Radiated measurements

All radiated measurements were performed with the test object installed in a RBS 3308 cabinet powered with -48 VDC and 120 VAC/ 60 Hz.

The RU unit was activated for maximum transmit power. The RU unit was activated as Single Carrier (1x43dBm) and Multi Carrier (2x40 dBm). The RF output power port was terminated with 50 ohm loads.

The settings below were found to be representative for all traffic scenarios when several settings were tested to find the setting for worst case.

The RU unit were allocated to the following UARFCN:

Single Carrier:

Downlink	4357 (871.4 MHz)	4357 (871.4 MHz)	4407 (881.4 MHz)	4407 (881.4 MHz)	4458 (891.6 MHz)	4458 (891.6 MHz)
Uplink	4132 (826.4 MHz)	4132 (826.4 MHz)	4182 (836.4 MHz)	4182 (836.4 MHz)	4233 (846.6 MHz)	4233 (846.6 MHz)
Test model	1	5	1	5	1	5
Power configuration	DC	DC	AC	AC	AC	AC

Test model 1: 64 DPCHs at 30 ksps (SF=128)
Test model 5: 30 DHCPs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

Multi Carrier:

Cell	1	2
Downlink	4357 (871.4 MHz)	4407 (881.4 MHz)
Uplink	4132 (826.4 MHz)	4182 (836.4 MHz)
Test model	1	5
Power configuration	DC	

Test model 1: 32 DPCHs at 30 ksps (SF=128)
Test model 5: 30 DHCPs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in 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

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: 2007-10-12

Manufacturer's representative

Mats Falk, Ericsson AB

Test engineers

Jonas Bremholt and Jörgen Wassholm

Test witnesses

Christer Hjort, Ove Nilsson, and Magnus Gyllenhammar, Ericsson AB

FCC ID: TA8AKRC11822-3
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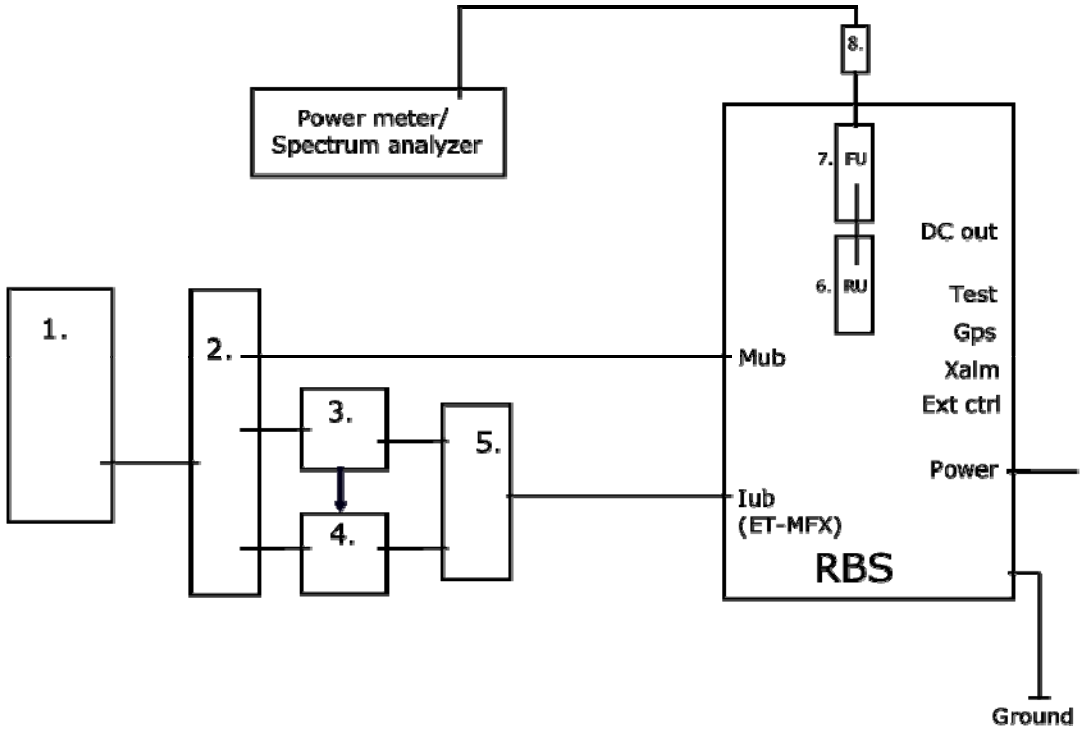
Appendix 1

Test set-up, conducted measurements



RBS 3308: SEB 104 083/1 with software CXP 901 2073 Rev. R5G06. More information about the RBS hardware units are shown in SP document F719449-H

1. Computer, Sunblade 1500, BAMS-1000245407
2. Ethernet switch, Netgear FSM726
3. RNC Sim CES 4780DA Mini-sim#65, S/n: 0215 (10 MHz ref out)
4. NTP Server, SyncServer S250, BAMS-1000491896
5. Ethernet switch, Netgear GS716T
6. Test object, RU KRC 118 22/3 Rev. R1A (FCC ID: TA8AKRC11822-3)
7. FU KRC 118 21/1 Rev. R1E
8. Attenuator, 50 ohm

FCC ID: TA8AKRC11822-3 Appendix 1
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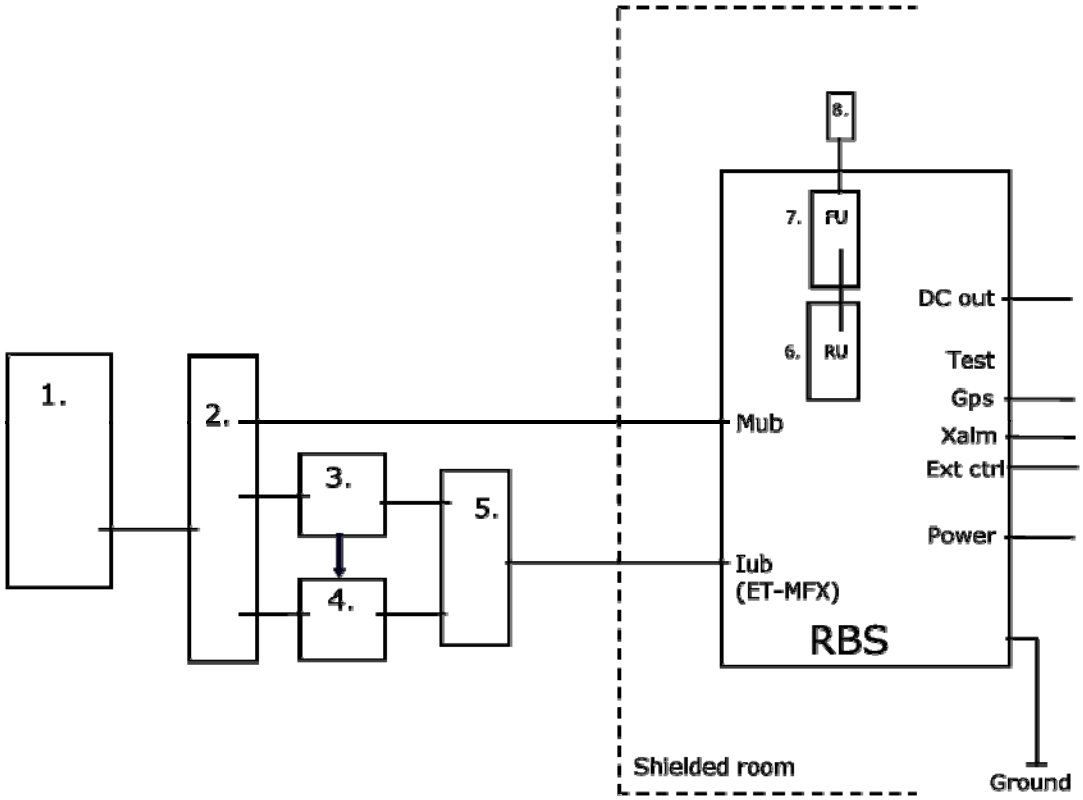
Test set-up, radiated measurements



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1. Computer, Sunblade 1500, BAMS-1000245407
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4. NTP Server, SyncServer S250, BAMS-1000491896
5. Ethernet switch, Netgear GS716T
6. Test object, RU KRC 118 22/3 Rev. R1A (FCC ID: TA8AKRC11822-3)
7. FU KRC 118 21/1 Rev. R1E
8. Terminator, 50 ohm

Interfaces:	**Type of port:**
Power, 120 VAC, 60 Hz	AC Mains
Power, -48 VDC	DC power
Coaxial cable with N connector and adaptor to 7/16”	Antenna
DC out, terminated in a resistive load (100 W??)	DC Power
Test, serial interface, no cable attached	Test purpose
GPS, Shielded multiwire, unterminated	Signal
Xalm, shielded multi-wire with RJ-45 connector, unterminated	Signal
Ext ctrl: shielded multi-wire, un-terminated	Signal
Mub, shielded multi-wire with RJ-45 connector	Test purpose
Iub, configured as IP by ET-MFX, shielded multi-wire with RJ-45 connector	Telecom

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Appendix 2

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

Date	Temperature	Humidity
2007-10-16	24 °C ± 3 °C	42 % ± 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 5 during the measurements.

Measurement equipment	Calibration Due	SP number
Boonton RF Peak power meter/analyzer	2008-12	503 144
Boonton Power sensor 56518-S/4	2009-06	503 145
Multimeter Fluke 87	2007-12	502 190
Testo 610, Temperature and humidity meter	2009-04	502 658

Measurement uncertainty: 0.5 dB

Results

Single carrier

Maximum rated output power level after FU unit: 1x43 dBm

Test conditions T_{nom} 22 °C/ V_{nom} -48 V DC	Transmitter power (dBm) RMS		
	Frequency 871.4	Frequency 881.4	Frequency 891.6
QPSK	43.1	43.2	42.9
16QAM	43.0	43.2	42.9

Multi carrier

Maximum rated output power level after FU unit: 2x40 dBm

Test conditions T_{nom} 23 °C/ V_{nom} -48 V DC	Transmitter combined power (dBm) RMS	
	Frequencies 871.4 + 881.4 MHz	Frequencies 881.6 + 891.6MHz
QPSK	43.1	43.0
16QAM	43.1	43.0

Limit

According to CFR § 22 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).

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
2007-10-16	24 °C ± 3 °C	42 % ± 5 %
2007-10-25	23 °C ± 3 °C	27 % ± 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 5 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2008-10	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

QPSK

	Frequency	OBW
Diagram 1:	871.4 MHz	4.2 MHz
Diagram 2:	881.4 MHz	4.2 MHz
Diagram 3:	891.6 MHz	4.2 MHz

16QAM

	Frequency	OBW
Diagram 4:	871.4 MHz	4.2 MHz
Diagram 5:	881.4 MHz	4.2 MHz
Diagram 6:	891.6 MHz	4.2 MHz

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Diagram 1

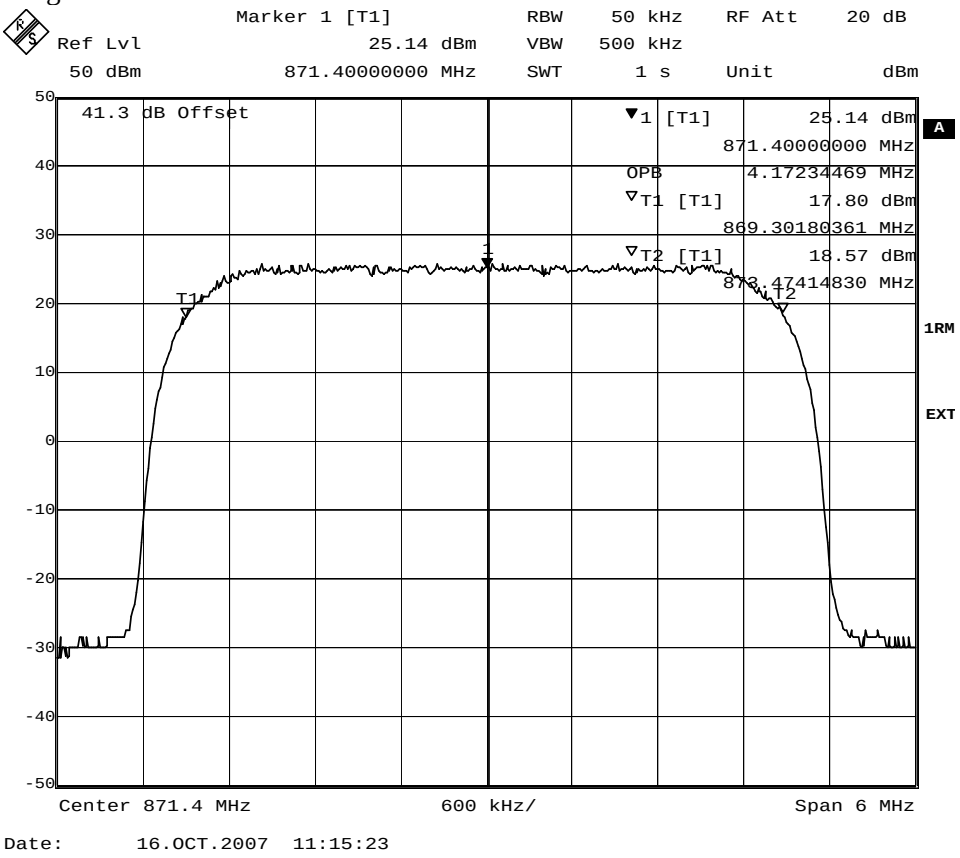

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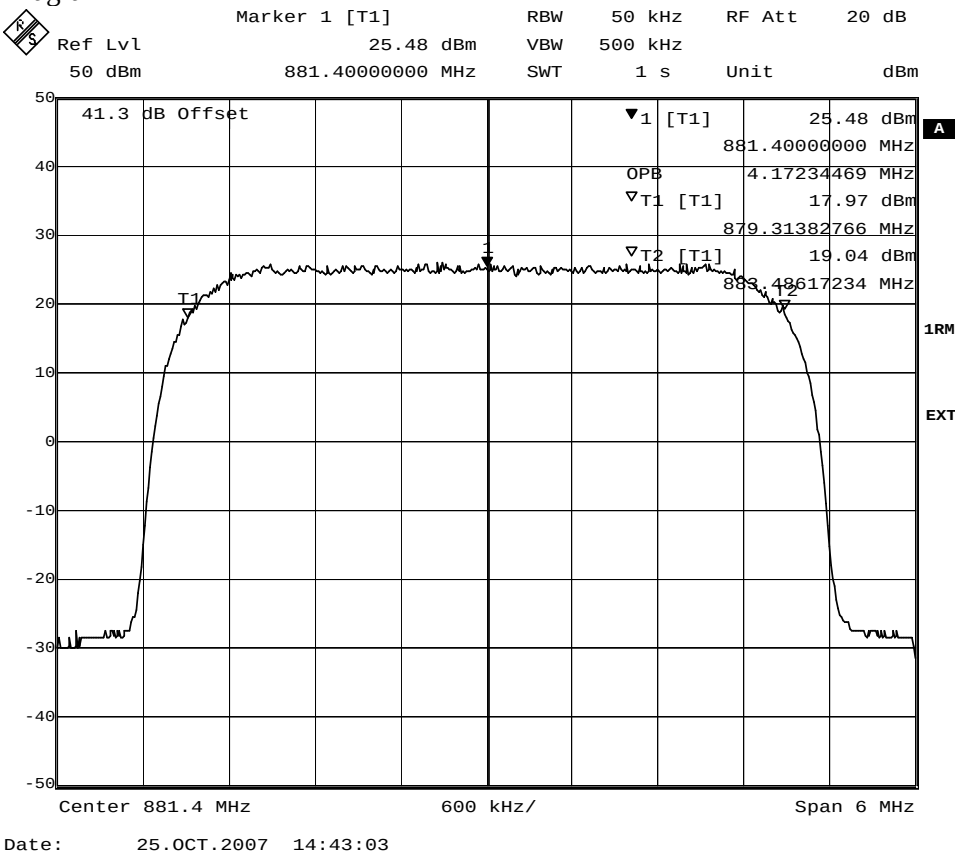
Diagram 2



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Appendix 3.1

Diagram 3

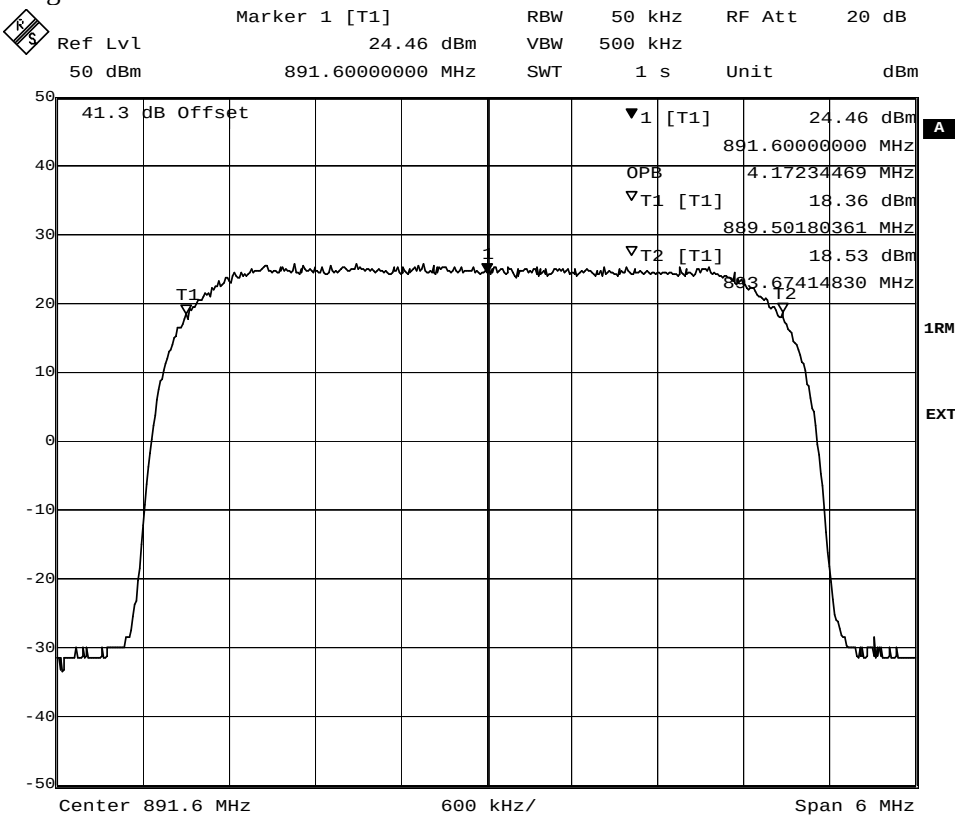

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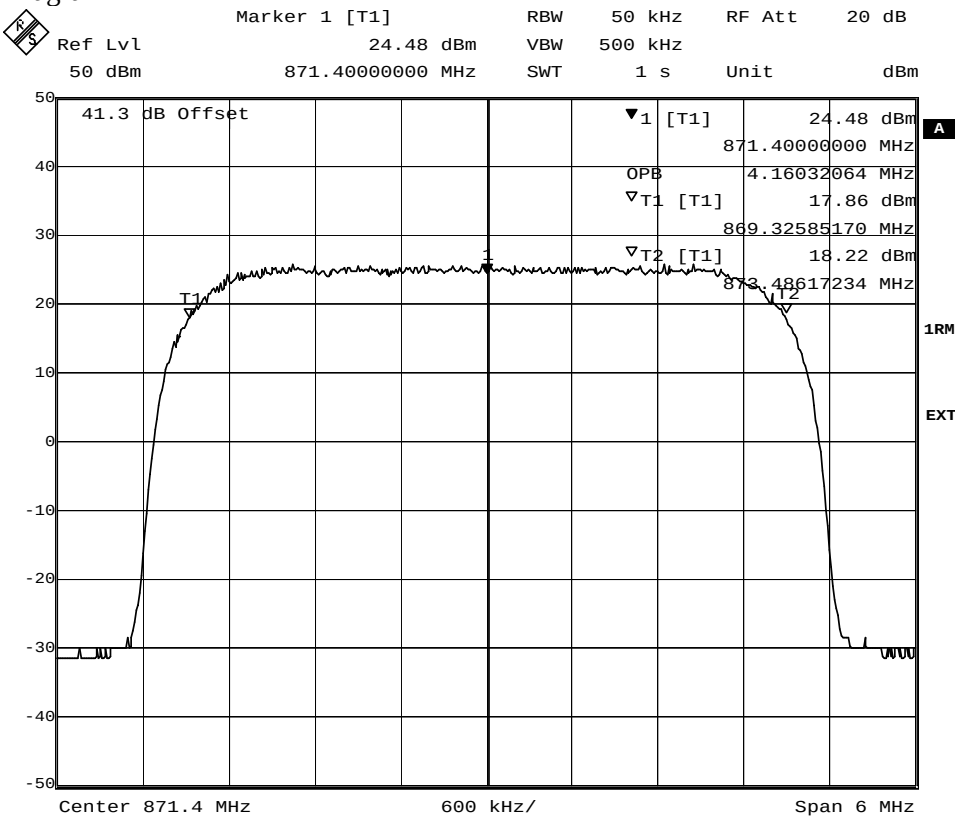
Diagram 4



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Appendix 3.1

Diagram 5

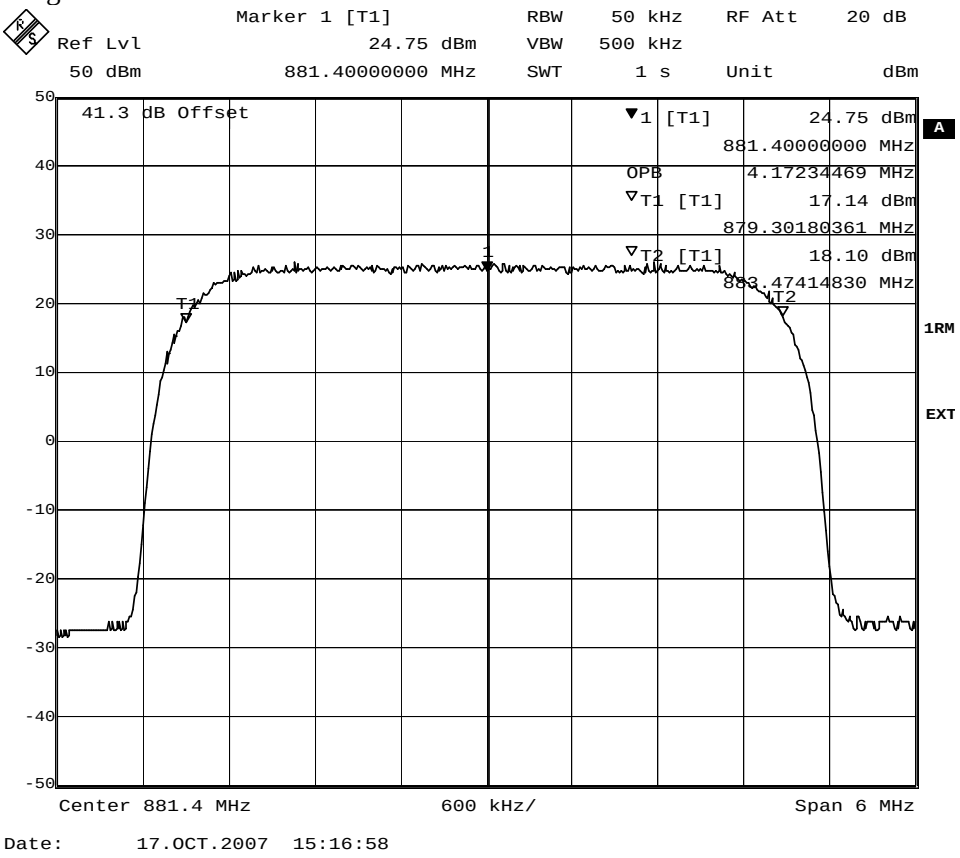

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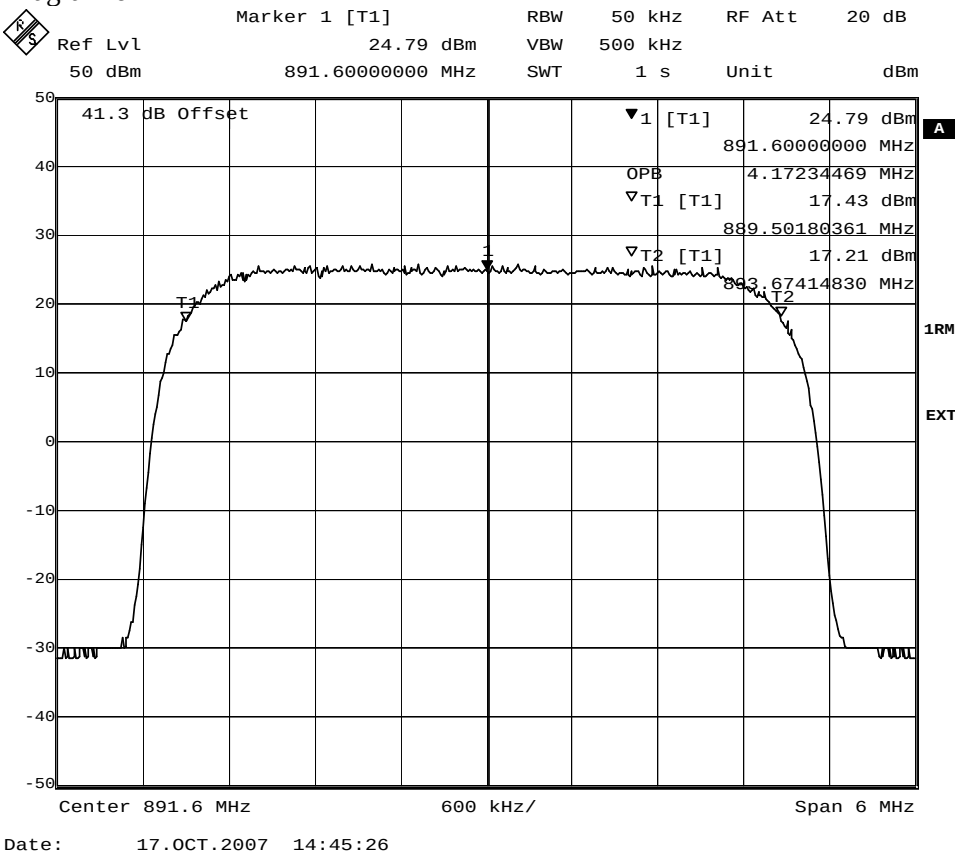
Diagram 6



Date: 17.OCT.2007 14:45:26

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Appendix 4

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

Date	Temperature	Humidity
2007-10-16	24 °C ± 3 °C	42 % ± 5 %
2007-10-17	23 °C ± 3 °C	35 % ± 5 %
2007-10-25	23 °C ± 3 °C	27 % ± 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 5 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2008-10	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

Single carrier

	QPSK		**16QAM**
Diagram 1:	871.4 MHz	Diagram 3:	871.4 MHz
Diagram 2:	891.6 MHz	Diagram 4:	891.6 MHz

Multi carrier

	QPSK		**16QAM**
Diagram 5:	871.4+881.4 MHz	Diagram 7:	871.4+881.4 MHz
Diagram 6:	881.6+891.6 MHz	Diagram 8:	881.6+891.6 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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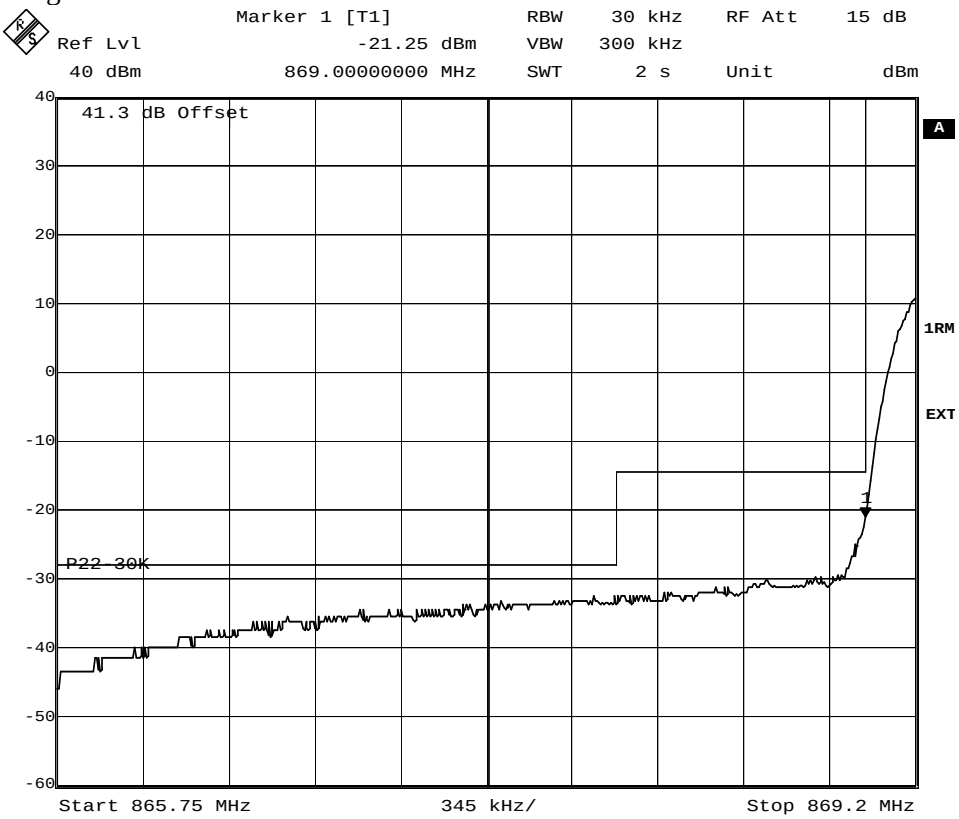
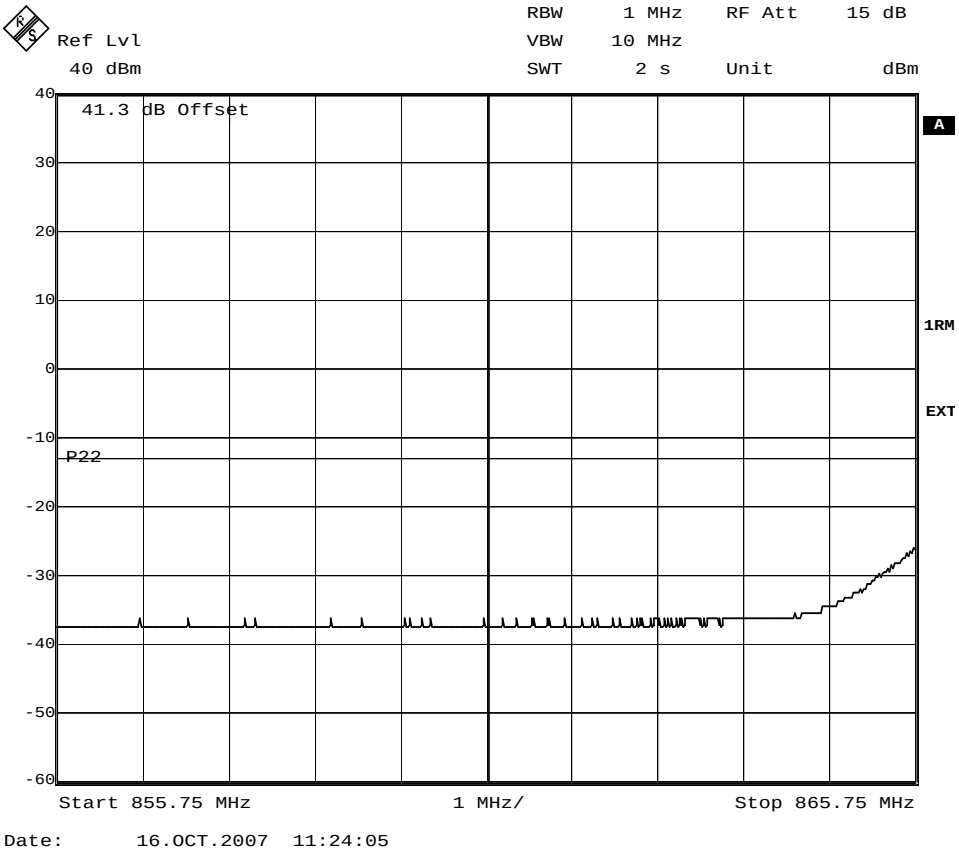
Appendix 4.1

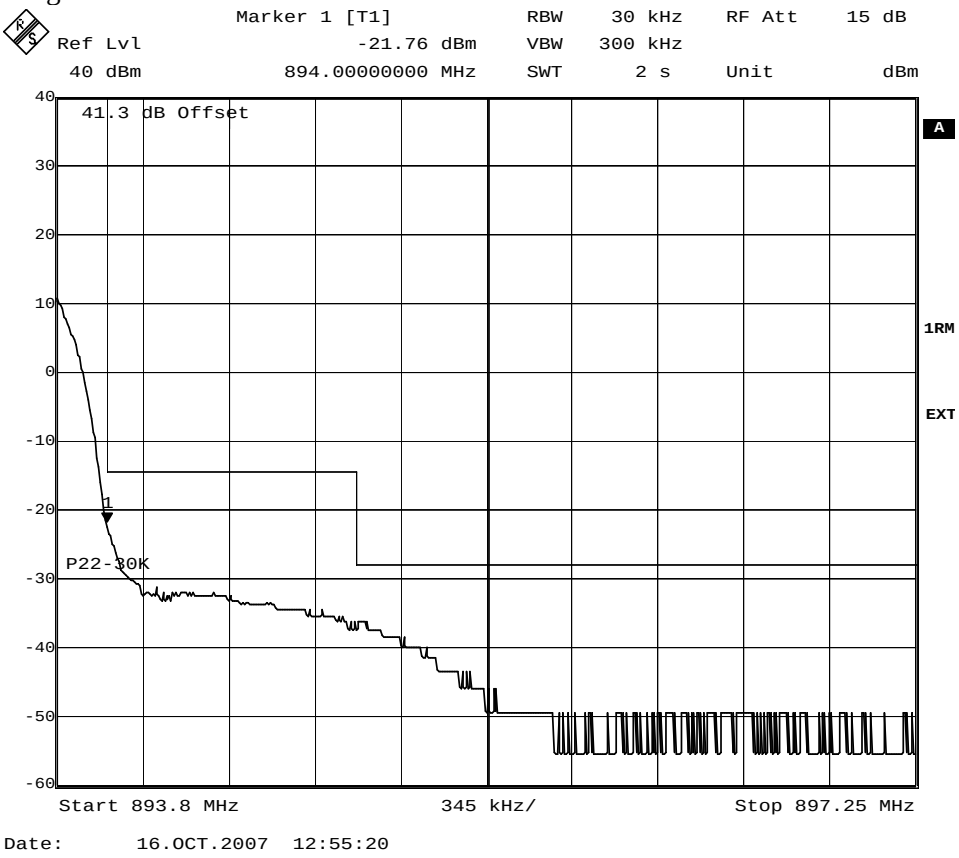
Diagram 1

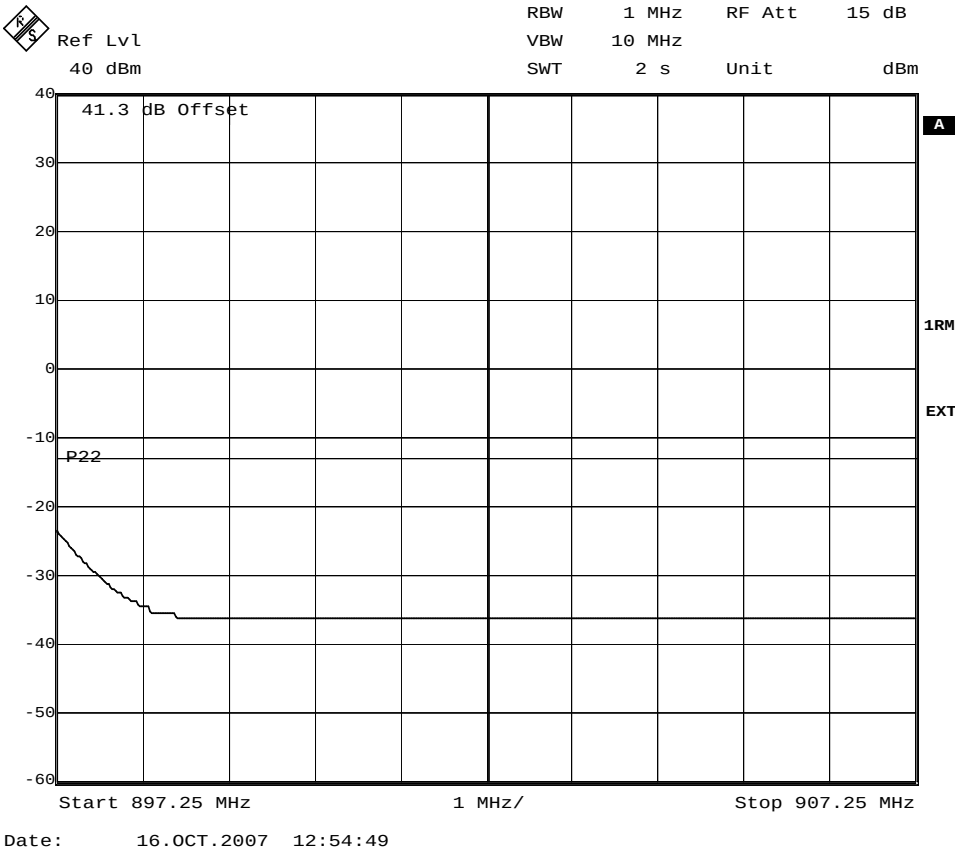




FCC ID: TA8AKRC11822-3 Appendix 4.1
IC: 287AB-AW118223

Diagram 2





FCC ID: TA8AKRC11822-3
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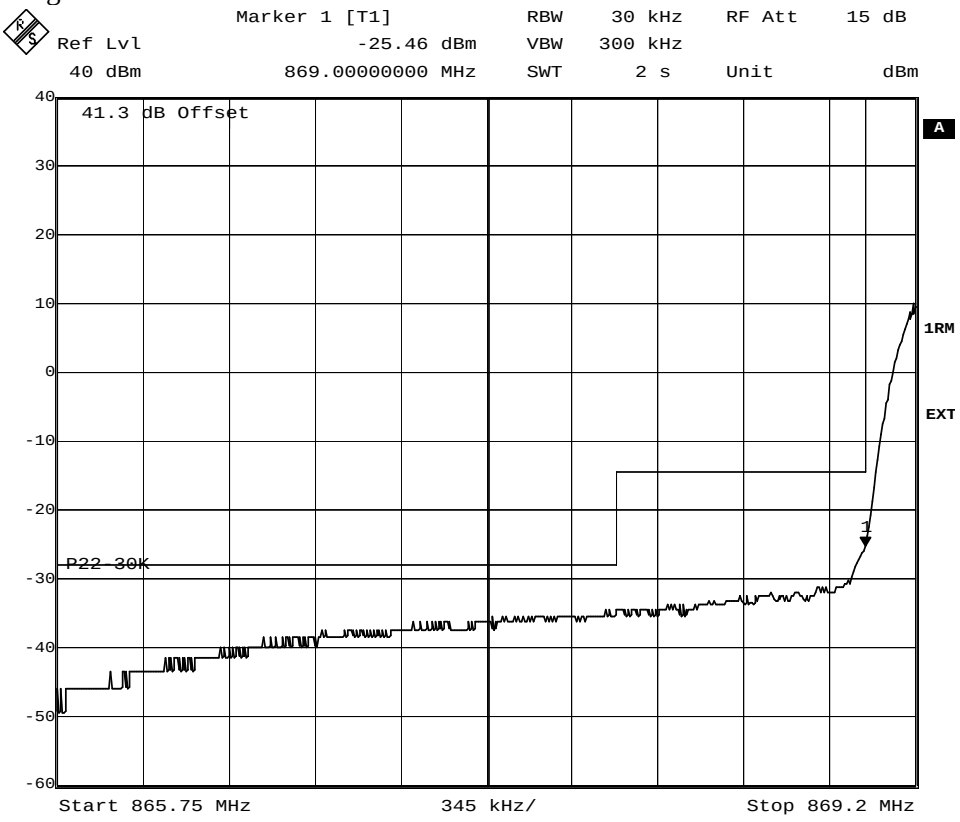
Appendix 4.1

Diagram 3



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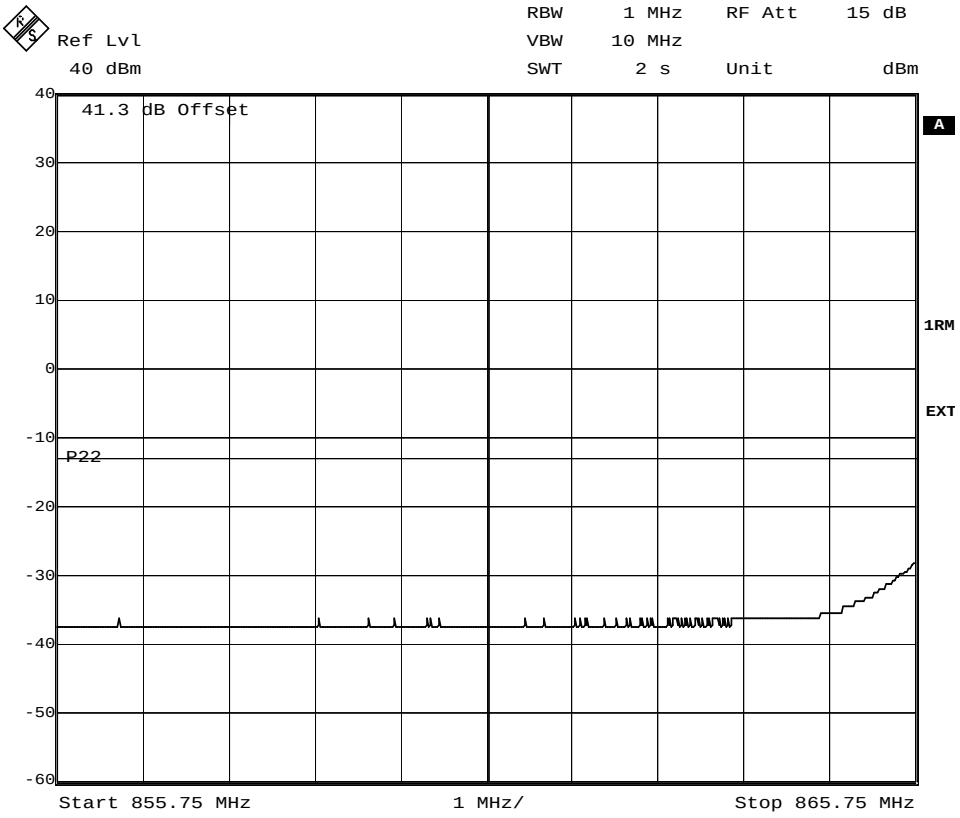

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FCC ID: TA8AKRC11822-3 Appendix 4.1
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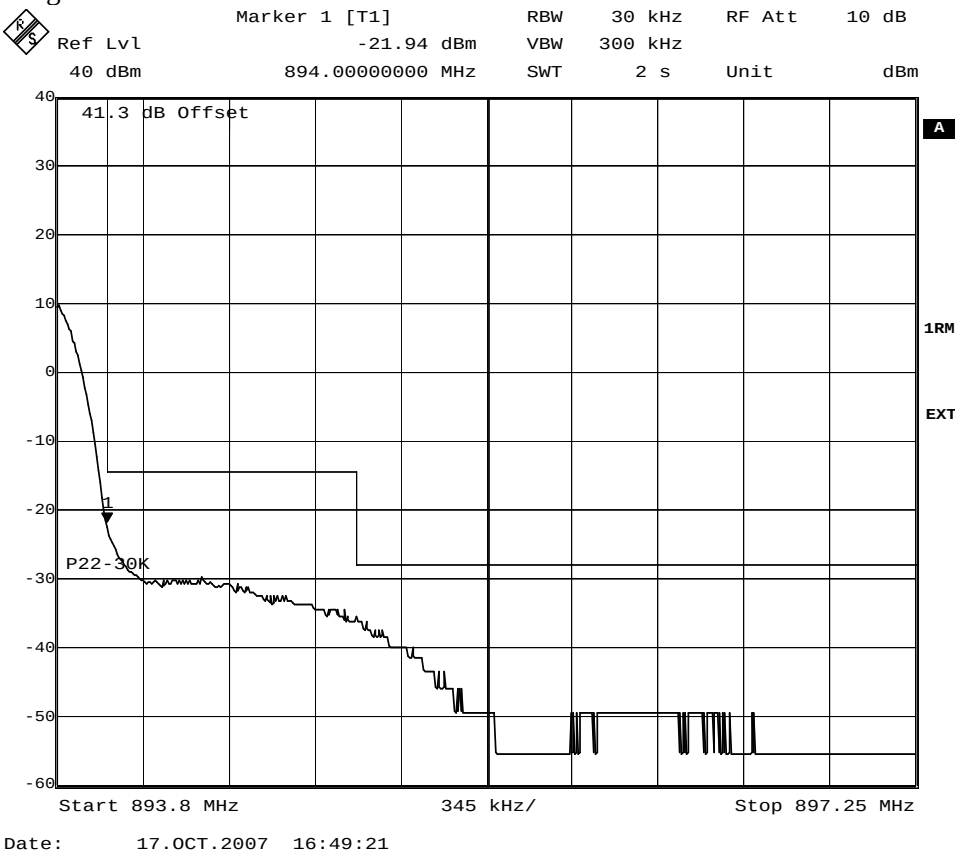
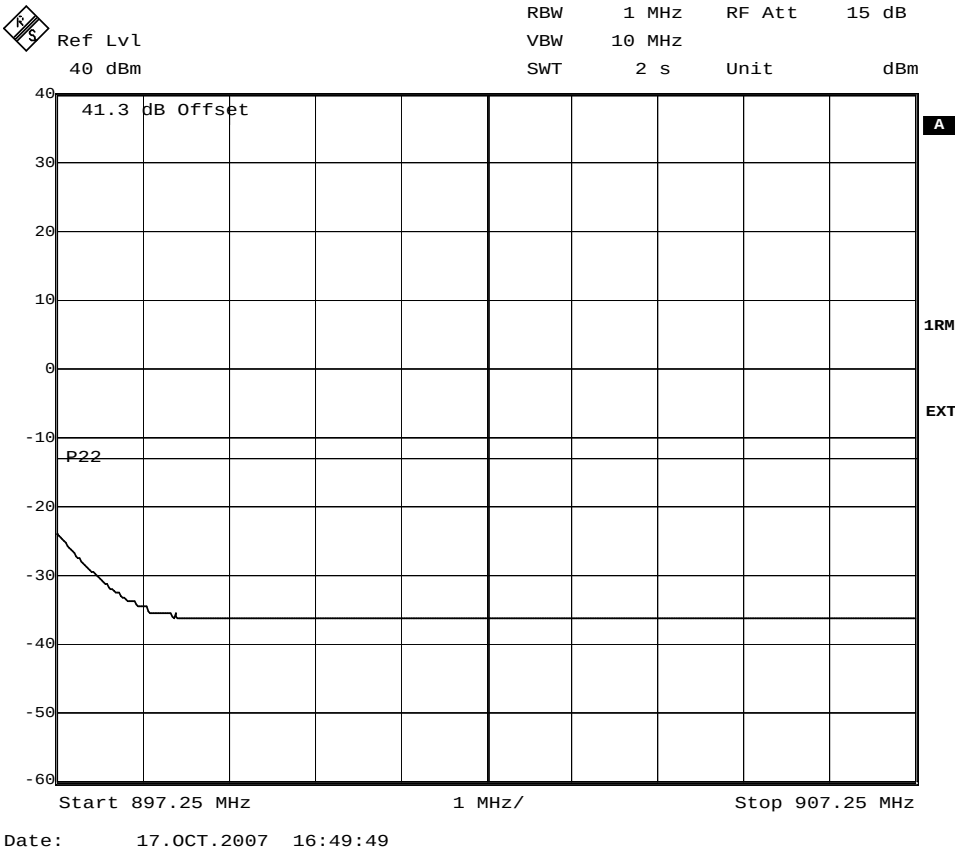
Diagram 4





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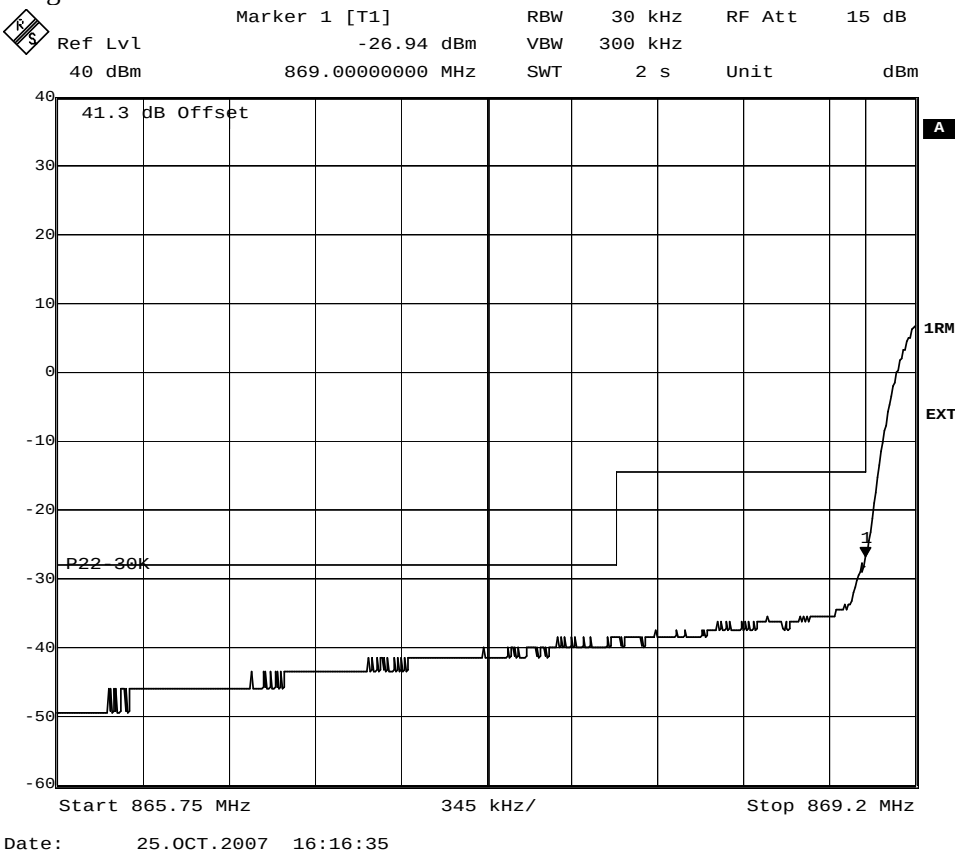
Appendix 4.1

Diagram 5



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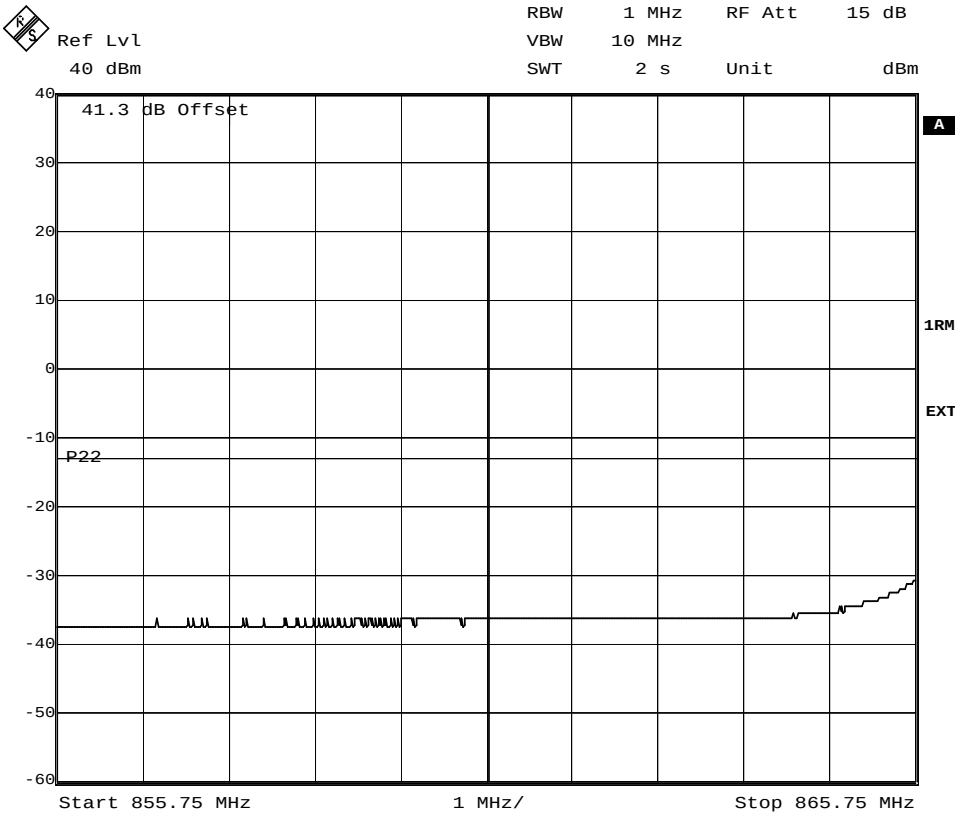

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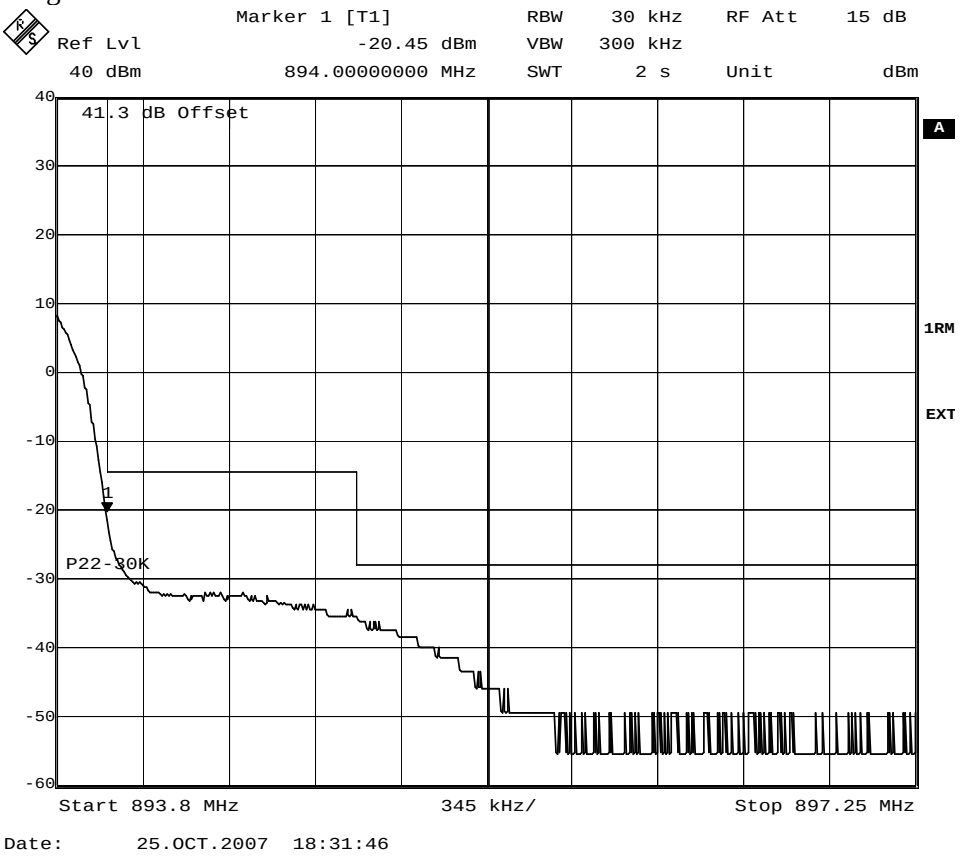
Diagram 6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Ref Lvl
40 dBm
-20.45 dBm
894.00000000 MHz
RBW 30 kHz
VBW 300 kHz
SWT 2 s
RF Att 15 dB
Unit dBm
41.3 dB Offset
A
1RM
EXT
P22-30K
Start 893.8 MHz
345 kHz/
Stop 897.25 MHz
Date: 25.OCT.2007 18:31:46

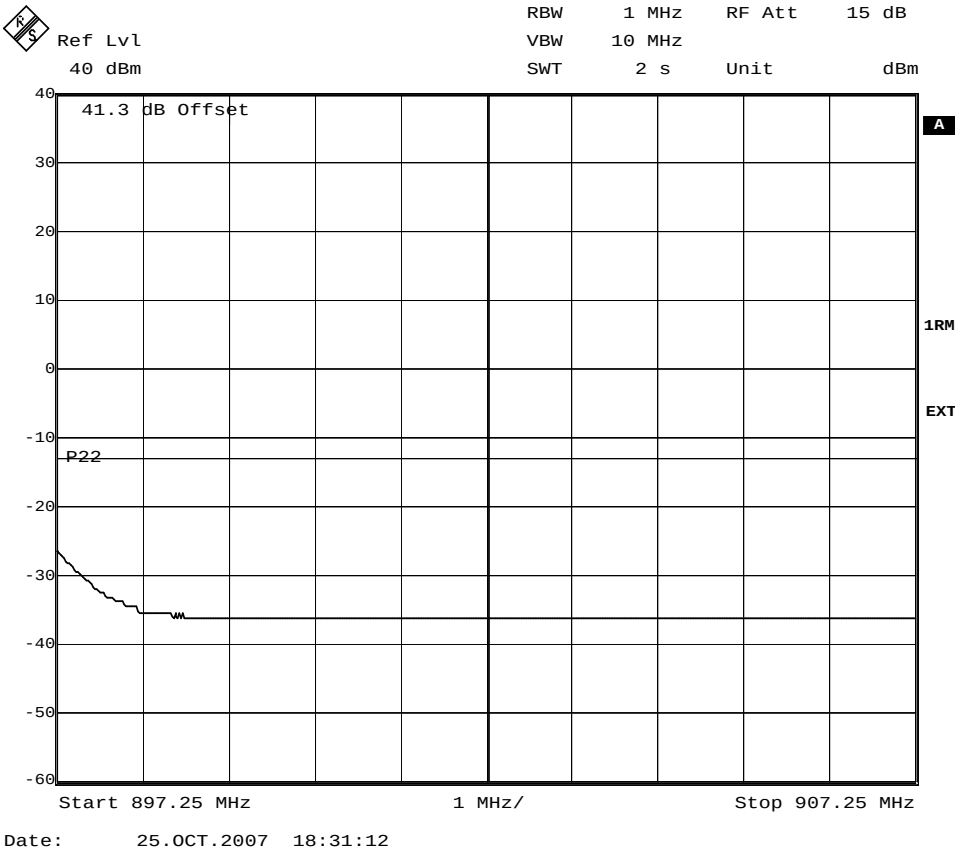
Ref Lvl
40 dBm
RBW 1 MHz
VBW 10 MHz
SWT 2 s
RF Att 15 dB
Unit dBm
41.3 dB Offset
A
1RM
EXT
P22
Start 897.25 MHz
1 MHz/
Stop 907.25 MHz
Date: 25.OCT.2007 18:31:12

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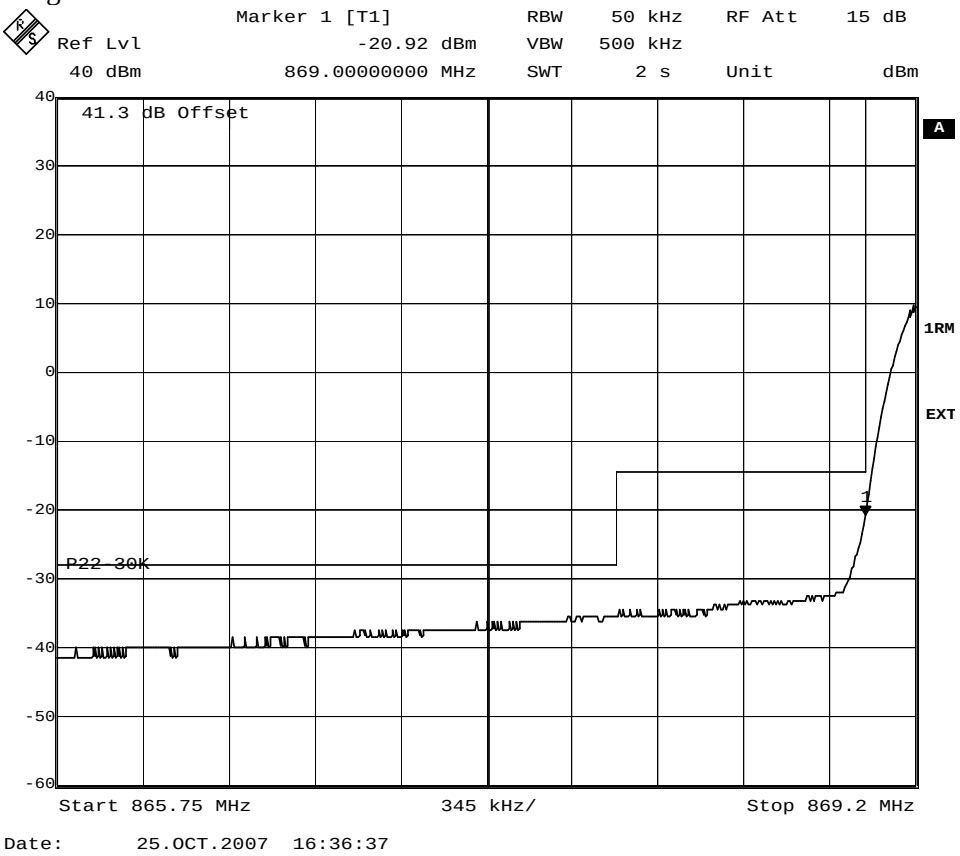
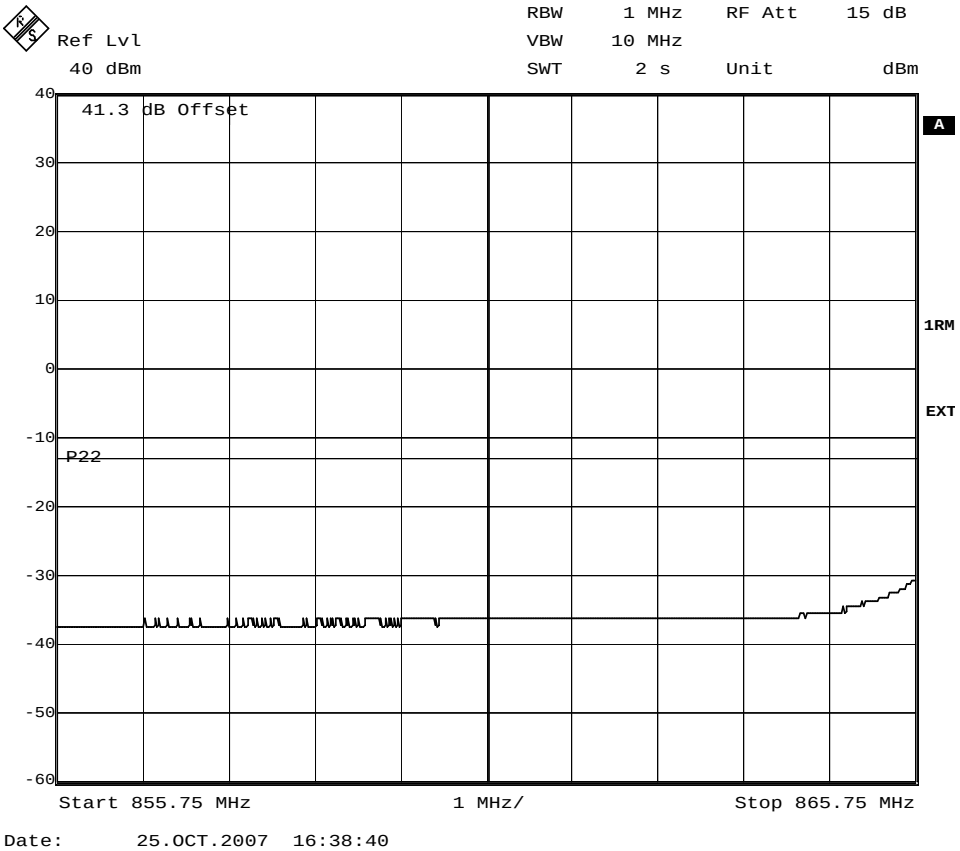
Diagram 7





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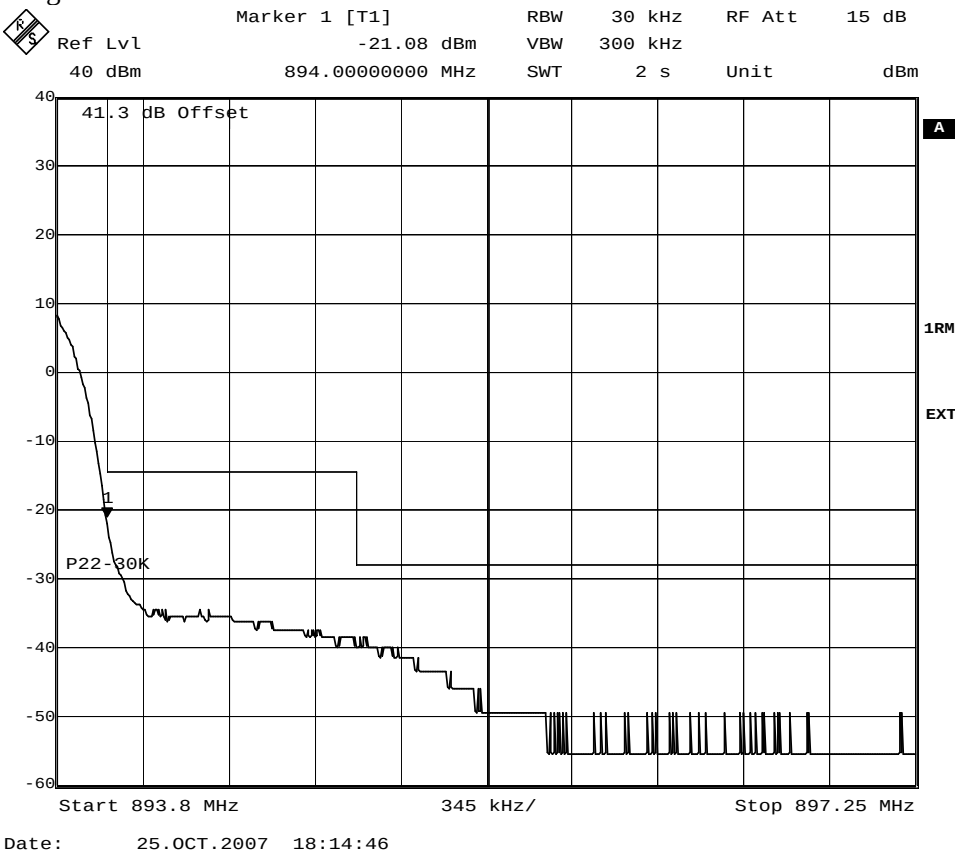
Appendix 4.1

Diagram 8



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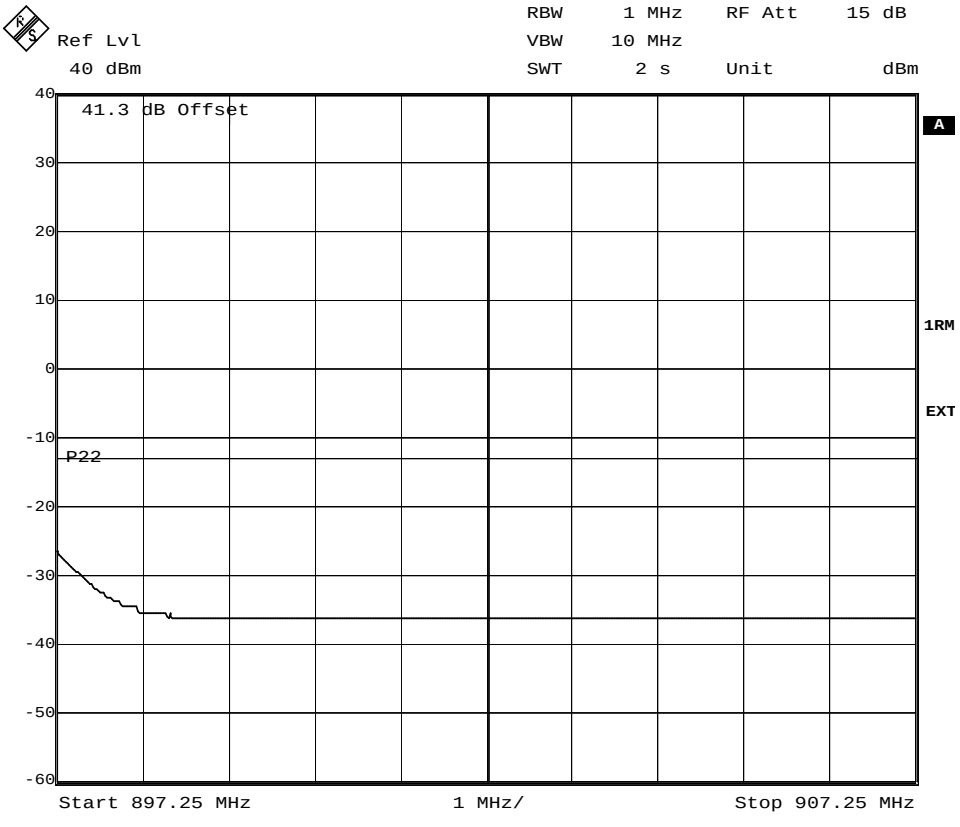


Date: 25.OCT.2007 18:15:32

FCC ID: TA8AKRC11822-3
IC: 287AB-AW118223

Appendix 5

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

Date	Temperature	Humidity
2007-10-16	24 °C ± 3 °C	42 % ± 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 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 5 during the measurements.

Measurement equipment	Calibration Due	SP number
R&S FSIQ	2008-10	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

Single carrier

QPSK		16QAM	
Diagram 1:	871.4 MHz	Diagram 4:	871.4 MHz
Diagram 2:	881.4 MHz	Diagram 5:	881.4 MHz
Diagram 3:	891.6 MHz	Diagram 6:	891.6 MHz

Multi carier

QPSK		16QAM	
Diagram 7:	871.4+881.4 MHz	Diagram 9:	871.4+881.4 MHz
Diagram 8:	881.6+891.6 MHz	Diagram 10:	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.

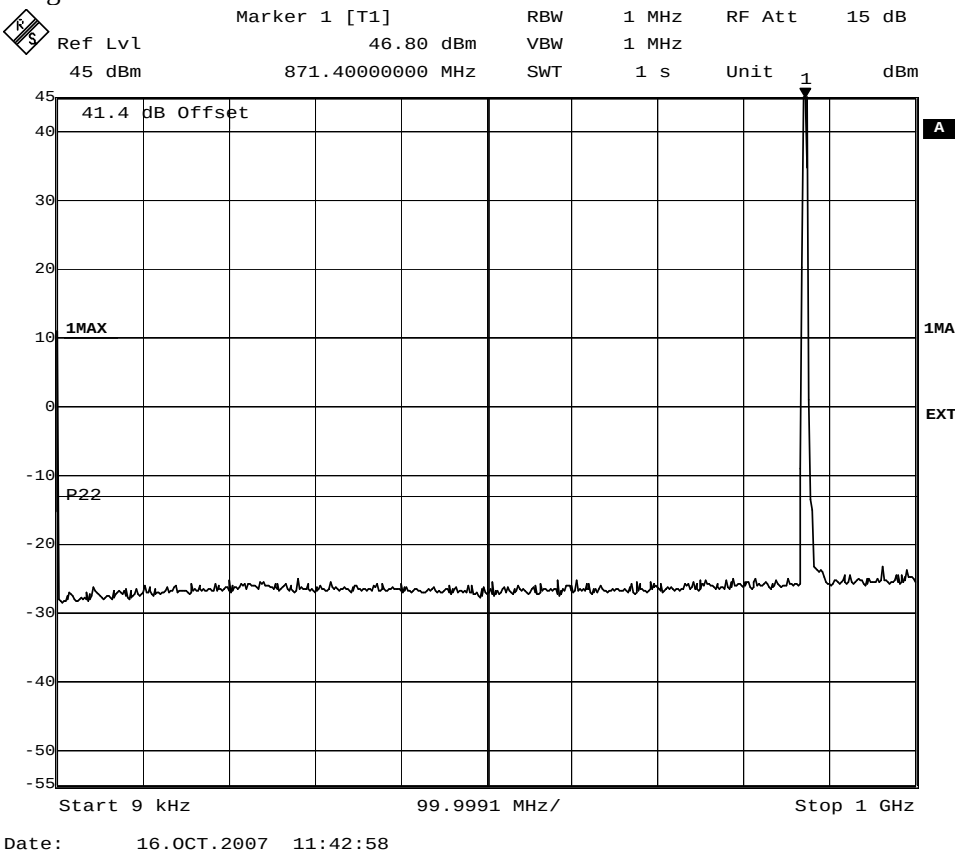
Limits

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

FCC ID: TA8AKRC11822-3 Appendix 5.1
IC: 287AB-AW118223

Diagram 1-1



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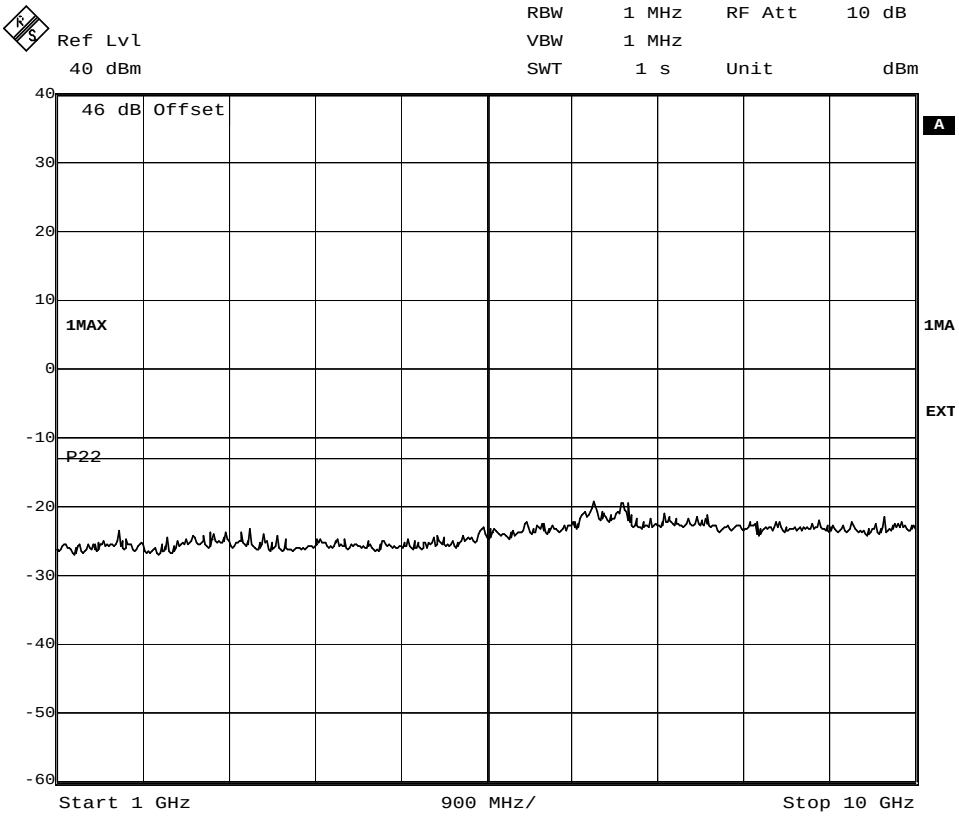

Date: 16.OCT.2007 11:39:03

FCC ID: TA8AKRC11822-3 Appendix 5.1
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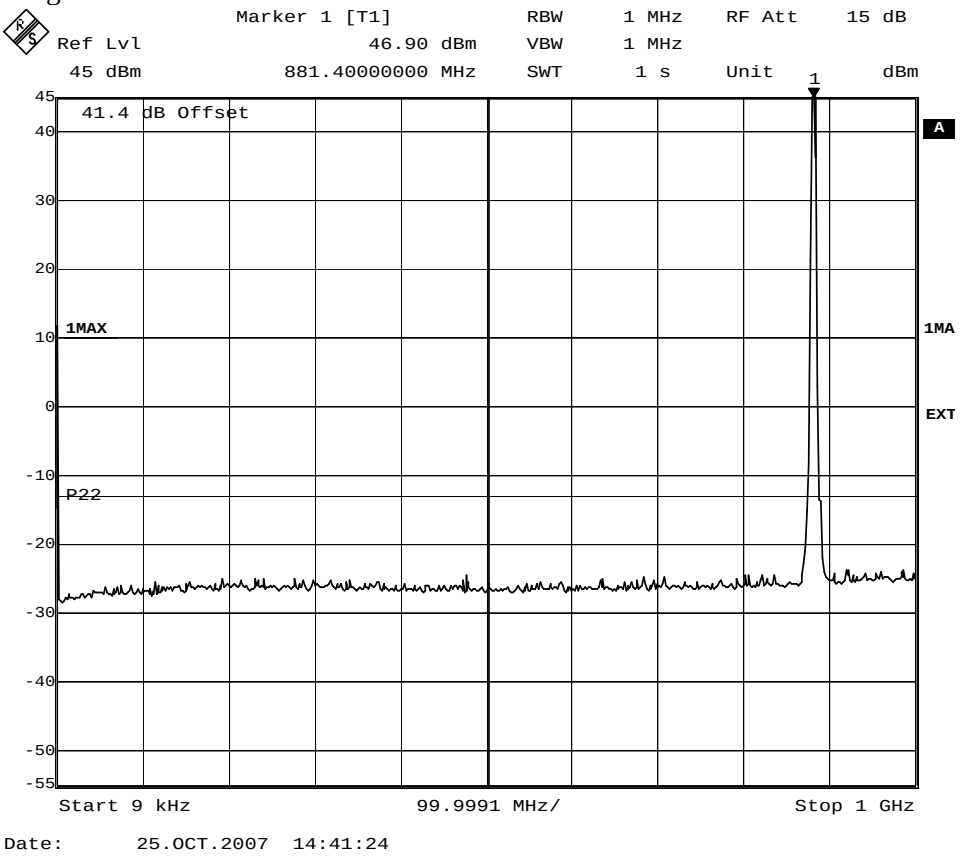
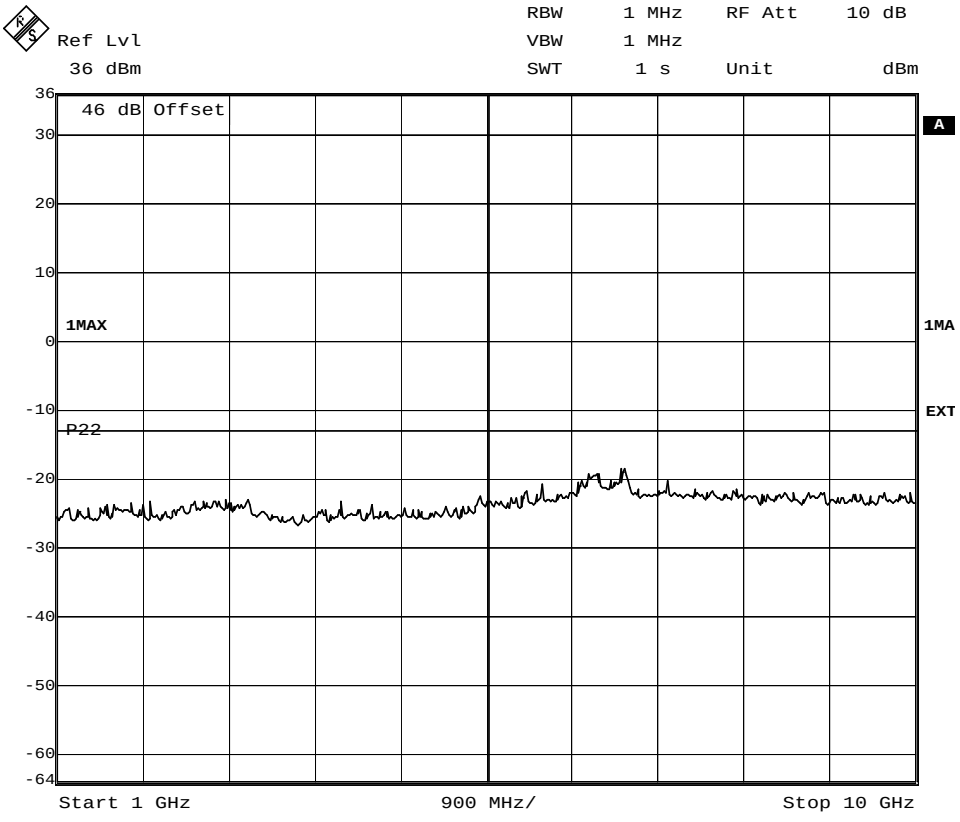
Diagram 2



Date: 25.OCT.2007 14:41:24



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FCC ID: TA8AKRC11822-3 Appendix 5.1
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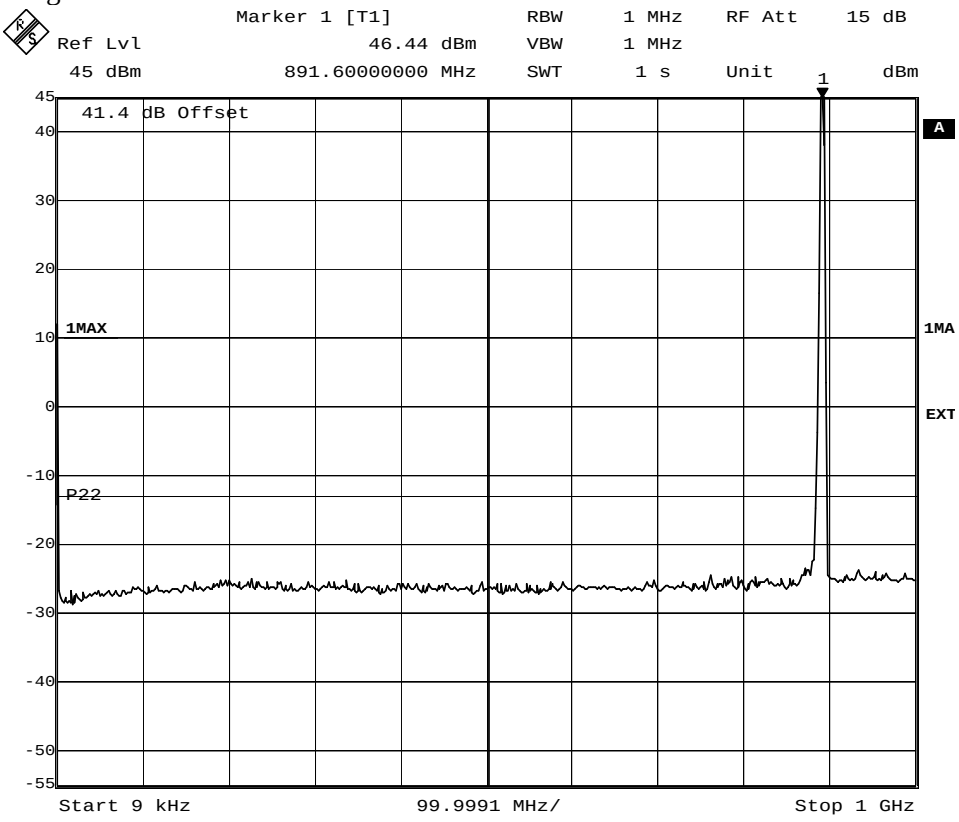
Diagram 3



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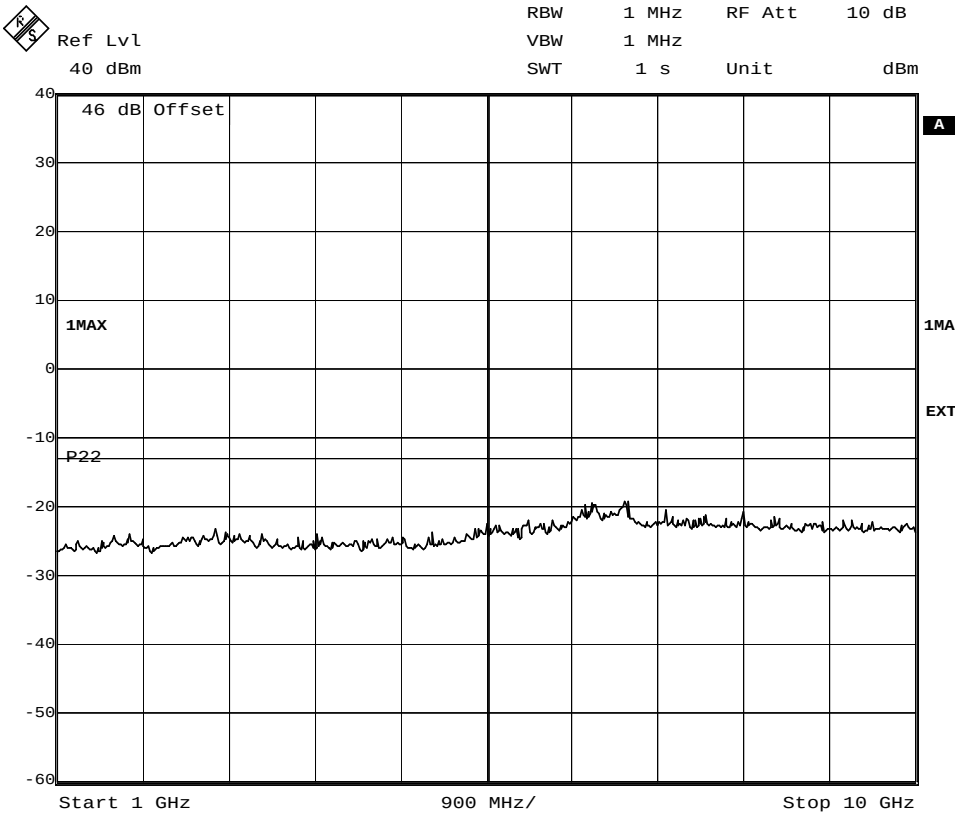
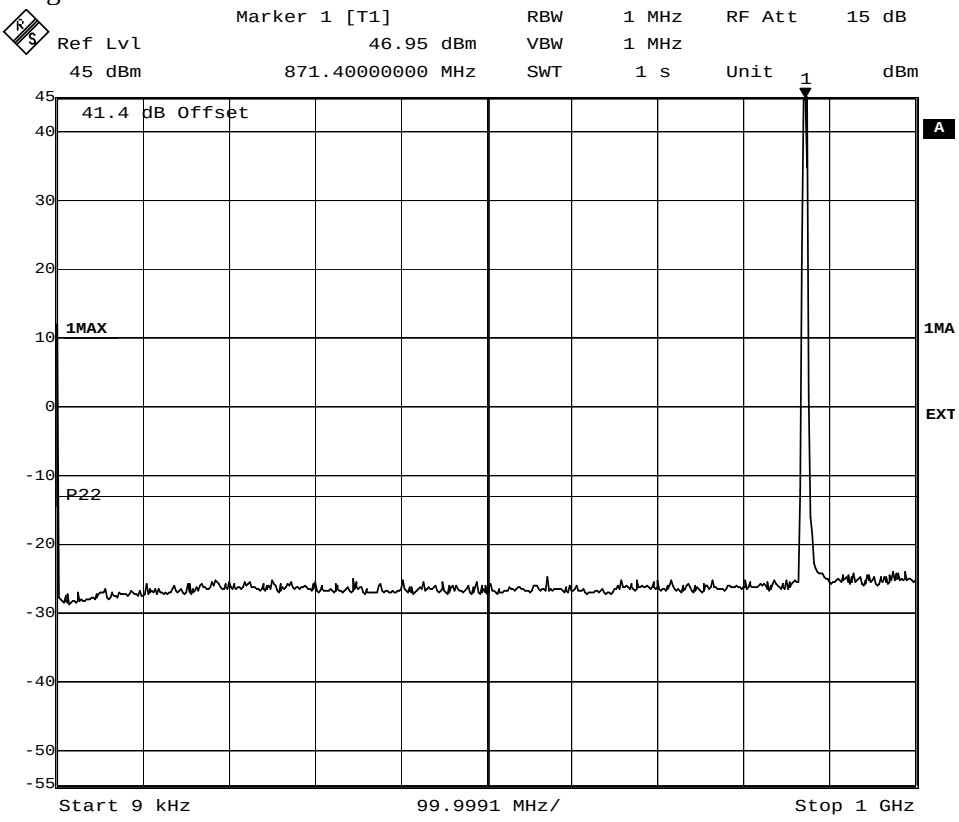


Date: 16.OCT.2007 13:01:43

FCC ID: TA8AKRC11822-3 Appendix 5.1
IC: 287AB-AW118223

Diagram 4



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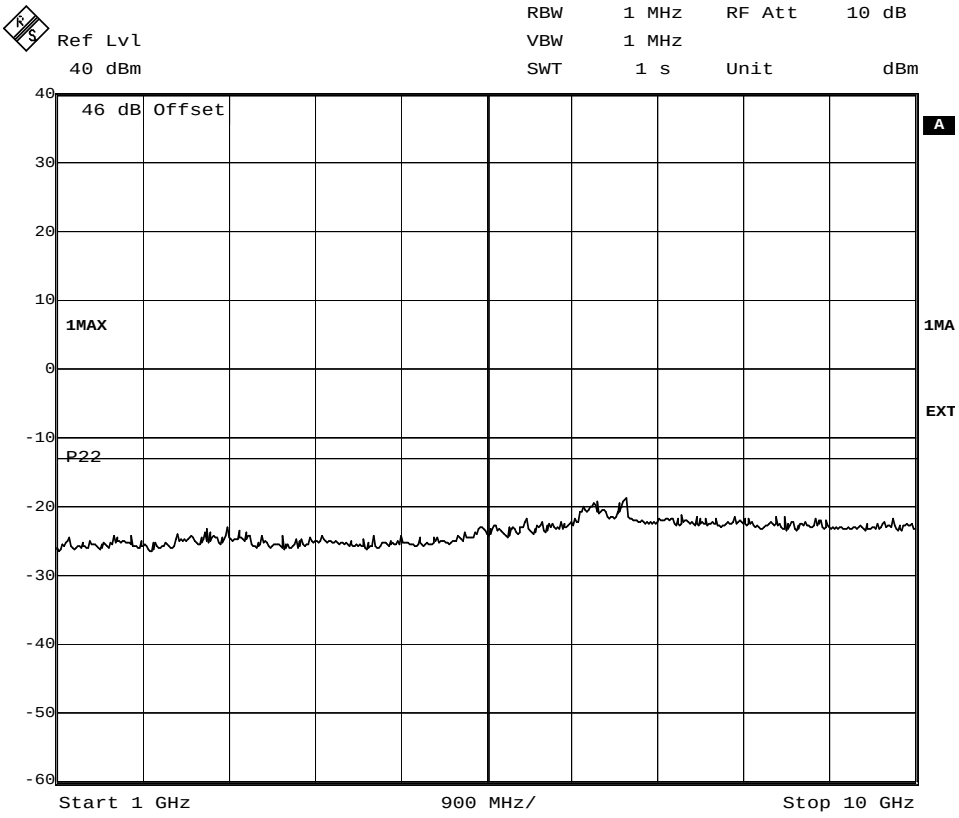

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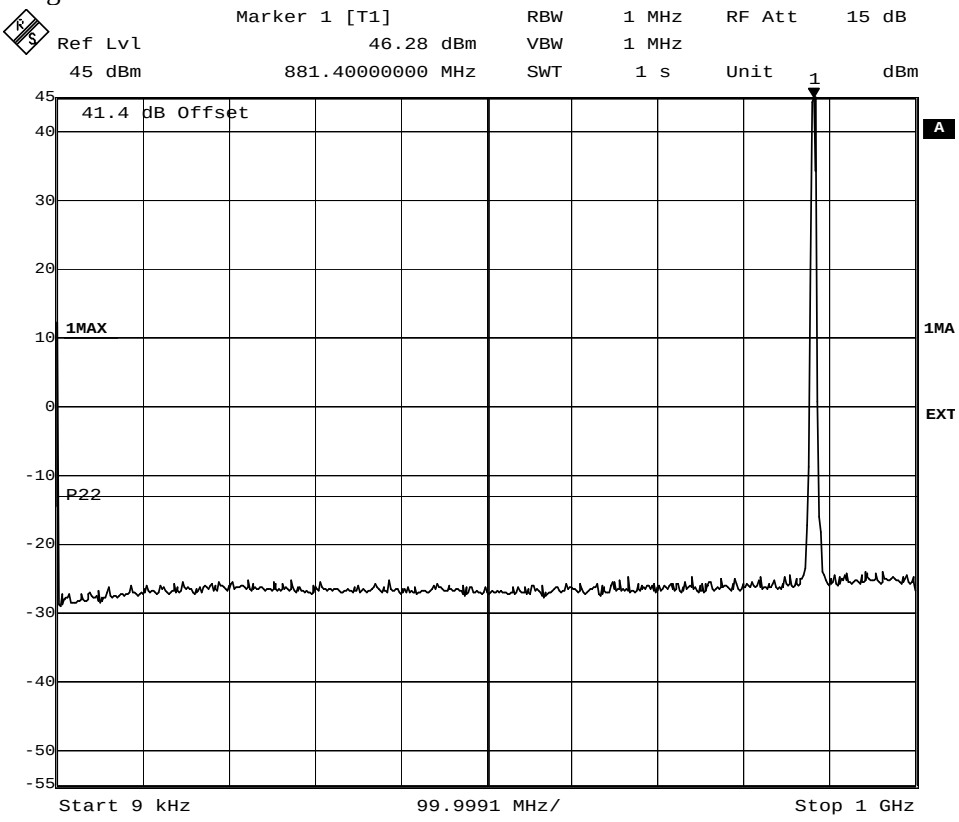
FCC ID: TA8AKRC11822-3 Appendix 5.1
IC: 287AB-AW118223

Diagram 5



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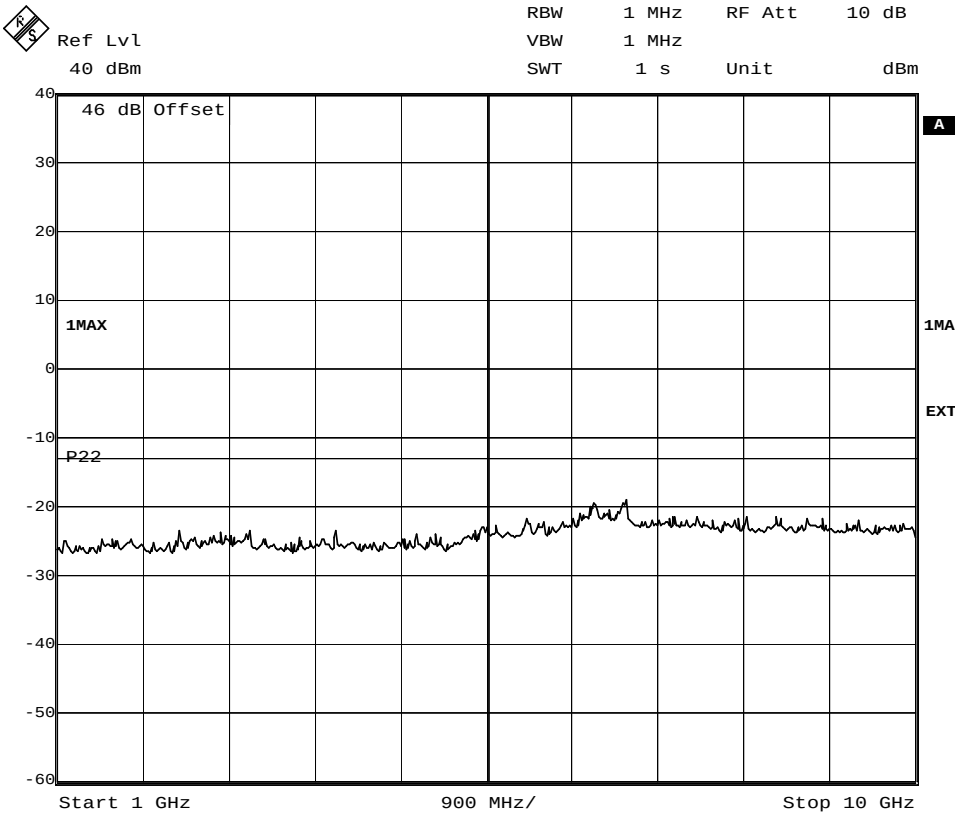

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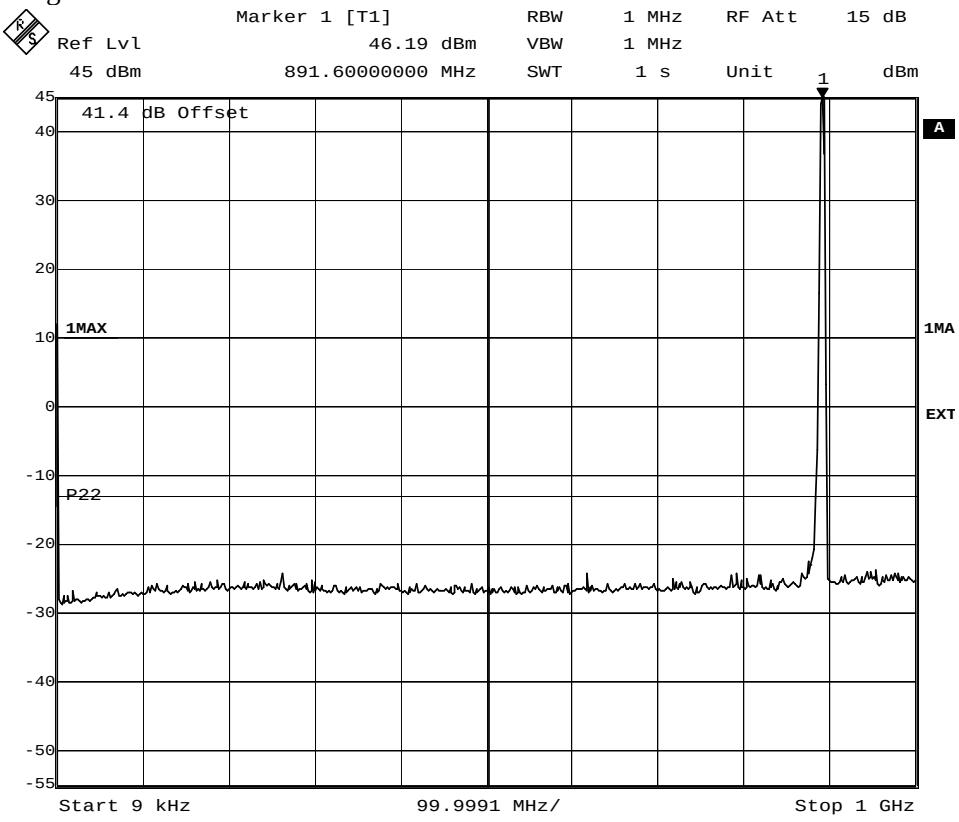
FCC ID: TA8AKRC11822-3 Appendix 5.1
IC: 287AB-AW118223

Diagram 6



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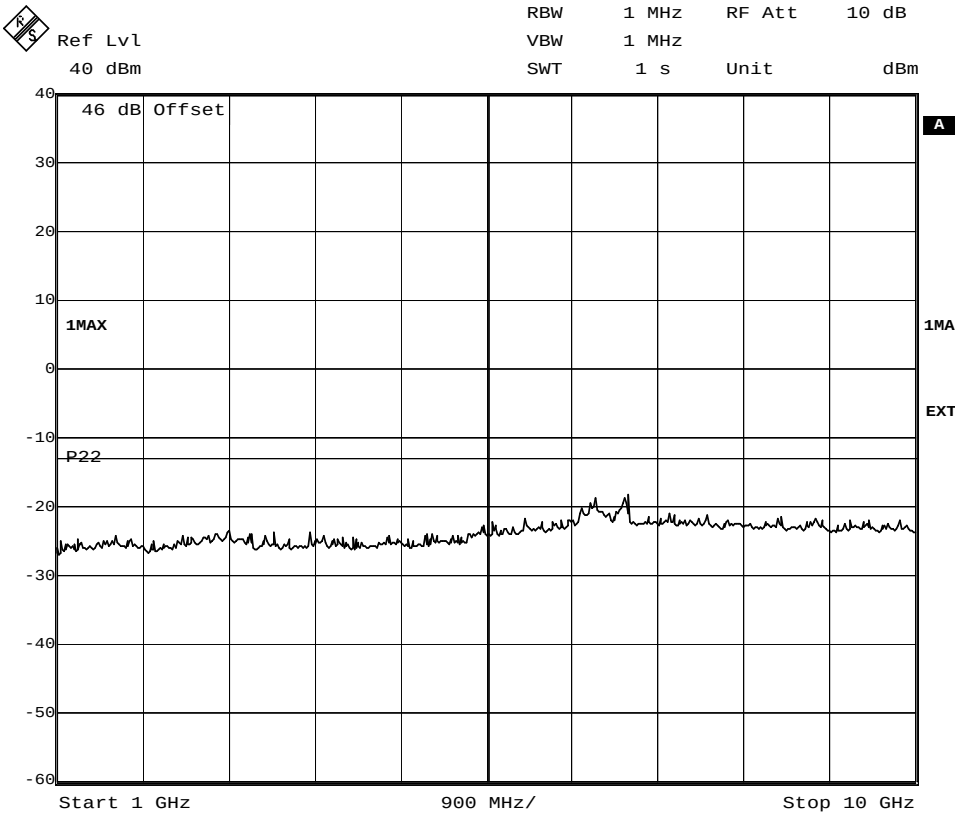

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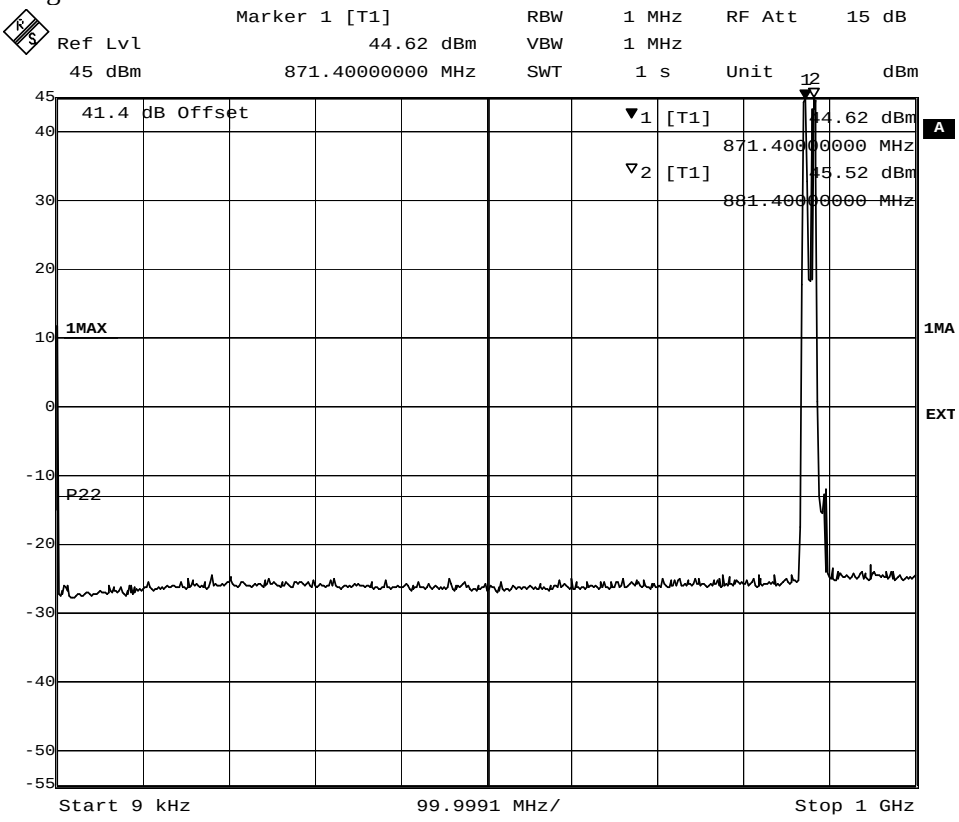
FCC ID: TA8AKRC11822-3 Appendix 5.1
IC: 287AB-AW118223

Diagram 7



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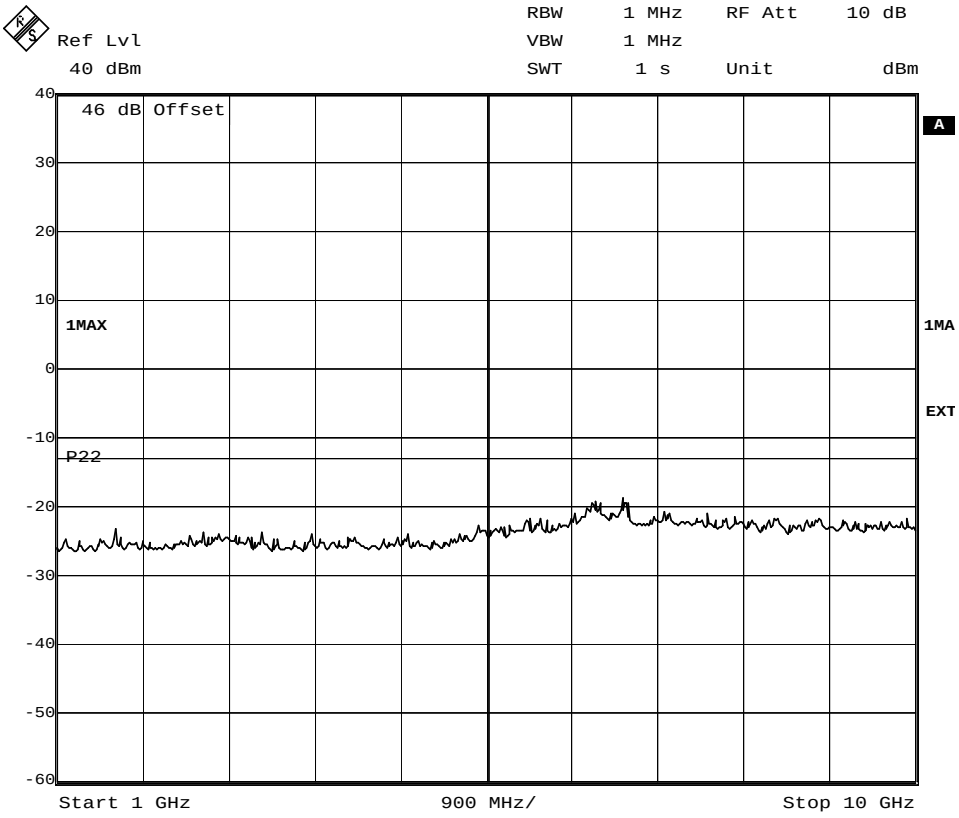

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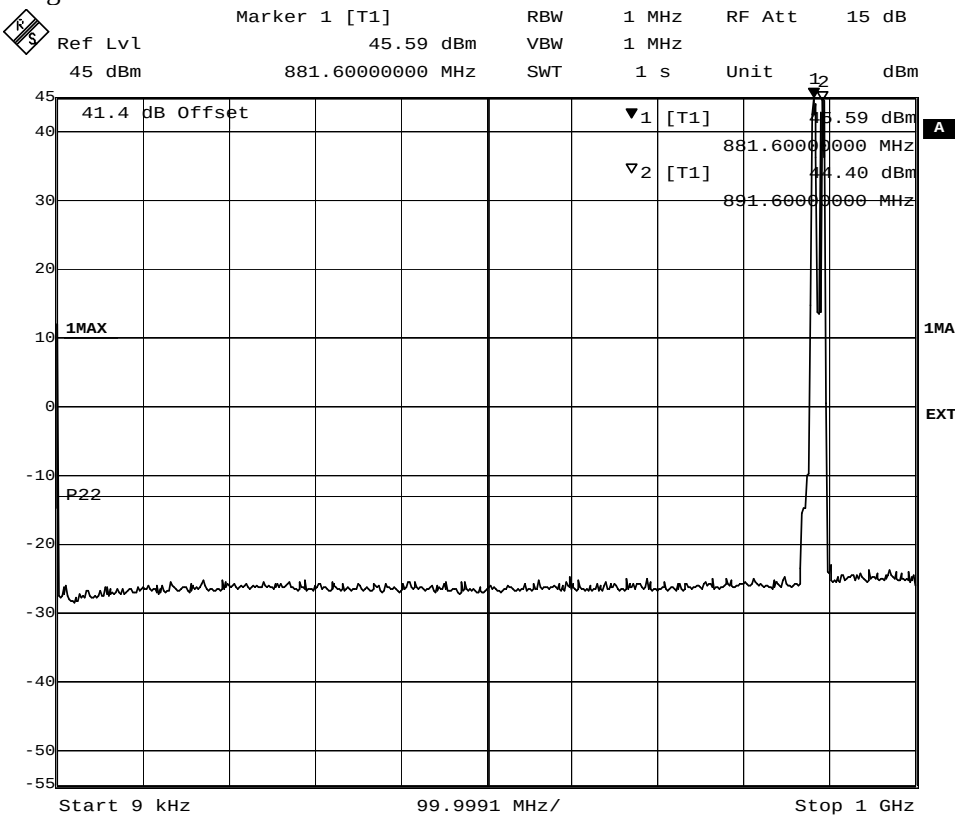
FCC ID: TA8AKRC11822-3 Appendix 5.1
IC: 287AB-AW118223

Diagram 8



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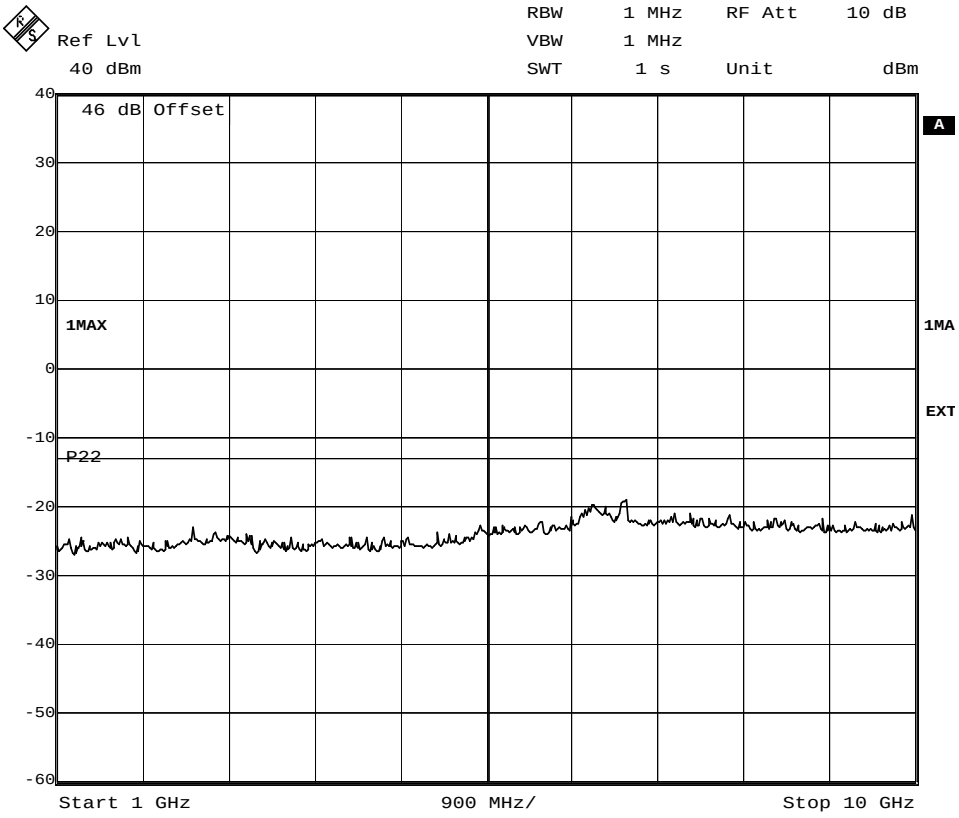
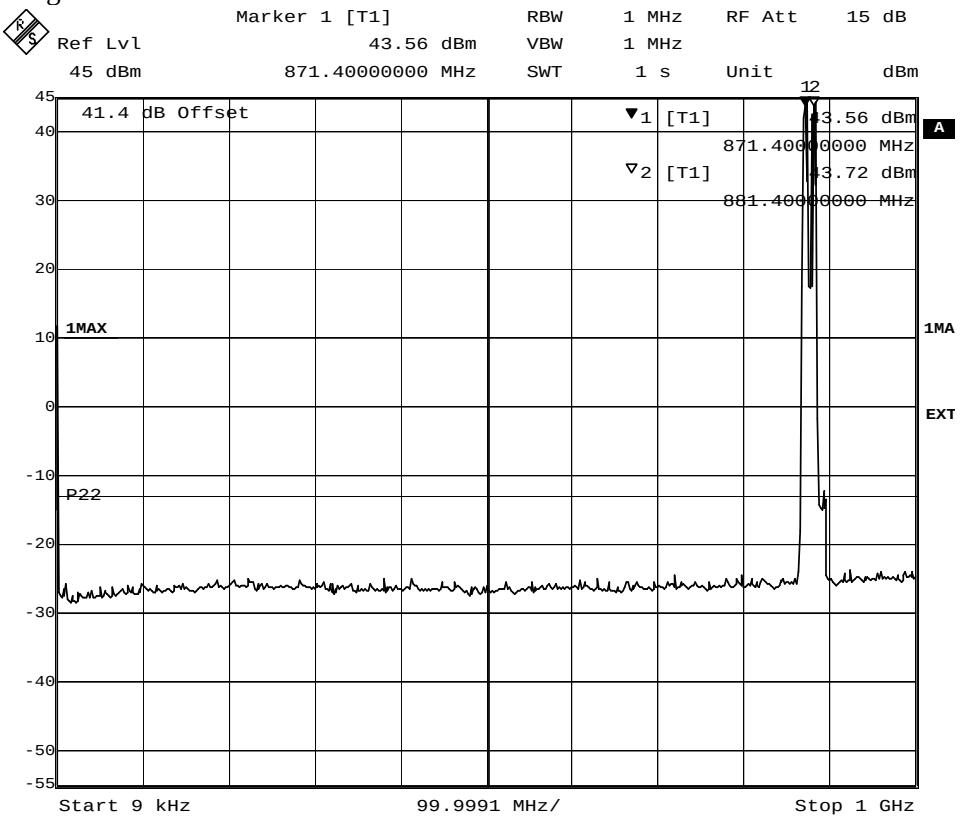


Date: 25.OCT.2007 18:34:56

FCC ID: TA8AKRC11822-3 Appendix 5.1
IC: 287AB-AW118223

Diagram 9



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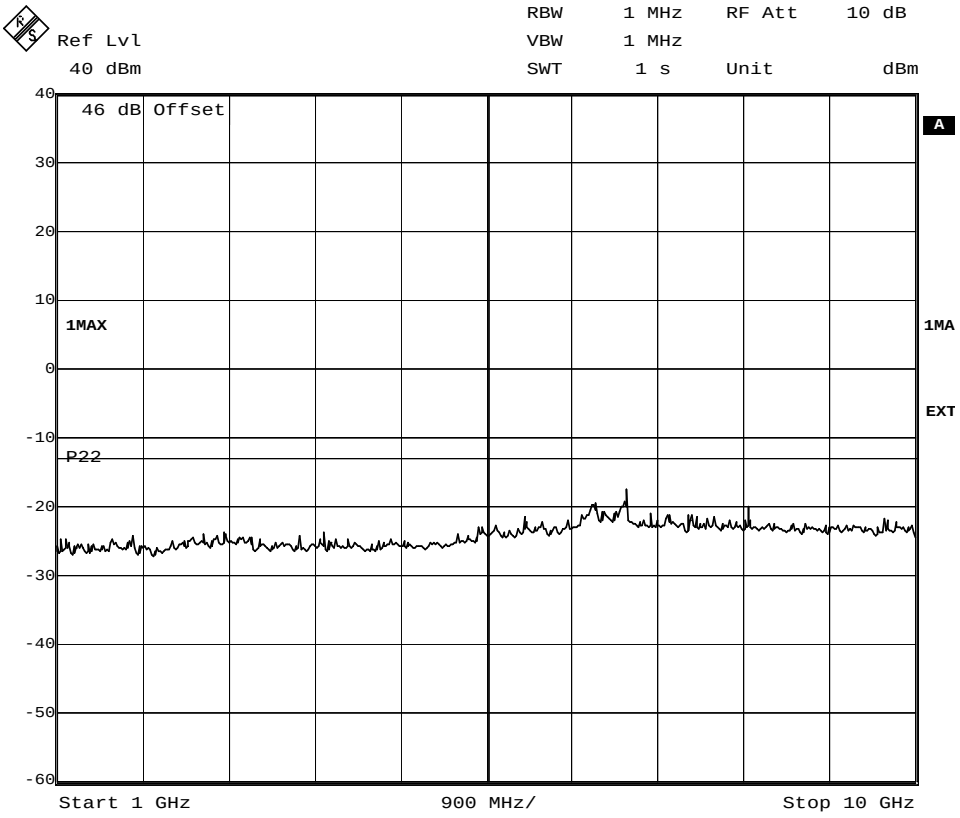
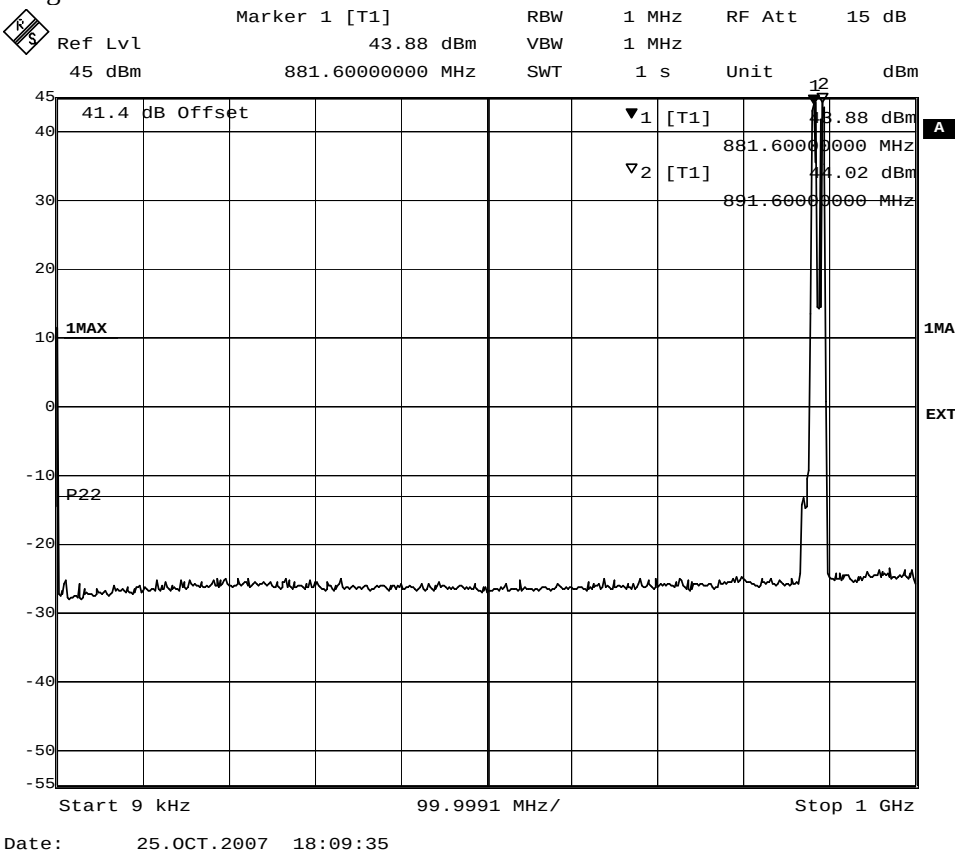


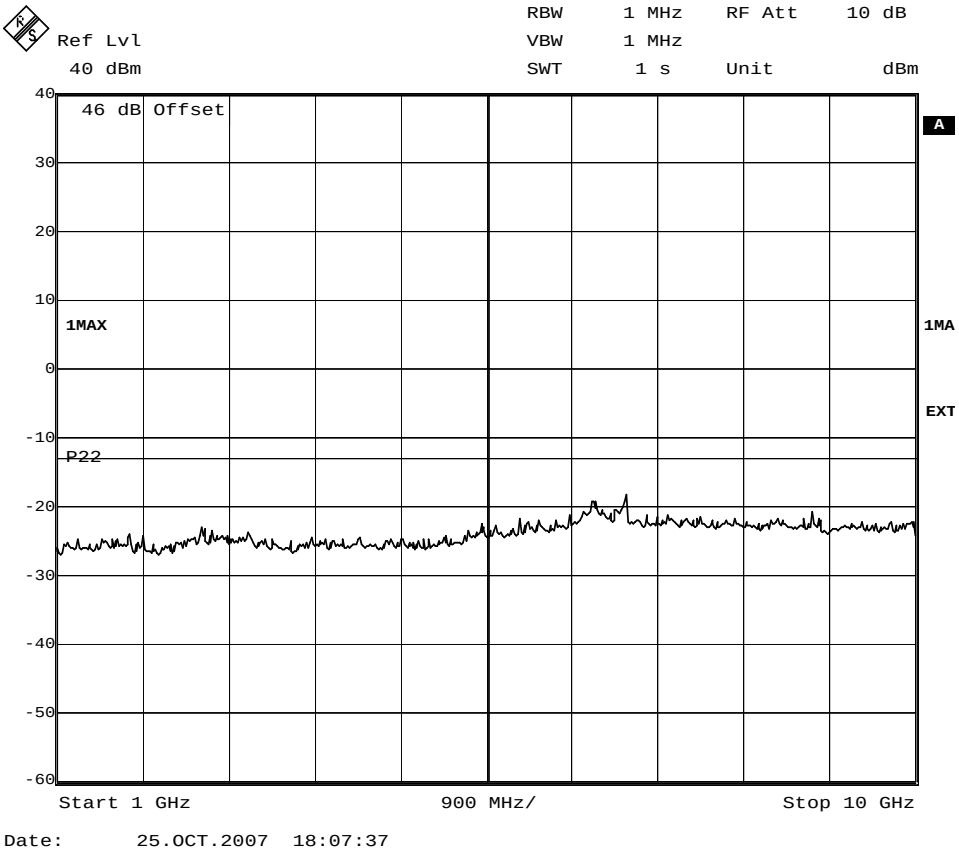
Date: 25.OCT.2007 16:40:56

FCC ID: TA8AKRC11822-3
IC: 287AB-AW118223

Appendix 5.1

Diagram 10





FCC ID: TA8AKRC11822-3
IC: 287AB-AW118223

Appendix 6

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

Date	Temperature	Humidity
2007-10-18 to 2007-10-22	20-22 °C ± 3 °C	22-28 % ± 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 5 during the measurements. The antenna ports were terminated with 50 ohm loads.

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,
$\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, is the propagation loss and D 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	2008-11	503 881
R&S ESI 26	2008-07	503 292
Control computer	-	503 479
Software: R&S ES-K1, ver. 1.60	-	-
Chase Bilog antenna CBL 6111A	2008-11	503 182
EMCO Horn Antenna 3115	2007-11	502 175
MITEQ Low Noise Amplifier	2007-08	503 285
Testo 610, Temperature and humidity meter	2009-04	502 658

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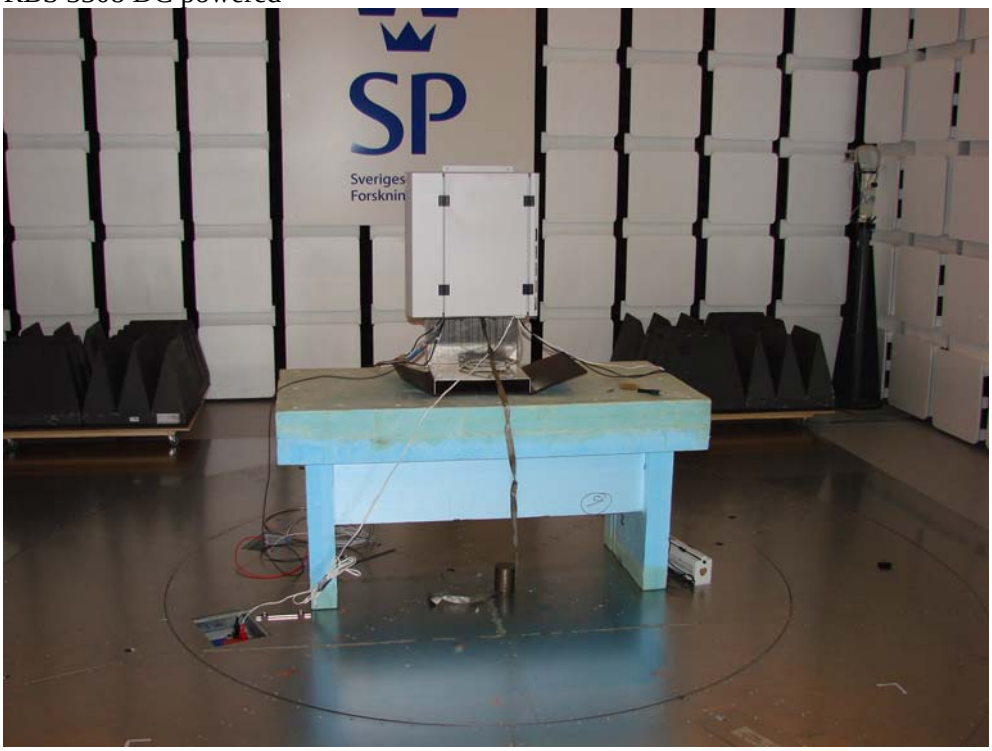
Appendix 6

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

RBS 3308 AC powered

RBS 3308 DC powered



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 measurements according to 47 CFR 2.1055/ RSS-132 4.3

Date	Temperature (test equipment)	Humidity (test equipment)
2007-10-29 to 2007-11-01	21-23 °C ± 3 °C	28-40 % ± 5 %

Test set-up and procedure

The measurement was made per 3GPP TS 25.141. 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 5 during the measurements.

Measurement equipment	Calibration Due	SP number
Climate chamber	2009-05	503 546
R&S FSIQ	2007-08	503 738
Multimeter Fluke 87	2008-04	502 190
Testo 610, Temperature and humidity meter	2008-04	502 658

Results

Nominal Voltage -48 V DC
43 dBm output power at 881.4 MHz

Test conditions		Frequency error (Hz)	
Supply voltage DC (V)	T (°C)	QPSK	16QAM
-48.0	+20	-14	-6
-55.2	+20	+11	+13
-40.8	+20	-7	+8
-48.0	+30	-15	-17
-48.0	+40	-8	+11
-48.0	+50	+7	-12
-48.0	+10	+10	-8
-48.0	0	+5	-10
Maximum freq. error (Hz)		17	
Measurement uncertainty		$< \pm 1 \times 10^{-7}$	

Note: At -10°C it was not possible to enable the transmitter, the cell was not available.

Limits (according to 3GPP TS 25.141)

The frequency error shall be within ± 0.05 PPM ± 12 Hz (±56.07 Hz).

Complies?	Yes

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Appendix 8

Receiver spurious emissions measurements according to 47 CFR 15.111

Date	Temperature	Humidity
2007-11-01	23 °C ± 3 °C	40 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.4-2003.

The measurements were performed on the receiver antenna terminal (Ant 2). 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	Calibration Due	SP number
R&S FSIQ 40	2008-10	503 738
Testo 610, Temperature and humidity meter	2009-04	502 658

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 port Ant 2 the combined TX/RX port Ant1 was terminated with 50 ohm, the TX was active at maximum power 46 dBm in single carrier mode with Test model 1.

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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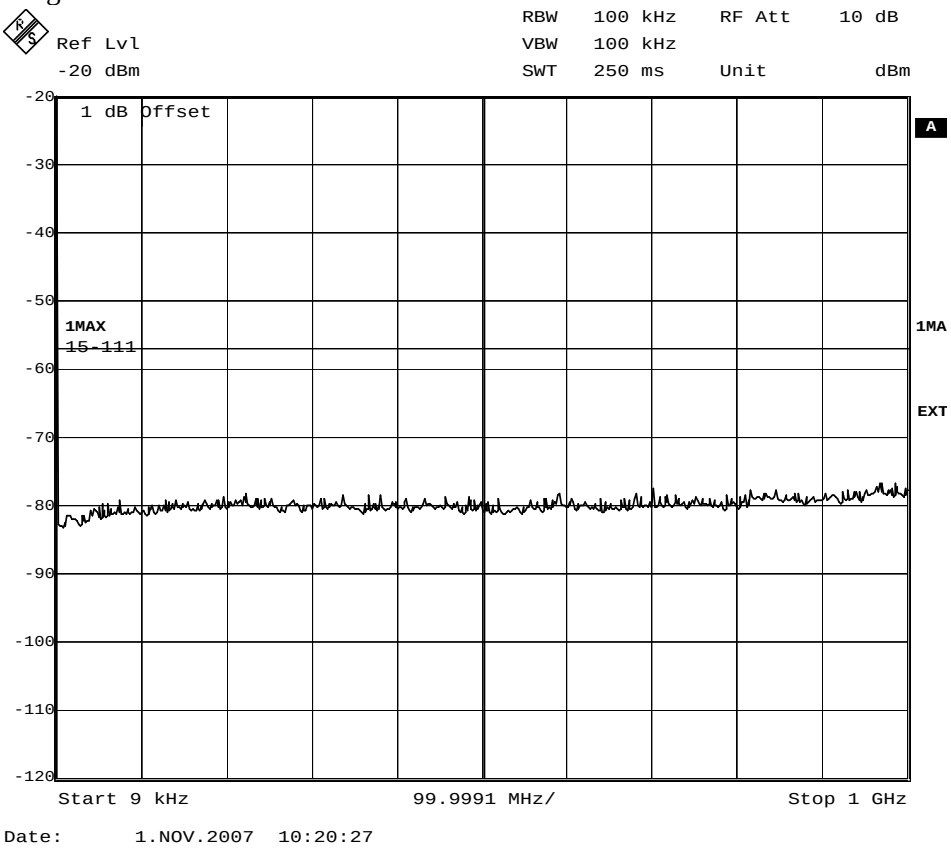
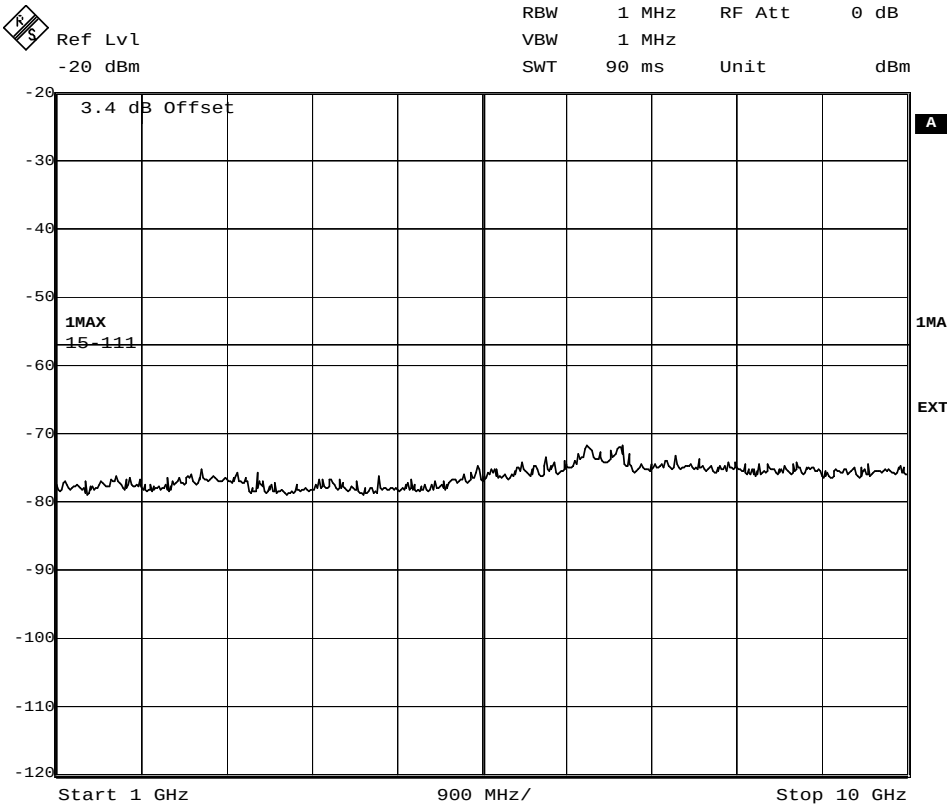
Appendix 8.2

Diagram 1



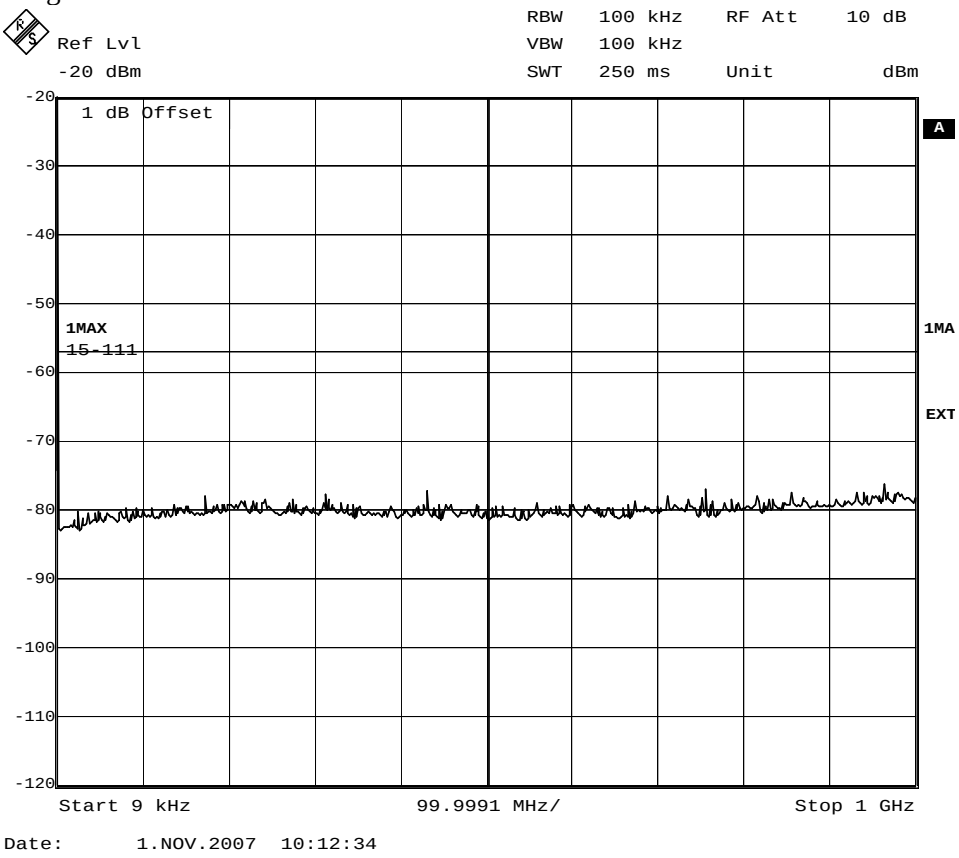
Date: 1.NOV.2007 10:20:27



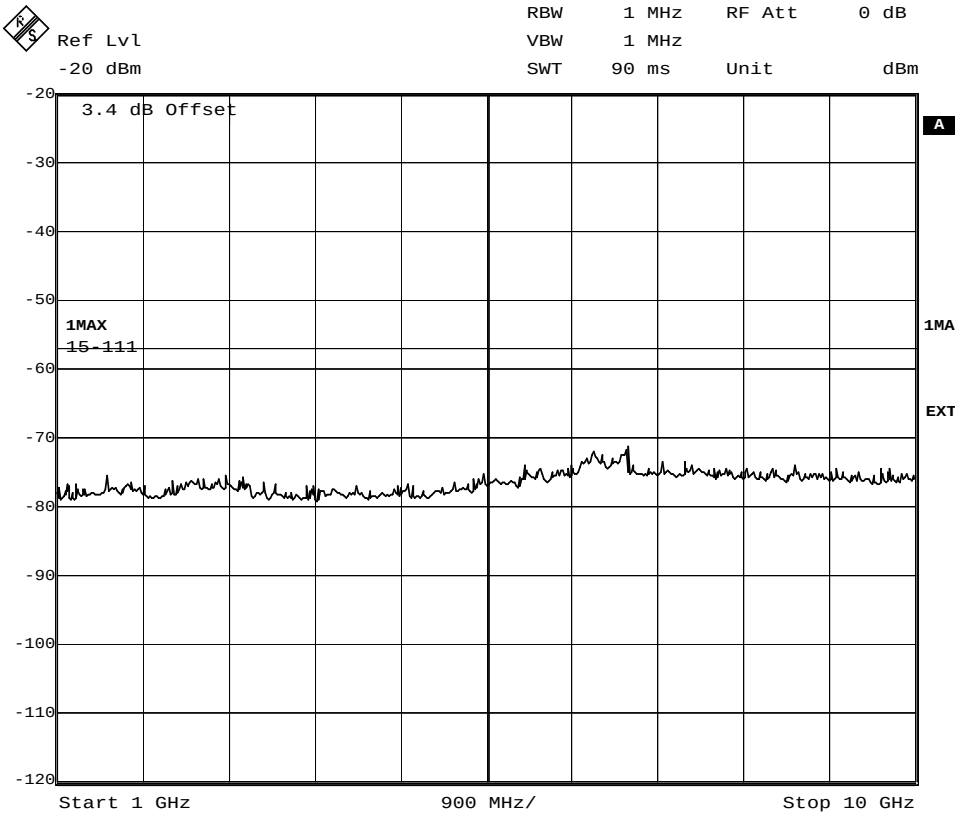
Date: 1.NOV.2007 10:19:27

FCC ID: TA8AKRC11822-3 Appendix 8.2
IC: 287AB-AW118223

Diagram 2



Date: 1.NOV.2007 10:12:34



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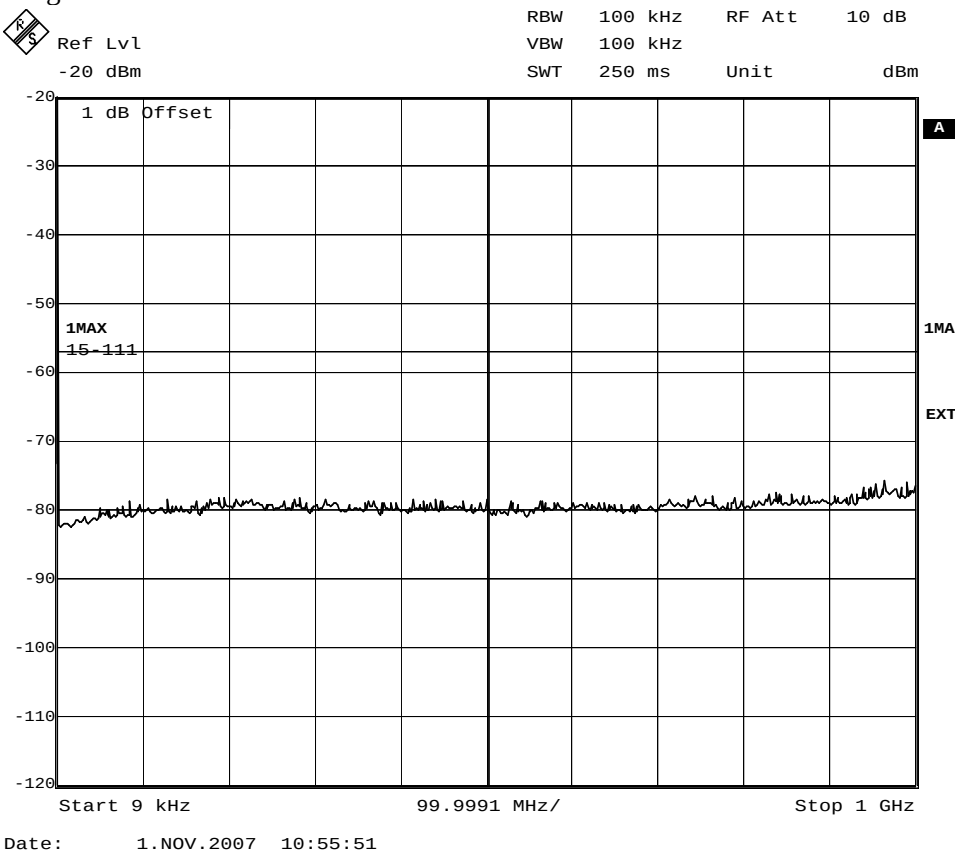
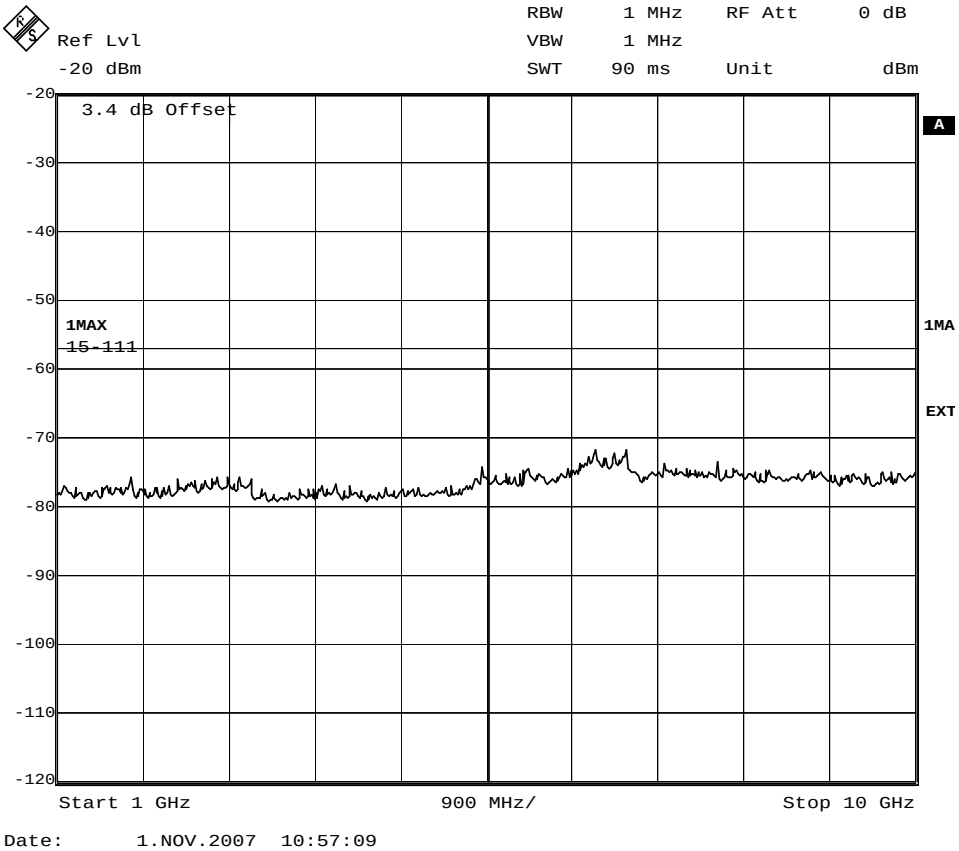
FCC ID: TA8AKRC11822-3
IC: 287AB-AW118223

Appendix 8.2

Diagram 3





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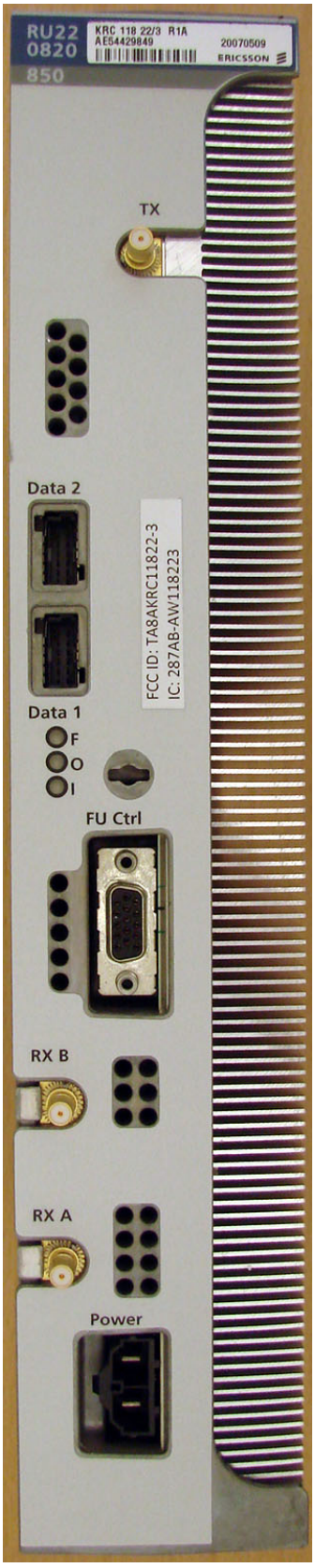
IC: 287AB-AW118223

Appendix 9

Photos
Radio Unit KRC 118 22/3

Front side



Rear side

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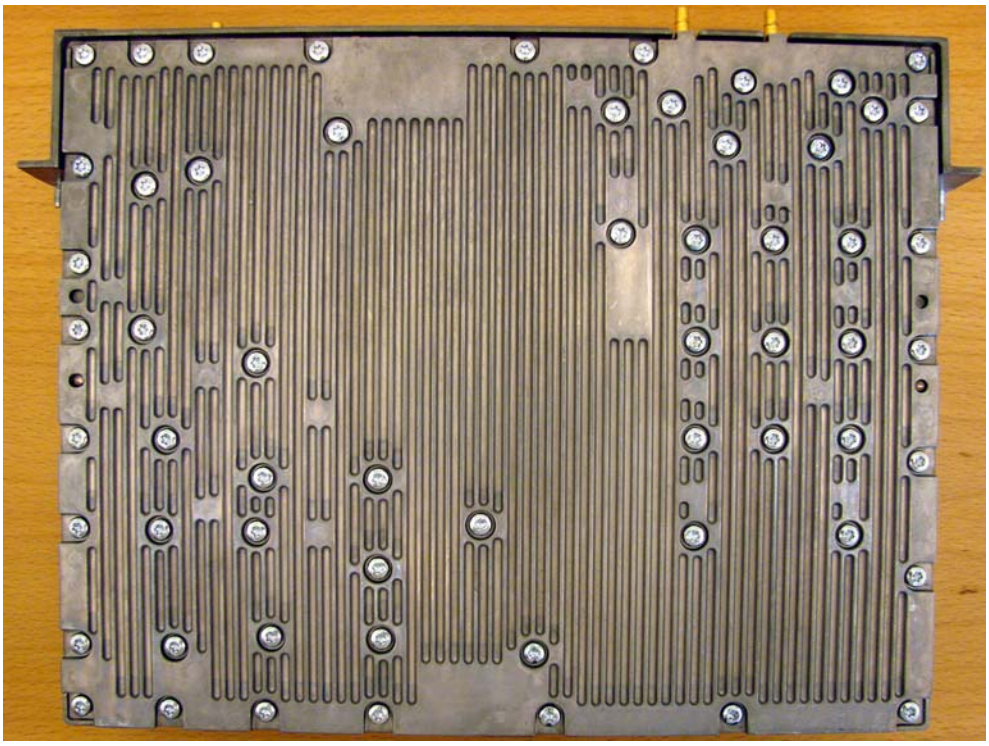
Appendix 9

Left side



Right side