

Handled by, department
Jonas Bremholt
Electronics
+46 (0)33 16 54 38, jonas.bremholt@sp.se

ERICSSON AB
Jan Rimming
PDU RBS WCDMA
164 80 STOCKHOLM

Equipment authorization measurements on WCDMA Base Station Radio Unit with FCC ID: TA8AKRC11819-1 (8 appendices)

Test object


Radio Unit KRC 118 19/1

Summary

Standard	Compliant	Appendix	Remarks
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	-
2.1055 Frequency stability	Yes	7	-

SP Swedish National Testing and Research Institute Electronics - EMC


Jan Welinder
Technical Manager


Jonas Bremholt
Technical Officer

SP Swedish National Testing and Research Institute

Postal address
SP
Box 857
SE-501 15 Borås
SWEDEN

Office location
Västeråsen
Brinellgatan 4
Borås

Phone / Fax / E-mail
+46 33 16 50 00
+46 33 13 55 02
info@sp.se

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FCC ID: TA8AKRC11819-1

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Description – Test object

Equipment: WCDMA Radio Unit (RU) 1900 MHz, single carrier

Tx Frequency range: 1932.5-1987.5 MHz

Modulations: QPSK and 16QAM

Maximum output power: 46 dBm (40 W)

Nominal power voltage: -48 VDC

Tested channels

ARFCN	Frequency
412	1932.5 MHz
537	1957.5 MHz
687	1987.5 MHz

Operation mode during measurements**Test models**

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

Test model 1: 16 DPCH:s at 30 ksp/s (SF=128)

Test model 5: 6 DHCP:s at 30 ksp/s and 2 HS-PDSCH:s at 240 ksp/s (SF=128)

Conducted measurements

All RF conducted measurements were performed with the test object installed in a RBS 3206 cabinet powered with -48 VDC. All measurements were done at the output connector (Ant A) of the Filter Unit (FU) KRC 118 20/1. All measurements were performed at maximum output power with both modulations. The frequency stability measurements were performed with the lub alternatively GPS as the timing source.

Radiated measurements

All radiated measurements were performed with the test object installed in a RBS 3106 cabinet powered with 3-phase 208/120 VAC and in a RBS 3206 cabinet powered with -48 VDC. In both cases there were three RU:s installed in the cabinets (RF configuration 3x1).

The RU:s were activated for maximum transmit power. Test model 5 was used in cell 1 and Test model 1 was used in cells 2 and 3. The RU:s were allocated to UARFCN 412, 537, and 687 (1932.5, 1957.5, and 1987.5 MHz) for downlink. The RF output power ports were terminated with 50 ohm loads.

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in FCC CFR 47.

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Appendix 1

References

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

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: 2005-04-18

Manufacturer's representative

Larry Lindström, Ericsson AB

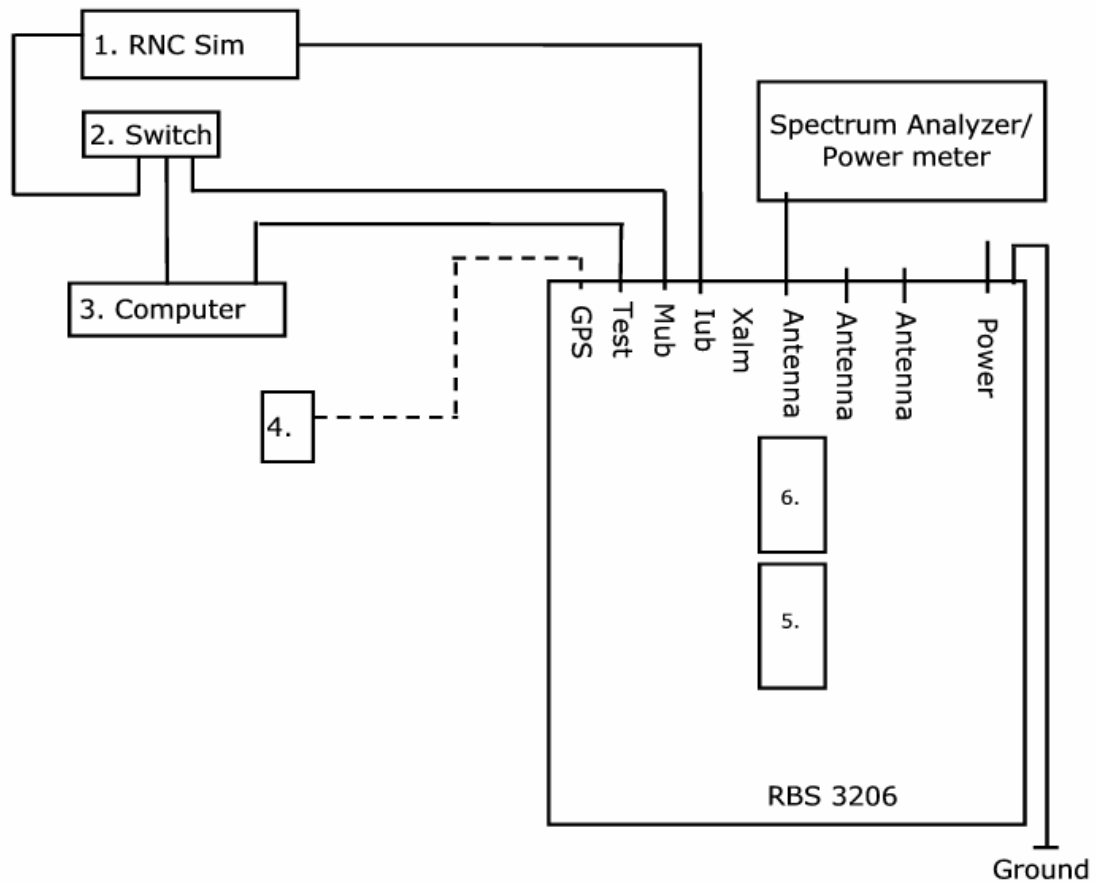
Test engineers

Reinhold Reul, Peter Grahn, and Jonas Bremholt all SP personnel.

Test witnesses

Larry Lindström, Mats Iregren, and Thomas Odén all from Ericsson AB

Test set-up, conducted measurements



RBS 3206: FAR 102 121/28, R-state P2F with software CXP 901 0810 rev. P6DD
Product number: 2/BFE 401 1012, R-state: R1C, Serial No: TU85684139

1. RNC Sim 10, Ericsson no.: ETE-004740
2. Switch, Netgear Ethernet switch FS108
3. Computer, SUN Microsystems, Ericsson no.: ETE-203520
4. GPS antenna (Frequency stability test only)
5. RU KRC 118 19/1 Rev. R1C, Serial No: AE51705563 (FCC id: TA8AKRC11819-1)
6. FU KRC 118 20/1 Rev. R1C, Serial No: A400186101

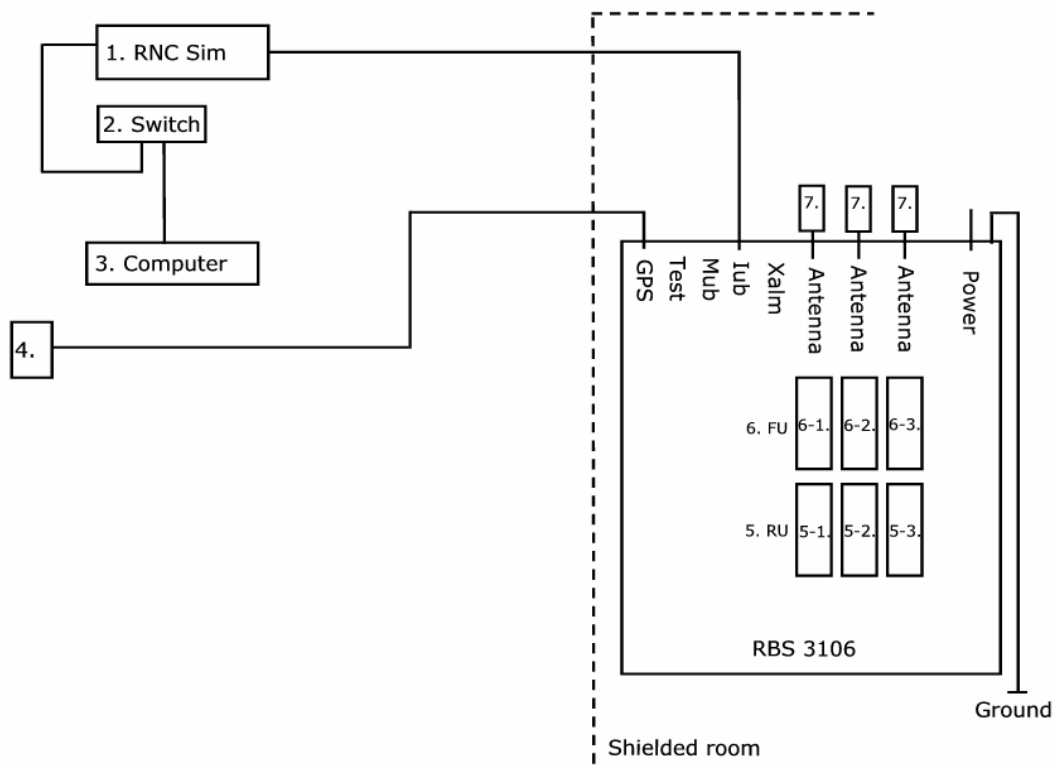
Interfaces:

Power, -48 VDC
Coaxial cable with N connector and adaptor to 7/16"
Iub, configured as T1 by CBU, shielded multi-wire with RJ-45 connector
Mub, shielded multi-wire with RJ-45 connector
Test, serial interface, shielded multi-wire with RJ-45 connector
Xalm, no cable attached.
GPS, shielded multi-wire with 9-pin D-sub

Type of port:

DC power
Antenna
Telecom
Test purpose
Test purpose
Signal
Signal

Test set-up, radiated measurements RBS 3106



RBS 3106: FAR 102 122/9, R-state P1T with software CXP 901 0810 rev. P6DD
Product number: 3/BFE 401 1015/08, R-state: R1C, Serial No: TU85782145

1. RNC Sim CES 4780DA Mini-sim#33, Ericsson no.: ETE-203565
2. Switch, Netgear Ethernet switch FS108
3. Computer, SUN Microsystems, Ericsson no.: ETE-203521
4. GPS antenna
5. RU KRC 118 19/1 Rev. R1C (FCC id: TA8AKRC11819-1)
 - 5-1. Serial No: AE51719154
 - 5-2. Serial No: AE51718344
 - 5-3. Serial No: AE51718333
6. FU KRC 118 20/1 Rev. R1C
 - 6-1. Serial No: A400187976
 - 6-2. Serial No: A400187985
 - 6-3. Serial No: A400187985
7. 50 ohm Termination

Interfaces:

Power, 208/120 VAC
Coaxial cable with N connector and adaptor to 7/16"
Iub, configured as T1 by CBU, shielded multi-wire with RJ-45 connector
Mub, no cable attached
Test, no cable attached
Xalm, no cable attached
GPS, shielded multi-wire

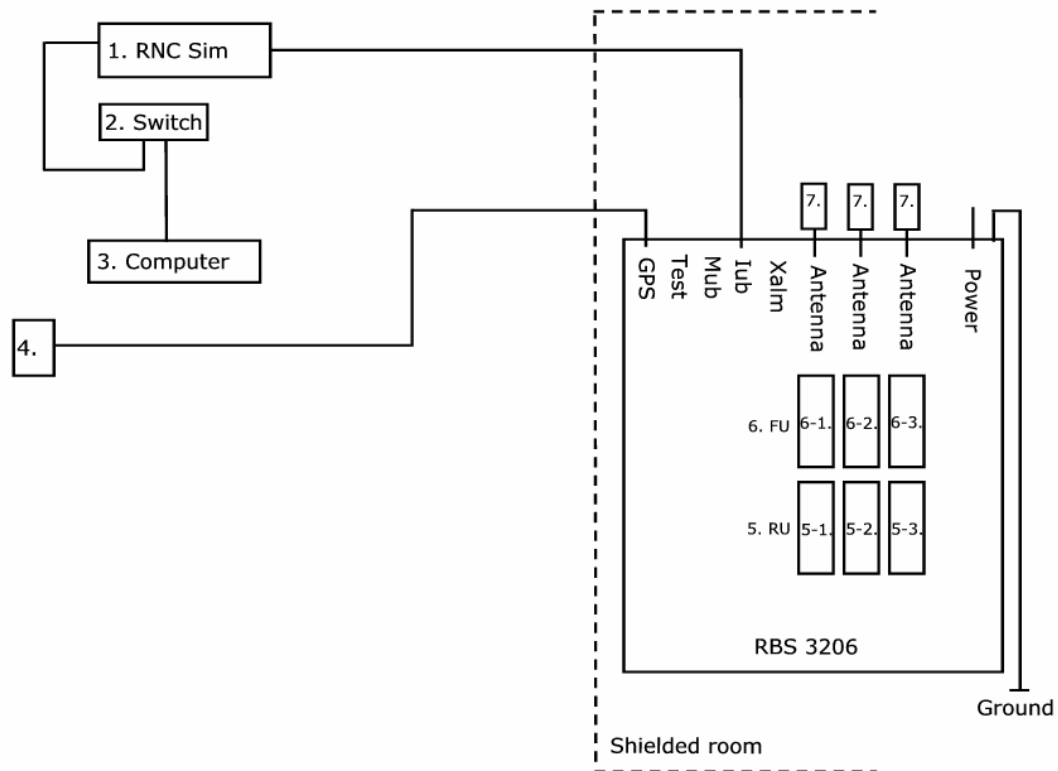
Type of port:

AC Mains
Antenna
Telecom
Test purpose
Test purpose
Signal
Signal

FCC ID: TA8AKRC11819-1

Appendix 1

Test set-up, radiated measurements RBS 3206



RBS 3206: FAR 102 121/28, R-state P2F with software CXP 901 0810 rev. P6DD
Product number: 2/BFE 401 1012, R-state: R1C, Serial No: TU85684139

1. RNC Sim CES 4780DA Mini-sim#33, Ericsson no.: ETE-203565
2. Switch, Netgear Ethernet switch FS108
3. Computer, SUN Microsystems, Ericsson no.: ETE-203521
4. GPS antenna
5. RU KRC 118 19/1 Rev. R1C (FCC id: TA8AKRC11819-1)
 - 5-1. Serial No: AE51705563
 - 5-2. Serial No: AE51705560
 - 5-3. Serial No: AE51705551
6. FU KRC 118 20/1 Rev. R1C
 - 6-1. Serial No: A400186101
 - 6-2. Serial No: A400185489
 - 6-3. Serial No: A400186103
7. 50 ohm Termination

Interfaces:

Power, -48 VDC
Coaxial cable with N connector and adaptor to 7/16"
Iub, configured as T1 by CBU, shielded multi-wire with RJ-45 connector
Mub, no cable attached
Test, no cable attached
Xalm, no cable attached
GPS, shielded multi-wire with 9-pin D-sub

Type of port:

DC Power
Antenna
Telecom
Test purpose
Test purpose
Signal
Signal

FCC ID: TA8AKRC11819-1

Appendix 2

RF power output measurements according to 47 CFR 2.1046

Date 2005-05-16	Temperature 22 °C ± 3 °C	Humidity 34 % ± 5 %
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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	2005-08	503 144
Boonton Power sensor 56518-S/4	2005-08	503 145
Multimeter Fluke 87	2005-11	502 190
Testo 610, Temperature and humidity meter	2006-12	502 658

Measurement uncertainty: 0.5 dB

Results

Rated output power level after FU12 (maximum): 46 dBm

Test conditions T_{nom} 22 °C/ V_{nom} -48 V DC	Transmitter power (dBm) Average		
	Frequency 1932.5	Frequency 1957.5	Frequency 1987.5
QPSK	45.5	45.3	45.6
16QAM	46.5	46.4	46.7

Limit

§24.232: Maximum output power shall not exceed 100W (50dBm).

Complies?	Yes
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Occupied bandwidth measurements according to 47 CFR 2.1049

Date 2005-05-18	Temperature 22 °C ± 3 °C	Humidity 31 % ± 5 %
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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	2005-07	503 738
Testo 610, Temperature and humidity meter	2006-12	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 3.1

QPSK

OBW 4.17 MHz

Diagram 1 1957.5 MHz

16QAM

OBW 4.17 MHz

Diagram 2 1957.5 MHz

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Appendix 3.1

Diagram 1

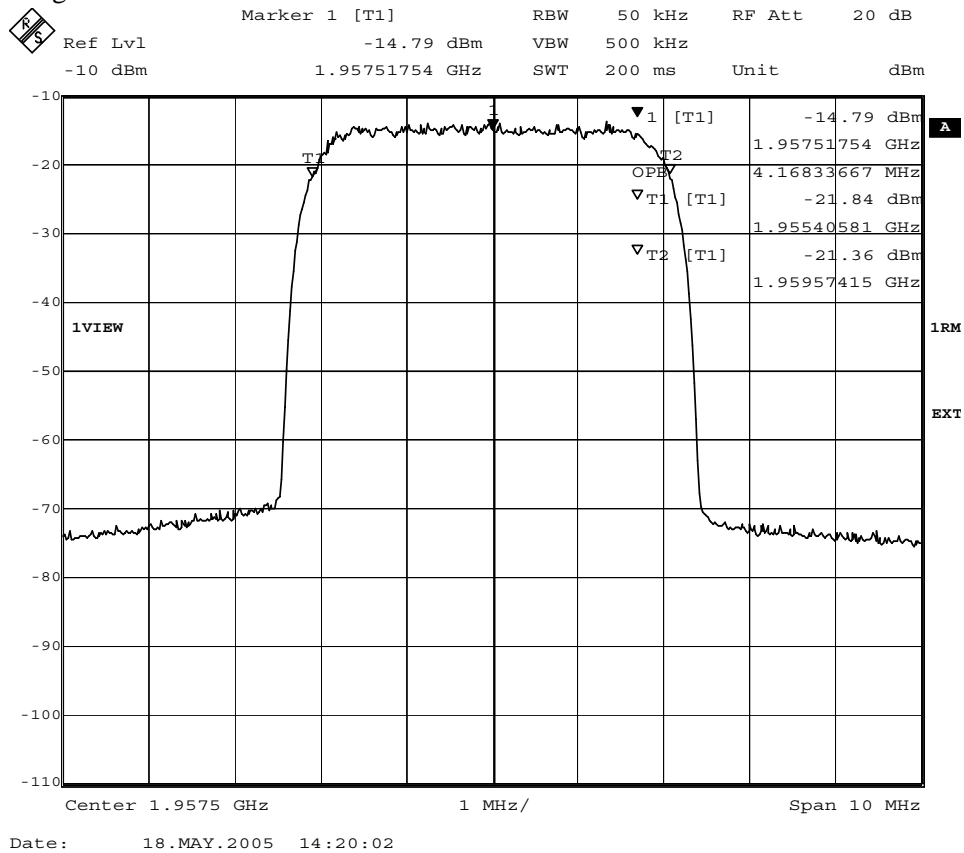
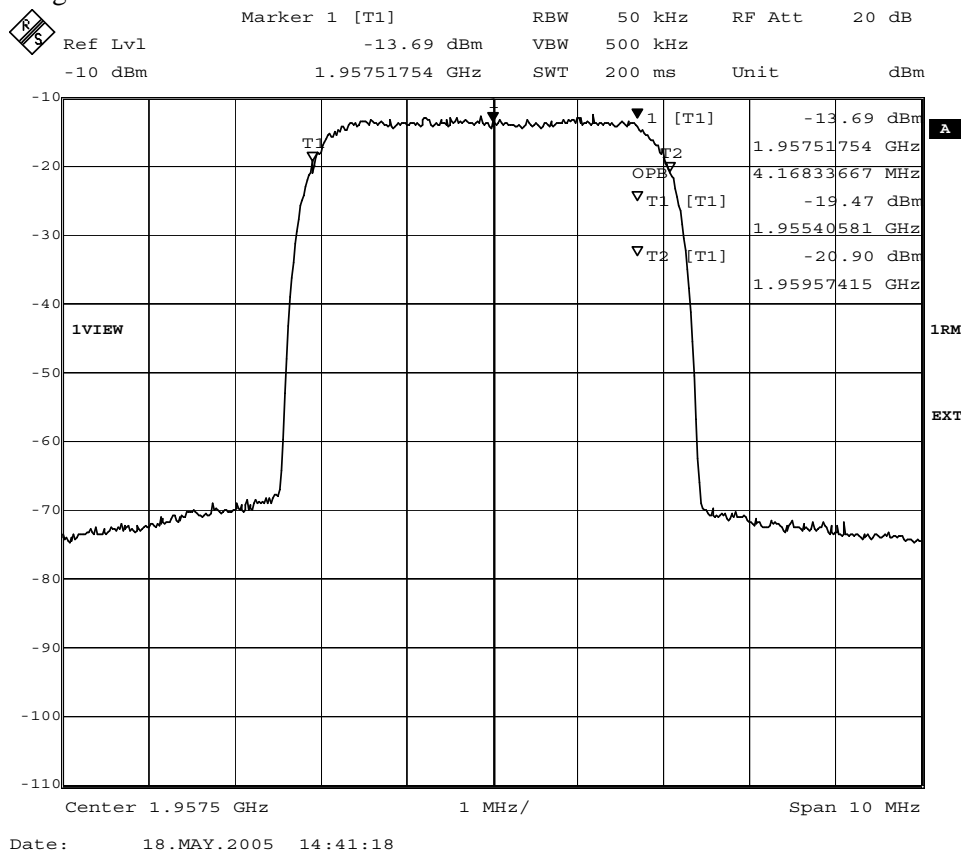


Diagram 2



Band edge measurements according to 47 CFR 2.1051

Date	Temperature	Humidity
2005-05-16	22 °C ± 3 °C	34 % ± 5 %
2005-05-17	22 °C ± 3 °C	22 % ± 5 %
2005-05-18	22 °C ± 3 °C	31 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §24.238. The output was connected to a spectrum analyzer with the average detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. A resolution bandwidth of 50 kHz (1% of Emission BW) was used up to 5 MHz away from the band edges. As the FCC rules specify a RBW of 1 MHz for measurements of emissions >1 MHz away from the band edges, the limit was adjusted with 13 dB to -26 dBm to compensate for the reduced measurement bandwidth. 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	2005-07	503 738
Testo 610, Temperature and humidity meter	2006-12	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1

QPSK

- Diagram 1 1932.5 MHz Band edge
- Diagram 2 1987.5 MHz Band edge

16QAM

- Diagram 3 1932.5 MHz Band edge
- Diagram 4 1987.5 MHz Band edge

Limits

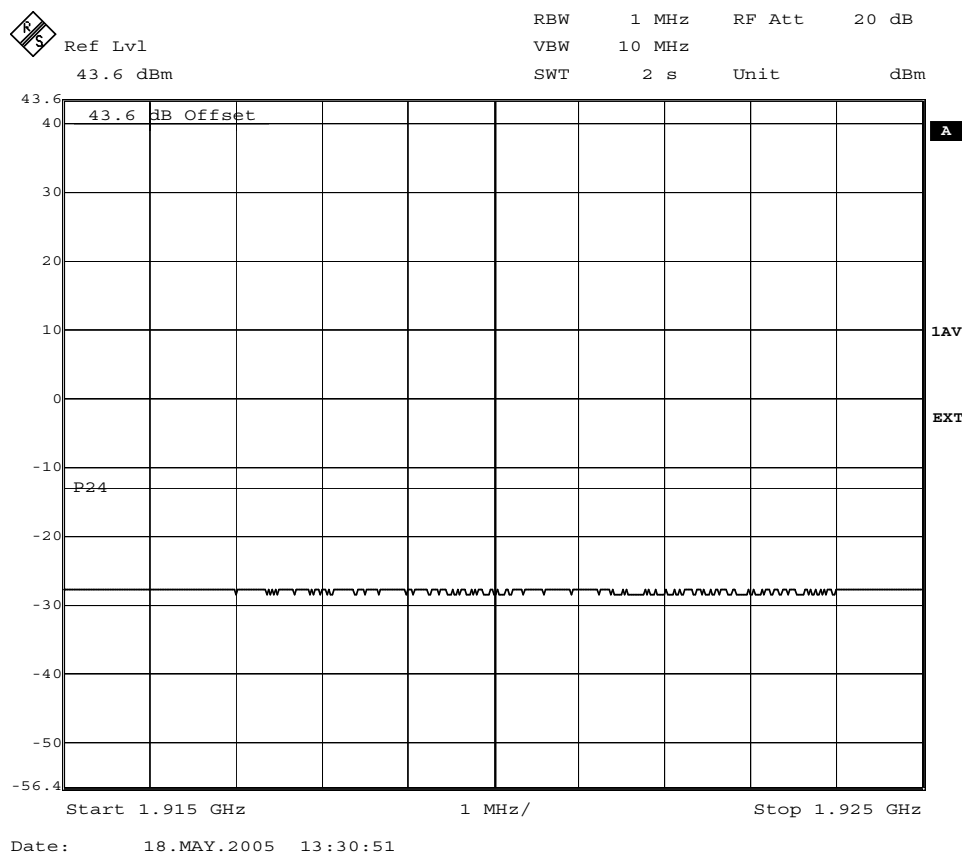
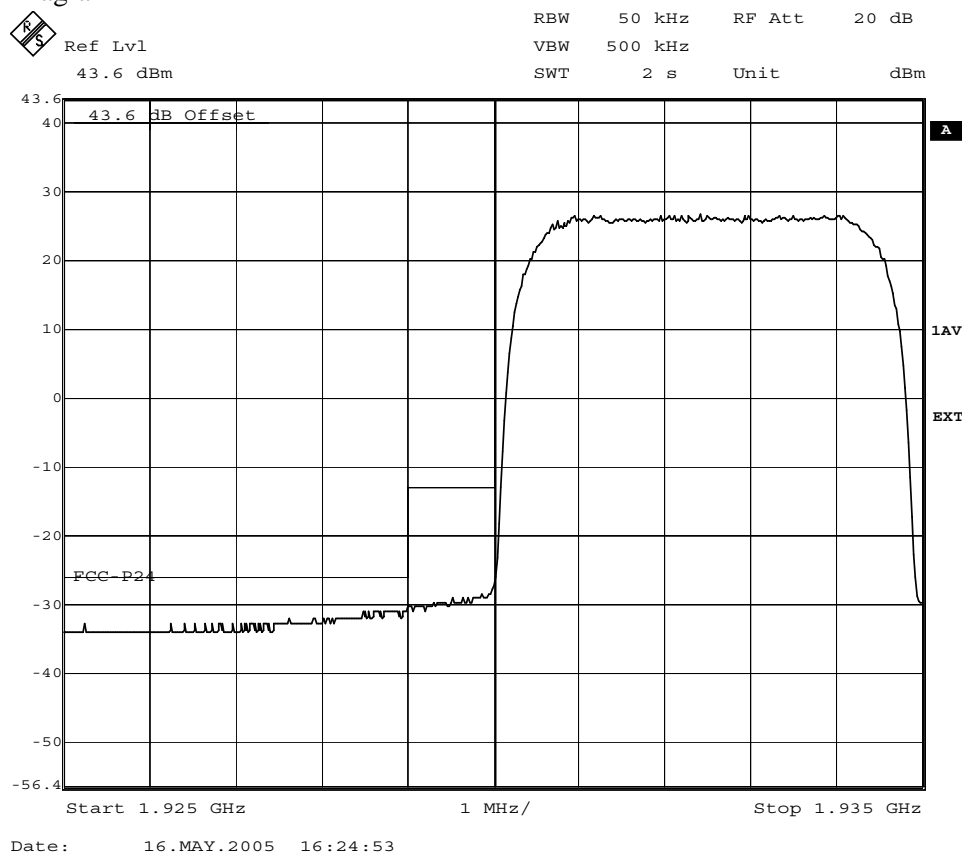
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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Appendix 4.1

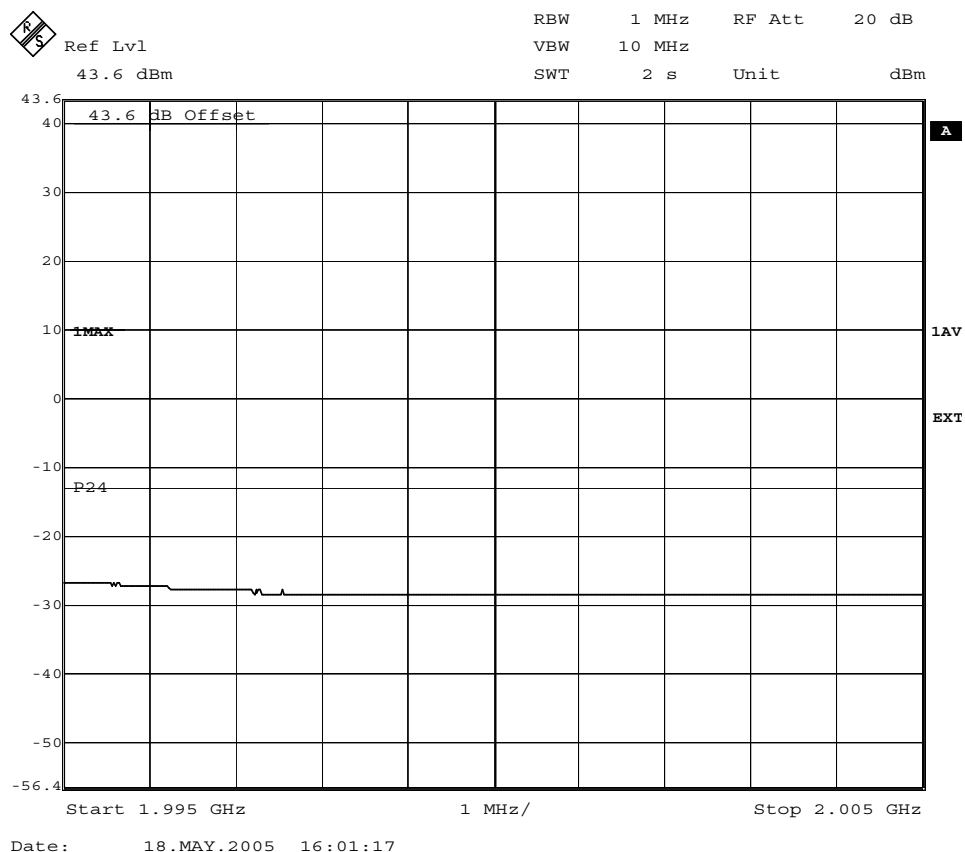
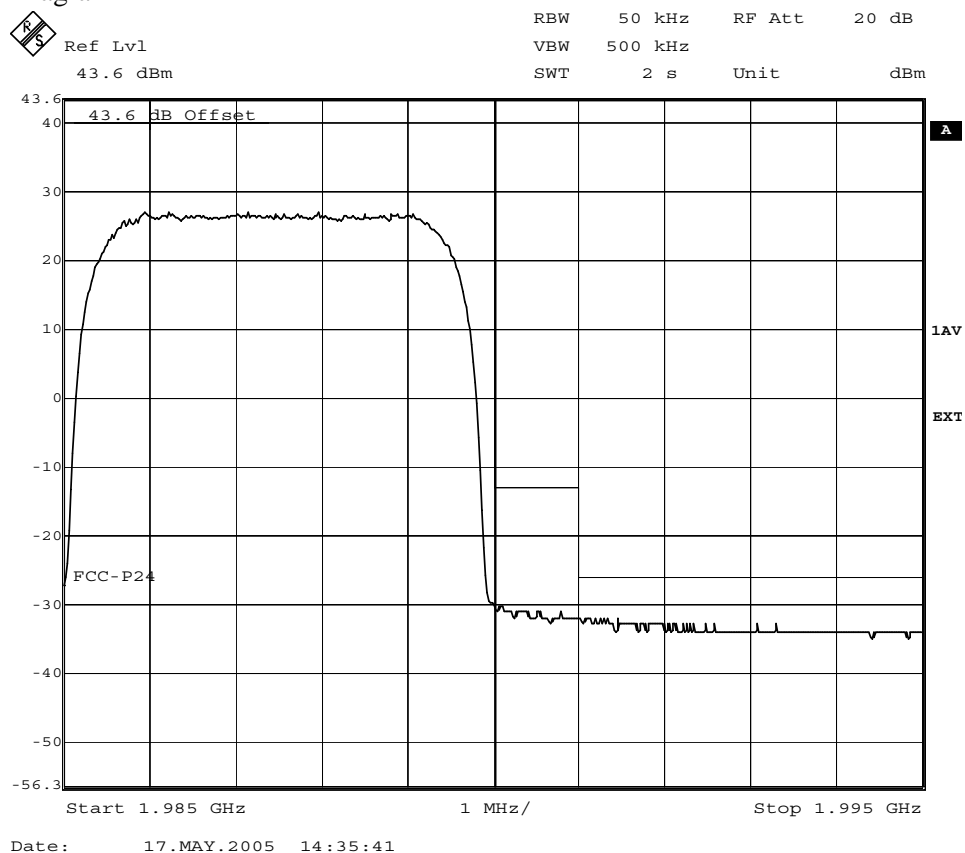
Diagram 1



FCC ID: TA8AKRC11819-1

Appendix 4.1

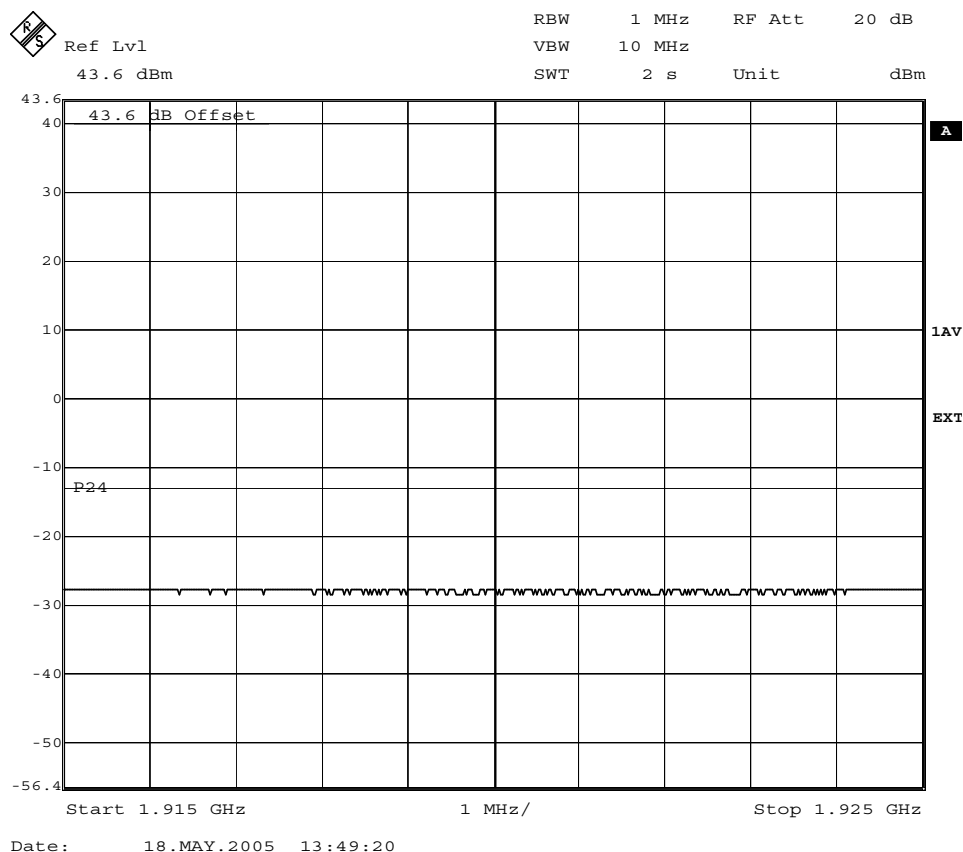
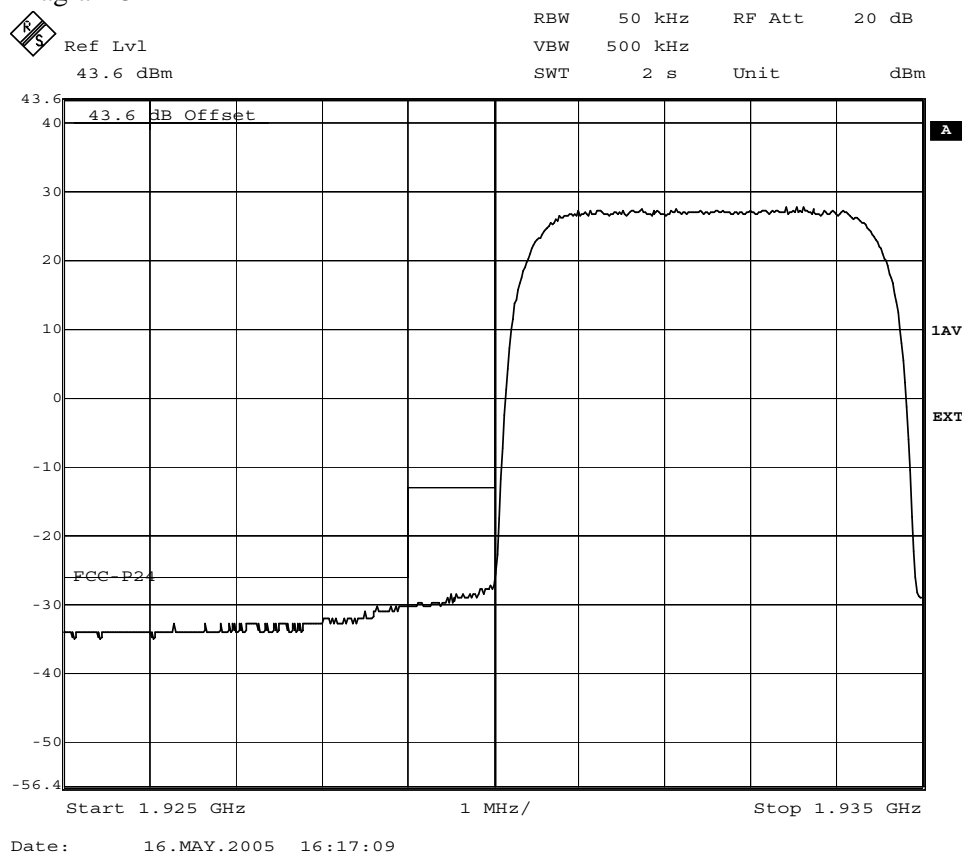
Diagram 2



FCC ID: TA8AKRC11819-1

Appendix 4.1

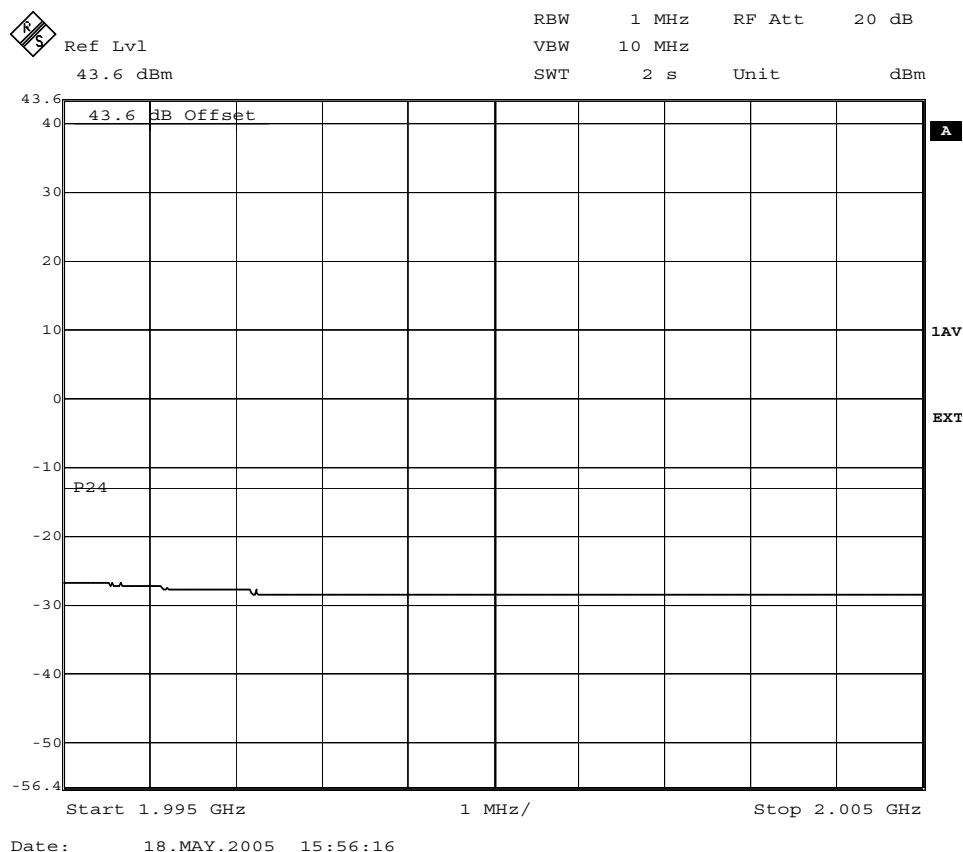
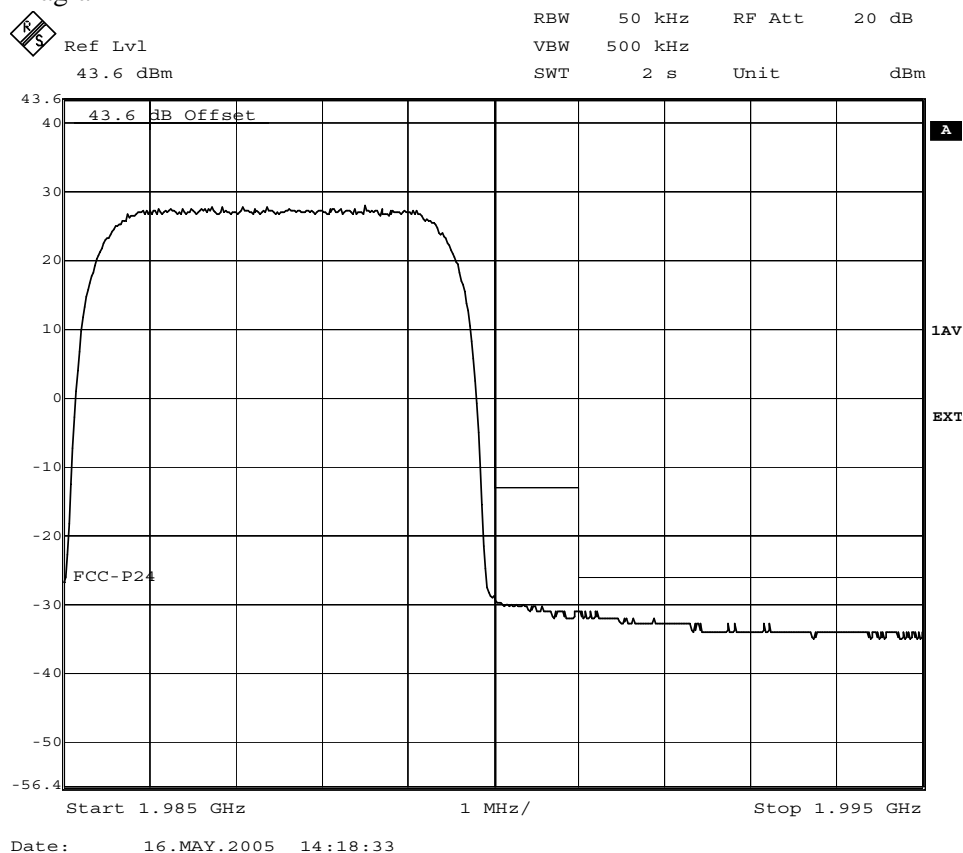
Diagram 3



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Appendix 4.1

Diagram 4



Conducted spurious emission measurements according to 47 CFR 2.1051

Date 2005-05-17	Temperature 22 °C ± 3 °C	Humidity 22 % ± 5 %
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Test set-up and procedure

The measurements were made per definition in §24.238. The output was connected to a spectrum analyzer with the average 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	2005-07	503 738
HP filter	2006-04	502 739
Testo 610, Temperature and humidity meter	2006-12	502 658

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 5.1

QPSK

Diagram 1: 1932.5 MHz

Diagram 2: 1987.5 MHz

16QAM

Diagram 3: 1932.5 MHz

Diagram 4: 1987.5 MHz

Limits

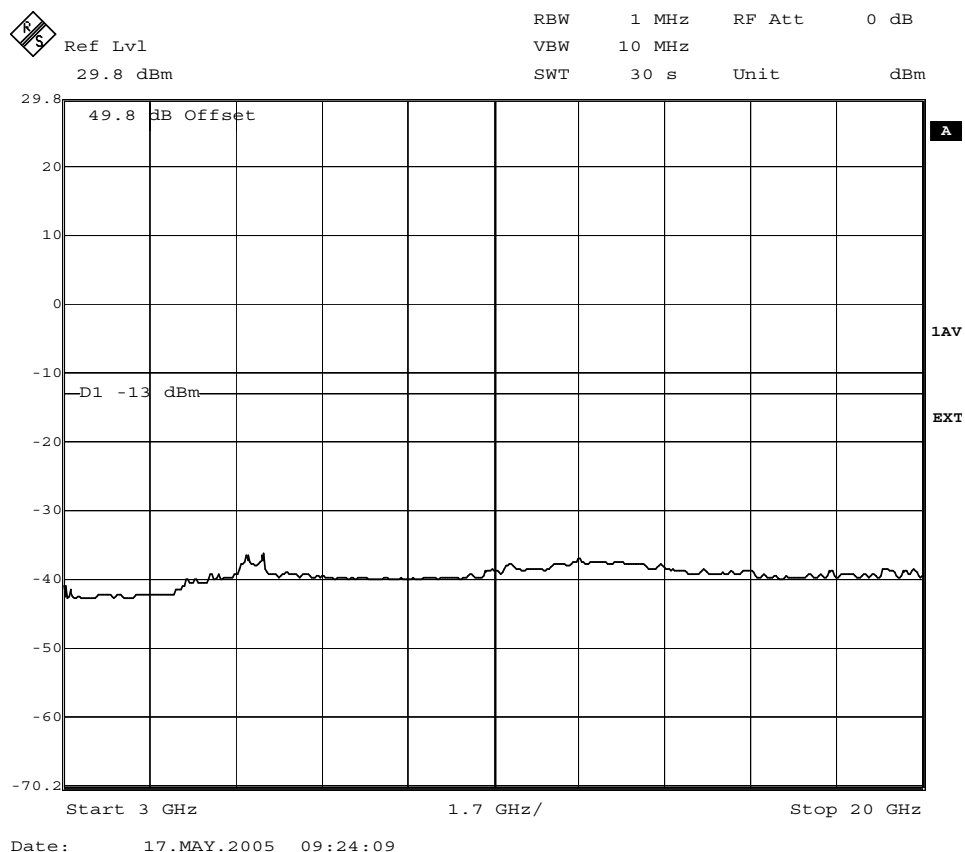
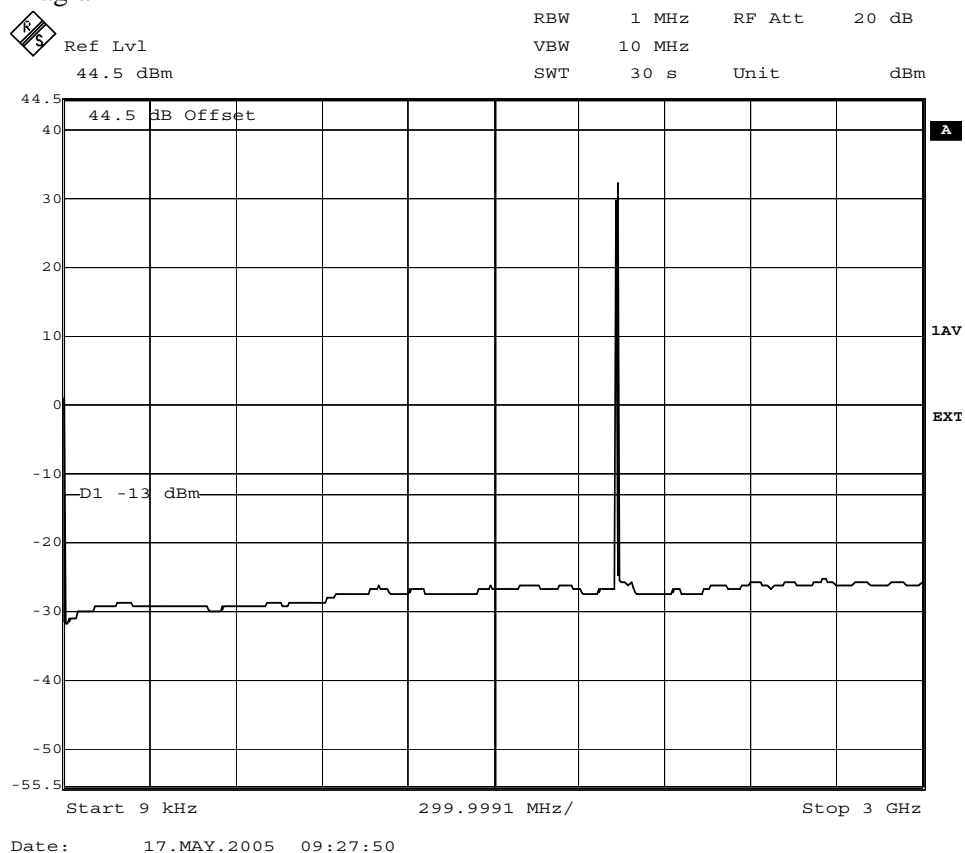
The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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FCC ID: TA8AKRC11819-1

Appendix 5.1

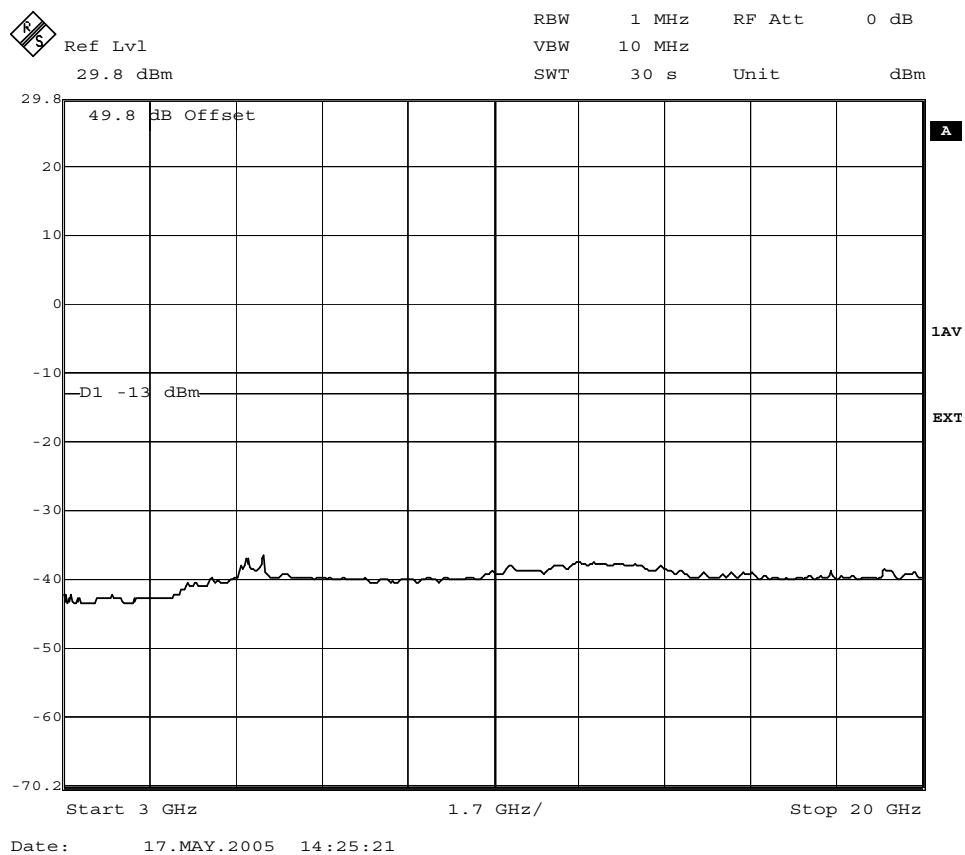
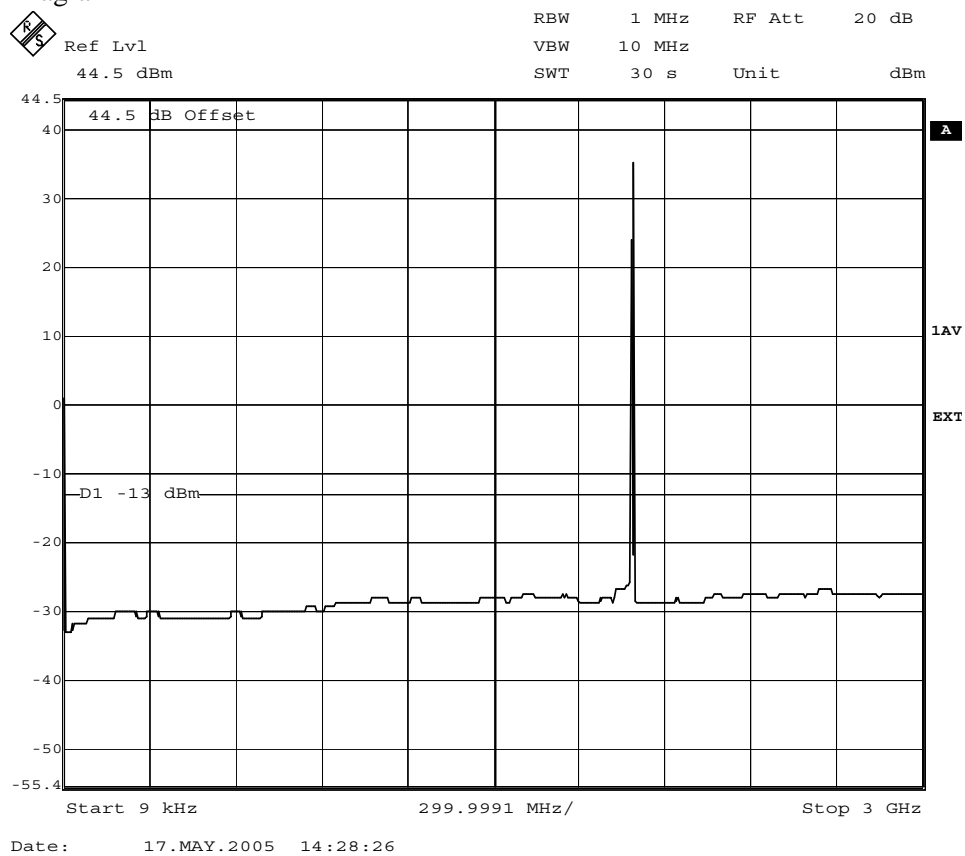
Diagram 1



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Appendix 5.1

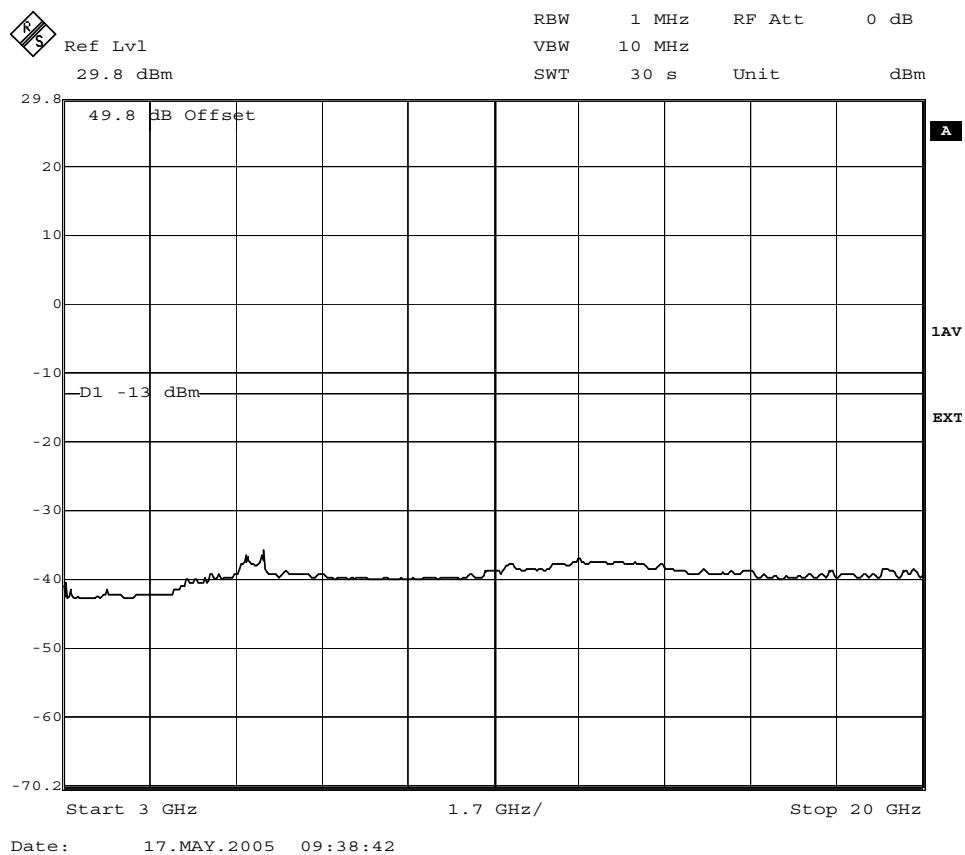
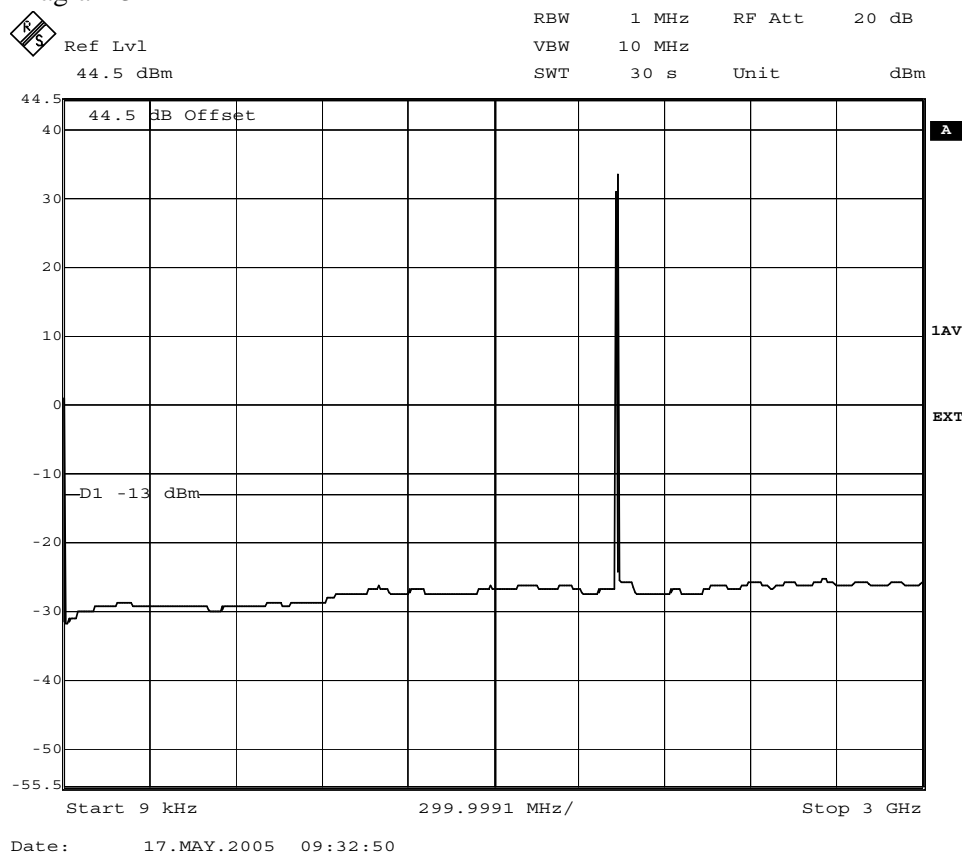
Diagram 2



FCC ID: TA8AKRC11819-1

Appendix 5.1

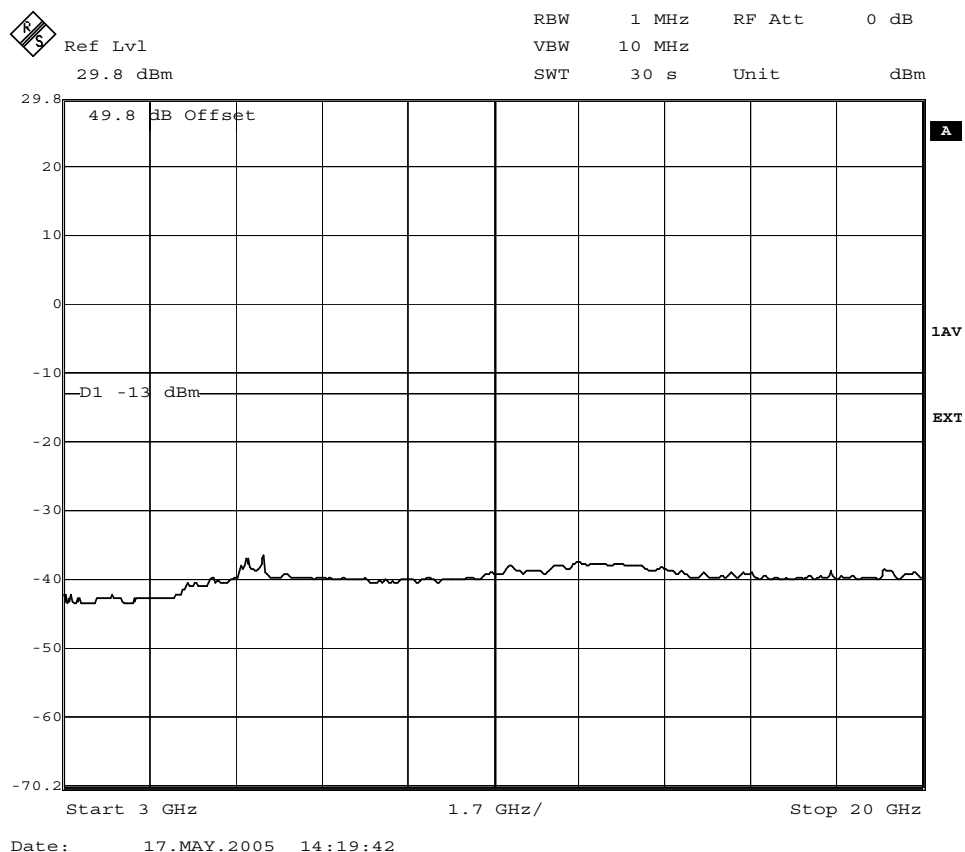
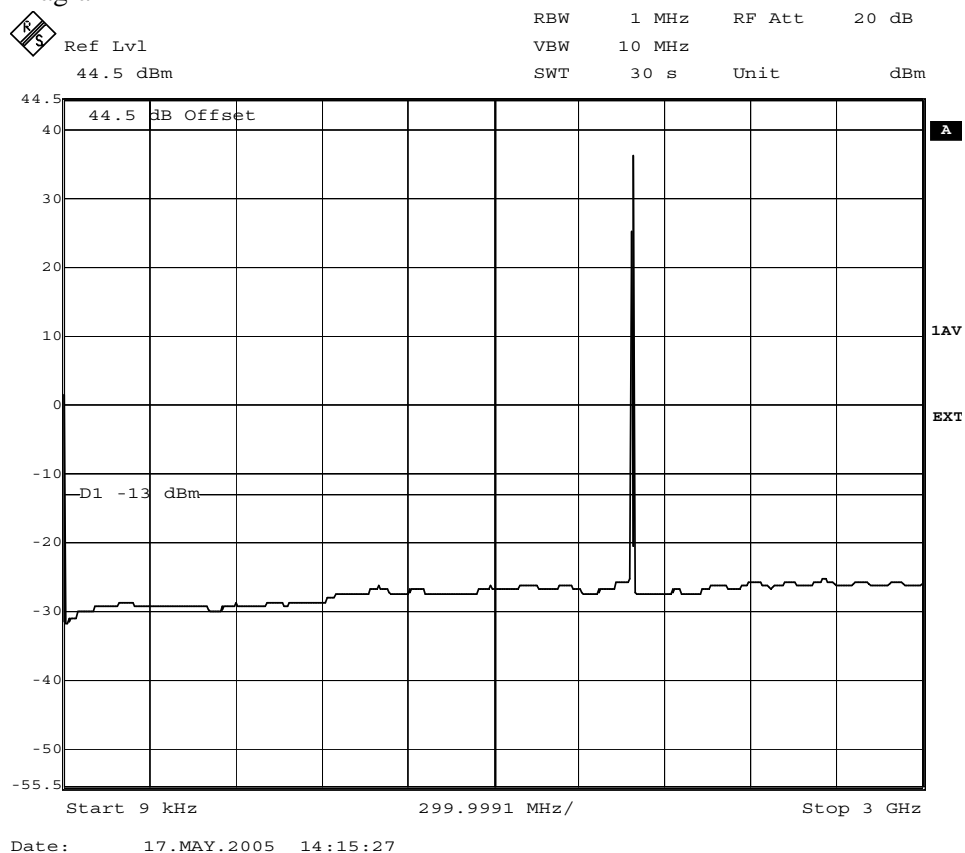
Diagram 3



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Appendix 5.1

Diagram 4



Field strength of spurious radiation measurements according to 47 CFR 2.1053

Date	Temperature	Humidity
2005-05-03	21 °C ± 3 °C	38 % ± 5 %
2005-05-12	22 °C ± 3 °C	31 % ± 5 %

Test set-up and procedure

The chamber is listed at FCC, Columbia with registration number: 93866. The test site also complies with RSS 212, Issue 1, 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 polarisation of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 18 GHz and 1m in the frequency range 18-20 GHz.

A pre-measurement was first performed:

In the frequency range 30 MHz-20 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,

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

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 average detector and the average value is reported, frequencies closer than 10 dB to the limit measured with the average detector was measured with the substitution method according to the standard.

Measurement equipment	Calibration Due	SP number
Anechoic chamber	-	15:115
R&S ESI 26	2005-08	503 292
Control computer	-	503 479
Software: R&S ES-K1, ver. 1.60	-	-
Chase Bilog antenna CBL 6111A	2006-08	503 182
EMCO Horn Antenna 3115	2006-11	502 548
MITEQ Low Noise Amplifier	2006-04	503 285
Testo 615, Temperature and humidity meter	2005-09	503 505

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

RBS 3106



RBS 3206



Results

Test object installed in RBS 3106

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
3865.0	-30.9	--
3915.1	-25.2	--
3975.1	-27.6	--
30-20 000	All other emission > 20 dB below limit	All other emission > 20 dB below limit
Measurement uncertainty		4.7 dB

Test object installed in RBS 3206

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
3895.0	-22.1	--
3915.1	--	-21.1
3975.1	--	-26.1
5797.6	--	-32.8
5872.9	--	-21.9
30-20 000	All other emission > 20 dB below limit	All other 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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Frequency stability measurements according to 47 CFR 2.1055

Date 2005-04-26 to 2005 04-29	Temperature (test equipment) 21 °C ± 3 °C	Humidity (test equipment) 35 % ± 5 %
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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	2006-02	503 546
R&S FSIQ	2005-07	503 738
Multimeter Fluke 87	2005-09	502 190
Testo 610, Temperature and humidity meter	2006-12	502 658

Results

Nominal Voltage -48 V DC
46 dBm output power at (1932.5 MHz)

Test conditions		Frequency error (Hz)			
Supply voltage DC (V)	T (°C)	QPSK With GPS	QPSK Without GPS	16QAM With GPS	16QAM Without GPS
-48.0	+20	+13	+15	+11	+10
-55.2	+20	-12	+16	-15	-19
-40.8	+20	+15	-11	-10	+14
-48.0	+30	+10	-12	+13	-13
-48.0	+40	+15	-14	+12	-22
-48.0	+50	-16	+16	-15	-18
-48.0	+10	+12	-12	-17	-20
-48.0	0	+12	-12	+15	-12
Maximum freq. error (Hz)		-22			
Measurement uncertainty		< ± 1 x 10 ⁻⁷			

Note: An temperature alarm “Outside limit” was reported at -5 °C and it was not possible to enable the transmitter.

Limits (according to 3GPP TS 25.141)

The frequency Error shall be within ± 0.05 PPM (96.625 Hz).

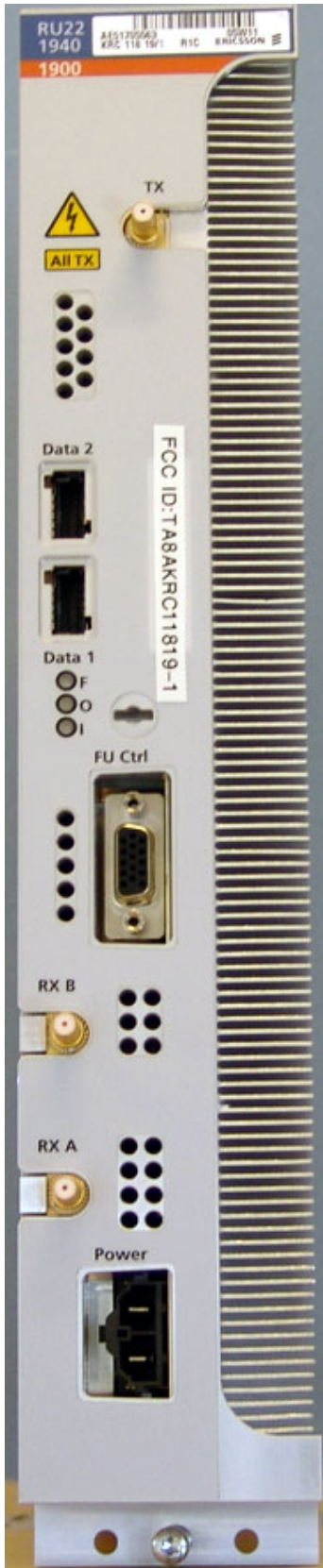
Complies?	Yes
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Appendix 8

Photos Radio Unit KRC 118 19/1

Front side



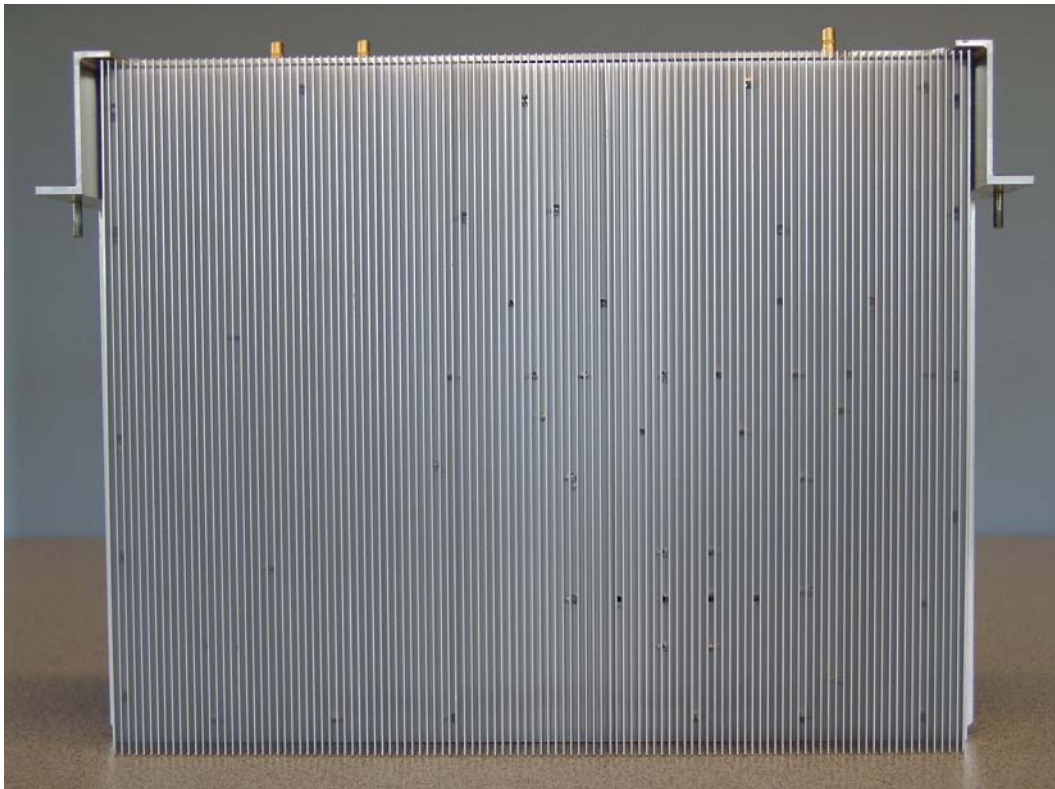
Rear side



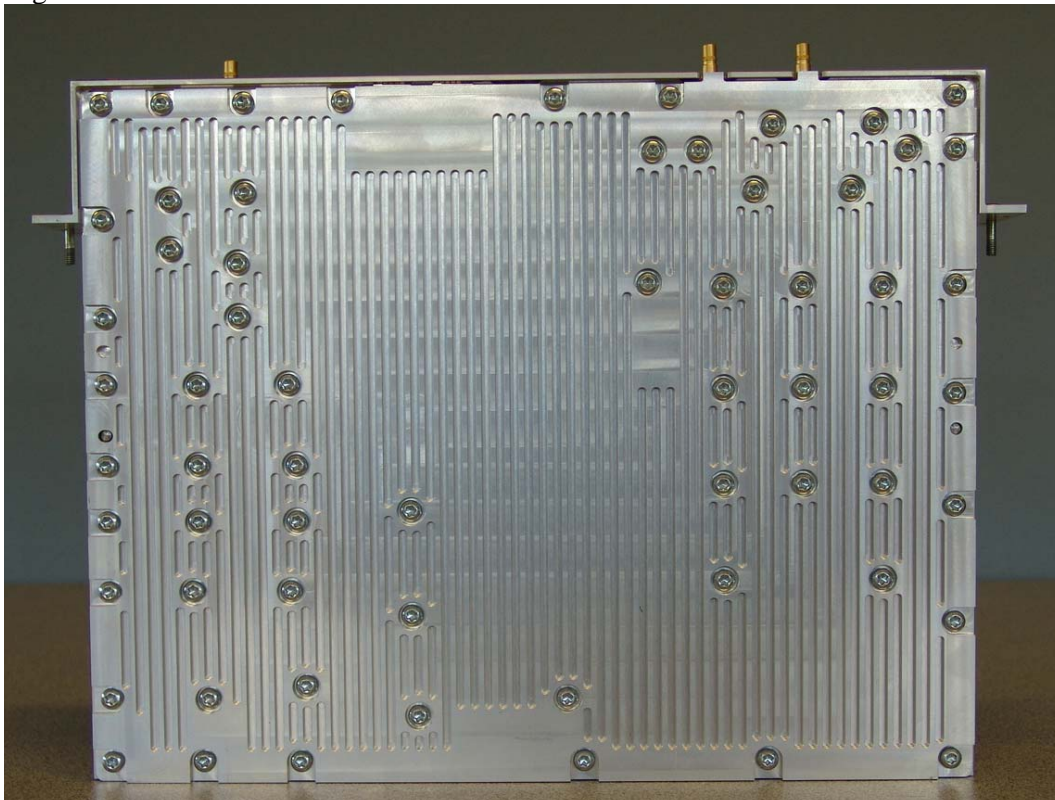
FCC ID: TA8AKRC11819-1

Appendix 8

Left side



Right side



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Appendix 8

RBS 3106

Front side



Rear side

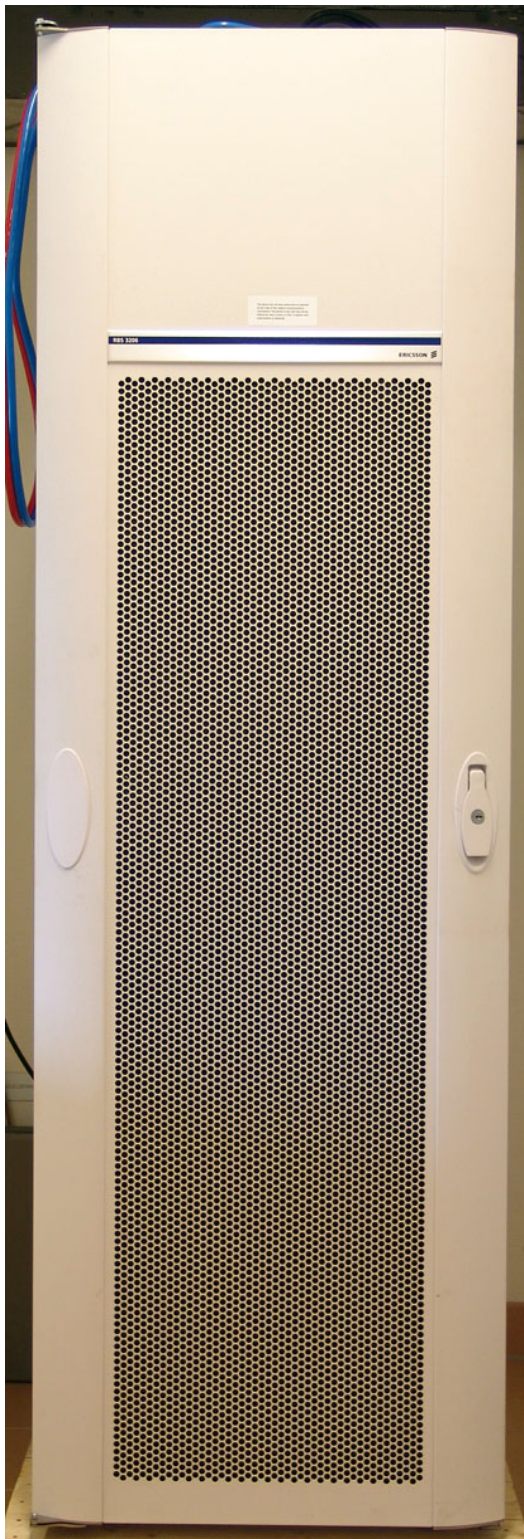


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Appendix 8

RBS 3206

Front side



Rear side

