

ERICSSON AB
Carl-Gunnar Sjöberg
Lindholmspiren 11
417 56 GÖTEBORG

Handläggare, enhet/Handled by, department
Jonas Bremholt
Electronics
Tel +46 (0) 33 16 54 38

Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

Sida/Page
1(1)

Equipment Authorization measurements on Mobitex Radio Base station 900 MHz

(7 enclosures)

Test objects

BRU19, product number KRC 161 022/9A, R-state R1A, no serial number.

Summary

Standard	Compliant	Enclosure	Remarks
FCC CFR 47			
2.1046/ 90.205 RF Power output	Yes	2	
2.1049/ 90.209/ 90.210 Occupied bandwidth	Yes	3	
2.1051/ 90.669 Spurious emission at antenna	Yes	4	
2.1053/ 90.669 Field strength of spurious radiation	Yes	5	
2.1055/ 90.213 Frequency stability	Yes	6	

SP Swedish National Testing and Research Institute Electronics - EMC


Jan Welinder
Technical Manager


Jonas Bremholt
Technical Officer

SP Sveriges Provnings- och Forskningsinstitut, Box 857, 501 15 BORÅS, Tel 033-16 50 00, Telefax 033-13 55 02, E-mail info@sp.se, Org.nr 556464-6874
SP Swedish National Testing and Research Institute, Box 857, S-501 15 BORÅS, SWEDEN, Telephone + 46 33 16 50 00, Telefax + 46 33 13 55 02, E-mail info@sp.se, Reg.No 556464-6874

Laboratorium ackrediteras av Styrelsen för ackreditering och teknisk kontroll (SWEDAC) enligt lag. Verksamheten vid de svenska ackrediterade laboratorierna uppfyller kraven enligt SS-EN 45001 (1989), SS-EN 45002 (1989) och ISO/IEC Guide 25 (1990:E). Denna rapport får endast återges i sin helhet, om inte SWEDAC och SP i förväg skriftligen godkänt annat.

Laboratories are accredited by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC) under the terms of the Act. The Swedish accredited laboratories meet the requirements set up in SS-EN 45001 (1989), SS-EN 45002 (1989) and ISO/IEC Guide 25 (1990:E). This report may not be reproduced other than in full, except with the prior written approval of SWEDAC and SP.

Description - Equipment Under Test (EUT)

Equipment: Mobitex Base station transceiver 900 MHz

Tx Frequency range: 935-941 MHz

Tested Channels:	Ch. 3601	935.012 5 MHz
	Ch. 3840	938.000 0 MHz
	Ch. 4079	940.987 5 MHz

BRU19, product number KRC 161 022/9A, R-state R1A, Prototype.

Photos

External and internal photos of the EUT can be found in encl. 7.

EUT configuration:

If not otherwise stated the transmitter was modulated (GMSK) with 8 kbs pseudorandom data (V.52, BT=0.3) during the measurements.

Manufacturer's representative: Carl-Gunnar Sjöberg, Ericsson AB

Purpose of test

The purpose of the tests is to verify compliance with the performance characteristics specified in FCC CFR47.

Reservation

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in the report.

Delivery of test object

The test object was delivered: 2004-02-09

Test engineer

Jonas Bremholt

Test witnesses

Rešad Zejnilović, Ericsson AB (partly present)
Carl-Gunnar Sjöberg, Ericsson AB (partly present)

Sign:.....

RF Power output measurements according to 47CFR 2.1046/90.205

Date 2004-02-10	Temperature 22 °C ± 3 °C	Humidity 16 % ± 5 %
--------------------	-----------------------------	------------------------

Test set-up and Procedure

The measurements were made per ANSI/TIA/EIA-603. Measurements were made at output connector TX ANT. The output was connected to a Peak power analyser via a 50 ohm attenuator. The RF power was measured with variation in supply voltage at the highest power level.

Measurement equipment	Calibration Due	SP number
Boonton RF Peak power meter/analyser	2004-02	503 144
Boonton Power sensor 56518-S/4	2004-02	503 145
Multimeter Fluke 87	2004-09	502 190
Testo 610, Temperature and humidity meter	2004-12	502 658

Results

Test object: **BRU19**

Mode: **CW**

Nominal voltage 24 V DC

Rated output power level at output connector TX ANT: 1 W (30 dBm)

BRU19		Transmitter power (dBm) Peak/ Average		
Test conditions		Channel 3601	Channel 3840	Channel 4079
T _{nom} 22°C	V _{nom} 24.0 V DC	29.5/ 29.1	30.3/ 29.9	29.9/ 29.5
T _{nom} 22°C	V _{min} 18 V DC	29.5/ 29.1	30.4/ 29.9	29.9/ 29.5
	V _{max} 36 V DC	29.6/ 29.1	30.3/ 29.9	29.9/ 29.5
Measurement uncertainty		0.5 dB		

Mode: **GMSK**

Nominal voltage 24 V DC

Rated output power level at output connector TX ANT: 1 W (30 dBm)

BRU19		Transmitter power (dBm) Peak/ Average		
Test conditions		Channel 3601	Channel 3840	Channel 4079
T _{nom} 22°C	V _{nom} 24.0 V DC	29.6/ 29.1	30.3/ 29.9	29.9/ 29.5
T _{nom} 22°C	V _{min} 18 V DC	29.6/ 29.1	30.3/ 29.9	29.9/ 29.5
	V _{max} 36 V DC	29.6/ 29.1	30.3/ 29.9	29.9/ 29.5
Measurement uncertainty		0.5 dB		

Sign:.....

REPORT

Datum/*Date*
2004-02-17

Beteckning/*Reference*
F401093-F90

Sida/*Page*
2 (2)
Encl. 2

Limits (according to Industry Canada RSS-119 Issue 6, 2000-03-25)

The output power shall be within ± 1 dB of the manufacturer's rated power.

Complies?	Yes
-----------	-----

Sign:.....

REPORT

Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

Sida/Page
1 (1)
Encl. 3

Occupied bandwidth measurements according to 47CFR 2.1049/90.209/90.210

Date 2004-02-10	Temperature 22 °C ± 3 °C	Humidity 16 % ± 5 %
--------------------	-----------------------------	------------------------

Test set-up and Procedure

The measurement test set-up was made per ANSI/TIA/EIA-603. Measurements were made at output connector TX ANT. The output was connected to a spectrum analyser. The transmitter was modulated (GMSK) with 8 kbs pseudorandom data (V.52, BT=0.3) during the measurements.

Measurement equipment	Calibration Due	SP number
R&S ESI 40	2004-07	503 125
Testo 610, Temperature and humidity meter	2004-12	502 658

Measurement uncertainty: 3.7 dB

Results

Test object: **BRU19**

Nominal voltage 24 V DC

Output power level at output connector TX ANT: 30 dBm

Diagram 1 Channel 3840 (938.000 MHz), 0.5 % of the total mean power (-23 dB points)

Diagram 2 Channel 3840 (938.000 MHz), mask J

Limits

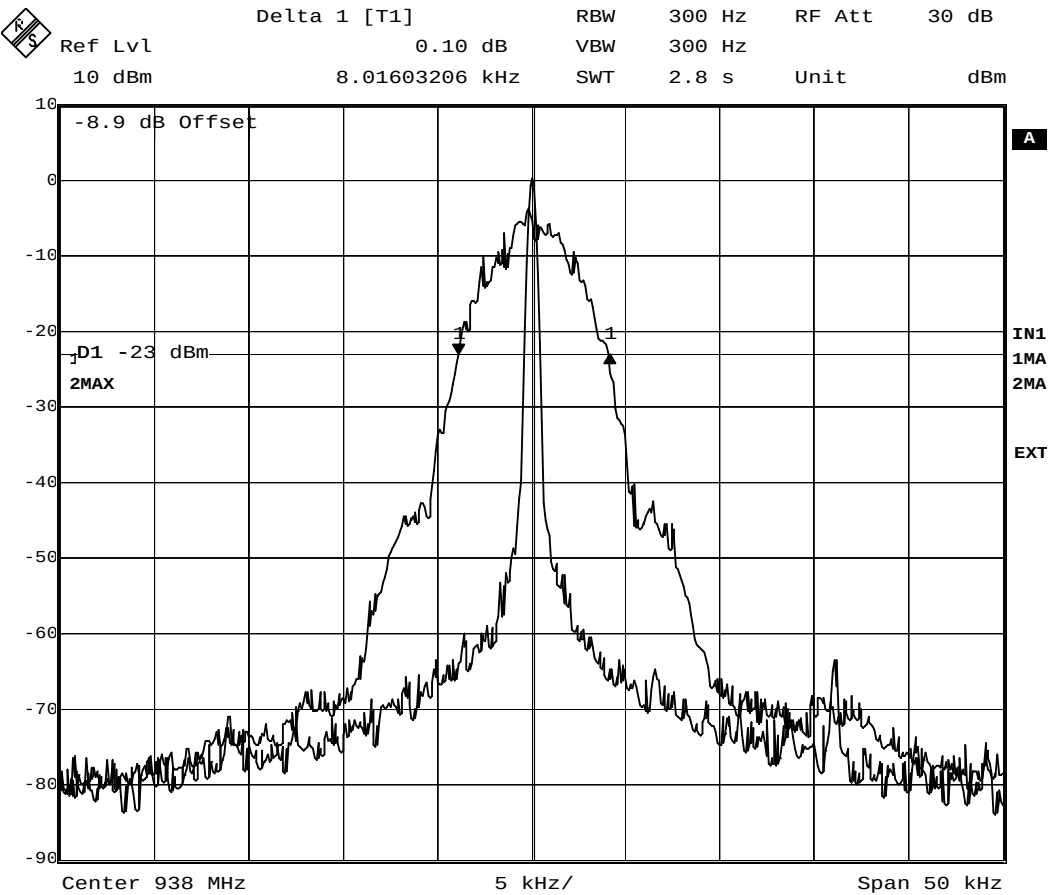
90.209: Authorized bandwidth < 13.6 kHz

90.210: Mask J

Complies?	Yes
-----------	-----

Sign:.....

REPORT



Date: 10.FEB.2004 13:57:51

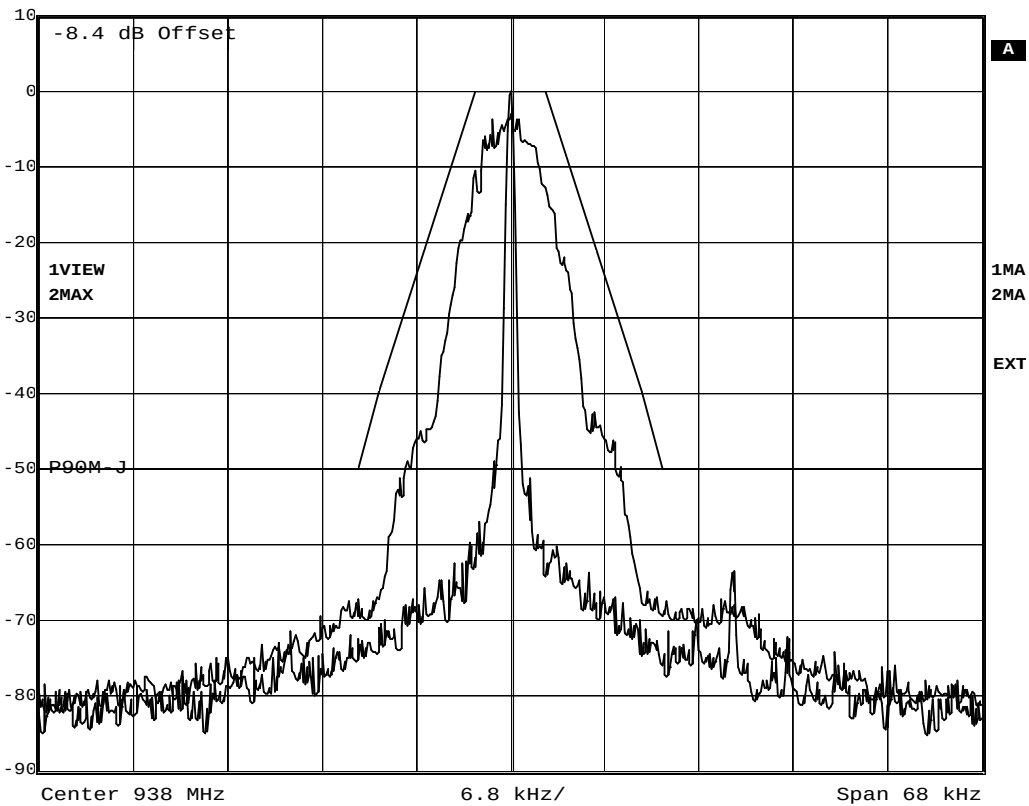
Sign:.....

REPORT



Ref Lvl
10 dBm

RBW	300 Hz	RF Att	30 dB
VBW	300 Hz		
SWT	3.8 s	Unit	dBm



Date: 12.FEB.2004 15:14:03

Sign:.....

REPORT

Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

Sida/Page
1 (1)
Encl. 4

Conducted spurious emission measurements according to 47CFR 2.1051/90.669

Date 2004-02-10	Temperature 22 °C ± 3 °C	Humidity 16 % ± 5 %
--------------------	-----------------------------	------------------------

Test set-up and Procedure

The measurement test set-up was made per ANSI/TIA/EIA-603. Measurements were made at output connector TX ANT. The output was connected to a spectrum analyser. The transmitter was modulated (GMSK) with 8 kbs pseudorandom data (V.52, BT=0.3) during the measurements.

Measurement equipment	Calibration Due	SP number
R&S ESI40	2004-07	503 125
Testo 610, Temperature and humidity meter	2004-12	502 658

Measurement uncertainty: 3.7 dB

Results

Test object: **BRU19**

Nominal Voltage 24 V DC

Diagram 1: Channel 3601 (935.012 5 MHz), 30 dBm, 9 kHz - 1 GHz

Diagram 2: Channel 3601 (935.012 5 MHz), 30 dBm, 1 - 10 GHz

Diagram 3: Channel 4079 (940.987 5 MHz), 30 dBm, 9 kHz - 1 GHz

Diagram 4: Channel 4079 (940.987 5 MHz), 30 dBm, 1 - 10 GHz

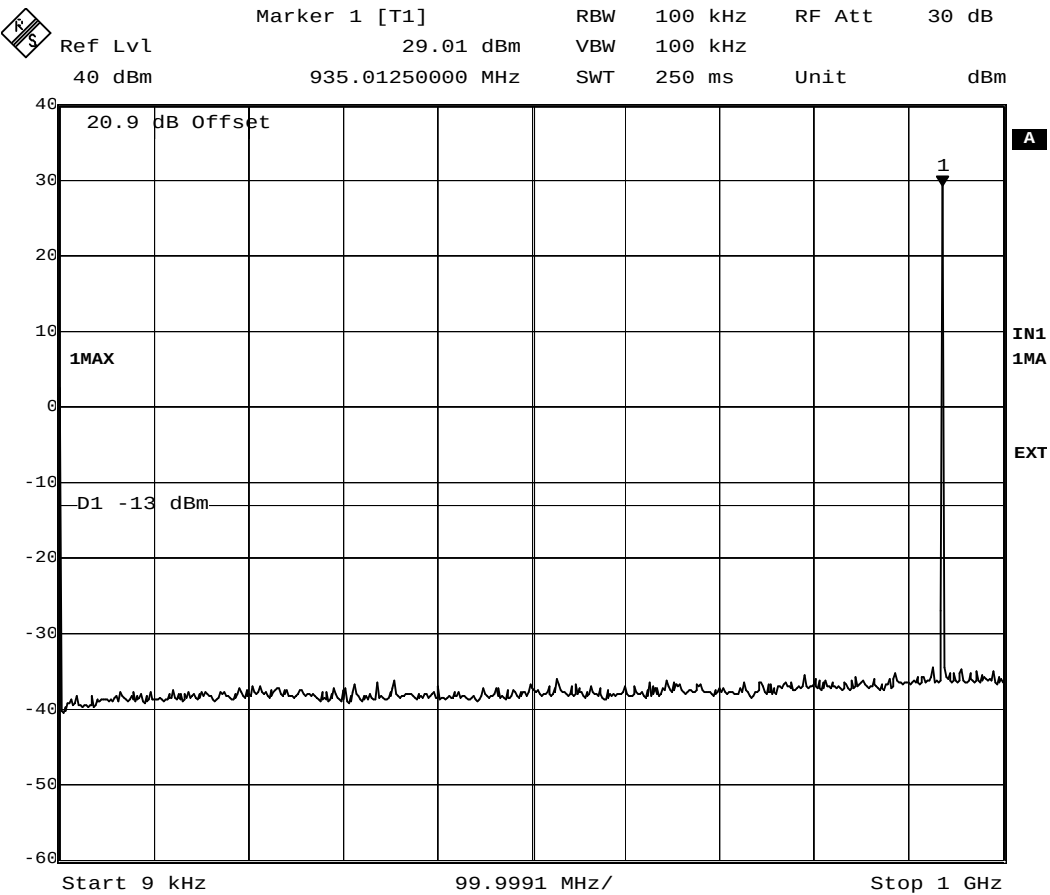
Limits

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
-----------	-----

Sign:.....

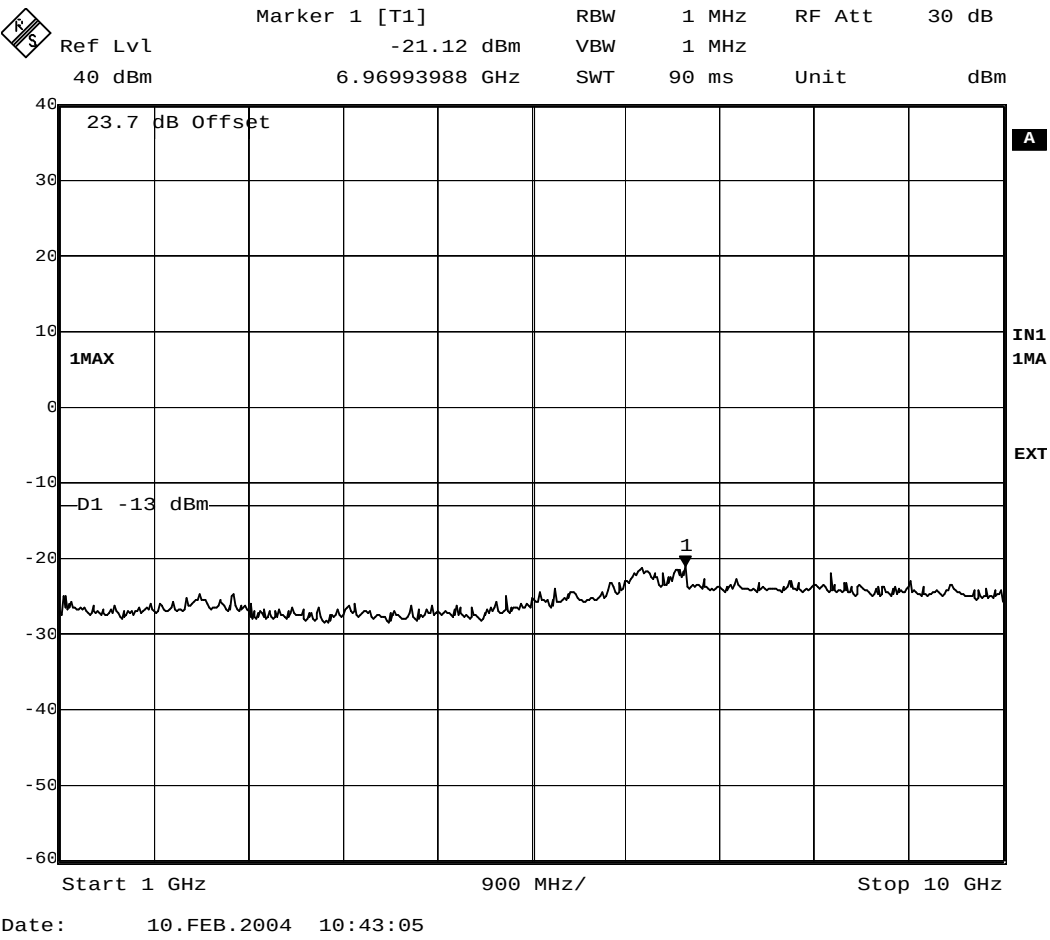
REPORT



Date: 10.FEB.2004 14:06:32

Sign:.....

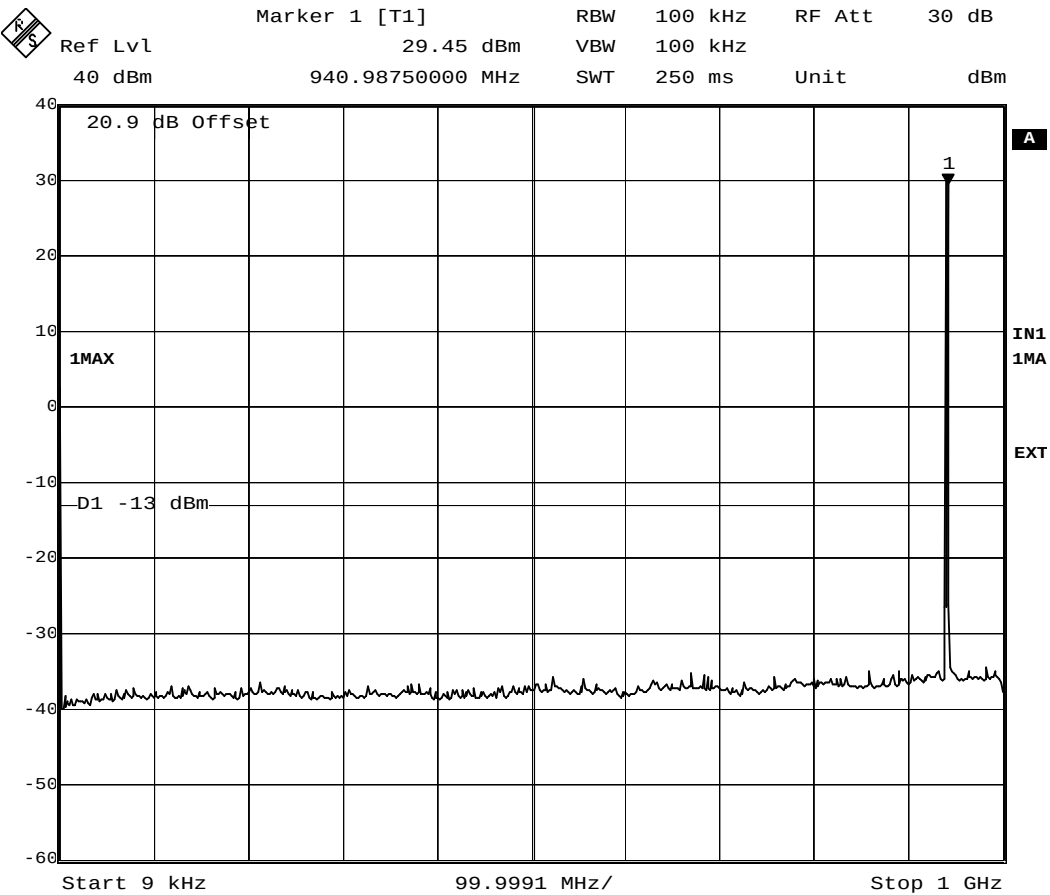
REPORT



Date: 10.FEB.2004 10:43:05

Sign:.....

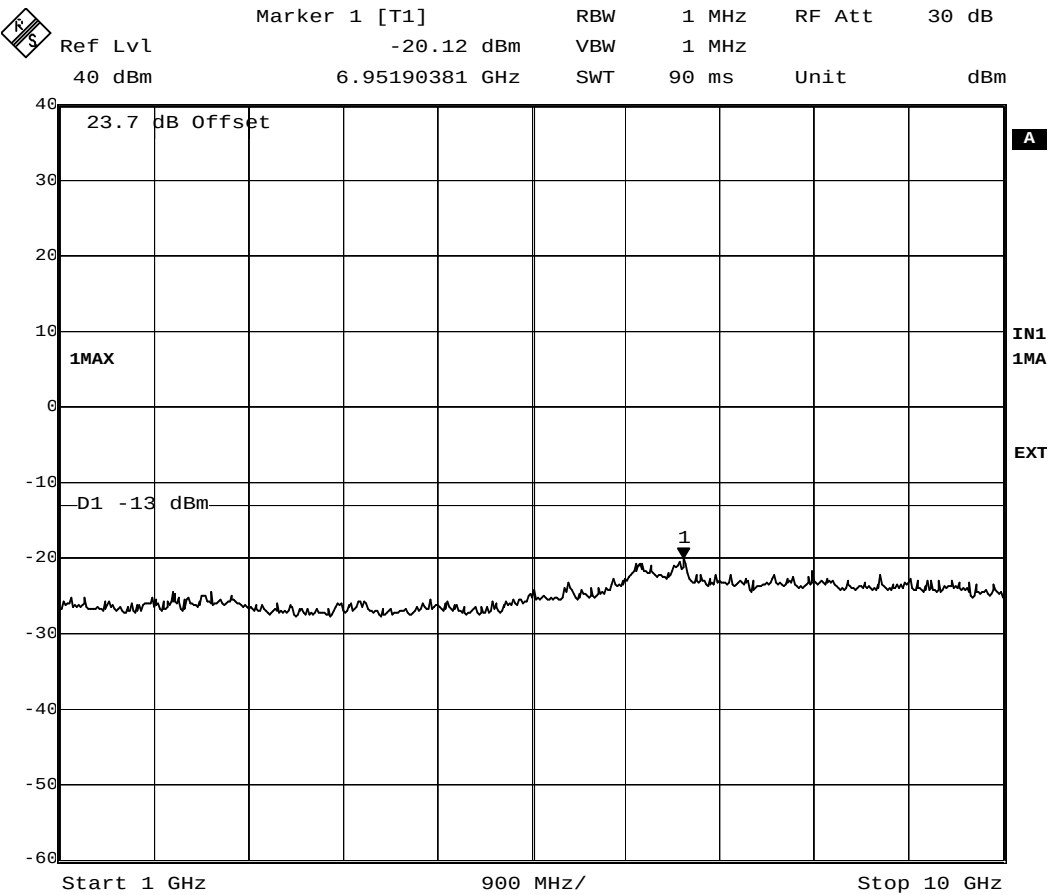
REPORT



Date: 10.FEB.2004 14:12:13

Sign:.....

REPORT



Date: 10.FEB.2004 10:41:02

Sign:.....

Field strength of spurious radiation measurements according to 47CFR 2.1053/90.669

Date 2004-02-09	Temperature 21 °C ± 3 °C	Humidity 16 % ± 5 %
--------------------	-----------------------------	------------------------

Test set-up and Procedure

The measurement procedure is per ANSI/TIA/EIA-603. 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 test of radiated emission was performed in a semi anechoic chamber with an antenna distance of 3 m.

Pre-measurement:

A pre-measurement with a correction factor was first performed. The EUT was rotated 360 degrees with a resolution of 45 degrees, the emission was measured with the antenna heights of 1, 1.5, and 2 m. The measurements were performed with both horizontal and vertical polarisation of the antenna.

Final measurement:

The final measurement with the substitution method was performed on emissions closer than 20 dB below the emission limit. In this case the EUT was scanned 360 degrees and the antenna height scanned from 1 to 4 m for maximum response.

The measurements were performed with the transmitter transmitting on channel 3601, 3840, and 4079. The transmitter was modulated (GMSK) with 8 kbs pseudorandom data (V.52, BT=0.3) during the measurements. The antenna port was terminated by a 50 ohm terminator. Cables were attached to the Ethernet and the RS-422 communication ports during the measurements.

Measurement equipment	Calibration Due	SP number
Semi anechoic chamber, Tesla	-	15:115
R&S ESI 26	2004-06	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	2004-11	502 175
MITEQ Low Noise Amplifier	2004-04	503 285
Testo 615, Temperature and humidity meter	2005-09	503 505

Sign:.....

The test set-up during the spurious radiation measurements can be seen in the picture below.



Results

The spurious radiation measured with the substitution method can be found in the table below:

		Spurious emission level (dBm)	
Frequency (MHz)	RBW	Vertical	Horizontal
30-1000	100 kHz	All emission > 20 dB below limit	All emission > 20 dB below limit
1000-10 000	1 MHz	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
-----------	-----

Sign:.....

Frequency stability measurements according to 47CFR 2.1055/90.213

Date	Temperature (test equipment)	Humidity (test equipment)
2004-02-11	20 °C ± 3 °C	19 % ± 5 %
2004-02-12	20 °C ± 3 °C	18 % ± 5 %

Test set-up and Procedure

The measurement test set-up was made per ANSI/TIA/EIA-603. Measurements were made at output connector TX ANT. The output was connected to a spectrum analyser. The spectrum analyser was connected to an external 10 MHz reference standard during measurement. The test was performed without modulation.

Measurement equipment	Calibration Due	SP number
Climate chamber	2004-11	501 031
R&S FSIQ 40	2004-04	503 738
Multimeter Fluke 87	2004-09	502 190
Testo 610, Temperature and humidity meter	2004-12	502 658

Results

Nominal Voltage 24V DC

Channel 3840 (938.000 MHz)

Output power level at output connector TX ANT: 30 dBm

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	Output TX ANT
24	+20	-23
18	+20	-22
36	+20	-25
24	+30	-15
24	+40	-10
24	+50	-14
24	+10	-35
24	0	-35
24	-10	- -
Maximum freq. error (Hz)		-35
Measurement uncertainty		$< \pm 1 \times 10^{-9}$

Sign:.....

REPORT

Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

Sida/Page
2 (2)
Encl. 6

Remark

The EUT was switched off during the temperature-stabilizing periods. The measurements were performed 15 minutes after the EUT had been switched on in stand-by mode. After the transmitter was switched to transmit condition the frequency error was monitored for one minute to record the maximum frequency error. At +50 °C the frequency error was also checked 30 minutes after the transmitter was switched to the transmit condition.

When the DC power was applied at -10 °C the EUT did not switch to operational mode. It was not possible to activate the transmitter.

Limits

The frequency Error shall be within ± 0.1 PPM (93.80 Hz).

Complies?	Yes
-----------	-----

Sign:.....

REPORT

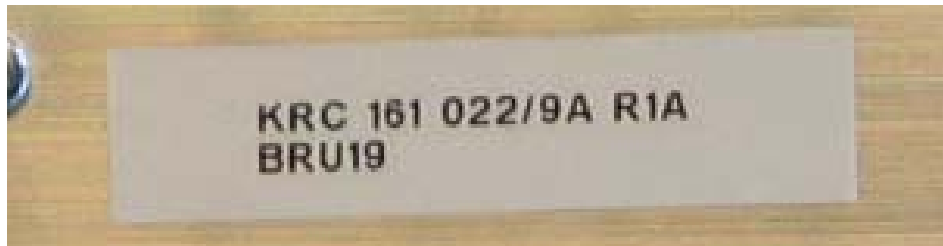
Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

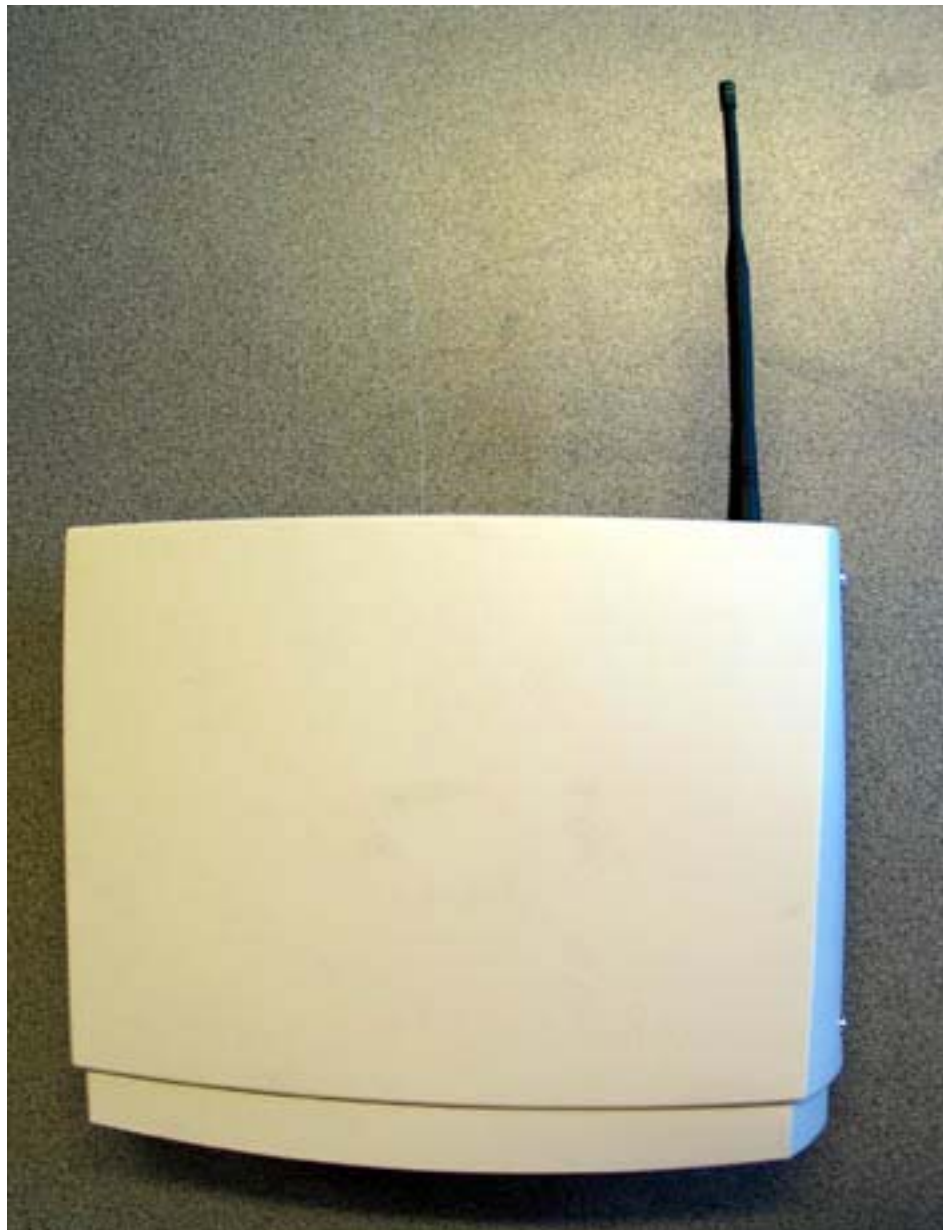
Sida/Page
1 (6)
Encl. 7

Photos

Product label



Front side with mounted antenna



Sign:.....

REPORT

Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

Sida/Page
2 (6)
Encl. 7

Rear side



Top



Bottom



Sign:.....

Front cover removed



FIB board, cover removed



Sign:.....

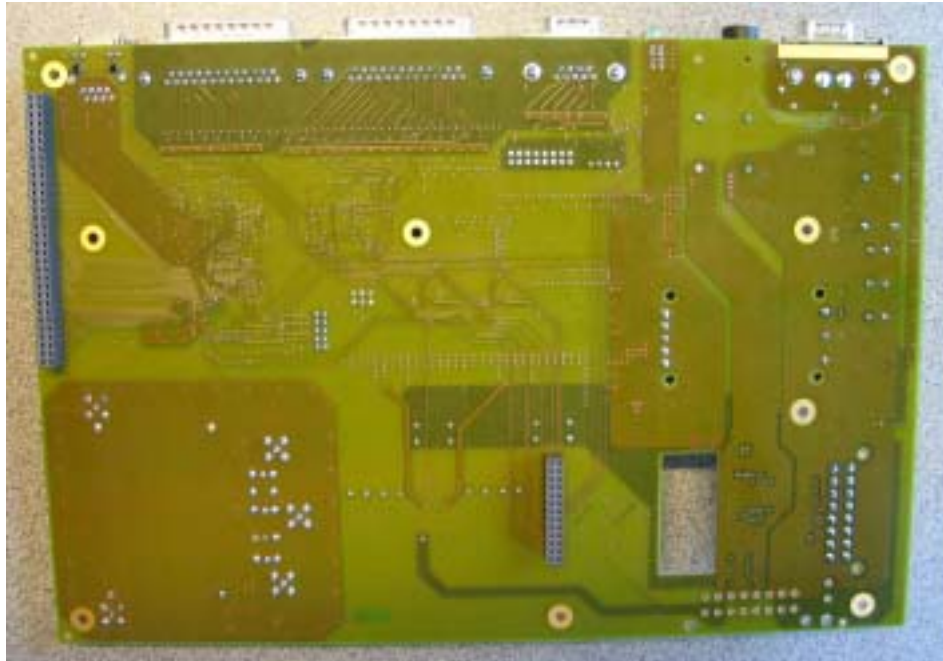
REPORT

Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

Sida/Page
4 (6)
Encl. 7

FIB board, back side



FCB board, FIB board removed



Sign:.....

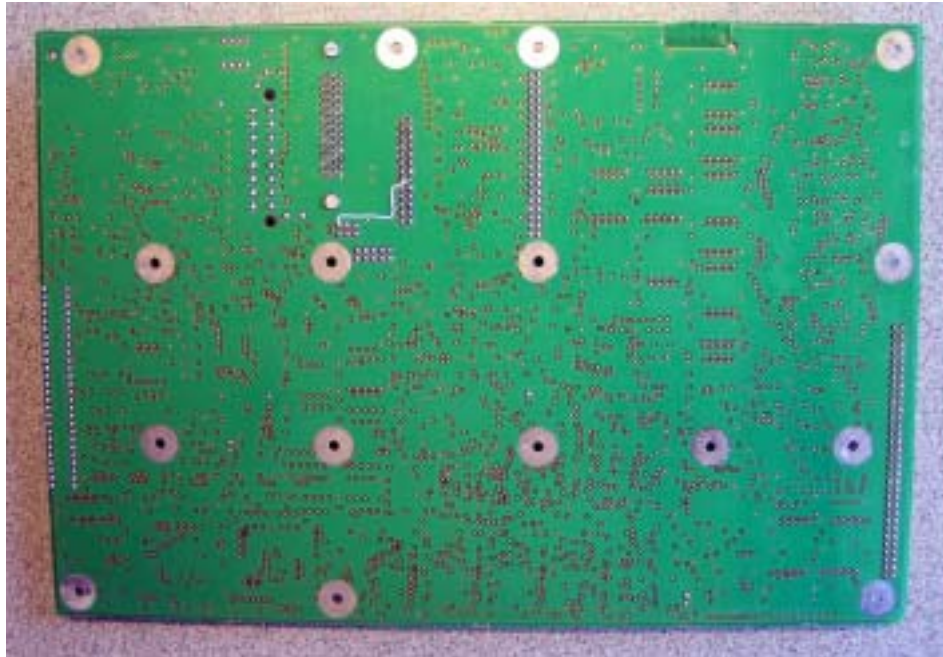
REPORT

Datum/Date
2004-02-17

Beteckning/Reference
F401093-F90

Sida/Page
5 (6)
Encl. 7

FCB board, back side



FRB board, cover removed



Sign:.....

REPORT

Datum/Date
2004-02-17

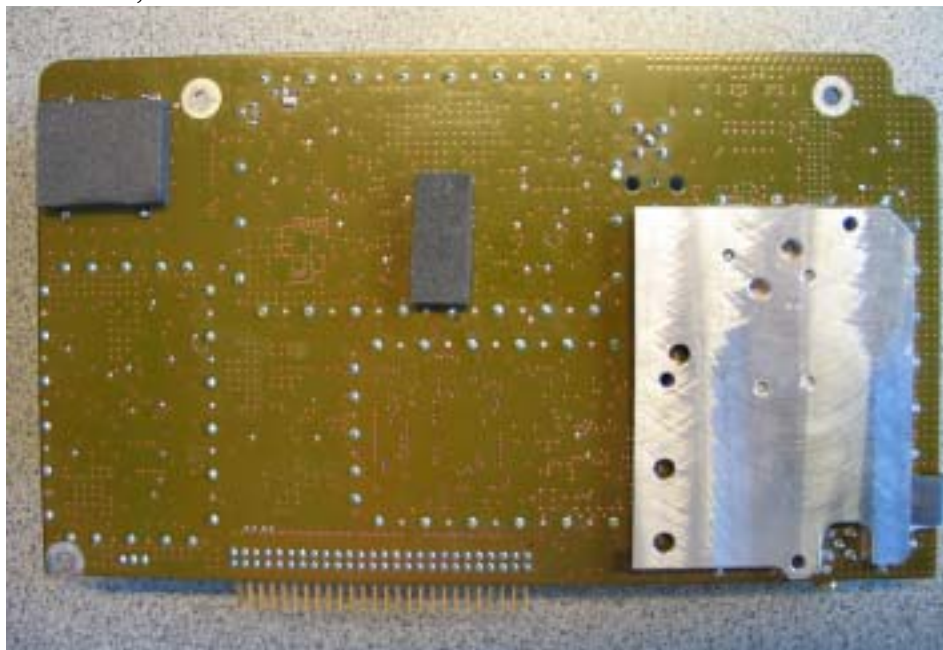
Beteckning/Reference
F401093-F90

Sida/Page
6 (6)
Encl. 7

FRB board without shielding covers



FRB board, back side



Sign:.....