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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



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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)

RF Power output measurements according to 47CFR 2.1046/90.205

Date 2004-02-10	Temperature 22 °C ± 3 °C	Humidity 16 % ± 5 %
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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 Test conditions		Transmitter power (dBm) Peak/ Average		
		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 Test conditions		Transmitter power (dBm) Peak/ Average		
		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		

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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
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Sign:.....

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

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

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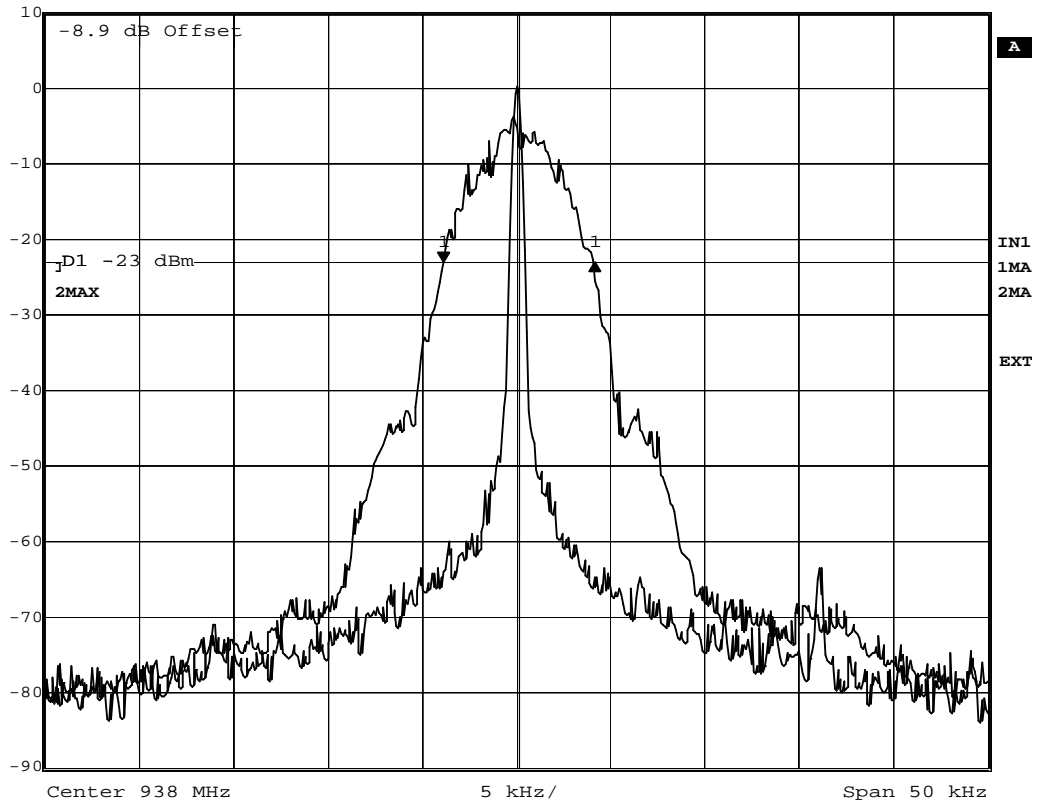
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Diagram 1 (2)
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Delta 1 [T1]	RBW	300 Hz	RF Att	30 dB
Ref Lvl	0.10 dB	VBW	300 Hz	
10 dBm	8.01603206 kHz	SWT	2.8 s	Unit dBm



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

Sign:.....

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2004-02-17

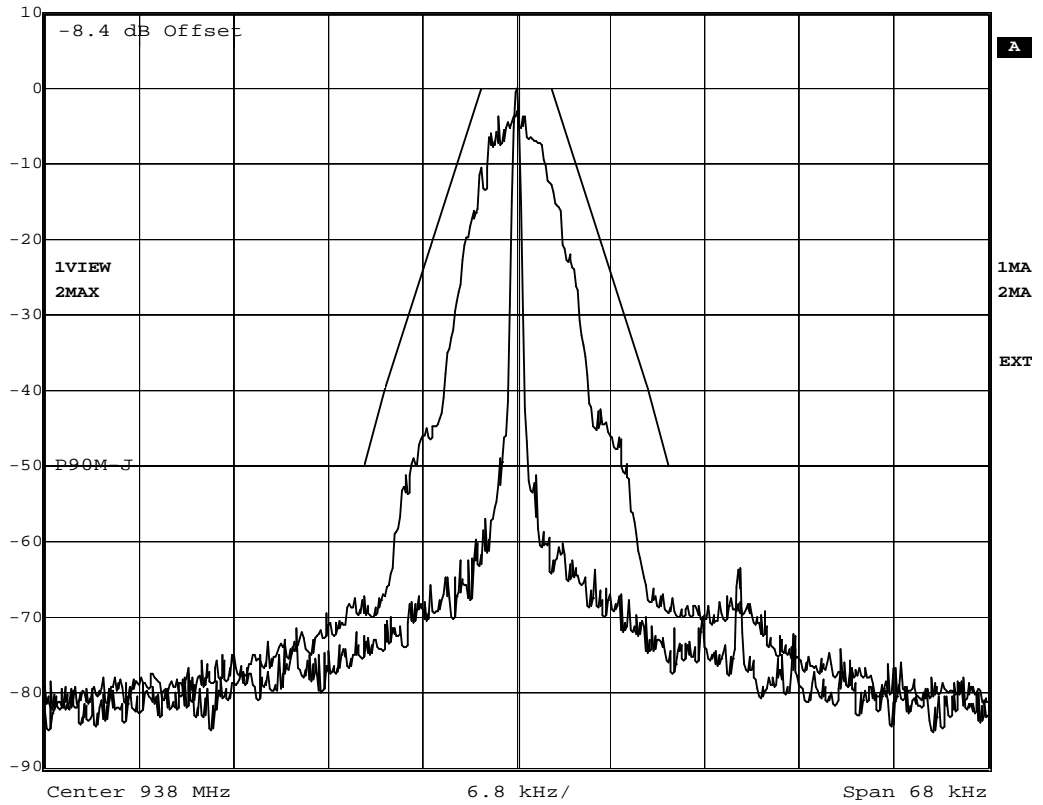
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Diagram 2 (2)
Encl. 3.1



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

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**Conducted spurious emission measurements according to 47CFR
2.1051/90.669**

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

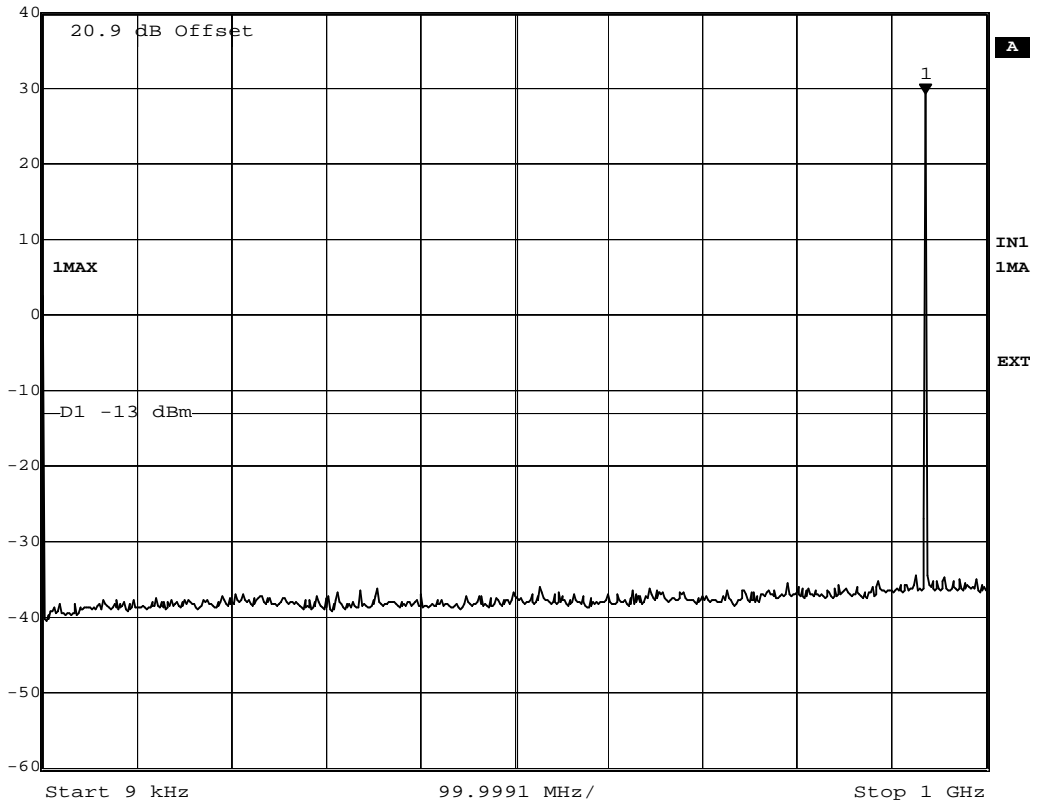
Datum/Date
2004-02-17

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Diagram 1 (4)
Encl. 4.1



Marker 1 [T1]	RBW	100 kHz	RF Att	30 dB
Ref Lvl	29.01 dBm	VBW	100 kHz	
40 dBm	935.01250000 MHz	SWT	250 ms	Unit dBm



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

Sign:.....

REPORT

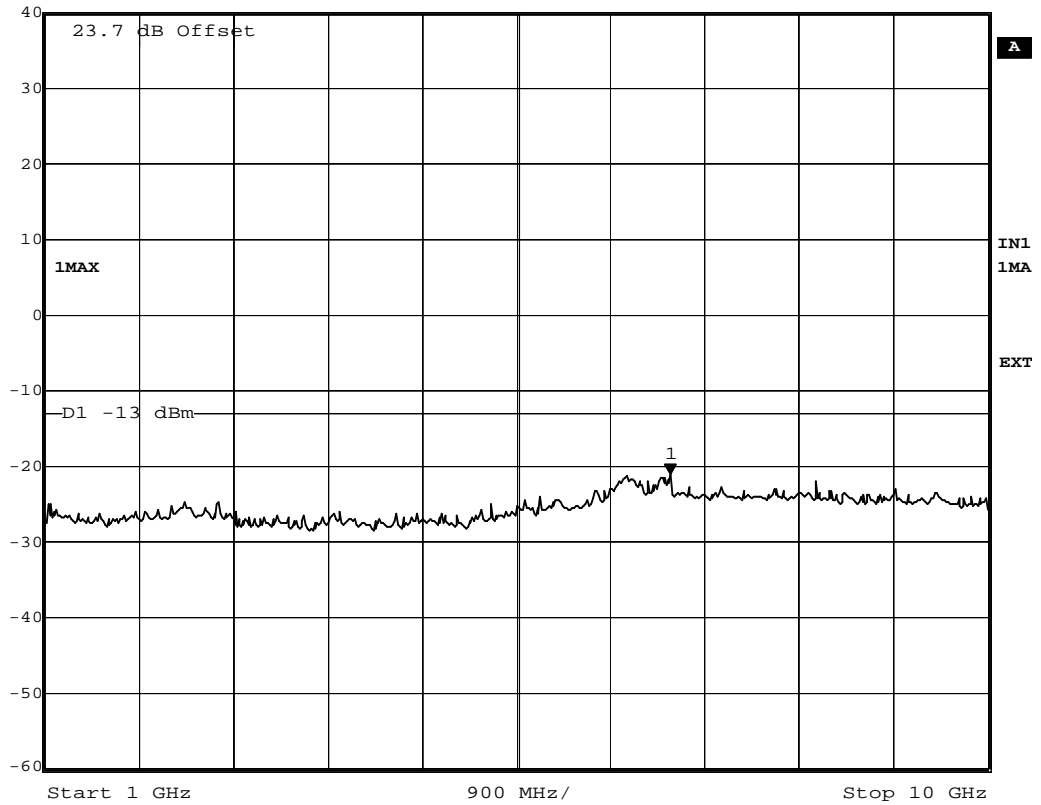
Datum/Date
2004-02-17

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Diagram 2 (4)
Encl. 4.1



Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
Ref Lvl	-21.12 dBm	VBW	1 MHz	
40 dBm	6.96993988 GHz	SWT	90 ms	Unit dBm



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

Sign:.....

REPORT

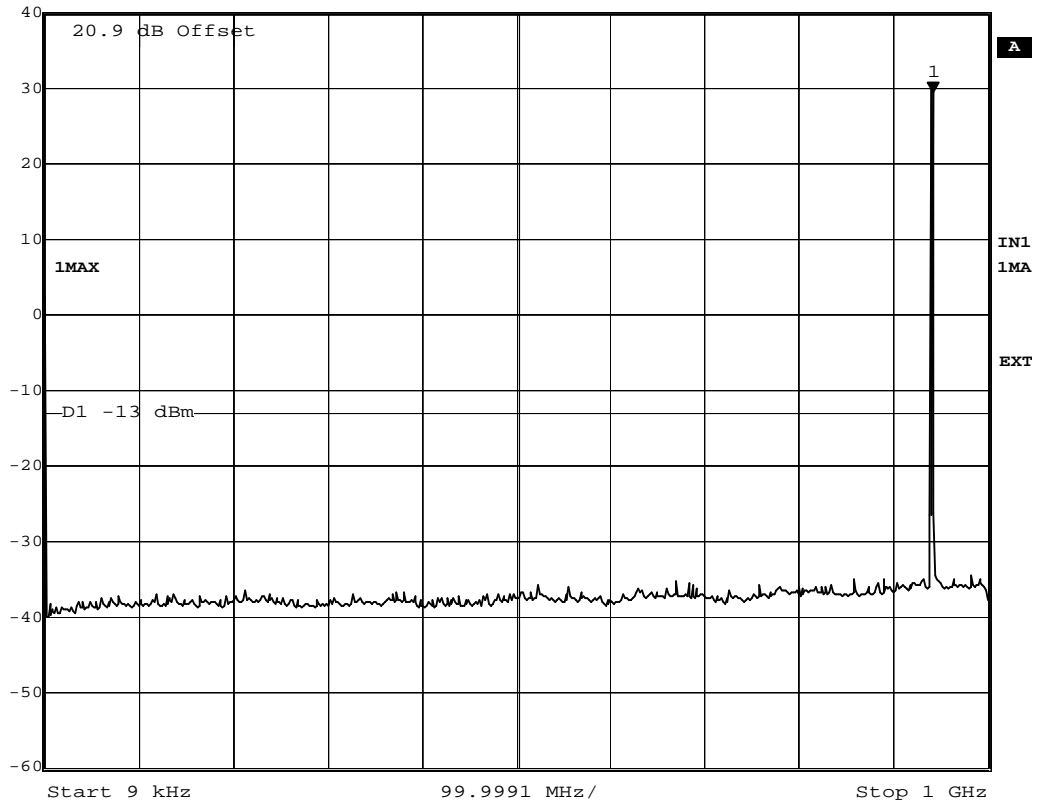
Datum/Date
2004-02-17

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Diagram 3 (4)
Encl. 4.1



Marker 1 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl 29.45 dBm VBW 100 kHz
40 dBm 940.98750000 MHz SWT 250 ms Unit dBm



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

Sign:.....

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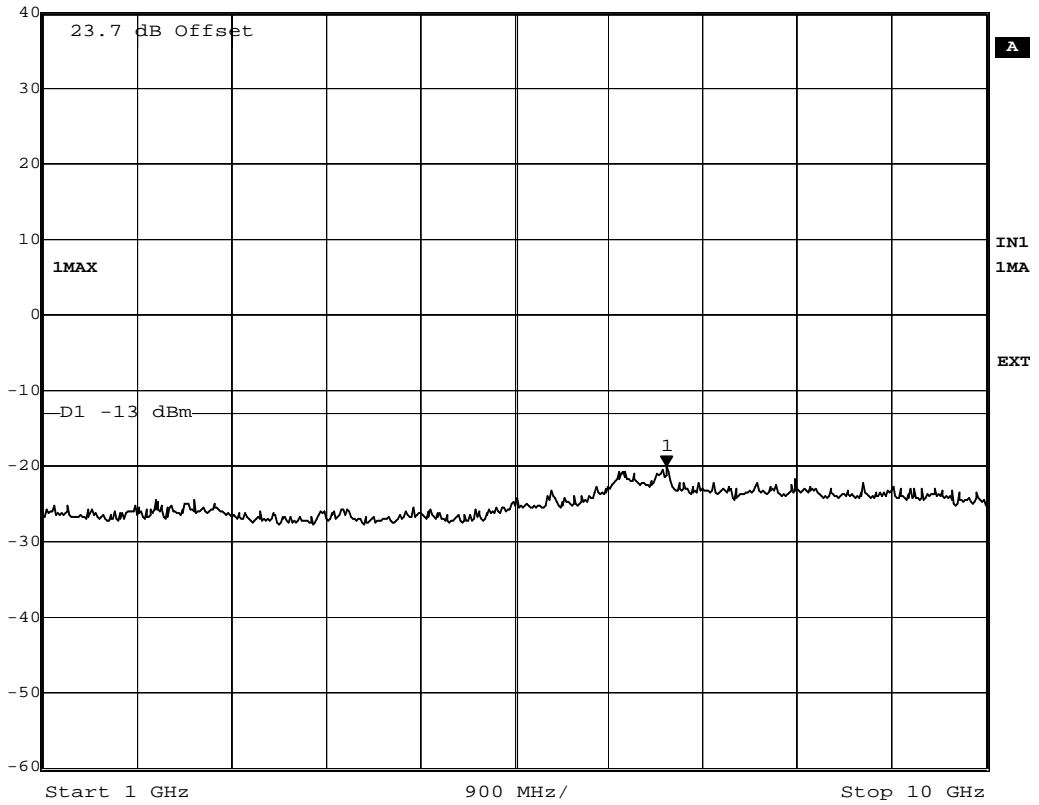
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2004-02-17

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Diagram 4 (4)
Encl. 4.1



Marker 1 [T1]	RBW	1 MHz	RF Att	30 dB
Ref Lvl	-20.12 dBm	VBW	1 MHz	
40 dBm	6.95190381 GHz	SWT	90 ms	Unit dBm



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 %
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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

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
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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		$< \pm 1 \times 10^{-9}$

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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
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Sign:.....

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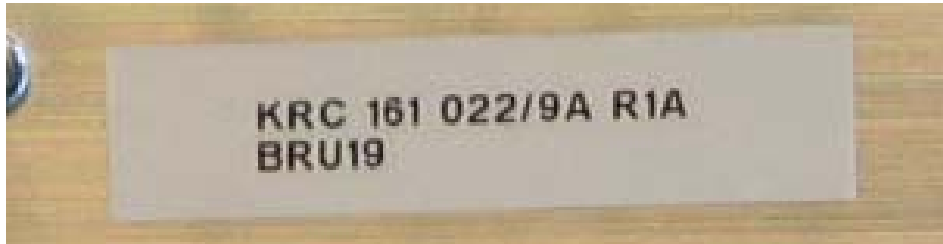
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Beteckning/Reference
F401093-F90

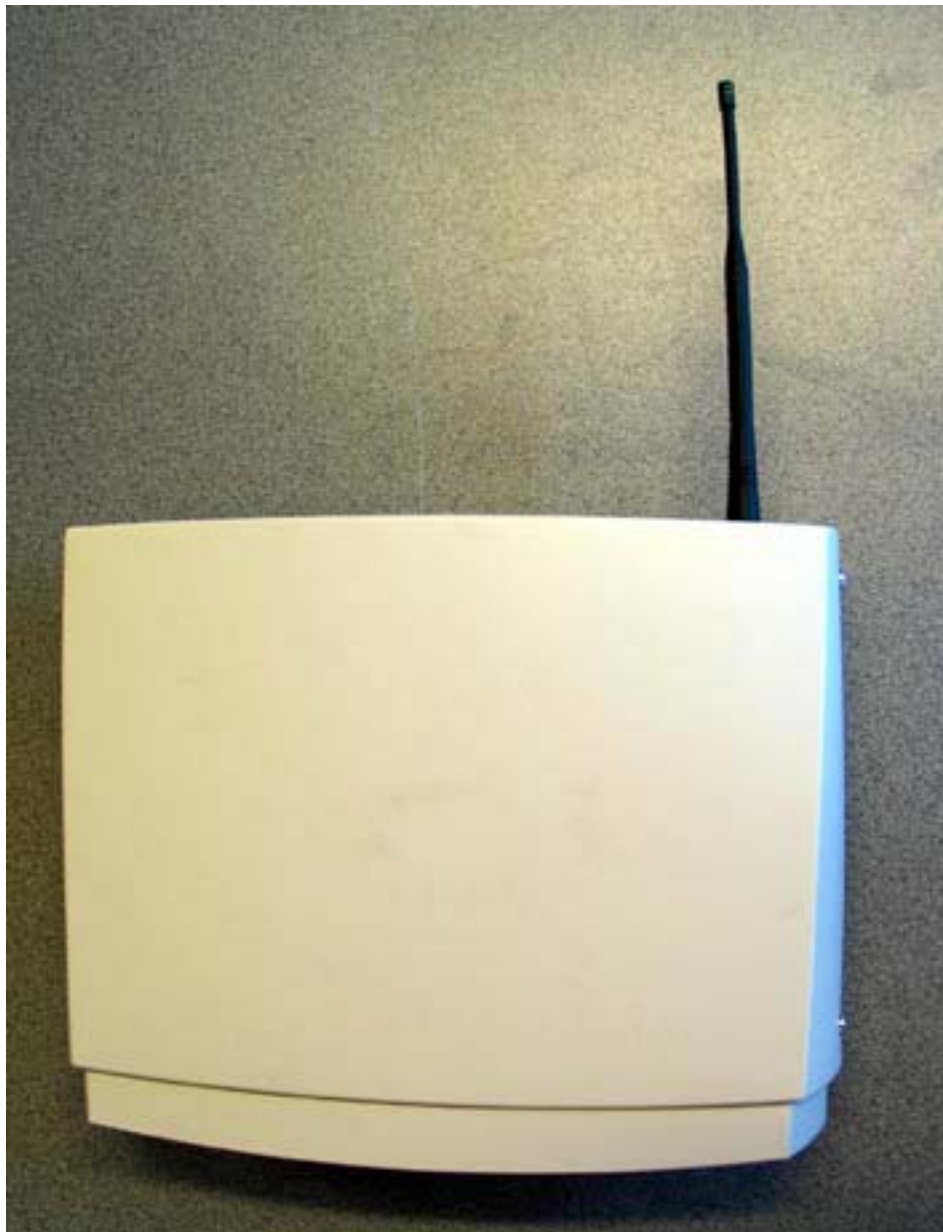
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Photos

Product label



Front side with mounted antenna



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Rear side



Top



Bottom



Sign:.....

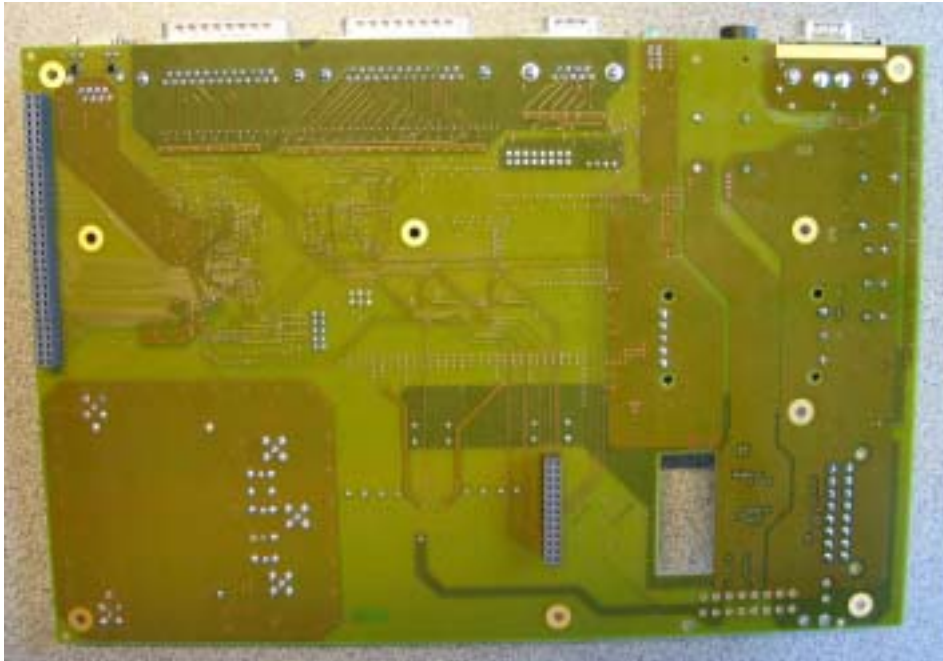
Front cover removed



FIB board, cover removed



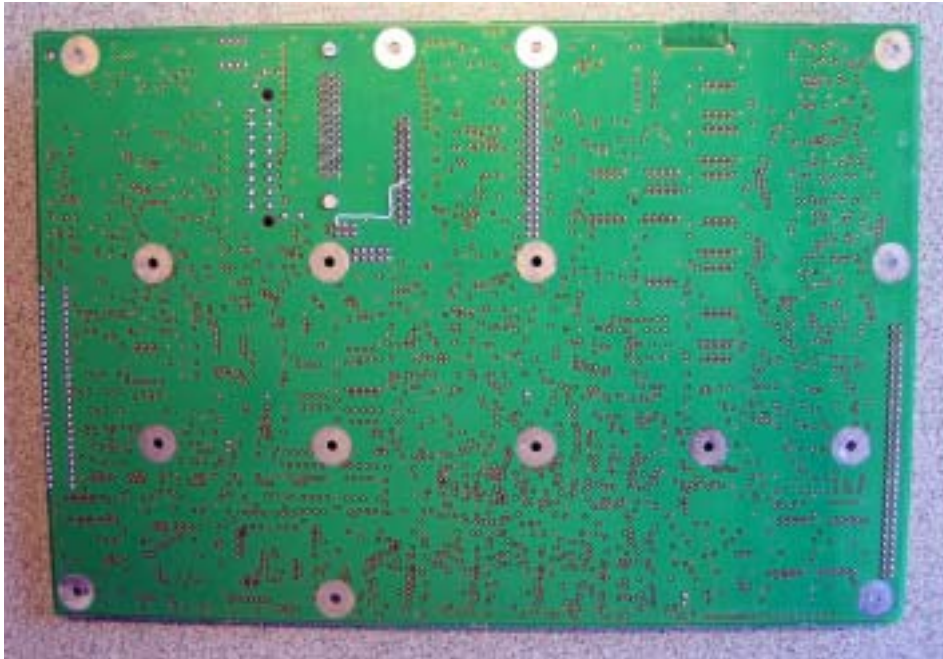
FIB board, back side



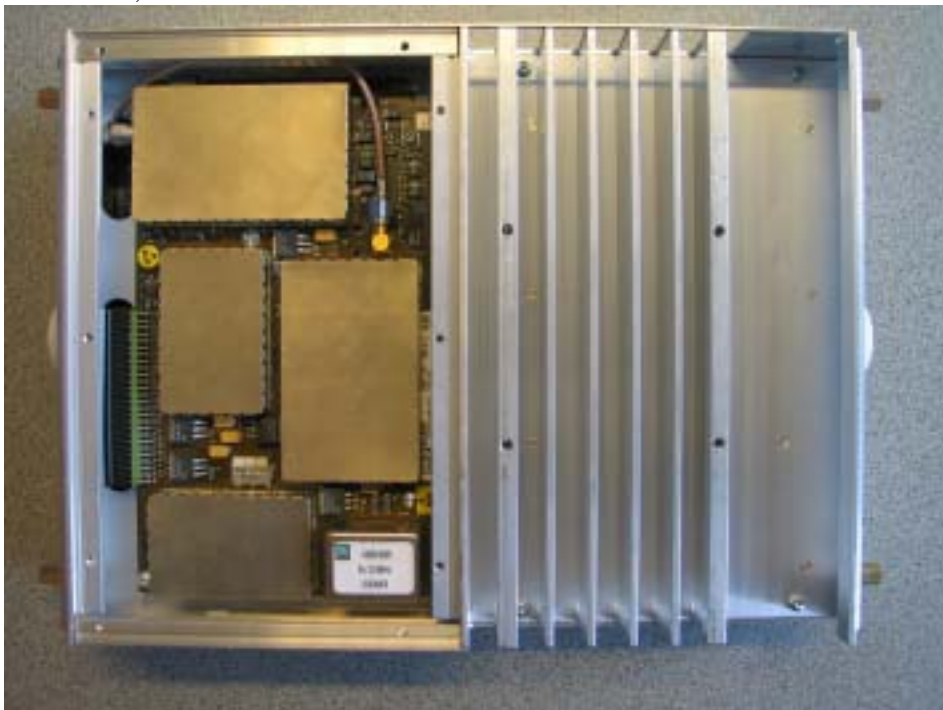
FCB board, FIB board removed



FCB board, back side



FRB board, cover removed



FRB board without shielding covers



FRB board, back side

