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SAR test report: M3090-Mobitex radio modem

Date of test: October 14, 1999

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1 General information

This report presents the Specific Absorption Rate (SAR) measurement data for the M3090-Mobitex radio modem. The measurements were conducted at the Corporate EMF Research Laboratory at Ericsson Research in Stockholm Sweden according to the procedures described in the *Ericsson SAR measurement specification*[1].

2 Device Under Test

- Antenna description

Type	**Car antenna**	**Portable antenna**
Location	Car roof mounted	Device mounted
Dimensions (mm)	length=318, Ø=2	length=142, depth=4, width=12
Configuration	Wire	Whip

- Device description

Device model	**M3090**
Serial number	MFA-S00510
Mode	Mobitex
Modulation	GMSK
Duty cycle[1]	1
Maximum peak output power	2 W
Transmitter frequency range	896-902 MHz

[1.] Maximum value for continuous data transmission. Normally, the duty-cycle is varying.

3 Test equipment

3.1 Dosimetric system

Schmid&Partner Engineering AG DASY3 professional (installed September 1997), software version 3.1c.

Description	Asset number	Due date
DASY3 DAE3	S/N 304	2000 08
E-field probe ET3DV6	S/N1394	2000 10
Dipole validation kit D900V2	S/N 015	2000 08

3.2 Additional equipment

Description	Asset number	Due date
Signal generator, R&S SMHU58	S/N 843863/034	1999 11
Dielectric probe kit HP85070B	S/N US33020318	2000 02
Network analyzer HP8753D	S/N 3410A08356	1999 11
Power meter R&S NRVS	S/N 848888/052	2000 03
Power sensor R&S NRV-Z32	S/N 825600/030	2000 02

4 Electrical parameters of the tissue simulating liquid

The parameters of the tissue simulating liquid were measured with the dielectric probe kit prior to the SAR measurement and the results are shown in the table below.

Parameter	Value
Frequency, f (MHz)	900
Relative permittivity, ε_r	41.2 (±5%)
Conductivity, σ (S/m)	0.84 (±10%)

5 System performance verification

A system performance verification for the DASY3 was conducted before the SAR measurements with the D900V2 validation kit and the obtained results are displayed in the table below. The results are within 5% from the reference values obtained from the manufacturer of the system.

f (MHz)	Test/Reference	SAR (W/kg)		σ (S/m)	ε_r	Date
		1g	10g			
900	Reference	9.24	6.04	0.86	43.1	Sept. 2,1998
	Test	**9.26**	**6.00**	0.84	41.2	Oct. 14, 1999

6 Test Results

The M3090-Mobitex radio modem was SAR measured for an output power level of 27 dBm or 0.5 W (at the device output connector) and a duty-cycle of 1/5. The table below shows the measured 1g averaged SAR and the corresponding values normalized to 2 W output power level and duty-cycle equal to 1. The temperature of the test facility during the tests was 22±1°C and the depth of the tissue simulating liquid in the phantom was 12 cm.

Device/ Antenna	Mode	f (MHz)	Measured output power (W)	SAR 1g (W/kg), Measured	SAR 1g (W/kg), Normalized to 2 W and duty-cycle 1
				Flat section, 5cm distance	
M3090/ Car antenna	Mobitex	896	0.43	**0.0195**	**0.46**
		899	0.43	0.0179	0.42
		902	0.43	0.0147	0.34
M3090/ Portable antenna	Mobitex	896	0.43	**0.0310**	**0.73**
		899	0.43	0.0309	0.72
		902	0.43	0.0300	0.70

7 References

[1] C. Törnevik, M. Siegbahn, T. Persson, M. Douglas and R. Plicanic, "Ericsson SAR Measurement Specification", Ericsson Internal Document, September 1999.

APPENDIX

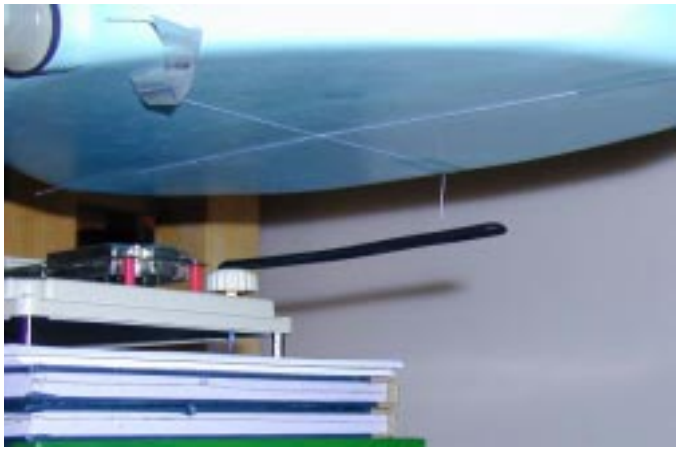
1. Pictures of the test setup and the DUT

2. SAR distribution plots

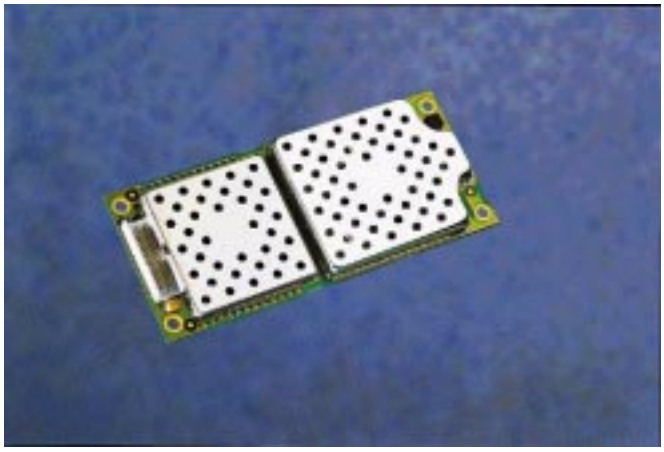
3. Probe calibration parameters for ET3DV6 SN:1394

APPENDIX 1: Pictures of the test setup and the DUT

(a) The car antenna, 5 cm distance to flat section of phantom



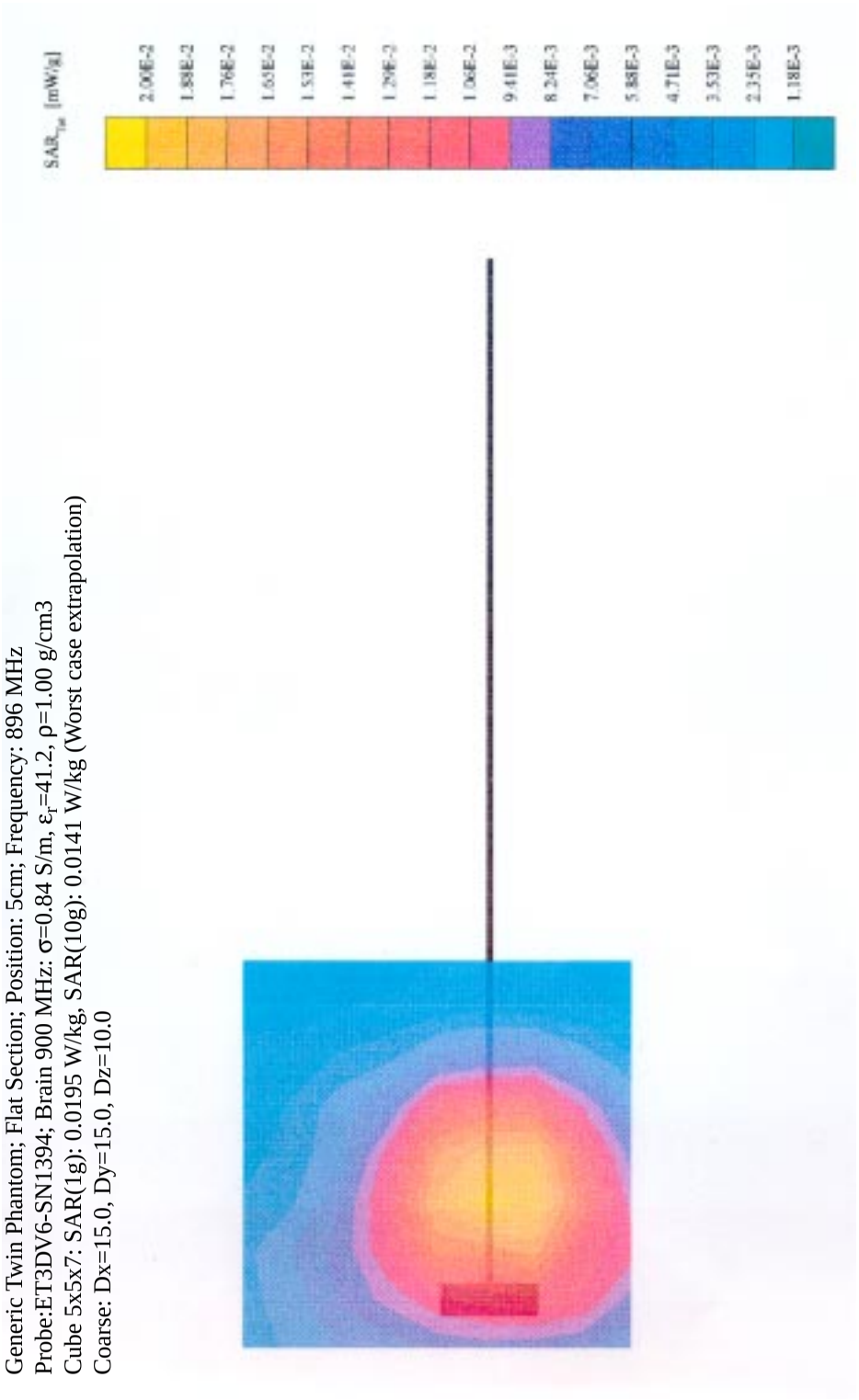
(b) The portable antenna, 5 cm distance to flat section of phantom



(c) The Ericsson M3090-Mobitex radio modem.

The setups of the mobitex antennas below the flat section of the DASY3 phantom. The car antenna was mounted on a separate ground plane (a) and the portable antenna directly on the radio modem (b). The M3090-Mobitex radio modem (c).

APPENDIX 2: SAR distribution plots



M3090-Mobitex Car Antenna
Generic Twin Phantom; Flat Section; Position: 5cm; Frequency: 896 MHz
Probe:ET3DV6-SN1394; Brain 900 MHz: σ=0.84 S/m, ε_r=41.2, ρ=1.00 g/cm3
Cube 5x5x7: SAR(1g): 0.0195 W/kg, SAR(10g): 0.0141 W/kg (Worst case extrapolation)
Coarse: Dx=15.0, Dy=15.0, Dz=10.0

SAR distribution plot for the car antenna for M3090-Mobitex radio modems. The plot shows the measurement data for the maximum area at the tested power level of 27 dBm and duty-cycle 1/5.

SAR distribution plot for the M3090-Mobitex radio modem with the antenna for portable units. The plot shows the measurement data for the maximum area at the tested power level of 27 dBm and duty-cycle 1/5.

APPENDIX 3: Probe calibration parameters for ET3DV6 SN:1394

Diode compression

Parameter	Value in mV
DCP X	98
DCP Y	98
DCP Z	98

Sensitivity in free space:

Parameter	Value in $\mu V/(V/m)^2$
Norm X	1.87
Norm Y	1.92
Norm Z	1.66

Conversion factors for tissue simulating liquid

Liquid for 900 MHz; ε_r=42.5 ± 5%, σ=0.86 ± 10%.

Boundary effect: alpha=0.55, Depth=2.17

Parameter	Value
ConvF X	6.87
ConvF Y	6.87
ConvF Z	6.87

Optical Surface Detection: 1.42 ± 0.2 mm