ERICSSON

November 9, 1998

Intertek Testing Services
4317-A Park Drive, NW
Norcross, GA 30093

RE: SAR Testing of the DCT1900 Wireless handset model number DT-620

Dear FCC Inspector,

We have completed SAR testing of the DCT1900 handset model number DT-620 at its center frequency of 1925.625 MHz and the band edges of 1920.625 MHz and 1929.375 MHz. As for typical use, the testing was done with telephone placed against a phantom test head with the reference line of the telephone case parallel to a line from the ear to the mouth. In the defined test position with the phone against the phantom head, the distance from the center of the antenna base to the outer surface of the phantom head was approximately 20 mm. The test head was filled with a liquid as described in section 3.2 of the test report, which closely matches actual tissue with respect to the dielectric constant and the conductivity of the liquid.

The highest SARs were determined by scanning the entire head on a coarse scan grid, and then performing a fine scan over areas were maximums were observed. The highest local SAR measured when the handset is operating at the maximum power setting of 90 mW peak power, averaged over 1 gram of material is 0.0111 mW/g. The highest local SAR averaged over 10 grams of material is 0.0045 mW/g. This is less than 1.6 W/kg suggested in the ANSI/IEEE C95.1 and FCC 96-326 safety guidelines.

Sincerely,

Gerald Michalak
Director of Wireless Development

Ericsson Inc.
7001 Development Drive
P.O. Box 13969
Research Triangle Park, North Carolina 27709

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RT/EUS/TR/X Mark Douglas	919-472-6334	EUS/TR/X-98:1616		
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Electromagnetic Near Field and Radio Frequency Dosimetry Laboratory

Research Triangle Park, NC, USA

SAR Assessment Measurements

Test Report

Ericsson Dixie

Single Band Telephone

Test Equipment:

Description	Asset Number	Due Date
DASY3 DAE V1	s/n 330	9901
E-field probe ETDV5	s/n 1324	9901
Dielectric probe kit HP 85070B	inv. 55733	9908
Network analyzer HP 8752C	inv. 57248	9907
Power meter HP 437B	inv. 49292	9909
Power sensor HP 8482H	inv. 8210-3386	9901

Date: 980925

Test approved:
Mark Douglas, Ph.D.

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Test Report: Dosimetric Assessment Measurements for the Ericsson Dixie single band device.

1. Introduction

In this test report Specific Absorption Rate (SAR) measurements for the Ericsson Dixie portable telephone are presented. The measurements were conducted at the Electromagnetic Near Field and Radio Frequency Dosimetry Laboratory at Ericsson, Inc. in Research Triangle Park, North Carolina, USA. The report describes the test procedure that were used and the test results that were recorded.

2. Device Under Test (D.U.T.)

- Antenna Description:

Type	Single band quarter-wave spiral, part KRE 101 1843	
Location	Back and left	
Dimension	length	16mm
	diameter	8.5mm
Configuration	Stub	

- Portable Telephone Description:

Device name	Dixie
Serial number	29
Mode	PWT
Modulation	TDMA
Duty Cycle	1 / 12
Peak Power	19.5 dBm
Center Frequency	1925.625 MHz

3. Measurement System

The measurements were made with the Dosimetric Assessment System, DASY, from Schmid & Partner AG (SPEAG) in Zurich, Switzerland. This system was developed by Professor Niels Kuster and his team at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland [II]. The system uses the implantable E-field probe technique to evaluate the SAR inside the generic twin phantom. The E-field is automatically scanned inside the phantom filled with a brain tissue simulating liquid [III]. The positioning of the E-field probe inside the left phantom head is done by a high precision 6 axis robot. A computer is used to control the robot and to collect the measured data.

3.1 Specification for the E-Field probe

This is a summary of the technical data for the E-field probe that is used for the measurements.

Sensitivity in tissue simulating liquid: 1 uW/g to 100 mW/g
Linearity: ± 0.2 dB
Deviation from isotropy in tissue,
normal to probe axis: ± 0.3 dB
in all planes, all polarizations: ± 0.8 dB
Spatial resolution of SAR measurements: < 0.125 cm^3
Reproducibility of probe positioning: < ± 0.2 mm

A more detailed description of the system is given in references [I] and [II].

3.2 Brain tissue simulating liquid data

The electrical data used for the brain tissue simulating liquid are according to the data provided by C. Gabriel. The liquid is prepared using the recipe [V] for the brain tissue simulating liquid. The electrical parameters of the brain tissue simulating liquid are measured at room temperature by the HP 85070B dielectric probe kit from Hewlett Packard. This probe kit uses an open-ended coaxial probe and a network analyzer to measure the electrical data for the liquid. The following values were measured for the relative permittivity (ε_r) and conductivity (σ) for the liquids that were used during the SAR measurements.

f (MHz)	**1800**
ε_r	**40.16**
σ (**S/m**)	**1.73**

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3.3 Calibration

The system is calibrated at fixed time intervals by the supplier of the system (SPEAG). The E-field probes are calibrated every 12 months by the supplier. A detailed description of probe calibration is found in reference [IV].

3.4 Measurement Tolerance

The total measurement uncertainty is estimated to be ±25% [II].

4. Test Procedure

The dosimetric assessment measurements are made according to the operating manual for the DASY3 system from SPEAG. Test codes in the device are used to control the phone during the SAR measurements. Before the measurement starts, the battery is fully charged. The SAR is measured at three frequencies (corresponding to the low, middle and high frequencies of the band).

4.1 Positioning of the Device Under Test.

The D.U.T. is placed in a position against the phantom head that corresponds to the intended or normal operating position. The normal position is a position that is convenient and provides good acoustic coupling. Appendix [3] shows pictures of the position used for the measurements. The position is defined as follows:

- The centre of the ear-piece is placed at the entrance of the auditory canal as marked on the head phantom.
- The reference line of the phone is defined to be the line (on the surface of the phones case facing the phantom) which connects the centre of the ear piece with the centre of the bottom of the case (typically near the microphone).
- The reference line defined above shall lie in the reference plane defined by the following three points: auditory canal openings of both ears and the centre of the closed mouth.
- The intended use position is defined by an angle between the reference line of the phone and the line connecting both auditory canal openings of 80º.

In the defined test position, the distance from the front of the phone to the outer surface of the phantom liquid was 6 mm. This includes a 2mm phantom shell and a 4mm ear spacer.

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4.2 Peak SAR determination procedure

The E-field probe is first scanned in a coarse grid with scanning resolution 15mm over a large area inside the phantom head, in order to locate the position of the maximum SAR. The size of the scanned region is selected large enough to guarantee that all possible peak SAR areas are included. Measurements are then taken in a fine grid volume with 3mm scanning resolution around the maximum SAR value. The size of the cubical fine grid region is approximately 30 cm^3. Numerical interpolation and extrapolation are used to determine the SAR values between measurement points in the cube and in the small region between the cube and the surface of the shell phantom which cannot be reached with the E-field probe. The 1g and 10 g averaged SAR values are computed by shifting cubes with side lengths of 10 mm and 21.5 mm, respectively, over the fine grid volume. The recorded peak SAR is the maximum value of all the evaluated positions.

5. Test Results

The conducted output power is measured with a spectrum analyzer. The SAR values for all three frequencies are shown in Table 1. The results shown are for the maximum SAR values averaged over 1 g and 10 g of tissue. This SAR values are within the FCC limits for the uncontrolled RF exposure environment.

Device	Mode	f (MHz)	Measured output power (dBm)	SAR(1g)(mW/g)	SAR(10g)(mW/g)
Dixie	PWT	**1920.625**	**19.64**	0.0102	0.0040
		1925.625	**19.68**	0.0100	0.0039
		1929.375	**19.64**	**0.0111**	**0.0045**

Table 1: SAR measurement results for the Ericsson Dixie telephone at maximum rated output power.

REFERENCES

[I] Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields – Supplement C

[II] Dosimetric Evaluation of Handheld Mobile Communications Equipment with Known Precision; ***Kuster, Kästle, Schmid-IEICE TRANS.COMMUN.vol.E80-B, 5 May 1997***

[III] Automated E-Field Scanning System for Dosimetric Assessments
Schmid, Egger, Kuster-IEEE:TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, vol. 44, No. 1, January 1996

[IV] Broadband Calibration of E-Field Probes in Lossy Media
Meier, Burkhardt, Schmid and Kuster-IEEE: TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, vol.44, No. 10, October 1996

[V] Schmid & Partner Engineering AG, Preliminary Manual DASY3 V1.0 for Windows 95, ***Zürich, Switzerland, pp. 82-84, December 1997***

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APPENDIX

[1] *SAR DISTRIBUTION PLOTS*

[2] *PICTURES OF ERICSSON DIXIE TELEPHONE*

[3] *POSITION OF ERICSSON DIXIE ON GENERIC TWIN PHANTOM*

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APPENDIX [1]

SAR DISTRIBUTION PLOT

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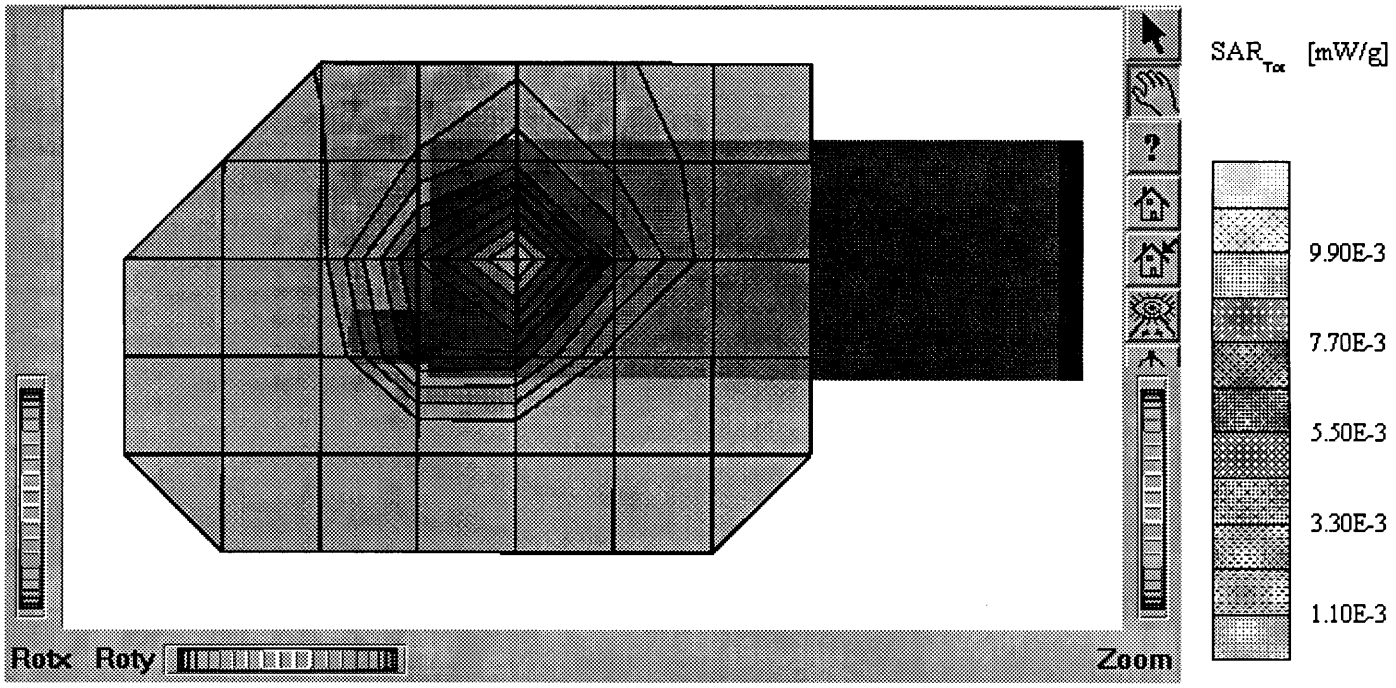
Dixie w/16mm stub

Generic Twin Phantom; Right Hand Section; Position: (80°,65°); Frequency: 1929 [MHz]
Probe: ET3DV5 - SN1324; ConvF(4.24,4.24,4.24); Crest factor: 24.0; Brain 1800 MHz: σ = 1.73 [mho/m] ε_r = 40.2 ρ = 1.03 [g/cm^3]
Cube 5x5x7: SAR (1g): 0.0111 [mW/g], SAR (10g): 0.0045 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 1.42 dB
S/N: 29



SAR distribution plot for Dixie at f = 1929.375 MHz and P = 19.64 dBm.

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APPENDIX [2]

PICTURES OF ERICSSON DIXIE

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Ericsson Dixie Front Side

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Ericsson Dixie Right Side

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APPENDIX [3]

POSITION OF ERICSSON DIXIE ON GENERIC TWIN PHANTOM

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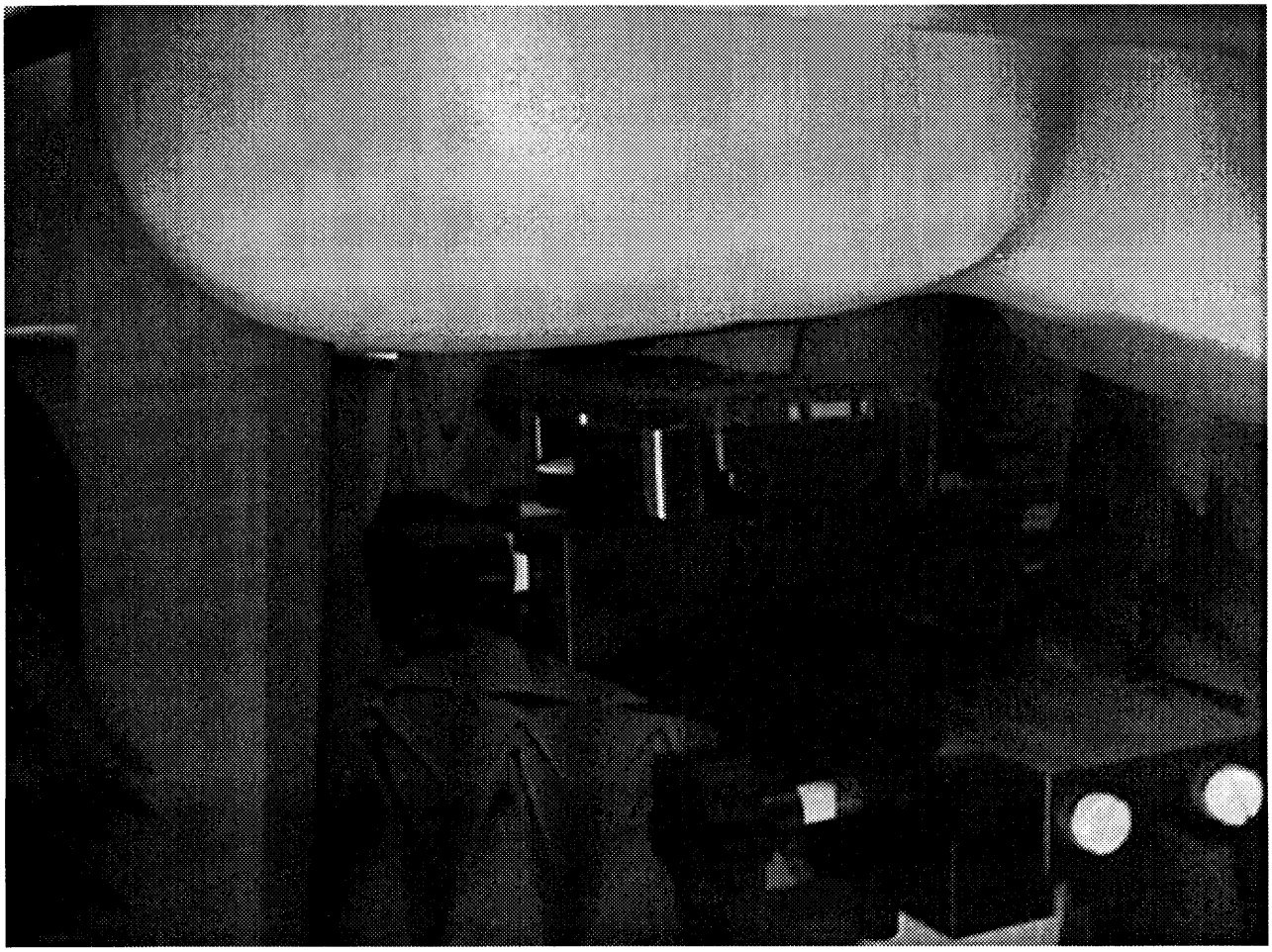

Ericsson Dixie on right side of phantom.