ERICSSON

To: Frank Coperich
Federal Communications Commission

From: Jim Sponsler
Date: 10-2-98

Correspondence ID 3848 ; Ericsson AXATR-366-A2

A response to the request for additional information dated October 2, 1998, for the AXATR-366-A2 submittal is summarized below. Attachments are for your reference.

1) A list of changes made between the existing AXATR-366-A2 filing for CF788 and the new model CF768 is attached. It details the changes as cosmetic only as basically only the front mechanics have changed.

2) Additional SAR information is included.

If you have any questions, please contact me.

Sincerely,

Jim

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Uppgjord - *Prepared*	Tfn - *Telephone*	Datum - *Date*	Rev	Dokumentnr - *Document no*
RT/EUS/TB/P Sven Young	919- 472 6188	7/14/1998	PA1	EUS/TB-98:
Godkänd – *Approved*	Kontr. - *Checked*			Tillhör / referens - *File / reference*
RT/EUS/TB/P (Sven Young)				

Comparison CF768 and CF788

Purpose:
The purpose of this document is to define the differences between the currently USA- marketed Ericsson CF788 and new design planned for launch in 1998, CF768.

Type numbers:

CF788: 1020602-BV FCCID: AXATR-366-A2
CF768: 1020603-BV FCCID: AXATR-366-A2

Hardware:

The hardware revision for both models is Rev A.

PCB:
Exactly the same PCB to be implemented in both models. PA-module will be same on both models.

Mechanics:
Same rear cover, microphone and earphone on both models.
CF768 will have newly designed front mechanics, flip and keypad. Front mechanics will have metalization on the inside surface, exactly as on CF788.

Antenna:
Same antenna on both models.

Software:

Exactly the same software module to be incorporated in both models: CXC 125 062 980127_1806.

Photographic Comparison:

CF788

CF768

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Electromagnetic Near Field and Radio Frequency Dosimetry Laboratory

Research Triangle Park, NC, USA

SAR Assessment Measurements

Test Report

Ericsson CF 768

Single Band (GSM 1900 MHz) 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
Radio Comm. Analyzer Anritsu MT8801B	s/n MB12477	9909

Date: 981002

Test approved:
Mark Douglas, Ph.D.

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Test Report: Dosimetric Assessment Measurements for the Ericsson CF 768 single band telephone.

1. Introduction

In this test report Specific Absorption Rate (SAR) measurements for the Ericsson CF 768 portable telephone are presented. The measurements were conducted at the dosimetry laboratory at Ericsson, Inc. in Research Triangle Park, North Carolina, USA. The report describes the test procedures that were used and the test results that were recorded.

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

- Antenna Description:

Type	Inductively-coupled retractable λ/2 whip	
Location	Back and right	
Dimensions	length extended	115 mm
	length retracted	23.5 mm
	diameter at base	10 mm
Configuration	Retractable monopole	
ERP/EIRP (dBm)	28.6 (EIRP)	

- Portable Telephone Description:

Device name	CF 768
Serial number	UA200J8D7N
Mode	GSM
Signal Modulation	TDMA
Duty Cycle	1 / 8
Peak Power Nominal	28 dBm
Center Frequency	1880 MHz

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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

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

Sensitivity in tissue simulating liquid:	1 μW/g to 100 μW/g
Linearity:	< ± 0.2 dB
Deviation from isotropy in tissue,	
Normal to probe axis:	± 0.2 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. A base station simulator was used to control the phone during the SAR measurements. The phone was supplied with a fully-charged battery for the tests. 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 80°.

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 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 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 measured 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 and the SAR values for the low, middle and high frequencies of the band are shown in Table 1. The device was tested on the right hand phantom (corresponding to the right side of the head) and the left hand phantom. Results are presented for the left hand phantom according to [I], as the SAR measurements for the right hand phantom were always lower. The conducted output power was measured with a base station simulator. The SAR results shown are maximum SAR values averaged over 1 g and 10 g of tissue. These SAR values are within the FCC limits for the uncontrolled RF exposure environment.

Device	Antenna Position	*f* (MHz)	Peak output power (dBm)	SAR(1g) (mW/g)	SAR(10g) (mW/g)
CF 768	**extended**	**1850**	**28.7**	0.300	0.152
		1880	**28.5**	0.365	0.185
		1910	**28.3**	**0.398**	**0.205**
	retracted	**1850**	**28.7**	0.664	0.351
		1880	**28.5**	0.717	0.374
		1910	**28.3**	**0.725**	**0.381**

Table 1: SAR measurement results for the Ericsson CF 768 telephone at maximum rated output power.

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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 CF 768 TELEPHONE*

[3] *POSITION OF ERICSSON CF 768 ON GENERIC TWIN PHANTOM*

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APPENDIX [1]

SAR DISTRIBUTION PLOTS

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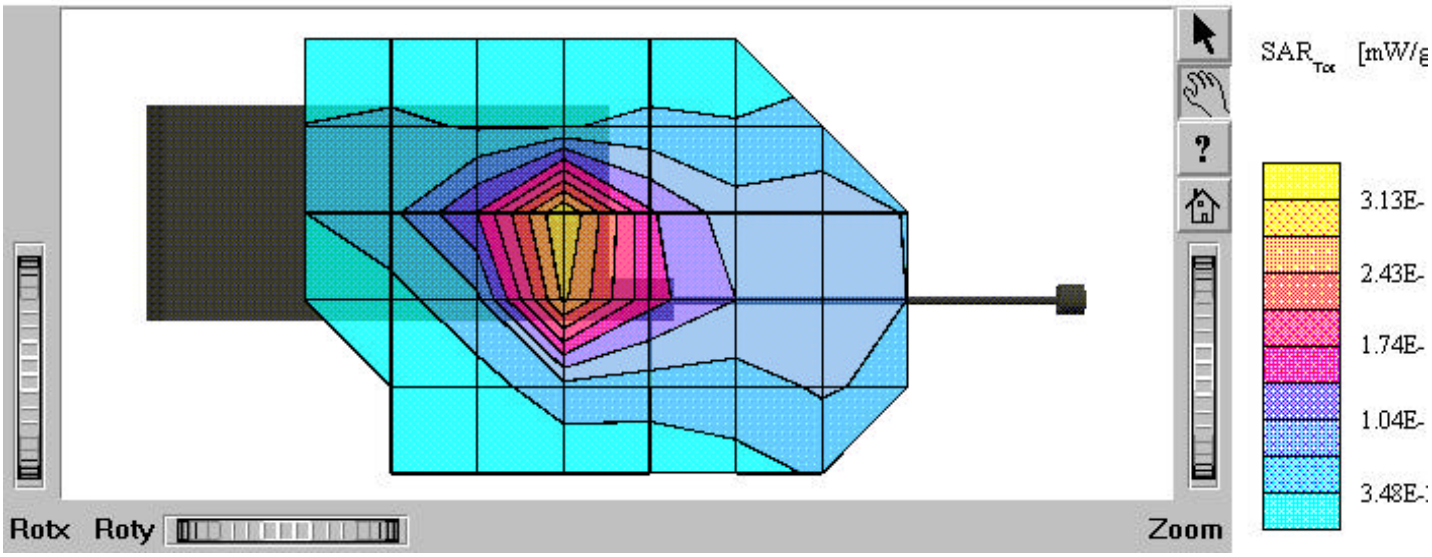
Patrica Erika

Generic Twin Phantom; Left Hand Section; Position: (80°,65°); Frequency: 1910 [MHz]
Probe: ET3DV5 - SN1324; ConvF(4.24,4.24,4.24); Crest factor: 8.0;
Medium: Brain 1800 MHz: σ = 1.73 [mho/m] ε_r = 40.2 ρ = 1.03 [g/cm^3]
Cube 5x5x7: SAR (1g): 0.398 [mW/g], SAR (10g): 0.205 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.03 dB
S/N: UA200J8D7N



SAR distribution plot for CF 768 with antenna extended at *f* = 1910 MHz.

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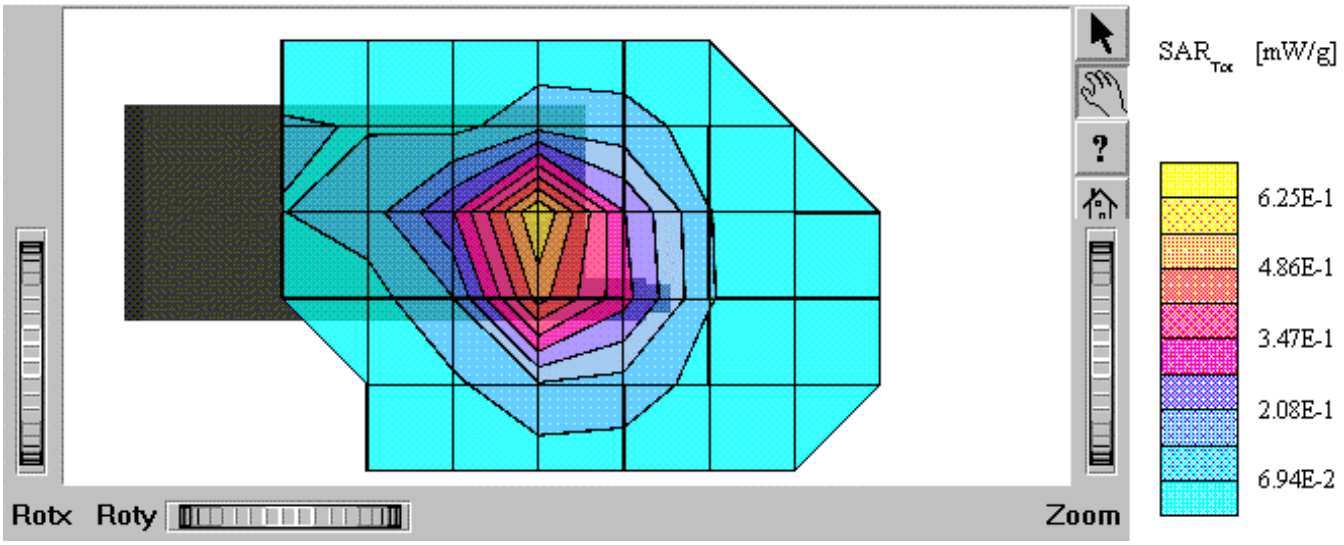
Probe: ET3DV5 - SN1324; ConvF(4.24,4.24,4.24); Crest factor: 8.0;
Medium: Brain 1800 MHz: σ = 1.73 [mho/m] ε_r = 40.2 ρ = 1.03 [g/cm^3]
Cube 5x5x7: SAR (1g): 0.725 [mW/g], SAR (10g): 0.381 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.02 dB
S/N: UA200J8D7N



SAR distribution plot for CF 768 with antenna retracted at *f* = 1910 MHz.

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APPENDIX [2]

PICTURES OF ERICSSON CF 768

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Ericsson CF 768 front view.

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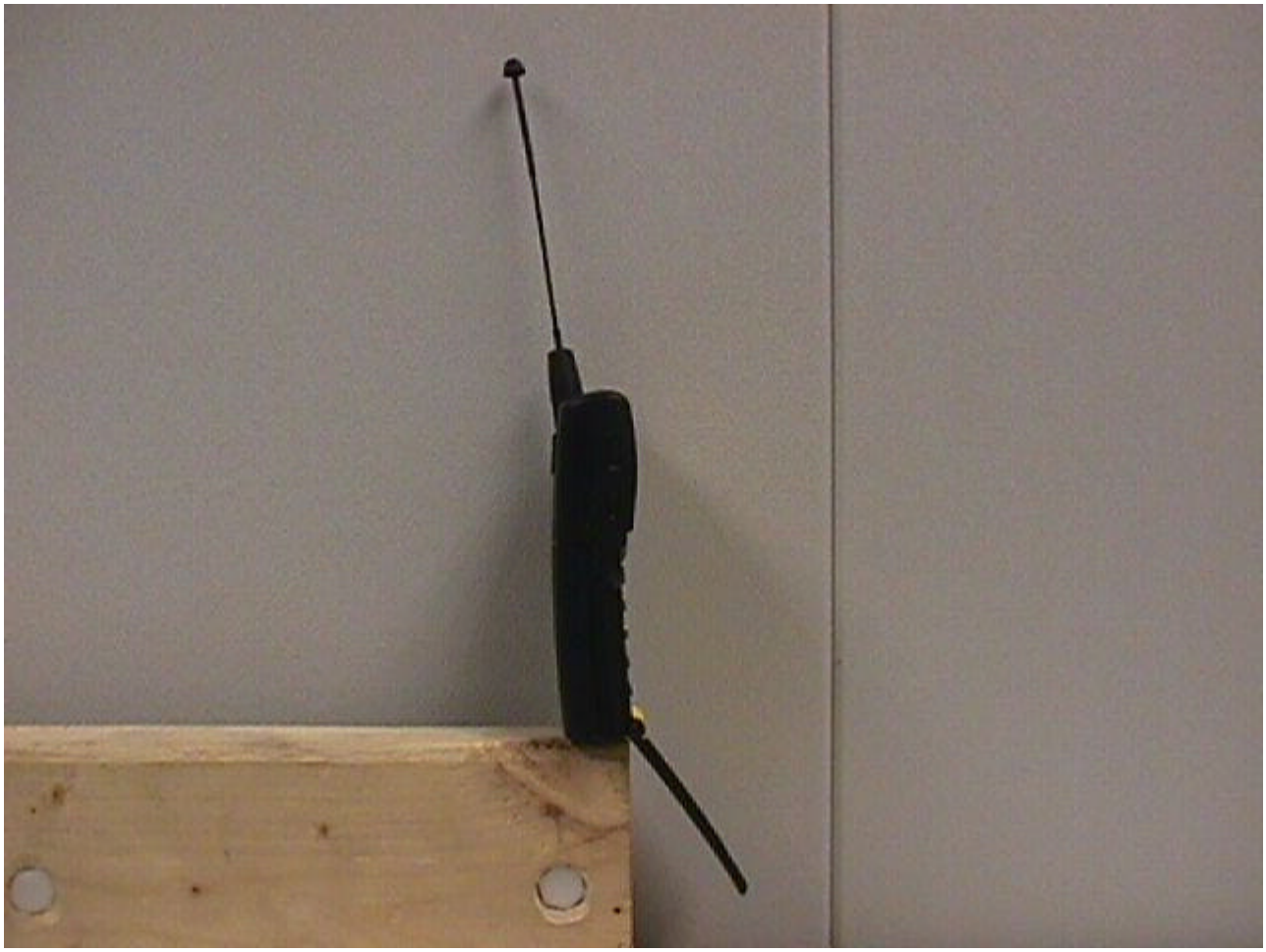

Ericsson CF 768 side view.

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APPENDIX [3]

POSITION OF ERICSSON CF 768 ON GENERIC TWIN PHANTOM

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Ericsson CF 768 on left side of phantom.