

Specific Absorption Rate (SAR) Test Report

for

Chi Mei Communications Systems, Inc

on the

Pocket PC

Model Number: EDS01

Test Report: 30223681

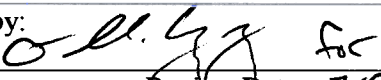
Date of Report: March 26, 2002

Date of Revision: July 24, 2002

Job #: 3022368

Date of Test: March 21 to 22, 2002

Total No of Pages Contained in this Report: 53

Tested by: 	Suresh Kondapalli, Test Engineer
Reviewed by:  for	David Chernomordik, Ph.D., EMC Technical Manager

Review Date: 7/25/02

All services undertaken are subject to the following general policy: Reports are submitted for exclusive use of the client to whom they are addressed. Their significance is subject to the adequacy and representative character of the samples and to the comprehensiveness of the tests, examinations or surveys made. This report shall not be reproduced except in full, without written consent of Intertek Testing Services, NA Inc..



Warnock Herse



emc



TABLE OF CONTENTS

1.0	JOB DESCRIPTION	3
1.1	Client Information	3
1.2	Equipment under test (EUT).....	3
1.1	Test Plan Reference	4
1.2	System Test Configuration	4
1.2.1	System Block Diagram & Support equipment.....	4
1.2.1	Test Position	5
1.4.3	Test Condition.....	6
1.1	Modifications required for compliance.....	6
1.2	Additions, deviations and exclusions from standards	6
2.0	SAR EVALUATION.....	7
2.1	SAR Limits	7
2.2	Configuration Photographs.....	8
2.3	System Verification	14
2.4	Evaluation Procedures.....	14
2.5	Test Results.....	15
3.0	TEST EQUIPMENT.....	17
3.1	Equipment List.....	17
3.2	Muscle Tissue Simulating Liquid.....	18
3.3	E-Field Probe Calibration.....	19
3.4	Measurement Uncertainty	19
3.5	Measurement Tractability.....	21
4.0	WARNING LABEL INFORMATION - USA.....	22
5.0	REFERENCES.....	23
5.0	DOCUMENT HISTORY.....	24
	APPENDIX A - SAR Evaluation Data.....	25
	APPENDIX B - E-Field Probe Calibration Data.....	34
	APPENDIX C – Calibration Certificate, 1800 MHz Dipole.....	47

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

1.0 JOB DESCRIPTION**1.1 Client Information**

The EDS01 has been tested at the request of:

Company: Chi Mei Communications Systems, Inc
11 F, No. 39, Chung Hua Road Sec. 1
Taipei, Taiwan 100
China

Name of contact: Mr. Eric You
Telephone: +886-2-2370-8699, Ext 2513
Fax: +886-2-2370-8399

1.2 Equipment under test (EUT)**Product Descriptions:**

Equipment	Pocket PC		
Trade Name	CMCS Edison	P/N.	EDS01
FCC ID	QDJ-200205ED01	S/N No.	Not Labeled
Category	Portable	RF Exposure	Uncontrolled Environment
Frequency Band	PCS: 1850 - 1990MHz	System	GSM

EUT Antenna Description			
Type	Monopole	Configuration	Fixed, 360° Rotation
Dimensions	35.5 mm (L),	Gain	0 dBi
Location	Left Side		

Use of Product : Wireless Data Communications

Manufacturer: Chi Mei Communications Systems, Inc

Production is planned: [X] Yes, [] No

EUT receive date: March 21, 2002

EUT received condition: Good working condition prototype

Test start date: March 21, 2002

Test end date: March 22, 2002

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

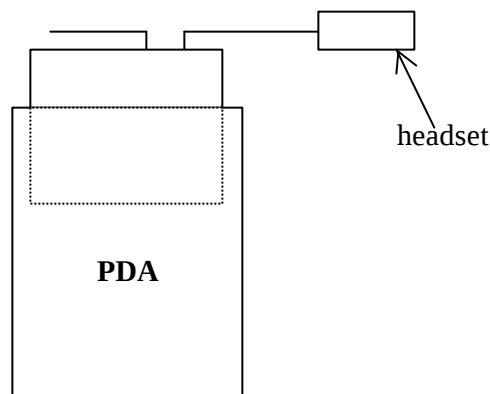
1.1 Test Plan Reference

FCC rule part 2.1093, Supplement C to OET Bulletin 65 (Edition 01-01)

1.2 System Test Configuration

1.2.1 System Block Diagram & Support equipment

The diagram shown below details test configuration of the equipment under test.



EUT was tested with PDA HP Jornada, Model 735

EUT was tested with Rohde & Schwarz Base station Simulator CMD55 . The test sample was operated in a test mode that allows control of the transmitter without the need to place actual phone calls. For the purposes of this test the device was commanded to test mode and set to the proper channel, transmitter power levels and transmit mode of operation with CMD 55. The device was then placed in the SAR measurement system with a fully charged battery.

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

1.2.1 Test Position

Three test configurations were used to show compliance with the FCC RF human exposure requirements. In all configurations, the EDS01 was configured for testing in a typical fashion (as a customer would normally use it). Due to the application and usage of the product, SAR measurements with the human head region are not necessary. Table 1 below describes the setup and condition:

Table 1, Equipment Setup	
Configuration	Description
A	Antenna in horizontal position, PDA is touching the Phantom, distance from antenna to the Phantom = 2 mm
B	Antenna in horizontal position, PDA is 5 mm from the Phantom, distance from antenna to Phantom = 7 mm

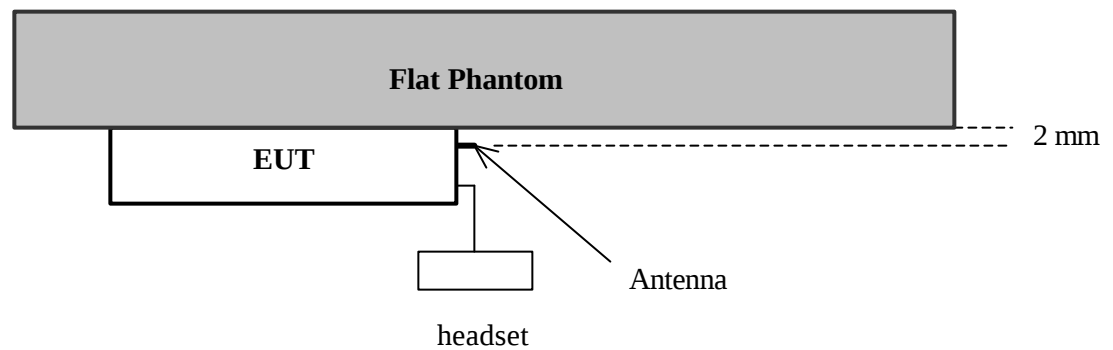


Figure 1: Configuration A

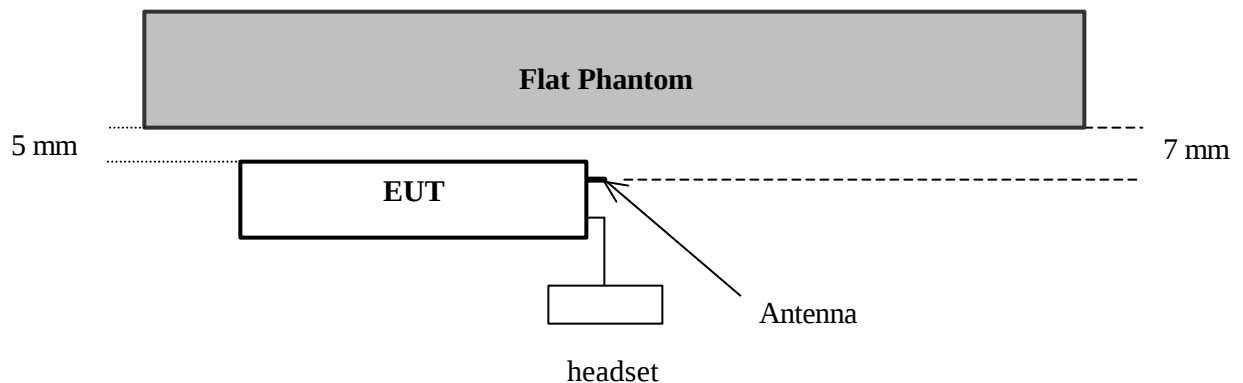


Figure 1: Configuration B

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

1.4.3 Test Condition

During tests, the worst case data (max. RF coupling) was determined with following conditions:

EUT Antenna	Fixed length	Orientation	N/A
Usage	Operates with a PDA	Distance between antenna axis at the joint and the phantom:	7 mm Configuration B
Simulating human Body/hand	Body	EUT Battery	Fully charged
Frequency	PCS band: Low: 1850.2 MHz, Mid: 1879.8 MHz, High: 1909.8 MHz		
Conducted output Power (peak)	1850.2 MHz 28.06 dBm	1880.0 MHz 27.89 dBm	1909.8 MHz 28.20 dBm

* Power output level was provided by customer.

The spatial peak SAR values were accessed for lowest, middle and highest operating channels defined by the manufacturer.

EUT was tested with PDA HP Jornada, Model 735

1.1 Modifications required for compliance

No modifications were implemented by Intertek Testing Services.

1.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standard.

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.0 SAR EVALUATION

2.1 SAR Limits

The following FCC limits for SAR apply to devices operate in General Population/Uncontrolled Exposure environment:

EXPOSURE (General Population/Uncontrolled Exposure environment)	SAR (W/kg)
Average over the whole body	0.08
Spatial Peak (1g)	1.60
Spatial Peak for hands, wrists, feet and ankles (10g)	4.00

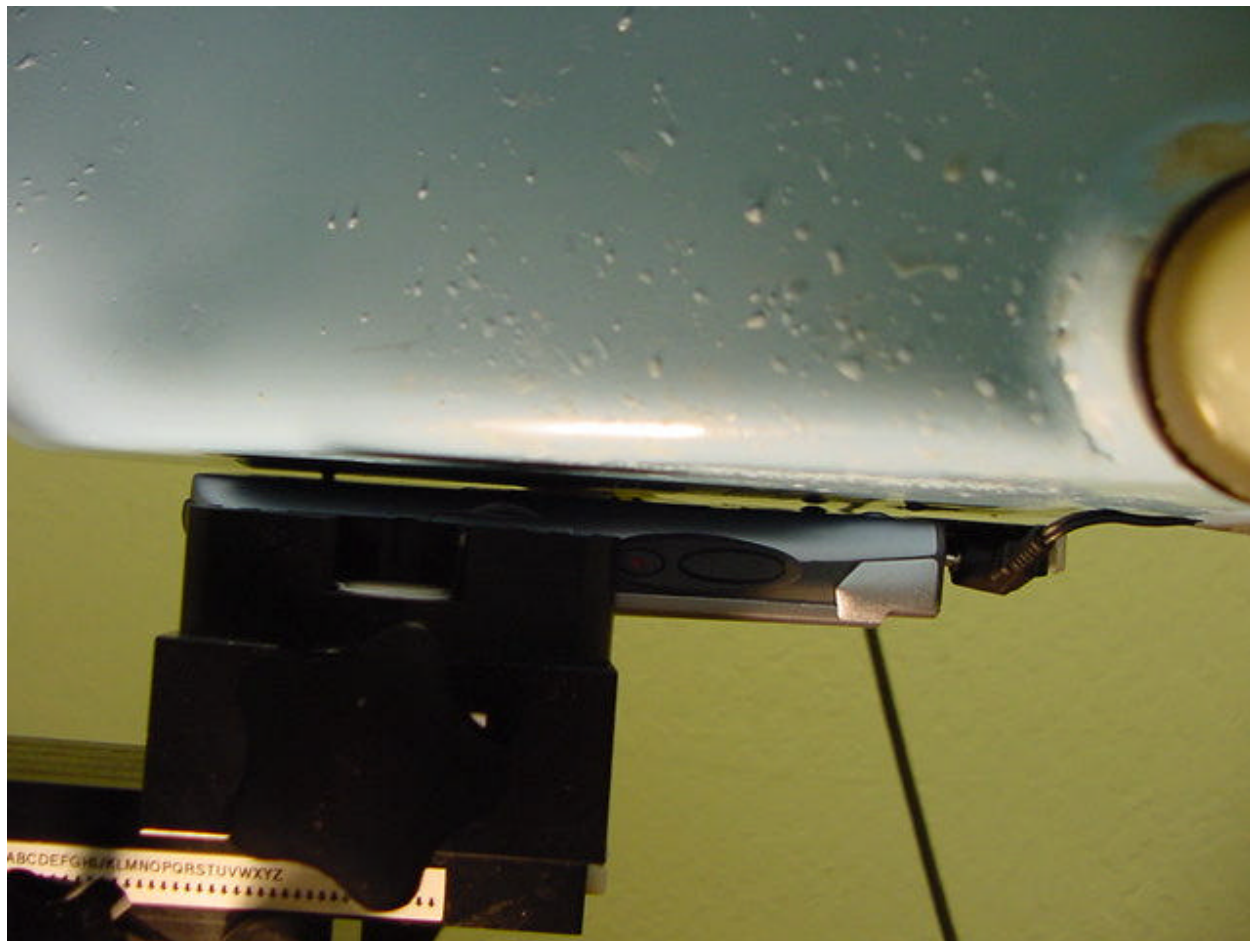
Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.2 Configuration Photographs

SAR Measurement Test Setup

(configuration A)

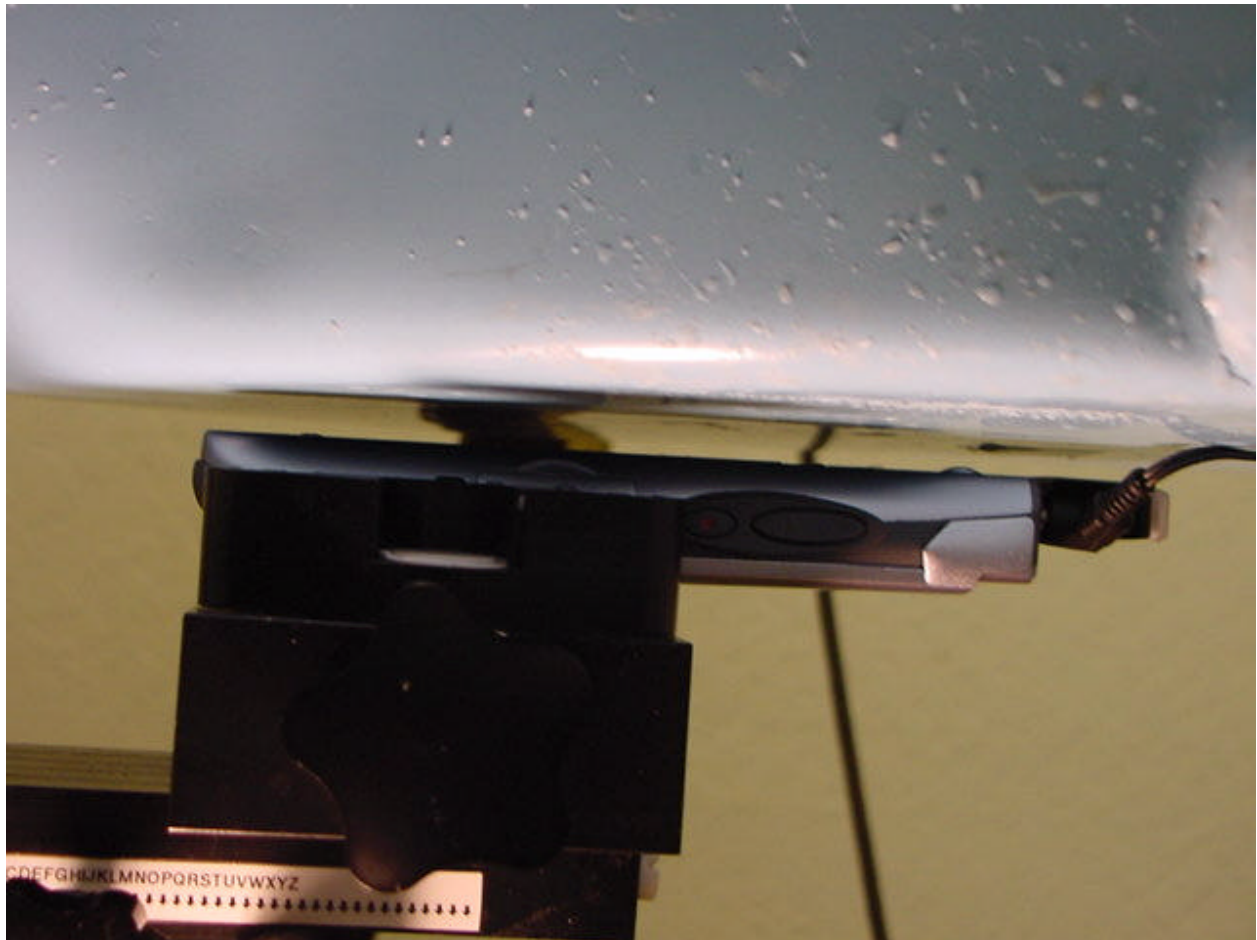


Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.2 Configuration Photographs (Continued)

SAR measurement Test Setup (configuration B)



Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.2 Configuration Photographs (Continued)

SAR measurement Test Setup

EUT Photo



Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.2 Configuration Photographs (Continued)

SAR measurement Test Setup

EUT Photo



Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.2 Configuration Photographs (Continued)

SAR measurement Test Setup

EUT Photo



Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.2 Configuration Photographs (Continued)

SAR measurement Test Setup

EUT Photo



Chi Mei Communications Systems, Inc, Model No: EDS01
 FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.3 System Verification

Prior to the assessment, the system was verified to the $\pm 10\%$ of the specifications by using the system validation kit. The validation was performed at 1800 MHz.

Validation kit	Targeted SAR _{1g} (mW/g)	Measured SAR _{1g} (mW/g)
#: 0013	9.76	9.17 *

* see plot #7

2.4 Evaluation Procedures

The SAR evaluation was performed with the following procedures:

- a. SAR was measured at a fixed location above the reference point and used as a reference value for the assessing the power drop.
- b. The SAR distribution at the exposed side of the flat Phantom was measured at a distance of 30 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.
- c. Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure:
 - i) The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measurement point is 1.6 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in Z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
 - ii) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum, the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3-D spline interpolation algorithm. The 3-D spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y and z directions). The volume was integrated with the trapezoidal algorithm. 1000 points (10 x 10 x 10) were interpolated to calculate the average.
 - iii) All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
- d. Re-measurements of the SAR value at the same location as in step a. above. If the value changed by more than 5 %, the evaluation was repeated.

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

2.5 Test Results

The results on the following page(s) were obtained when the device was tested in the condition described in this report. Detail measurement data and plots, which reveal information about the location of the maximum SAR with respect to the device, are reported in Appendix A.

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

Measurement Results

Trade Name:	CMCS Edison	Model No.:	EDS01
Serial No.:	Not Labeled	Test Engineer:	Suresh Kondapalli

TEST CONDITIONS			
Ambient Temperature	23.5 °C	Relative Humidity	55 %
Liquid Temperature	22 ? 0.5 °C	Signal Modulation	GSM
Test Signal Source	Test Mode	Output Power After SAR Test	Changes < 0.03dB
Output Power Before SAR Test	See page 6	Number of Battery Change	New Battery for every scan
Test Duration	23 Min. each scan		

Configuration A PDA is touching the Phantom					
Channel	Operating Mode	Crest Factor	Measured SAR _{1g} (mW/g)	Measured SAR _{10g} (mW/g)	Plot Number
1850	GSM	8	1.60	0.78	1
1880	GSM	8	2.17	1.06	2
1910	GSM	8	2.90	1.41	3

Configuration B PDA is 5 mm from the Phantom					
Channel	Operating Mode	Crest Factor	Measured SAR _{1g} (mW/g)	Measured SAR _{10g} (mW/g)	Plot Number
1880	GSM	8	0.917	0.454	4
1850	GSM	8	0.663	0.348	5
1910	GSM	8	0.906	0.453	6

Dipole					
Channel	Operating Mode	Crest Factor	Measured SAR _{1g} (mW/g)	Measured SAR _{10g} (mW/g)	Plot Number
1800	CW	1	9.17	4.90	7

Note: a) Worst case data were reported
b) Duty cycle factor included in the measured SAR data
c) Uncertainty of the system is not included

Chi Mei Communications Systems, Inc, Model No: EDS01
 FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

3.0 TEST EQUIPMENT

3.1 Equipment List

The Specific Absorption Rate (SAR) tests were performed with the SPEAG model DASY 3 automated near-field scanning system, which is a package, optimized for dosimetric evaluation of mobile radios [3].

The following major equipment/components were used for the SAR evaluations:

SAR Measurement System			
EQUIPMENT	SPECIFICATIONS	S/N #	LAST CAL. DATE
Robot	Stäubli RX60L	597412-01	N/A
	Repeatability: $\pm 0.025\text{mm}$ Accuracy: 0.806×10^{-3} degree Number of Axes: 6		
E-Field Probe	ET3DV6	1576	02/27/02
	Frequency Range: 10 MHz to 6 GHz Linearity: ± 0.2 dB Directivity: ± 0.1 dB in brain tissue		
Data Acquisition	DAE3	317	N/A
	Measurement Range: $1\mu\text{V}$ to $>200\text{mV}$ Input offset Voltage: $< 1\mu\text{V}$ (with auto zero) Input Resistance: 200 M		
Phantom	Generic Twin V3.0	N/A	N/A
	Type: Generic Twin, Homogenous Shell Material: Fiberglass Thickness: 2 ± 0.1 mm Capacity: 20 liter Ear spacer: 4 mm (between EUT ear piece and tissue simulating liquid)		
Simulated Tissue	Mixture	N/A	03/21/02
	Please see section 3.2 for details		
Power Meter	HP 8900D w/ 84811A sensor	3607U00673	08/08/01
	Frequency Range: 100kHz to 18 GHz Power Range: $300\mu\text{W}$ to 3W		

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

3.2 Muscle Tissue Simulating Liquid

Ingredient	
DGBE Dilethylene Glycol	44.92%
Toniton X-100 (Polyethylene Glycol Mono) Ether	0.1%
Salt	0.18%
Water	54.8%

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C network Analyzer. The dielectric parameters were:

Frequency (MHz)	ϵ_r^*	σ^* (mho/m)	ρ^{**} (kg/m ³)
1880	55.8	1.49	1000

* Worst case uncertainty of the HP 85070A dielectric probe kit

** Worst case assumption

Brain Simulating Liquid Ingredients

Brain Simulating Liquid Ingredients Frequency (1800 MHz)	
Water	52.90 %
Salt	0.181%
DGBE Diethylene Glycol	44.92%
ton X-100 (Polyethylene Glycol Mono) Ether	0.1 %

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C network Analyzer. The dielectric parameters were:

Frequency (MHz)	ϵ_r^*	σ^* (mho/m)	ρ^{**} (kg/m ³)
1800	40.9	1.35	1000

* Worst case uncertainty of the HP 85070A dielectric probe kit

** Worst case assumption

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

3.3 E-Field Probe Calibration

Probes were calibrated by the manufacturer in the TEM cell ifi 110. To ensure consistency, a strict protocol was followed. The conversion factor (ConF) between this calibration and the measurement in the tissue simulation solution was performed by comparison with temperature measurement and computer simulations. Probe calibration factors are included in Appendix C.

3.4 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the Draft IEEE Standard 1528-200X April 4, 2002 and is given in the following table. The extended uncertainty (K=2) was assessed to be 21.8 %

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

a	c	d	$e = f(d,k)$	F	g	$h = c \times f / e$	$i = c \times g / e$
Uncertainty Component	Tol. (? %)	Prob. Dist.	Div.	c_i (1-g)	c_i (10-g)	1-g u_i (? %)	10-g u_i (? %)
Measurement System							
Probe Calibration	3.3	N	1	1	1	3.3	3.3
Axial Isotropy	2.4	R	?3	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	1.0	1.0
Hemispherical Isotropy	1.2	R	?3	? c_p	? c_p	0.5	0.5
Boundary Effect	1.0	R	?3	1	1	1.0	1.0
Linearity	2.7	R	?3	1	1	1.5	1.5
System Detection Limits	0.6	R	?3	1	1	0.3	0.3
Readout Electronics	1.0	N	1	1	1	1.0	1.0
Response Time	0.8	R	?3	1	1	0.5	0.5
Integration Time	3.0	R	?3	1	1	1.7	1.7
RF Ambient Conditions	0.25	R	?3	1	1	0.3	0.3
Probe Positioner Mechanical Tolerance	1.0	R	?3	1	1	1.0	1.0
Probe Positioning with respect to Phantom Shell	2.9	R	?3	1	1	1.7	1.7
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	3.0	R	?3	1	1	1.7	1.7
Test sample Related							
Test Sample Positioning	6.0	N	1	1	1	6.0	6.0
Device Holder Uncertainty		N	1	1	1	5.9	5.9
Output Power Variation - SAR drift measurement	1.0	R	?3	1	1	1.0	1.0
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	4.0	R	?3	1	1	2.3	2.3
Liquid Conductivity Target - tolerance	5.0	R	?3	0.7	0.5	2.0	1.4
Liquid Conductivity - measurement uncertainty	5.0	R	?3	0.7	0.5	2.0	1.4
Liquid Permittivity Target tolerance	5.0	R	?3	0.6	0.5	1.7	1.4
Liquid Permittivity - measurement uncertainty	5.0	R	?3	0.6	0.5	1.7	1.4
Combined Standard Uncertainty		RSS				10.9	10.6
Expanded Uncertainty (95% CONFIDENCE INTERVAL)						21.8	21.2

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

Notes.

1. Column heading abbreviations:

Tol. - tolerance in influence quantity. If $c_i = 1$, this is a SAR tolerance.

N, R, U - normal, rectangular, U-shaped probability distributions

Div. - divisor used to get standard uncertainty

2. The divisor is a function of the probability distribution and degrees of freedom (ν_i and ν_{eff}). See NIST Technical Note TN1297, NIS 81 and NIS 3003 for further discussions.
3. c_i is the sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
4. See Annex F.2.3 for discussions on degrees of freedom (ν_i) for standard uncertainty and effective degrees of freedom (ν_{eff}) for the expanded uncertainty.
5. Interim dielectric constant tolerance of 10% may be used for glycol-based liquids at frequencies above 2 GHz.

3.5 Measurement Tractability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards or appropriate national standards.

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

4.0 WARNING LABEL INFORMATION - USA

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with an accessory that contains no metal and that positions the device a minimum of 5 mm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

5.0 REFERENCES

- [1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, The Institute of electrical and Electronics Engineers, Inc., New York, NY 10017, 1992
- [2] Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”, OET Bulletin 65, FCC, Washington, D.C. 20554, 1997
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, “Automated E-field scanning system for dosimetric assessments”, *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.
- [4] Niels Kuster, Ralph Kastle, and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with know precision”, *IEICE Transactions on Communications*, vol. E80-B, no. 5, pp.645-652, May 1997.
- [5] NIS81, NAMAS, “The treatment of uncertainty in EMC measurement”, Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddinton, Middlesex, England, 1994.
- [6] Barry N. Taylor and Chris E. Kuyatt, “Guidelines for evaluating and expressing the uncertainty of NIST measurement results”, Tech. Rep., National Institute of Standards and Technology, 1994.

Chi Mei Communications Systems, Inc, Model No: EDS01
FCC ID: QDJ-200205ED01

Date of Test: March 21 to 22, 2002

5.0 DOCUMENT HISTORY

Revision/ Job Number	Writer Initials	Date	Change
1.0 /3022368	SS	March 26, 2002	Original document