ITS Intertek Testing Services
ETL SEMKO

Specific Absorption Rate (SAR) Test Report
for
Arima Communication
on the
Single Band Phone – GSM 1900
Model Number: Arima M2001C

Test Report: 20395891
Date of Report: February 16, 2001

Job #: J20039589
Date of Test: February 4, 2001

Total No of Pages Contained in this Report: 23 + Data Sheets

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1.0 Job description

1.1 Client Information

The Arima M2001C has been tested at the request of

Company: Arima Communication
6th Fl., No 349 Jen Ho Road,
Taoyuan, Taiwan
Republic of China

Name of contact: Mr. Rong Ho
Telephone: (86) 755-9502 ext. 112/119
Fax: (86) 755-9502 ext. 115

1.2 Equipment under test (EUT)

Product Descriptions:

Equipment	Single Band Cellular Phone		
Trade Name	Arima Communication	Model No	Arima M2001C
FCC ID	N/A	S/N No.	N/A
Category	Portable	RF Exposure	Uncontrolled Environment
Frequency Band	1860 – 1910 MHz	System	GSM 1900 (PCS)

EUT Antenna Description			
Type	Monopole	Configuration	Fixed
Dimensions	26mm (L)	Gain	0 dBi
Location	Top, Right		

Use of Product : Voice Communication

Manufacturer: SAME as above.

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

EUT receive date: February 4, 2001

EUT received condition: Good working condition prototype

Test start date: February 4, 2001

Test end date: February 4, 2001

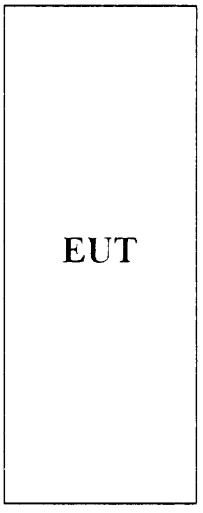
1.3 Test plan reference

FCC rule part 2.1093, FCC Docket 96-326 & Supplement C to OET Bulletin 65

1.4 System test configuration

1.4.1 System block diagram & Support equipment

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



1.4.2 Test Position

The Arima M2001C was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in C95.1 (1992) and Supplement C of OET 65 (1998). The EUT was placed in the intended use position, i.e. CENELEC 80° position. This position is defined by a reference plane and a line. The reference plane of the head is given by three points, the auditory canal opening of both ears and center of the closed mouth. The reference line of the EUT is defined by the line, which connects the center of the ear piece with the center of the bottom of the case and lies on the surface of the case facing the phantom. The reference line of the EUT lies in the reference plane of the head. The center of the ear-piece of the EUT is placed at the entry of the auditory canal. The angle between the reference line of the phone and the line connecting both auditory canal openings is 80°. Please refer to figure 1 below for the position details:

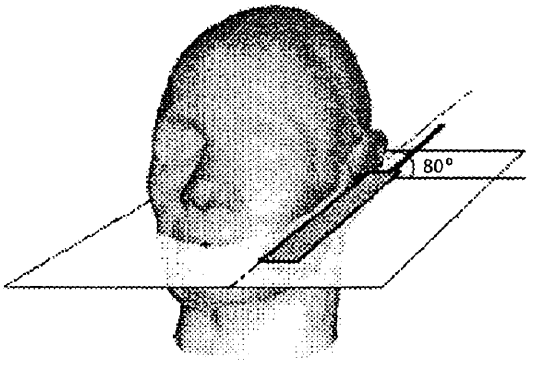


Figure 1: Intended use position

Additionally, the EUT was tested in a second position from the normal 80° angle between the reference line of the phone and the line connecting both auditory canal openings. The center of the ear piece of the EUT is placed at the entry of the auditory canal. The angle between the reference line of the phone and the line connecting both auditory canal openings was adjusted from 80° to the angle where two points of the phone were in contact with the phantom (ear hole and cheek).

Data pages indicate the position of the EUT during testing. The first position of 80° has data pages labeled '1 point touch'. The second position has data pages labeled '2 point touch'.

The left and right hand sections of the phantom were used for measuring the low, middle, and high channels in the 1 point touch and 2 point touch positions.

1.4.3 Test Condition

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

EUT Antenna	Fixed length	Orientation	80°
Usage	Left Hand & Right Hand	Distance between antenna axis at the joint and the liquid surface:	17.5mm
Simulating	Brain & Muscle	EUT Battery	Fully Charged battery
Power output - Maximum power at antenna port	1850.2 MHz, Ch 512: 32.0 dBm 1880. MHz, Ch 661: 31.6 dBm 1909.6 MHz, Ch 810: 31.0 dBm		

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

Antenna port power measurement was performed by manufacturer.

1.5 Modifications required for compliance

No modifications were implemented by Intertek Testing Services.

1.6 Additions, deviations and exclusions from standards

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

2.0 SAR EVALUATION

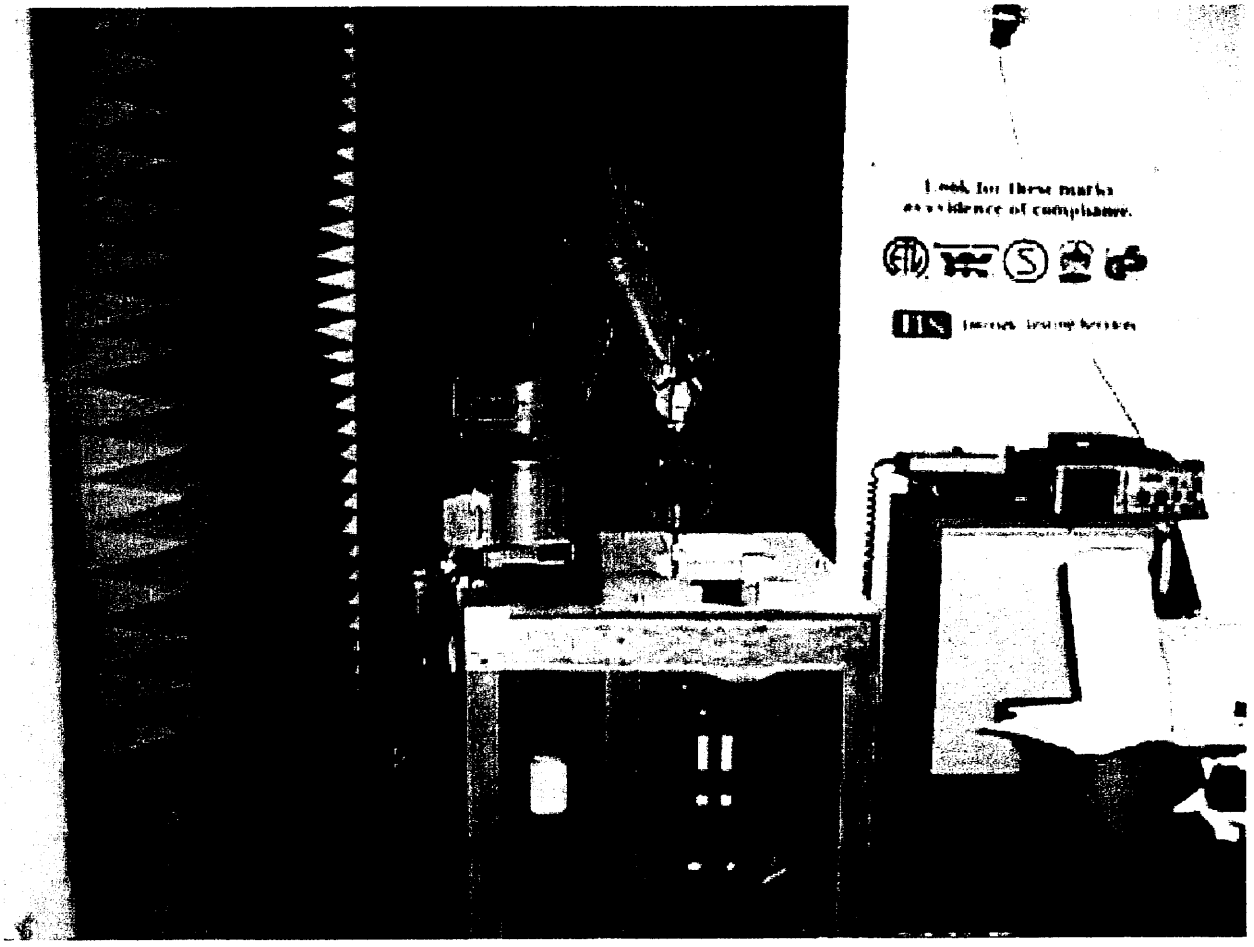
2.1 SAR Limits

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

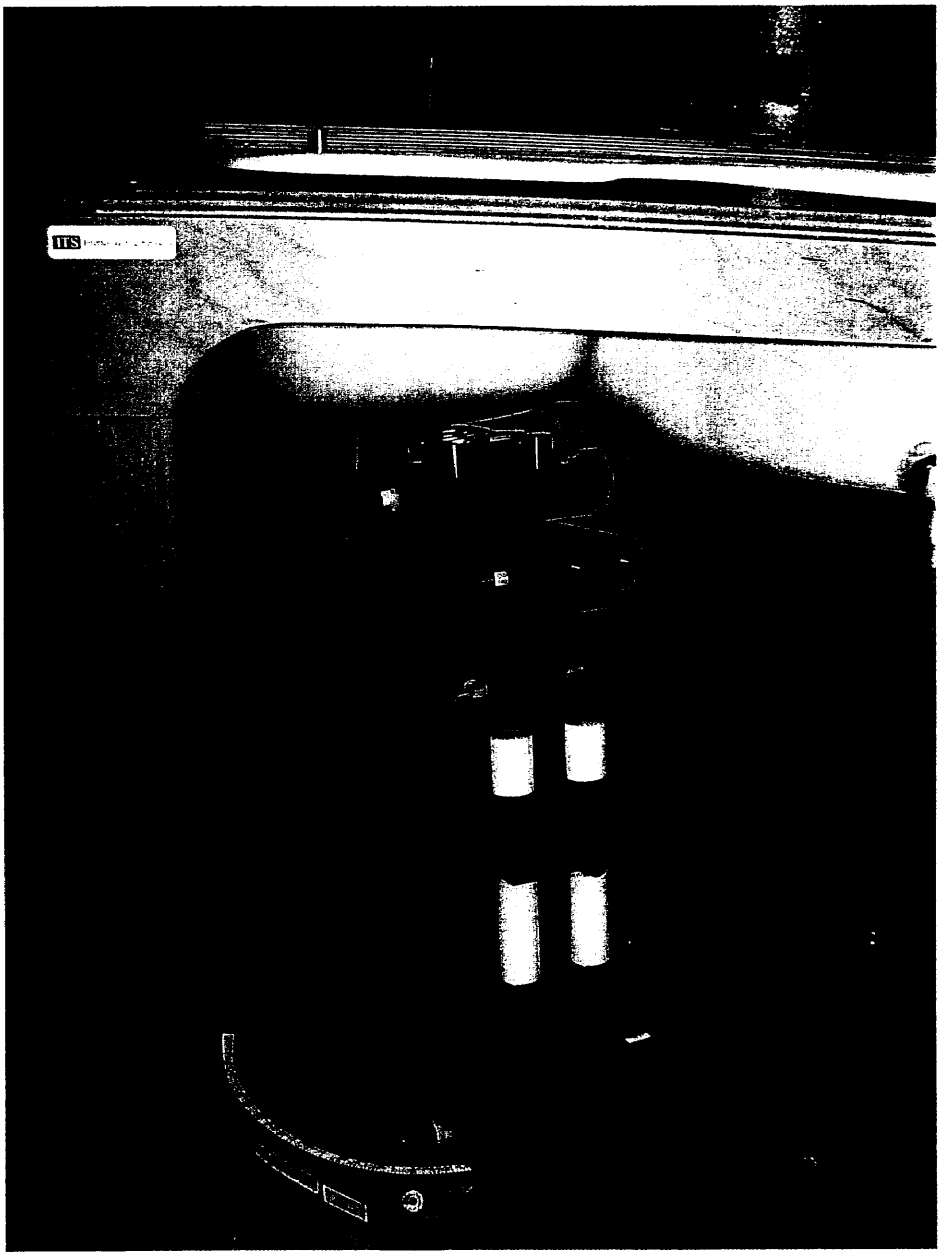
2.2 Configuration Photographs

SAR measurement Test Setup



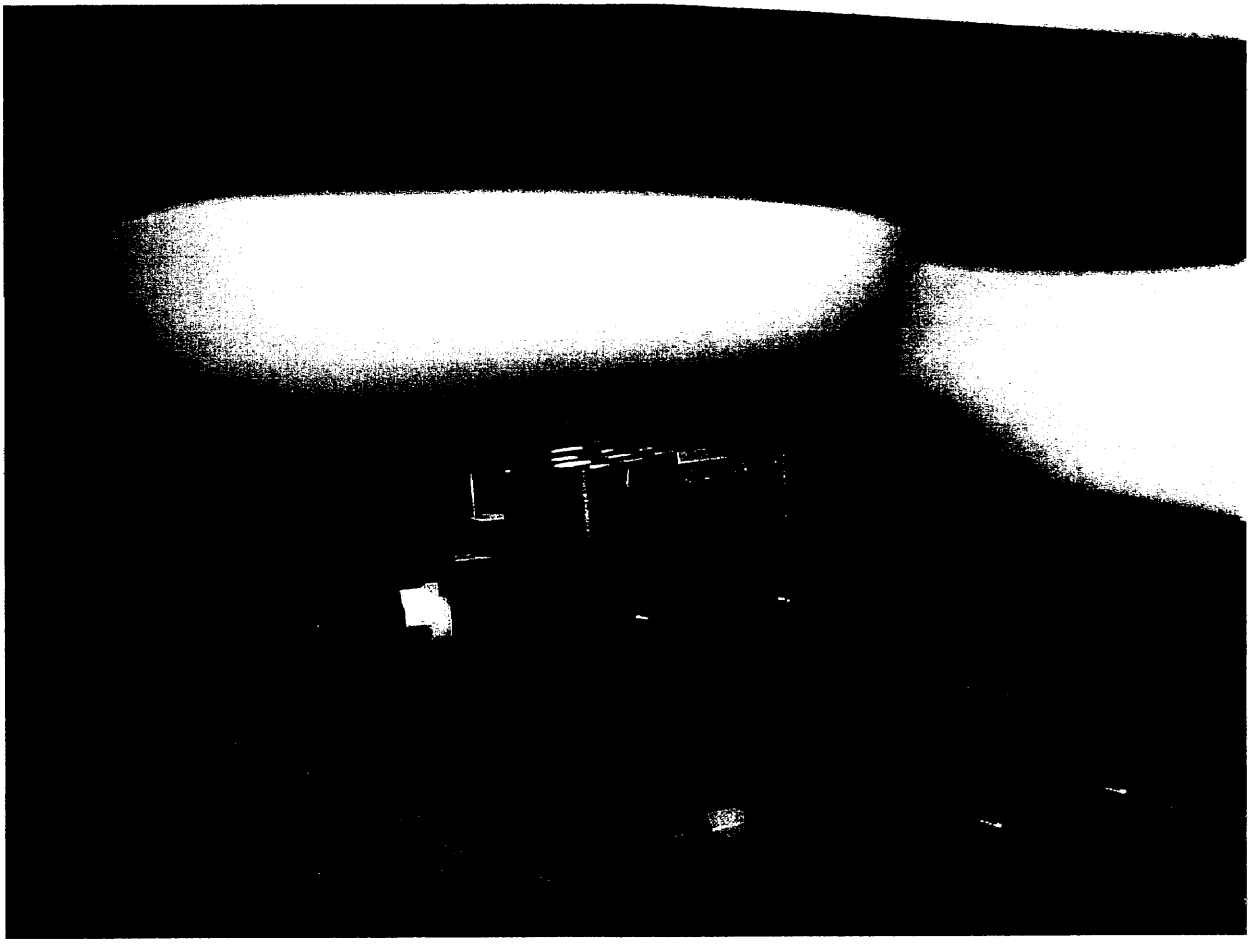
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



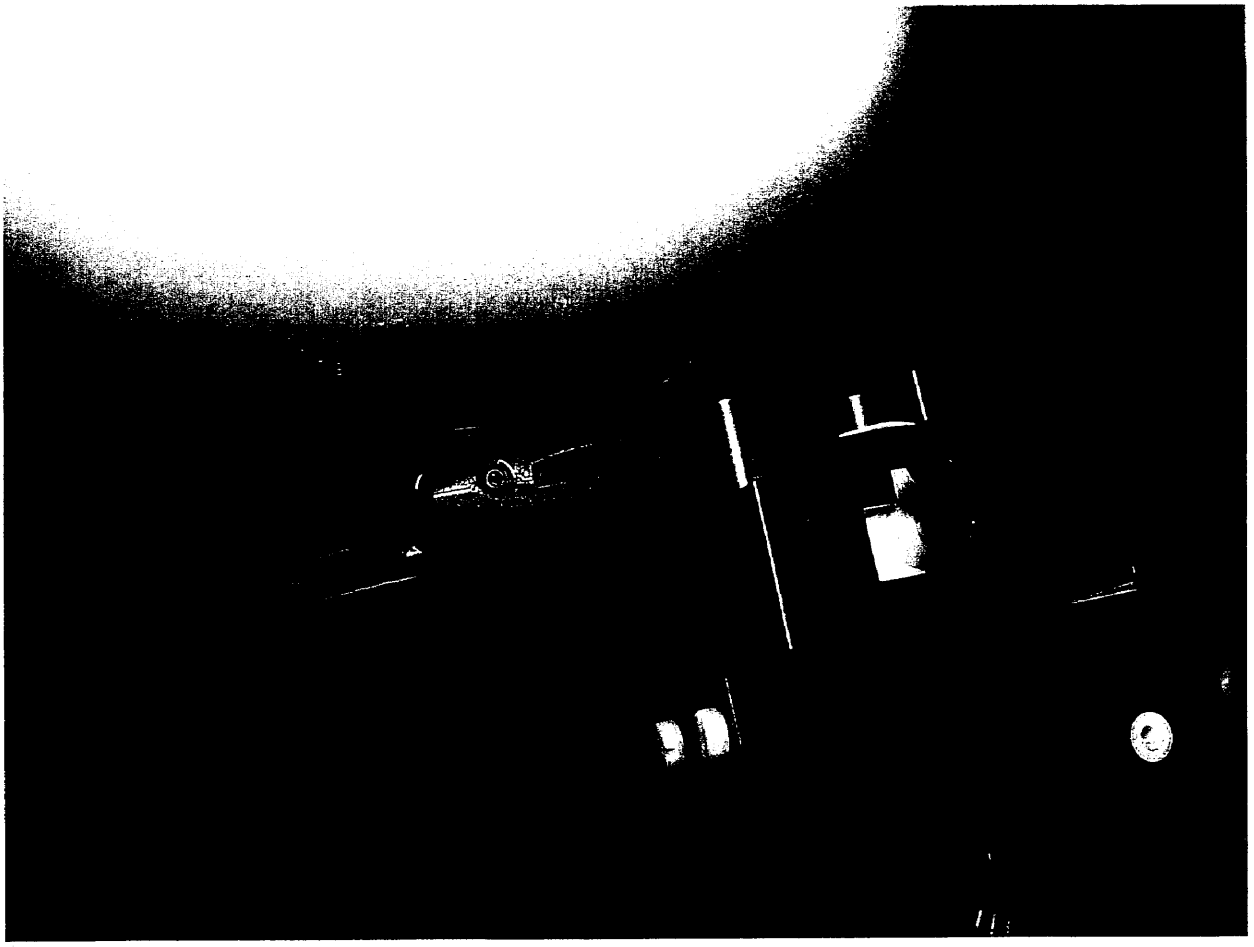
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



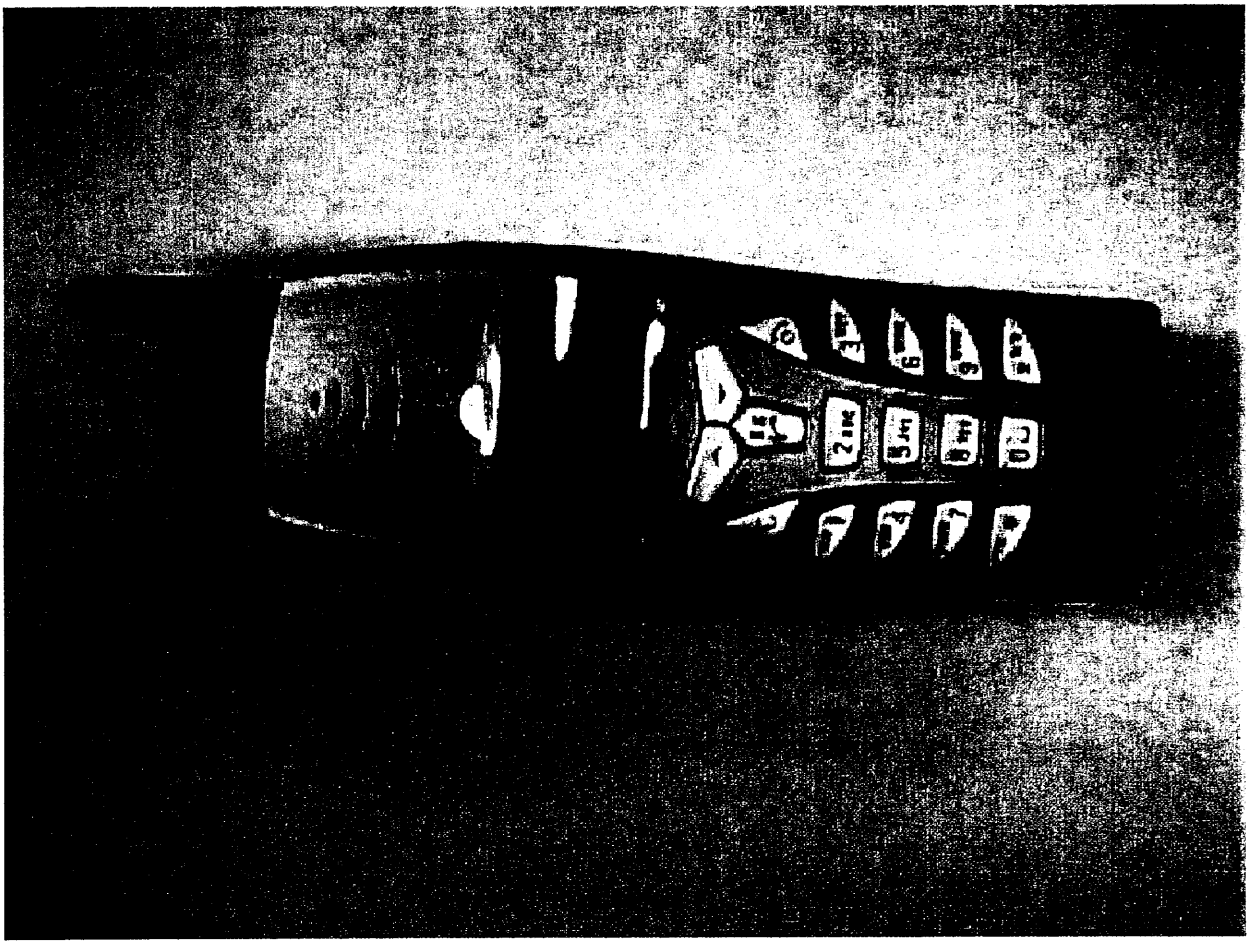
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



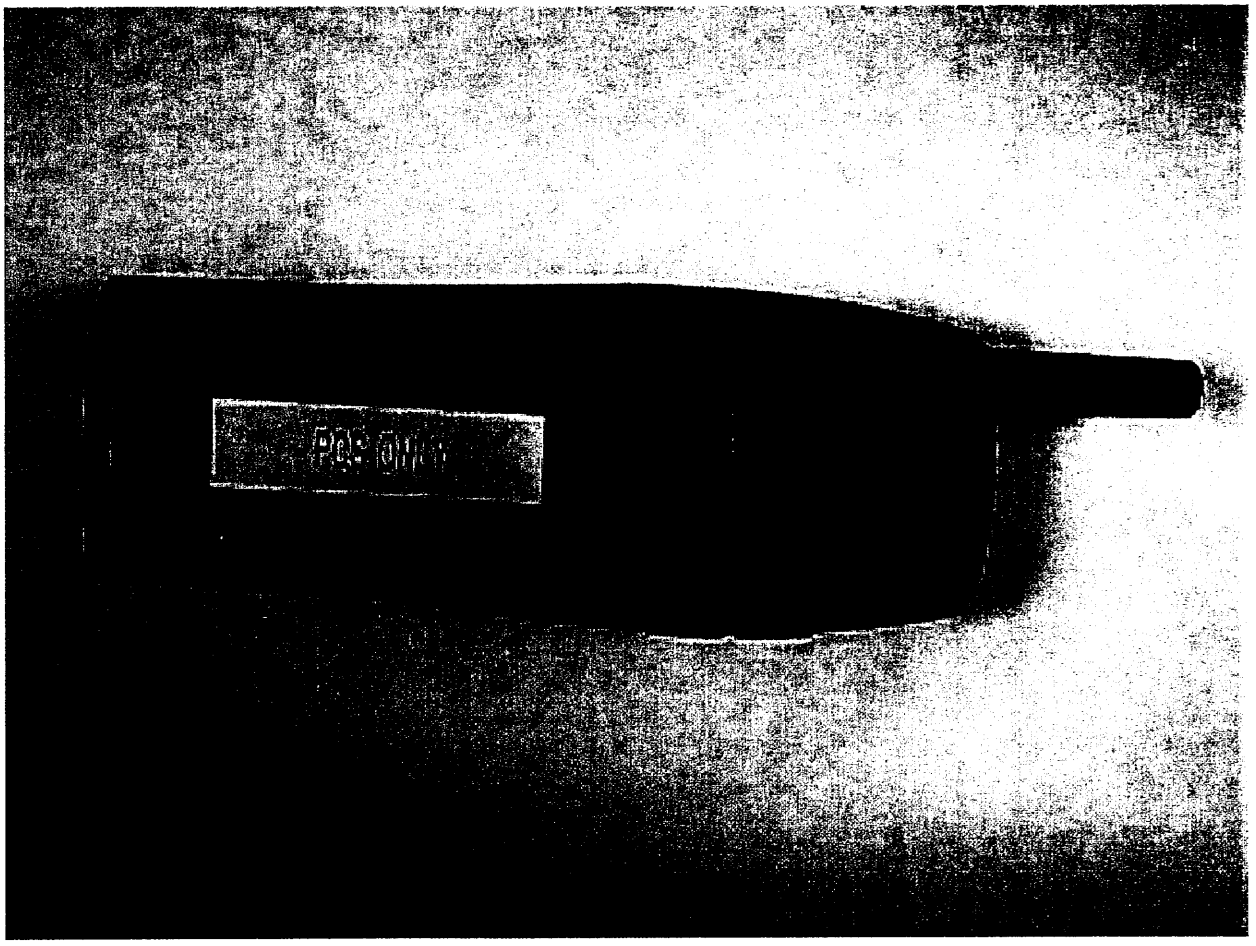
2.2 Configuration Photographs (Continued)

EUT Photo



2.2 Configuration Photographs (Continued)

EUT Photo



2.3 System Verification

Prior to the assessment, the system was verified to the ±5% of the specifications by using the system validation kit. The validation was performed at 900 MHz.

Validation kit	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)
D900V2, S/N #: 0013	4.03	3.9

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 straight-forward 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-measurement 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.

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.

Measurement Results

Trade Name:	Arima Communication	**Model No.:**	Arima M2001C
Serial No.:	Not Labeled	**Test Engineer:**	Xi-Ming Yang

TEST CONDITIONS			
Ambient Temperature	22.1 °C	Relative Humidity	52 %
Test Signal Source	Test Mode	Signal Modulation	GSM
Output Power Before SAR Test	1850.2 MHz, Ch 512: 32.0 dBm 1880. MHz, Ch 661: 31.6 dBm 1909.6 MHz, Ch 810: 31.0 dBm	Output Power After SAR Test	1850.2 MHz, Ch 512: 32.0 dBm 1880. MHz, Ch 661: 31.6 dBm 1909.6 MHz, Ch 810: 31.0 dBm
Test Duration	23 Min. each test	Number of Battery Change	Every Scan

EUT Position: Left Hand 80°				
Channel MHz	**Operating Mode**	**Duty Cycle ratio**	**Measured SAR_{1g} (mW/g)**	**Plot Number**
1850.4	GSM	8	1.32	2
1880.0	GSM	8	1.18	3
1909.8	GSM	8	0.915	4

EUT Position: Left Hand, 2 Points Touching Phantom				
Channel MHz	**Operating Mode**	**Duty Cycle ratio**	**Measured SAR_{1g} (mW/g)**	**Plot Number**
1850.4	GSM	8	1.12	1

EUT Position: Right Hand 80°				
Channel MHz	**Operating Mode**	**Duty Cycle ratio**	**Measured SAR_{1g} (mW/g)**	**Plot Number**
1850.4	GSM	8	1.25	5

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
d) 80° antenna to hand 17.5mm
e) Two-Touch antenna to hand 20.5mm

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 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 #	CAL. DATE
Robot	**Stäubi RX60L**	597412-01	N/A
	Repeatability: ± 0.025mm Accuracy: 0.806×10^{-3} degree Number of Axes: 6		
E-Field Probe	**ET3DV5**	1334	4/10/00
	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: 1μV to >200mV Input offset Voltage: < 1μV (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	1/26/01
	Please see section 6.2 for details		
Power Meter	**HP 8900D w/ 84811A sensor**	1312A01255	8/01/00
	Frequency Range: 100kHz to 18 GHz Power Range: 300μW to 3W		

3.2 Tissue Simulating Liquid

Brain	
Ingredient	**Frequency** (900 MHz)
Water	40.47 %
Cellulose	0.25 %
Salt	0.7 %
Preservative	0.1 %
Sugar	58.48 %

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)	$_r$ *	*(mho/m)	**(kg/m^3)
900	45.5 ± 5%	0.81 ± 10%	1000

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

** *worst case assumption*

Brain	
Ingredient	**Frequency** (1900 MHz)
Water	45.32 %
Cellulose	0.25%
Salt	0 %
Preservative	0.1%
Sugar	54.33 %

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)	$_r$ *	*(mho/m)	**(kg/m^3)
1900	42.8 ± 5%	1.77 ± 10%	1000

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

** *worst case assumption*