# **SAR** Test Report

# For

Product Type	:	GSM900/DCS1800/PCS1900
• •		GSM/GPRS mobile phone
<b>Model Number</b>	:	HERC1(M580)
Brand Name	:	BenQ
Applicant	:	BenQ Corporation
Address	:	157 Shan-Ying Road, Gueishan Taoyuan 333 Taiwan, R.O.C.

# Report No.:SF-NLS00294

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	Test Report Certificate
Applicant	: BenQ Corporation
Address	157 Shan-Ying Road, Gueishan Taoyuan 333 Taiwan, R.O.C.
Product Type	GSM900/DCS1800/PCS1900 GSM/GPRS mobile phone
Model Number	: HERC1(M580)
Brand Name	: BenQ
Test Standard	: FCC OET65 Supplement C(Edition01-01)
	IEEE1528:2003
Max SAR value	: PCS1900 Head SAR: 0.622W/Kg
	PCS1900 Body SAR: 1.291W/Kg
Sample Received	: Aug. 15, 2005
Test Date	: Aug. 26, 2005/ Oct. 21, 2005
Test Engineer	: Nicole (in; Date: Dct. >6, >005
Documented By	: NT206 (In; Date: Oct. >6 >005
Reviewed By	: Janes Soong; Date: 26, 007, 2005
Approved By	: James Soong; Date: 26,007, 2003

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# 1. General Information

# 1.1 EUT Description

Product Name	GSM900/DCS1800/PCS1900 GSM/GPRS mobile phone	
Trade Name	BenQ	
Model No.	HERC1(M580)	
IMEI No.	357032~4-00-XXXXXX	
TX Frequency	1850MHz~1910MHz	
RX Frequency	1930MHz~1990MHz	
Max. Output Power	GSM Mode:29.94 dBm	
(Conducted)	GPRS Mode:29.79 dBm	
Antenna Type	Fixed, Internal	
Device Category	Identical Prototype	
RF Exposure Environment	Uncontrolled environment	
Type of Modulation	GMSK	
Hardware version	LPR-3-4-B	
Software version	V0.18	
Power Adapter / Changer	2E.11060.XXX(X=0~9, A~Z or blank)	
	AC Input: 100V~240V, 50Hz~ 60Hz	
	(5V/ 700mA)	
Battery Pack	2C.2G0M0.101 (870Ah)	
Other accessories	Earpiece:2C.43035.111	
Applicant Type	ID	

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#### **1.2 Test Environment**

Ambient conditions refer to standard:

Items	Required
Temperature (°C)	18-25
Humidity (%RH)	30-70
Temperature deviate during the test	±2°C

#### **1.3 Test Configuration**

The Device was controlled by the base station simulator, and should be set to the maximum output power level. The communication between the device and base station should by air link.

Measurement should be performed on the lowest, middle, and highest channel for each position for HEAD SAR testing. If the SAR measured at the middle channels for each test configuration is at least 2.0dBm lower than the SAR limit, testing at the higher and lower channel is optional for such test configuration(s).

The Crest Factor should be 1 for system verification, and should be 8 for GSM link mode.

For the GPRS mode, the Crest Factor will be 4 for GPRS class 10 And should use 2 time slots to uplink.

For the peak value of each channel and position, turn the Bluetooth device on and off and confirm the highest SAR reading.

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# 2. SAR Measurement System

## 2.1 ALSAS-10U System Description

**ALSAS-10-U** is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller.

ALSAS-10U uses the latest methodologies and FDTD ode ling to provide a platform which is repeatable with minimum uncertainty.

#### **2.1.1 Applications**

Predefined measurement procedures compliant with the guidelines of CENELEC, IEEE, IEC, FCC, etc are utilized during the assessment for the device. Automatic detection for all SAR

maxima are embedded within the core architecture for the system, ensuring that peak locations used for centering the zoom scan are within a 1mm resolution and a 0.05mm repeatable position. System operation range currently available up-to 6 GHz in simulated tissue.

#### 2.1.2 Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm<sup>2</sup> step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

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#### 2.1.3 Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the ALSAS-10U software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m<sup>3</sup> is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (For IEEE1528) utilize a physical step of 5X5X7, (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 30mm in the Z-Axis.

#### 2.1.4 ALSAS-10U Interpolation and Extrapolation Uncertainty

The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

$$f_3(x, y, z) = A \frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2} \cdot \left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a+2z)^2}\right)$$

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#### **2.2 Isotropic E-Field Probe**

The isotropic E-Field probe has been fully calibrated and assessed for isotropic, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change. A number of methods are used for calibrating probes, and these are outlined in the table below:

Calibration Frequency	Air Calibration	Tissue Calibration
1900MHz	TEM Cell	Temperature

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



SAR is assessed with a calibrated probe which moves at a default height of 5mm from the center of the diode, which is mounted to the sensor, to the phantom surface (in the Z Axis). The 5mm offset height has been selected so as to minimize any resultant boundary effect due to the probe being in close proximity to the phantom surface.

The following algorithm is an example of the function used by the system for linearization of the output from the probe when measuring complex modulation schemes.

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

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#### 2.2.1 Isotropic E-Field Probe Specification

Calibration in Air	Frequency Dependent	
	Below 2GHz Calibration in air performed in a TEM Cell	
	Above 2GHz Calibration in air performed in waveguide	
Sensitivity	$0.70 \ \mu V/(V/m)^2$ to $0.85 \ \mu V/(V/m)^2$	
Dynamic Range	0.0005 W/kg to 100W/kg	
Isotropic Response	Better than 0.2dB	
Diode Compression point	Calibration for Specific Frequency	
(DCP)		
Probe Tip Radius	< 5mm	
Sensor Offset	1.56 (+/- 0.02mm)	
Probe Length	290mm	
Video Bandwidth	@ 500 Hz: 1dB	
	@1.02 KHz: 3dB	
Boundary Effect	Less than 2% for distance greater than 2.4mm	
Spatial Resolution	Diameter less than 5mm Compliant with Standards	

#### 2.3 Boundary Detection Unit and Probe Mounting Device

ALSAS-10U incorporates a boundary detection unit with a sensitivity of 0.05mm for detecting all types of surfaces. The robust design allows for detection during probe tilt (probe normalize) exercises, and utilizes a second stage emergency stop. The signal electronics are fed directly into the robot controller for high accuracy surface detection in lateral and axial detection modes (X, Y, & Z).

The probe is mounted directly onto the Boundary Detection unit for accurate tooling and displacement calculations controlled by the robot kinematics. The probe is connect to an isolated probe interconnect where the output stage of the probe is fed directly into the amplifier stage of the Daq-Paq

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2.4 Daq-Paq (Analog to Digital Electronics)

ALSAS-10U incorporates a fully calibrated Daq-Paq (analog to digital conversion system) which has a 4 channel input stage, sent via a 2 stage auto-set amplifier module. The input signal is amplified accordingly so as to offer a dynamic range from  $5\mu V$  to 800mV. Integration of the fields measured is carried out at board level utilizing a Co-Processor which then sends the measured fields down into the main computational module in digitized form via an RS232 communications port. Probe linearity and duty cycle compensation is carried out within the main Daq-Paq module.

ADC	12 Bit	
Amplifier Range	20mV to 200mV and 150mV to 800mV	
Field Integration	Local Co-Processor utilizing proprietary integration	
	algorithms	
Number of Input Channels	4 in total 3 dedicated and 1 spare	
Communication	Packet data via RS232	

#### 2.5 Axis Articulated Robot



ALSAS-10U utilizes a six axis articulated robot, which is controlled using a Pentium based real-time movement controller. The movement kinematics engine utilizes proprietary (Thermo CRS) interpolation and extrapolation algorithms, which allow full freedom of movement for each of the six joints within the working envelope. Utilization of joint 6 allows for full probe rotation with a tolerance better than 0.05mm around the central axis.

Robot/Controller Manufacturer	Thermo CRS	
Number of Axis	Six independently controlled axis	
Positioning Repeatability	0.05mm	
Controller Type	Single phase Pentium based C500C	
Robot Reach	710mm	
Communication	RS232 and LAN compatible	

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#### 2.6 ALSAS Universal Workstation

ALSAS Universal workstation allows for repeatability and fast adaptability. It allows users to do calibration, testing and measurements using different types of phantoms with one set up, which significantly speeds up the measurement process.

#### 2.7 Universal Device Positioner

The universal device positioner allow complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales which form the design used to indicate positioning for any given test scenario in all major axes. A 15° tilt indicator is included for the of aid cheek to tilt movements for head SAR analysis. Overall uncertainty for measurements have been reduced due to the design of the Universal device positioner, which allows positioning of a device in as near to a free-space scenario as possible, and by providing the means for complete repeatability.



#### 2.8 Phantom Types

The ALSAS-10U allows the integration of multiple phantom types. SAM Phantoms fully compliant with IEEE 1528, Universal Phantom, and Universal Flat.

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#### 2.8.1 APREL SAM Phantoms

The SAM phantoms developed using the IEEE SAM CAD file. They are fully compliant with the requirements for both IEEE 1528 and FCC Supplement C. Both the left and right SAM phantoms are interchangeable, transparent and include the IEEE 1528 grid with visible NF and MB lines.



#### 2.8.2 APREL Laboratories Universal Phantom

The Universal Phantom is used on the ALSAS-10U as a system validation phantom. The Universal Phantom has been fully validated both experimentally from 800MHz to 6GHz and numerically using XFDTD numerical software. The shell thickness is 2mm overall, with a 4mm spacer located at the NF/MB intersection providing an overall thickness of 6mm in line with the requirements of IEEE-1528.



The design allows for fast and accurate measurements, of

handsets, by allowing the conservative SAR to be evaluated at on frequency for both left and right head experiments in one measurement.

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# 3. Tissue Simulating Liquid

#### 3.1 The composition of the tissue simulating liquid

INGREDIENT	1900MHz	1900MHz
(% Weight)	Head	Body
Water	54.9%	40.5%
Salt	0.18%	0.50%
Sugar	-	58.0%
HEC	-	0.50%
Preventol	-	0.50%
DGBE	44.92%	-

#### **3.2 Tissue Calibration Result**

The dielectric parameters of the liquids were verified prior to the SAR evaluation using APREL Dielectric Probe Kit and Anritsu MS4623B Vector Network Analyzer

Tissue Simulate Measurement				
Frequency	Frequency Description		Dielectric Parameters	
[MHz]	Description	ε <sub>r</sub>	σ [s/m]	[°C]
1000 MIL-	Reference result	40	1.4	N/A
1900 MHZ Head	$\pm$ 5% window	38 to 42	1.33 to 1.47	1N/A
Head	Aug. 26, 2005	39.65	1.47	
1850 MHz	Lowest	39.72	1.431	22.5
1880 MHz	Middle	39.63	1.458	22.3
1910MHz	Highest	39.65	1.470	
1000 MIL-	Reference result	53.3	1.52	N/A
1900 MHZ	$\pm$ 5% window	50.635 to 55.965	1.444 to 1.596	1N/A
Body	Aug. 26, 2005	54.4	1.591	
1850 MHz	Lowest	54.87	1.520	22.4
1880 MHz	Middle	54.61	1.581	22.4
1910MHz	Highest	54.34	1.593	

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#### 3.3 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Target Frequency	He	ad	Bo	dy
(MHz)	ε <sub>r</sub>	σ (S/m)	ε <sub>r</sub>	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 - 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

( $\varepsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho$  = 1000 kg/m<sup>3</sup>)

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## 4. SAR Measurement Procedure

#### 4.1 SAR System Validation

#### 4.1.1 Validation Dipoles



The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical specifications for the dipoles.

Frequency	L (mm)	h (mm)	d (mm)
1900MHz	68.0	39.5	3.6

#### 4.1.2 Validation Result

System Performance Check at 1900MHz				
Validation Kit: ASL-D-1900-S-2				
Frequency [MHz]	Description	SAR [w/kg]	SAR [w/kg] 10g	Tissue Temp.
	Reference result ± 5% window	39.7 37.715 to 41.685	20.5 19.475 to 21.525	N/A
1900 MHZ	Aug. 26, 2005	38.219	19.597	22.5
	Oct. 21, 2005	38.387	19.982	22.5
Note: All SAR values are normalized to 1W forward power.				

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#### 4.2 Arrangement Assessment Setup

#### 4.2.1 Test Positions of Device Relative to Head

This specifies exactly two test positions for the handset against the head phantom, the "cheek" position and the "tilted" position. The handset should be tested in both positions on the left and right sides of the SAM phantom. If the handset construction is such that it cannot be positioned using the handset positioning procedures described in 4.2.2.1 and 4.2.2.2 to represent normal use conditions (e.g., asymmetric handset), alternative alignment procedures should be considered with details provided in the test report.



#### 4.2.1.1 Definition of the "Cheek" Position

The "cheek" position is defined as follows:

- a. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover. (If the handset can also be used with the cover closed both configurations must be tested.)
- b. Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width *wt* of the handset at the level of the acoustic output (point A on Figures 4.1a and 4.1b), and the midpoint of the width  $w_b$  of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 4.1a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 4.1b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.

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- c. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 4.2), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
- d. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the pinna.
- e. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
- f. Rotate the handset around the vertical centerline until the handset (horizontal line) is symmetrical with respect to the line NF.
- g. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 4.2 the physical angles of rotation should be noted.



Figure 4.2 – Phone position 1, "cheek" or "touch" position.

#### **4.2.1.2 Definition of the "Tilted" Position**

The "tilted" position is defined as follows:

- a. Repeat steps (a) (g) of 4.2.1.1 to place the device in the "cheek position."
- b. While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.
- c. Rotate the handset around the horizontal line by 15 degrees.

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d. While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna (e.g., the antenna with the back of the phantom head), the angle of the handset should be reduced. In this case, the tilted position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is contact with the phantom (e.g., the antenna with the back of the head).



Figure 4.3 – Phone position 2, "tilted" position.

#### 4.2.2 Test Positions for body-worn

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distance may be use, but not exceed 2.5 cm.

#### 4.3 Procedure for Assessing the Spatial Peak SAR

Step 1: Power Reference Measurement:

The measurements should be taken at a reference point to monitor power changes during the testing. The reference point should be at a distance of less than 10mm from liquid-shell interface in the vicinity of the ERP 10mm.

Step2: Area scan:

If the peak is at the border of the area, the area scan should be repeated using an enlarged area when possible.

Step3: Zoom Scan:

If the Spatial peak volume touches any side wall of the zoom volume, Step 3

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should be repeated with the new center of the zoom scan located at the previous determined spatial peak.

Step 4: Power Reference Measurement:

The measurement should be measured at exactly the same location as step 1. If the power has changed by more than 5%, the measurement should be repeated or the entire differences shall be added to the assessed value.

#### 4.4 SAR Measurement Method

The ALSAS-10U calculates SAR using the following equation,

$$SAR = \frac{\sigma |\mathbf{E}|^2}{\rho}$$

 $\sigma$ : represents the simulated tissue conductivity

ρ: represents the tissue density

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## 5. SAR Exposure Limits

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 "Uncontrolled Environments" limits. These limits apply to a location which is deemed as "Uncontrolled Environment" which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

Type Exposure	Uncontrolled
	<b>Environment Limit</b>
Spatial Peak SAR	1 6 W/A-2
(1g cube tissue for brain or body)	1.0 W/Kg
Spatial Peak SAR	0.0811/1/2~
(whole body)	0.08W/Kg
Spatial Peak SAR	
(10g for hands, feet, ankles and wrist)	4 W/Kg

Limits for General Population/Uncontrolled Exposure (W/kg)

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# 6. Test Equipment List

Instrument	Manufacturer	Model No.	Serial No.	Last
				Calibration
Data Acquisition Package	Aprel	ALS-DAQ-PAQ-3	110-00212	Jul. 2005
Miniature E-Field Probe	Aprel	ALS-E020	260	Feb. 2005
Miniature E-Field Probe	Aprel	ALS-E020	261	Feb. 2005
Validation Dipole @ 1900Mhz	Aprel	ALS-D-1900-S-2	210-00702	Feb. 2005
Probe Mounting Device and Boundary Detection Sensor	Aprel	ALS-PMDPS-3	120-00261	N/A
System				
Dielectric Probe Kit	Aprel	ALS-PR-DIEL	260-00952	N/A
Universal Work Station	Aprel	ALS-UWS	100-00152	N/A
Device Holder 2.0	Aprel	ALS-H-E-SET-2	170-00502	N/A
Left Ear SAM Phantom	Aprel	ALS-P-SAM-L	130-00303 130-00304	N/A
Right Ear SAM Phantom	Aprel	ALS-P-SAM-R	140-00353	N/A
Universal Phantom	Aprel	ALS-P-UP-1	150-00403 150-00404	N/A
Aprel Dipole Spacer	Aprel	ALS-DS-U	250-00902	N/A
SAR Software	Aprel	ALSAS-10	Ver. 2.1.0	N/A
CRS C500C Controller	Thermo	ALS-C500	RCF0432270	N/A
CRF F3 Robot	Thermo	ALS-F3	RAF0439250	N/A
Power Amplifier	Mini-Circuit	ZHL-42	D020705	N/A
Directional Coupler	Agilent	778D-012	50658	N/A
Radio Communication Analyzer	Anritsu	MT8820A	6200374504	Apr. 2005
GSM MS Tester	JRC	NJZ-917BJ	ED49581	Mar. 2004
Vector Network	Anritsu	MS4623B	050401	Mar. 2005
Signal Generator	Anritsu	MG3691A	044909	Mar. 2005
Power Meter	Anritsu	ML2487A	6K00002328	Mar. 2005
Wide Bandwidth Sensor	Anritsu	MA2491	032006	Mar. 2005

Note: All equipment's calibrated period base on the spec.

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# 7. Measurement Uncertainty

Source of UncertaintyProbability ValueDistributionDivisor (1-g) $(1-g)$ <t< th=""><th>0</th><th><b>m</b>-1</th><th>Develope had I dates</th><th>Distant</th><th></th><th>1 1</th><th>Chan dan d</th><th>about down</th></t<>	0	<b>m</b> -1	Develope had I dates	Distant		1 1	Chan dan d	about down
Onder LaintyValueDistribution(10-g) </th <th>Source or</th> <th>Velue</th> <th>Distribution</th> <th>DIVISOF</th> <th><math>\begin{pmatrix} 1 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\</math></th> <th>(10, a)</th> <th>Uncontraintu</th> <th>Uncontaintu</th>	Source or	Velue	Distribution	DIVISOF	$\begin{pmatrix} 1 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$	(10, a)	Uncontraintu	Uncontaintu
Measurement System111111Probe Calibration3.5normal11113.53.5Axial Isotropy3.7rectangular $\sqrt{3}$ $(1^{-1/2})$ $(1^{-1/2})$ $(1^{-1/2})$ $(1^{-1/2})$ $(1^{-1/2})$ $(1^{-1/2})$ Hemispherical10.9rectangular $\sqrt{3}$ $\sqrt{2}$ $(1^{-1/2})$ $(1^{-1/2})$ $(1^{-1/2})$ $(1^{-1/2})$ Boundary Bifect1.0rectangular $\sqrt{3}$ 11 $0.6$ $0.6$ Linearity4.7rectangular $\sqrt{3}$ 11 $0.6$ $0.6$ Betterionic1.0normal11 $1.0$ $1.0$ $0.6$ Readout Electronics1.0normal11 $1.0$ $1.0$ Repose Time0.8rectangular $\sqrt{3}$ 1 $1$ $0.5$ $0.5$ Integration Time1.7rectangular $\sqrt{3}$ 1 $1$ $0.2$ $0.2$ Probe Positioner $0.4$ rectangular $\sqrt{3}$ 1 $1$ $1.7$ $1.7$ Probe Positioning $2.9$ rectangular $\sqrt{3}$ 1 $1$ $1.7$ $1.7$ Probe Positioning $2.9$ rectangular $\sqrt{3}$ 1 $1$ $2.1$ $2.1$ Probe Positioning $2.9$ rectangular $\sqrt{3}$ $1$ $1$ $2.1$ $2.1$ Probe Positioning $2.9$ rectangular $\sqrt{3}$ $1$ $1$ $1.2$ $2.1$ Probe Position	Uncertainty	value	Distribution		(1-g)	(10-g)	Uncertainty	(10 a) %
Measurement SystemnnnnProbe Calibration2.5normal1113.53.5Axial Isotropy2.7rectangular $\sqrt{3}$ $(1-c_p)^{1/2}$ $(1-c_p)^{1/2}$ 1.5Henispherical10.9rectangular $\sqrt{3}$ $(1-c_p)^{1/2}$ 1.51.5Boundary Effect1.0rectangular $\sqrt{3}$ 110.60.6Linearity4.7rectangular $\sqrt{3}$ 110.60.6Readout Electronics1.0normal1111.01.0Readout Electronics1.0normal1111.01.0Readout Electronics0.8rectangular $\sqrt{3}$ 111.01.0Readout Electronics0.4rectangular $\sqrt{3}$ 111.01.0Readout Electronics0.4rectangular $\sqrt{3}$ 111.71.7Probe Positioning0.4rectangular $\sqrt{3}$ 111.71.7Probe Positioning2.9rectangular $\sqrt{3}$ 111.71.7Phantom Shell2.0normal1111.21.21.2Extrapolation and Integration3.7rectangular $\sqrt{3}$ 111.21.2Phantom Shell2.0normal1111.21.21.2Prift of Output Power2.1rectangular							(1-g) %	(10-g) %
Measurement SystemImage: state of the systemImage: state of the systemProbe Calibration2.5normal1113.53.5Axial Isotropy3.7rectangular $\sqrt{3}$ $(1-)$ (cp) $^{1/2}$ 1.51.5Hemispherical Isotropy10.9rectangular $\sqrt{3}$ $(1-)$ (cp) $^{1/2}$ 1.51.5Boundary Effect1.0rectangular $\sqrt{3}$ 110.60.6Linearity4.7rectangular $\sqrt{3}$ 110.60.6Detection Limit1.0rectangular $\sqrt{3}$ 110.60.6Response Time0.8rectangular $\sqrt{3}$ 111.01.0Reponse Time1.7rectangular $\sqrt{3}$ 111.01.0Probe Positioner0.4rectangular $\sqrt{3}$ 111.01.0Probe Positioning Probe Positioning2.9rectangular $\sqrt{3}$ 111.71.7Probe Positioning Position and Integration3.7rectangular $\sqrt{3}$ 111.71.7Probe Positioning Positioning Positioning4.0normal1112.02.0Device Holder Doubert eff2.0normal1111.21.2Probe Positioning Positioning3.4rectangular $\sqrt{3}$ 111.21.2Device Rolder Doubert eff0.0normal <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>								
Measurement System     rest     rest </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Measurement System							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $								
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$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Axial Isotropy	3.7	rectangular	√3	(1- cp) <sup>1/2</sup>	(1- cp) <sup>1/2</sup>	1.5	1.5
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Hemispherical	10.9	rectangular	12	Ven	Ven	4.4	4.4
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Isotropy		j	15	100	, op		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Boundary Effect	1.0	rectangular	√3	1	1	0.6	0.6
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Linearity	4.7	rectangular	13	1	1	2.7	2.7
Readout Electronics     1.0     normal     1<	Detection Limit	1.0	rectangular	$\sqrt{2}$	1	1	0.6	0.6
Response Time   1.0   1.0   1.0   1.0   1.0   1.0     Response Time   0.8   rectangular $\sqrt{3}$ 1   1   0.5   0.5     Integration Time   1.7   rectangular $\sqrt{3}$ 1   1   1.0   1.0     RP Ambient Condition   3.0   rectangular $\sqrt{3}$ 1   1   1.7   1.7     Probe Positioner   0.4   rectangular $\sqrt{3}$ 1   1   0.2   0.2     Mech.	Readout Electronics	1.0	normal	1	1	1	1.0	1.0
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Response Time	0.8	rectangular	1/2	1	1	0.5	0.5
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Integration Time	1.7	rectangular	13	1	1	1.0	1.0
Rr amblent condition3.0rectangular $\sqrt{3}$ 1111.71.7Probe Positioner0.4rectangular $\sqrt{3}$ 110.20.2MechRestrictionProbe Positioning2.9rectangular $\sqrt{3}$ 111.71.7Phantom ShellBxtrapolation and3.7rectangular $\sqrt{3}$ 111.71.7Test Sample4.0normal1114.04.0PositioningDevice Bolder2.0normal1111.21.2Drift of Output2.1rectangular $\sqrt{3}$ 111.21.2Phantom and SetupPhantom (shape & thickness tolerance)3.4rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Conductivity(target)5.0rectangular $\sqrt{3}$ 0.70.53.52.5Liquid Liquid Combined UncertaintyS.0rectangular $\sqrt{3}$ 0.60.51.71.4Eventivity(meas.)5.0rectangular $\sqrt{3}$ 0.60.50.4-Combined UncertaintyRSS-10.09.5Combined Uncertainty <td>DR Subject Condition</td> <td>1.7</td> <td>rectangular</td> <td>V3</td> <td>1</td> <td>1</td> <td>1.0</td> <td>1.0</td>	DR Subject Condition	1.7	rectangular	V3	1	1	1.0	1.0
Probe Positioner Mech.0.4rectangular rectangular $\sqrt{3}$ 110.20.2Restriction Probe Positioning with respect to Phantom Shell2.9rectangular v $\sqrt{3}$ 111.71.7Extrapolation and Device Holder3.7rectangular rectangular $\sqrt{3}$ 112.12.1Integration Device Holder4.0normal rectangular1112.02.0Uncertainty Device Holder2.0normal rectangular1112.02.0Drift of Output Power2.1rectangular rectangular $\sqrt{3}$ 111.21.2Phantom and Setup Phantom Uncertainty (shape & Conductivity(target)5.0rectangular rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Conductivity(meas.)5.0rectangular rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Liquid Combined Uncertainty0.9normal10.60.50.41.4Combined Uncertainty Combined UncertaintyRSS10.09.50.4	RF Ambient Condition	3.0	rectangular	13	1	1	1.7	1.7
Nech.Image: constraint of the section of	Probe Positioner	0.4	rectangular	√3	1	1	0.2	0.2
RestrictionImage: constraint of the sector of	Mecn.							
Restriction2.9rectangular $\sqrt{3}$ 111.71.7Probe Positioning3.7rectangular $\sqrt{3}$ 1111.71.7Mathematical Sample4.0normal1112.12.1Positioning111114.04.0Positioning111112.02.0Device Holder2.0normal1111.20Uncertainty2.1rectangular $\sqrt{3}$ 111.21.2Power2.1rectangular $\sqrt{3}$ 112.02.0Uncertainty (shape & thickness tolerance)3.4rectangular $\sqrt{3}$ 112.02.0Liquid Conductivity(meas.)5.0rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Permittivity(meas.)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Combined Uncertainty RessRSS10.09.50.40.4Combined UncertaintyRSS10.09.50.4Combined UncertaintyNormal (k=2)19.919.010.0	Do atovi at i an							
Proble Positioning with respect to Phantom Shell2.9rectangular rectangular $\sqrt{3}$ 111.71.7Bxtrapolation and Integration3.7rectangular rectangular $\sqrt{3}$ 112.12.1Integration Positioning4.0normal1114.04.0Device Holder Device Holder2.0normal1111.2.02.0Uncertainty Power2.1rectangular $\sqrt{3}$ 111.2.21.2Power2.1rectangular $\sqrt{3}$ 112.02.0Drift of Output Phantom Uncertainty (shape & thickness tolerance)3.4rectangular $\sqrt{3}$ 112.0Liquid Conductivity(target)5.0rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Liquid Conductivity(meas.)5.0normal10.60.51.71.4Liquid Liquid Liquid Combined Uncertainty0.9normal10.60.50.4Permittivity(meas.)0.9normal10.60.50.42.5Combined Uncertainty (coverage factor=2)RSS10.09.510.09.5	Restriction	2.0	we at an an law		1	1	1.7	1.7
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	with respect to	2.9	rectangular	V3	1	1	1.7	1.7
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Dhanton Chell							
IntegrationIntegrationImage and the second stateImage and the second stateImage and the second stateImage and the second stateTest Sample4.0normal11114.0Positioning2.0normal11112.0Device Holder2.0normal1111.2Drift of Output2.1rectangular $\sqrt{3}$ 111.2PowerImage and the second stateImage and the second stateImage and the second stateImage and the second statePhantom and SetupImage and the second stateImage and the second stateImage and the second stateImage and the second statePhantom and SetupImage and the second stateImage and the second stateImage and the second stateImage and the second statePhantom and SetupImage and the second stateImage and the second stateImage and the second stateImage and the second statePhantom and SetupImage and the second stateImage and the second stateImage and the second stateImage and the second stateInduct Second stateImage and the second stateImag	Extrapolation and	37	rectancular	12	1	1	2 1	2.1
Test Sample Positioning4.0normal1114.04.0Device Holder Uncertainty2.0normal11112.02.0Drift of Output Power2.1rectangular V $\sqrt{3}$ 111.21.2Power2.1rectangular V $\sqrt{3}$ 111.21.2Phantom and Setup Phantom Uncertainty (shape & thickness tolerance)3.4rectangular V $\sqrt{3}$ 112.02.0Liquid Conductivity(target)5.0rectangular V $\sqrt{3}$ 0.70.52.01.4Liquid Liquid Liquid Dermittivity(target)5.0rectangular V $\sqrt{3}$ 0.60.51.71.4Liquid Dermittivity(target)0.9normal10.60.50.50.4Liquid Dermittivity(meas.)0.9normal10.60.50.50.4Combined Uncertainty (coverage factor=2)RSS10.09.519.019.0	Integration	5.7	recoungarar	15	-	-	2.1	2.1
PositioningIntervent of the second seco	Test Sample	4.0	normal	1	1	1	4.0	4.0
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Positioning			-	-	-		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Device Holder	2.0	normal	1	1	1	2.0	2.0
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Uncertainty							
PowerImage: Constraint of the second se	Drift of Output	2.1	rectangular	√3	1	1	1.2	1.2
Phantom and Setup3.4rectangular $\sqrt{3}$ 112.02.0Phantom Uncertainty (shape & thickness tolerance)3.4rectangular $\sqrt{3}$ 1112.02.0Liquid Conductivity(target)5.0rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Conductivity(meas.)5.0normal10.70.53.52.5Liquid Permittivity(target)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Permittivity(target)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Permittivity(meas.)0.9normal10.60.50.50.4Combined Uncertainty Combined UncertaintyRSS10.09.519.0Combined Uncertainty (coverage factor=2)Normal(k=2)19.919.0	Power		-					
Phantom and Setup3.4rectangular $\sqrt{3}$ 112.02.0Phantom Uncertainty(shape & thickness tolerance)3.4rectangular $\sqrt{3}$ 1112.02.0Liquid Conductivity(target)5.0rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Conductivity(meas.)5.0normal10.70.53.52.5Liquid Permittivity(target)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Permittivity(meas.)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Permittivity(meas.)0.9normal10.60.50.50.4Combined Uncertainty (coverage factor=2)RSS10.09.519.0								
Phantom Uncertainty (shape & thickness tolerance)3.4rectangular rectangular $\sqrt{3}$ 112.02.0Liquid Conductivity(target)5.0rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Conductivity(meas.)5.0normal10.70.53.52.5Liquid Permittivity(target)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Permittivity(meas.)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Permittivity(meas.)0.9normal10.60.50.50.4Combined Uncertainty (coverage factor=2)RSS10.09.519.0	Phantom and Setup							
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Phantom	3.4	rectangular	√3	1	1	2.0	2.0
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Uncertainty (shape &							
Liquid Conductivity(target)5.0rectangular rectangular $\sqrt{3}$ 0.70.52.01.4Liquid Conductivity(meas.)5.0normal10.70.53.52.5Liquid Permittivity(target)5.0rectangular $\sqrt{3}$ 0.60.51.71.4Liquid Permittivity(meas.)0.9normal10.60.50.50.4Combined Uncertainty (coverage factor=2)RSS10.09.519.0	thickness tolerance)							
$\begin{array}{c cccc} \hline Conductivity(target) & & & & & & & & & & & & & & & & & & &$	Liquid	5.0	rectangular	√3	0.7	0.5	2.0	1.4
Liquid Conductivity(meas.)5.0normal1 $0.7$ $0.5$ $3.5$ $2.5$ Liquid Permittivity(target)5.0rectangular $\sqrt{3}$ $0.6$ $0.5$ $1.7$ $1.4$ Liquid Permittivity(meas.)0.9normal1 $0.6$ $0.5$ $0.5$ $0.4$ Combined UncertaintyRSS10.0 $9.5$ Combined UncertaintyNormal (k=2)19.9 $19.0$	Conductivity(target)	5.0				0.5		
$\begin{array}{c c} \hline Conductivity(meas.) & \hline & & \hline & & \hline & & \hline & & & & & & \hline & & & & & & \hline & & & & & & & & \hline & & & & & & & & \hline & & & & & & & & \hline & & & & & & & & \hline & & & & & & & & \hline & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & & \hline & & & & & & & & & & \hline & & & & & & & & & & & \hline & & & & & & & & & & & & & \hline & & & & & & & & & & & & \hline & & & & & & & & & & & & & \hline & & & & & & & & & & & & & & \hline & & & & & & & & & & & & & & & & & & & \hline &$	(anduationity (mass )	5.0	normal	1	0.7	0.5	3.5	2.5
Inquit5.0rectangular $\sqrt{3}$ 0.60.51.71.4Permittivity(target)0.9normal10.60.50.50.4Permittivity(meas.)Combined UncertaintyRSS10.09.5Combined UncertaintyNormal(k=2)19.919.0	Liquid	5.0	neatonallan		0.0	0.5	1 7	1.4
Liquid     0.9     normal     1     0.6     0.5     0.4       Permittivity(meas.)     Combined Uncertainty     RSS     10.0     9.5       Combined Uncertainty     Normal(k=2)     19.9     19.0	Dermittivity(target)	5.0	rectangular	¥3	0.8	0.5	1.7	1.4
Permittivity(meas.) Normal (k=2) Normal (k=2) Normal (k=2) 10.0 9.5	Liquid	0.9	normal	1	0.6	0.5	0.5	0.4
Combined Uncertainty RSS 10.0 9.5   Combined Uncertainty Normal(k=2) 19.9 19.0   (coverage factor=2) 19.9 19.0	Permittivitv(meas)	v.,	normar	-	0.0	0.5	0.0	V. 4
Combined Uncertainty (coverage factor=2) Normal(k=2) 19.9 19.0	Combined Uncertainty		RSS				10.0	9.5
(coverage factor=2)	Combined Uncertainty		Normal $(k=2)$				19.9	19.0
	(coverage factor=2)							

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# 8. Test Results

# 8.1.1 SAR Test Results Summary for GSM 1900MHz Head

SAR Measur	rement					
Ambient Tem	perature (°C) :	21.6±1	Relative H	Iumidity (%):	58	
Liquid Tempe	erature (°C) : 2	2.5 ±1	Depth of l	Liquid (cm):>1	5	
Product: GSN	1900/DCS1800	)/PCS1900 GSN	A/GPRS Mobile	Phone		
Test Mode: G	SM 1900					
Max. Conduc	ted Power: 33d	lBm				
Test Position	Antenna	Freq	uency	SAR 1g	SAR 10g	Limit
Head	Position	Channel	MHz	(W/kg)	(W/kg)	(W/kg)
Right-Cheek	Internal	512	1850.2	0.505	0.372	1.6
Right-Cheek	Internal	661	1880	0.572	0.436	1.6
Right-Cheek	Internal	810	1909.8	0.611	0.413	1.6
Right-Tilted	Internal	512	1850.2	-	-	1.6
Right-Tilted	Internal	661	1880	0.267	0.241	1.6
Right-Tilted	Internal	810	1909.8	-	-	1.6
Left-Cheek	Internal	512	1850.2	0.566	0.402	1.6
Left-Cheek	Internal	661	1880	0.6	0.406	1.6
Left-Cheek	Internal	810	1909.8	0.622	0.435	1.6
Left-Tilted	Internal	512	1850.2	-	-	1.6
Left-Tilted	Internal	661	1880	0.231	0.207	1.6
Left-Tilted Internal 810 1909.8 1.6						
Actual Condu	icted power: 5	512:29.94dBm	; 661:29.44dBn	n; 810:29.44d	lBm.	

## Double check the Bluetooth effect for Head SAR value:

Test Position	Bluetooth	Frequency		SAR 1g	SAR 10g	Limit
Head	Status	Channel	MHz	(W/kg)	(W/kg)	(W/kg)
Right-Cheek	Off	810	1909.8	0.611	0.413	1.6
Right-Cheek	On	810	1909.8	0.585	0.406	1.6

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#### 8.1.2 SAR Test Results Summary for GSM 1900MHz Body

SAR Measur	rement					
Ambient Tem	perature (°C) :	21.6±1	Relative H	Aumidity (%):	58	
Liquid Tempe	erature (°C) : 2	2.4 ±1	Depth of l	Liquid (cm):>1	5	
Product: GSM	1900/DCS1800	)/PCS1900 GSN	I/GPRS Mobile	Phone		
Test Mode: G	SM 1900					
Max. Conduc	ted Power: 33d	lBm				
Test Position	Antenna	Freq	uency	SAR 1g	SAR 10g	Limit
Body Worn	Position	Channel	MHz	(W/kg)	(W/kg)	(W/kg)
15mm	Internal	512	1850.2	0.586	0.436	1.6
15mm	Internal	661	1880	0.684	0.493	1.6
15mm	Internal	810	1909.8	0.707	0.49	1.6
Actual Condu	cted power: 5	512:29.94dBm;	661:29.44dBn	n; 810:29.44c	lBm.	
Test Mode: G	PRS 1900					
Max. Conduc	ted Power: 33d	lBm				
Test Position	Antenna	Freq	uency	SAR 1g	SAR 10g	Limit
Body Worn	Position	Channel	MHz	(W/kg)	(W/kg)	(W/kg)
15mm	Internal	512	1850.2	1.236	0.821	1.6
15mm	Internal	661	1880	1.261	0.913	1.6
15mm	Internal	810	1909.8	1.291	0.838	1.6
Actual Condu	cted power: 5	512:29.79dBm	, 661:29.34dBn	n; 810:29.4dH	3m.	

# Double check the Bluetooth effect for Body SAR value:

Test Mode	Bluetooth	Frequency		SAR 1g	SAR 10g	Limit
@15mm	Status	Channel	MHz	(W/kg)	(W/kg)	(W/kg)
GPRS	Off	661	1880	1.261	0.913	1.6
GPRS	On	661	1880	1.247	0.909	1.6

Report No:	Product Regulatory Laboratory	Page: 25 of 37
SF-NLS00294	EMC Test Team	Form No.: PRL17025-2-29F-02

# 8.2 SAR System Validation Report

#### 8.2.1 for 1900MHz Validation

#### SAR Test Report

Report Date By Operator Measurement Date Starting Time End Time Scanning Time	: 30-Aug-2005 : BenQ : 26-Aug-2005 : 26-Aug-2005 09:56:58 AM : 26-Aug-2005 10:13:10 AM : 972 Becs
Product Data Device Name Serial No. Type Model Frequency Max. Transmit Pwr Drift Time Length Width Depth Antenna Type Orientation Power Drift-Start Power Drift-Finis Power Drift (%) Picture	: ALS-D-1900-S-2 : 210-00702 : Dipole : 210-00702 : 1900.00 MHz : 1 W : 0 min(s) : 68 mm : 3.6 mm : 3.6 mm : Internal : Touch : 21.230 W/kg h: 20.795 W/kg : -2.052 : (No picture)
Phantom Data Name Type Size (mm) Serial No. Location Description	: APREL-Uni : Uni-Phantom : 280 x 280 x 200 : User Define : Center : Uni-Phantom User Define
Tiasue Data Type Serial No. Frequency Last Calib. Date Temperature Ambient Temp. Humidity Epsilon Sigma Density	: HEAD : 290-01101 : 1900.00 MHz : 08-Peb-2005 : 22.50 °C : 21.60 °C : 58.00 RH% : 39.650 P/m : 1.470 S/m : 1000.00 kg/cu. m
Probe Data Name Model Type Serial No. Last Calib. Date Frequency Duty Cycle Factor Conversion Factor Probe Sensitivity Compression Point offset	: Probe 260 - BenQ : E020 : E-Pield Triangle : 260 : 14-Feb-2005 : 1900.00 MHZ : 1 : 4.7 : 1.20 1.20 1.20 µV/(V/m) : 95.00 mV : 2.44 mm
Measurement Data Crest Pactor Scan Type Tissue Temp. Ambient Temp.	: 1 : Complete : 22.50 °C : 21.60 °C

Report No:	Product Regulatory Laboratory	Page: 26 of 37
SF-NLS00294	EMC Test Team	Form No.: PRL17025-2-29F-02

# SAR Compliance Report

# Beno Products Regulatory Lab.

Set-up Date Set-up Time	÷	26-Aug-2005 9:52:51 AM
Area Scan	÷	4x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan	:	5x5x8 : Measurement x=8mm, y=8mm, z=4mm
Other Data		
DUT Position	:	Touch
Separation	:	0
Channel	:	Mid - 1900
1 gram SAR value		: 38.219 W/ka

1 gram SAR value : 38.219 w/kg 10 gram SAR value : 19.597 W/kg Area Scan Peak SAR : 41.727 W/kg Zoom Scan Peak SAR : 70.362 W/kg



Report No:	Product Regulatory Laboratory	Page: 27 of 37
SF-NLS00294	EMC Test Team	Form No.: PRL17025-2-29F-02

Report Date By Operator Measurement Date	: 21-Oct-2005 : Beng : 21-Oct-2005
Starting Time End Time	: 21-0ct-2005 08:31:27 AM : 21-0ct-2005 08:46:57 AM
Scanning Time	: 986 secs
Product Data Device Name Serial No. Type Model Frequency Max. Transmit Pwr Deiff There	: ALS-D-1900-S-2 : 210-00702 : Dipole : 210-00702 : 1900.00 MHz : 1 W
Length	: 68.2 mm
Width	: 3.6 mm
Antenna Type	: Internal
Orientation	: Touch
Power Drift-Start	: 24.400 W/kg : 22.270 W/kg
Power Drift (%)	: -4.618
Picture	: (No picture)
Phantom Data Name :	AFREL-Uni
Type :	Uni-Phantom
Size (mm) : Seriel No :	280 x 280 x 200 User Define
Location :	Center
Description :	Uni-Phantom User Define
Tissue Data Type :	HEAD
Serial No. :	290-01101
Frequency : Last Calib. Date :	1900.00 MHZ 10-Oct-2005
Temperature :	22.50 °C
Ambient Temp. :	21.60 °C
Humidity :	58.00 RH%
sigma :	1.470 S/m
Density :	1000.00 kg/cu. m
Probe Data	
Name :	Probe 260 - Beng
Model : Type :	E020 R-Field Triangle
Serial No. :	260
Last Calib. Date :	14-Feb-2005
Frequency : Duty Cycle Rectory	1900.00 MHz
Conversion Factor:	4.7
Probe Sensitivity:	$1.20 \ 1.20 \ 1.20 \ \mu V/(V/m)^{\circ}$
Compression Point: Offset :	95.00 mV 2.44 mm
Measurement Data	1
Scan Type :	Complete
Tissue Temp.	22.50 °C
Ambient Temp. :	21.60 °C
sec-up bace :	21-000-2005

# SAR Test Report

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Beng Products Regulatory Lab.

# ALSAS-10U VER 2.2.0

Set-up Time : Area Scan : Zoom Scan :	09:12:51 AM 4x8x1 : Measurement x=10mm, y=10mm, z=4mm 5x5x8 : Measurement x=8mm, y=8mm, z=4mm
Other Data DUT Position : Separation : Channel :	Touch 0 1900
l gram SAR value 10 gram SAR value Area Scan Peak SAR Zoom Scan Peak SAR	: 38.387 W/kg : 19.982 W/kg : 41.123 W/kg : 69.361 W/kg
	SAR-Z Axis at Hotopot x7.20 y.1.00
70	
50	
1# 40	
30	
20	
10	
0 5 1	0 15 20 25 30 Z Distance (mm)

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Beng Products Regulatory Lab.

# 8.3 Test Setup Photographs

**Right Head (EUT Cheek)** 



**Right Head (EUT Tilted)** 



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Left Head (EUT Cheek)



Left Head (EUT Tilted)



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Body Worn



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Beng Products Regulatory Lab.

# 8.4 EUT Photographs

**Front Open** 



**Front Close** 



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**Beng** Products Regulatory Lab.

Rear open



**Rear close** 



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**Right side** 



Left side



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	EMC Test Team	Form No.: PRL17025-2-29F-02

# **Attachment 1: Test plots and details**

(Total 32 pages)

Report No: SF-NLS00294	Product Regulatory Laboratory	Page: 36 of 37						
	EMC Test Team	Form No.: PRL17025-2-29F-02						
SAR	Test	Repo	ort -	Head	Rig	ht C	'heek	Ch512
---------------	------------	------------------	-----------------	----------	-------------	-----------	-----------------	----------
Report	Date	- :	26-0ct	-2005	-			
Ву Оре	rator	:	123					
Measur	ement Da	ate :	26-Aug	-2005				
Starti	ng Time	:	26-Aug	-2005 0	3:22:	51 PM		
End Ti	me	:	26-Aug	-2005 0	3:37:	42 PM		
Scanni	ng Time	:	891 se	CS				
Produc	t Data							
Device	Name		M580					
Serial	No.		open f	ront				
Tvpe			Clamsh	ell Cell	. Phon	le		
Model		:	M580					
Freque	ncy	:	1900.0	0 MHz				
Max. T	ransmit	Pwr :	1 W					
Drift	Time	:	0 min(	s)				
Length		:	160.48	mm				
Width		:	44.4 m	n				
Depth	- <b>m</b>	:	22.8 m	n 7				
Antenn	a Type	:	Inter	nal				
Dowor	Drift_C	tart :		w/ka				
Power	Drift-F	inich:	0.238	W/kg				
Power	Drift (?	2112511. %) ·	-4 507	M/ Kg				
Pictur	e	• •	C:\als	as\bitma	m\M58	0-of.h	omo	
1 1 0 0 0 0 1	0	-	01 (0120		-p (110 0	0 0214	<u>P</u>	
Phanto	m Data							
Name		:	APREL-S.	AM Right	: Ear			
Туре		:	SAM-Rig	ht				
Size (	mm)	:	280 x 2	80 x 280	)			
Serial	NO.	:	User De	tine				
Dogari	ntion	•	Right D	Jaor De	fino			
Descii	peron	•	Rigiic F	-USEI DE	; i i i i e			
Tissue	Data							
Туре		:	HEAD					
Serial	No.	:	290-011	01				
Freque	ncy	:	1900.00	MHz				
Last C	alib. Da	ate :	08-Feb-	2005				
Temper	ature	:	22.50					
Humidi	t remp.	:	21.60 P	с ЦР				
Ensilo	cy m	:	39 650	F/m				
Sigma			1.470 S	/m				
Densit	y	:	1000.00	kg/cu.	m			
	-							
Probe	Data		Deve la co					
Name		:	Probe 2	60 - Ber	ιQ			
Turno		•	EUZU E-Eiold	Triangl	0			
Serial	No	•	260	IIIangi				
Last C	alib. Da	ate :	14-Feb-	2005				
Freque	ncy	:	1900.00	MHz				
Duty C	ycle Fa	ctor:	8					
Conver	sion Fa	ctor:	4.7					
Probe	Sensitiv	vity:	1.20 1	.20 1.2	20 µ	.V/(V/n	n) <sup>2</sup>	
Compre	ssion Po	oint:	95.00 m	V				
Offset		:	2.44 mm					
Measur	ement D	ata						
Crest	Factor	:	8					
Scan T	'ype	:	Complet	е				
Tissue	Temp.	:	22.50 °	С				
Ambien	t Temp.	:	21.60 °	С				
Set-up	Date	:	26-Aug-	2005				
Set-up	Time	:	11:17:5	B AM		10	10	
Area S	can	:	5X5X1 :	Measure	ement	x = 10mn	n, y=10m	z=4mm
200111 S	Call	:	JYJYA :	measure	TILETT	∧=σıιιιι,	y = o m n	∠=411111

Other Data DUT Position : Touch Separation : 0 Channel : Low - 512



1 gram SAR value : 0.505 W/kg 10 gram SAR value : 0.372 W/kg Area Scan Peak SAR : 0.545 W/kg Zoom Scan Peak SAR : 0.750 W/kg

SAR-Z Axis at Hotspot x:61.70 y:4.30



SAR Test Rep	ort Head Right Cheek Ch661
Report Date	26-Oct-2005
By Operator	: 123
Measurement Date	26-Aug-2005
Starting Time	26-Aug-2005 03:05:31 PM
End Time	26-Aug-2005 03:21:31 PM
Scanning Time	960 secs
Product Data	
Device Name	M580
Serial No.	open front
Type	Clamshell Cell Phone
Model	M580
May Transmit Dwr	1 W
Drift Time	0 min(s)
Length	160.48 mm
Width	: 44.4 mm
Depth	: 22.8 mm
Antenna Type	Internal
Orientation	Touch
Power Drift-Start	0.234  W/Kg
Power Drift (%)	-0.618
Picture	C:\alsas\bitmap\M580-of.bmp
1100010	(arbab (bromap (11500 01.5mp
Phantom Data	
Name :	APREL-SAM Right Ear
Type :	SAM-Right
Size (mm) :	280 X 280 X 280 User Define
Location :	Right
Description :	Right P-User Define
-	5
Tissue Data	
Type :	HEAD 200 01101
Frequency	1900 00 MHz
Last Calib. Date :	08-Feb-2005
Temperature :	22.50 °C
Ambient Temp. :	21.60 °C
Humidity :	58.00 RH%
Epsilon :	39.650 F/m
Sigma :	1.470  S/m
Density :	1000.00 kg/cu. m
Probe Data	
Name :	Probe 260 - BenQ
Model :	
Type :	E-Field Triangle
Last Calib Date .	200 14-Feb-2005
Frequency :	1900.00 MHz
Duty Cycle Factor:	8
Conversion Factor:	4.7
Probe Sensitivity:	1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point:	95.00 mV
Offset :	2.44 mm
Measurement Data	
Crest Factor :	8
Scan Type :	Complete
Tissue Temp. :	22.50 °C
Ambient Temp. :	21.60 °C
Set-up Date :	20-AUG-2000 11.17.58 AM
Area Scan	5x5x1 : Measurement x=10mm. v=10mm. z=4mm
Zoom Scan :	5x5x8 : Measurement x=8mm, y=8mm, z=4mm
	, <u>,</u> ,

Other Data DUT Position : Touch Separation : 0 Channel : Mid - 661



1 gram SAR value : 0.572 W/kg 10 gram SAR value : 0.436 W/kg Area Scan Peak SAR : 0.589 W/kg Zoom Scan Peak SAR : 0.700 W/kg

SAR-Z Axis



SAR Test Re	port - Head Right Cheek Ch810
Report Date	: 26-Oct-2005
By Operator	: 123
Measurement Date	: 21-Oct-2005
End Time	$\cdot 21 - 0ct - 2005 11:20:34 \text{ AM}$
Scanning Time	: 859 secs
Product Data	
Device Name	: M580
Type	· Clamshell Cell Phone
Model	: M580
Frequency	: 1900.00 MHz
Max. Transmit Pwi	: 1 W
Drift Time	$: 0 \min(s)$
Width	$\cdot 44 4 \text{ mm}$
Depth	: 22.8 mm
Antenna Type	: Internal
Orientation	: Touch
Power Drift-Start	L : 0.206  W/Kg
Power Drift (%)	: -3.756
Picture	: C:\alsas\bitmap\M580-of.bmp
Phantom Data	
Name	: APREL-SAM Right Ear
Size (mm)	$: 280 \times 280 \times 280$
Serial No.	: User Define
Location	: Right
Description	: Right P-User Define
Tissue Data	
Type	: HEAD
Serial No.	: 290-01101
Frequency	: 1900.00 MHz
Last Calib. Date	: 10-Oct-2005
Ambient Temp.	: 22.50 C
Humidity	: 58.00 RH%
Epsilon	: 39.650 F/m
Sigma	: 1.470 S/m
Density	: 1000.00 kg/cu. m
Probe Data	
Name	: Probe 260 - BenQ
Model	: E020
Type	: E-Field Triangle
Last Calib Date	: 260 • 14-Feb-2005
Frequency	: 1900.00 MHz
Duty Cycle Factor	: 8
Conversion Factor	: 4.7
Probe Sensitivity	$\gamma$ : 1.20 1.20 1.20 $\mu V / (V/m)^2$
Offset	• 2 44 mm
Measurement Data	
Crest Factor	: 8
Scan Type	: COMPLETE
Ambient Temp.	: 21.60 °C
Set-up Date	: 21-Oct-2005
Set-up Time	: 11:17:58 AM
Area Scan	: 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
	: $3x_3x_0$ : measurement $x=0$ mm, $y=0$ mm, $z=4$ mm

Other Data DUT Position : Touch Separation : 0 Channel : High - 810



1 gram SAR value : 0.611 W/kg 10 gram SAR value : 0.413 W/kg Area Scan Peak SAR : 0.629 W/kg Zoom Scan Peak SAR : 0.930 W/kg

SAR-Z Axis at Hotspot x:70.30 y:0.10



#### SAR Test Report Head Right Tilt Ch661 Report Date : 26-Oct-2005 By Operator : 123 Measurement Date : 26-Aug-2005 Starting Time : 26-Aug-2005 03:55:48 PM End Time : 26-Aug-2005 04:16:17 PM Scanning Time : 1229 secs Product Data : M580 Device Name : open front Serial No. : Clamshell Cell Phone : M580 : 1900.00 MHz Type Frequency Max. Transmit Pwr : 1 W Drift Time : 0 min(s) Length : 160.48 mm Width : 44.4 mm : 22.8 mm Depth Antenna Type : Internal Orientation : Touch Power Drift-Start : 0.266 W/kg Power Drift-Finish: 0.255 W/kg Power Drift (%) : -4.098 Picture : C:\alsas\bitmap\M580-of.bmp Phantom Data : APREL-SAM Right Ear Name Type : SAM-Right TypeSAM-RightSize (mm): 280 x 280 x 280Serial No.: User DefineLocation: RightDescription: Right P-User Define Tissue Data : HEAD Туре Serial No. : 290-01101 Frequency : 1900.00 MHz Last Calib. Date : 08-Feb-2005 Temperature : 22.50 °C Ambient Temp. : 21.60 °C Humidity : 58.00 RH% Epsilon : 39.650 F/m Epsilon : 1.470 S/m Siqma : 1000.00 kg/cu. m Density Probe Data Name : Probe 260 - BenQ : E020 Model Type : E-Field Triangle Serial No. : 260 Last Calib. Date : 14-Feb-2005 Frequency : 1900.00 MHz Duty Cycle Factor: 8 Conversion Factor: 4.7 Probe Sensitivity: 1.20 1.20 1.20 $\mu V/\left(V/m\right)^2$ Compression Point: 95.00 mV Offset : 2.44 mm Measurement Data Crest Factor : 8 Scan Type : Complete Scall Type: CompleteTissue Temp.: 22.50 °CAmbient Temp.: 21.60 °CSet-up Date: 26-Aug-2005Set-up Time: 11:17:58 AMArea Scan: 5x5x1 : Measurement x=10mm, y=10mm, z=4mmZoom Scan: 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data DUT Position : Touch Separation : 0 Channel : Mid - 661



1 gram SAR value : 0.267 W/kg 10 gram SAR value : 0.241 W/kg Area Scan Peak SAR : 0.271 W/kg Zoom Scan Peak SAR : 0.170 W/kg



SAR Test Rep	ort - Head Left Cheek Ch512
Report Date	: 26-Oct-2005
By Operator	: 123
Measurement Date	: 26-Aug-2005
End Time	$26 - \Delta u \alpha - 2005 = 10.45 : 16 \text{ AM}$
Scanning Time	: 835 secs
Product Data	
Device Name	: M580
Serial No.	: open front . Clampholl Coll Dhone
Model	: M580
Frequency	: 1900.00 MHz
Max. Transmit Pwr	: 1 W
Drift Time	: 0 min(s)
Lengtn Width	: 160.48 mm
Depth	: 22.8 mm
Antenna Type	: Internal
Orientation	: Touch
Power Drift-Start	: 0.219 W/kg
Power Drift-Finish	: 0.211 W/kg
Power Drift (3)	: -3.653 • C·\algag\bitman\M580-of bmp
FICCULE	
Phantom Data	
Name :	APREL-SAM Left Ear
Type :	SAM-Left
Size (mm) :	280 x 280 x 280 Ugor Dofino
Location :	Left
Description :	SAM-Left User Define
-	
Tissue Data	
Type :	HEAD
Frequency ·	1900 00 MHz
Last Calib. Date :	08-Feb-2005
Temperature :	22.50 °C
Ambient Temp. :	21.60 °C
Humidity :	58.00 RH%
Sigma :	39.650 F/m 1 470 S/m
Density :	1000.00 kg/cu. m
Probe Data	
Name :	Probe 260 - BenQ
Model :	EU2U E-Field Triangle
Serial No. :	260
Last Calib. Date :	14-Feb-2005
Frequency :	1900.00 MHz
Duty Cycle Factor:	8
Conversion Factor:	4.7 1.20, 1.20, 1.20, $uV/(V/m)^2$
Compression Point:	$\mu = 1.20 + 1.2$
Offset :	2.44 mm
Measurement Data	
Crest Factor :	8 Complete
Tissue Temp	22.50 °C
Ambient Temp. :	21.60 °C
Set-up Date :	26-Aug-2005
Set-up Time :	10:44:44 AM
Area Scan :	5x4x1 : Measurement x=10mm, y=10mm, z=4mm
200111 Scan :	$\Delta x \Delta x \delta x$ : Measurement $x = \delta m m$ , $y = \delta m m$ , $z = 4 m m$

Other Data DUT Position : Touch Separation : 0 Channel : Mid - 512



1 gram SAR value : 0.566 W/kg 10 gram SAR value : 0.402 W/kg Area Scan Peak SAR : 0.625 W/kg Zoom Scan Peak SAR : 0.800 W/kg

SAR-Z Axis at Hotspot x:65.20 y:2.40



SAR Test Rep	ort - Head Left Cheek Ch661
Report Date	: 26-Oct-2005
By Operator	: 123 . 26 Jug 2005
Starting Time	: 26-Aug-2005 10:25:30 AM
End Time	: 26-Aug-2005 10:42:26 AM
Scanning Time	: 1016 secs
Product Data	
Device Name	: M580
Serial No.	: open front . Clamaball Coll Phone
Model	: M580
Frequency	: 1900.00 MHz
Max. Transmit Pwr	: 1 W
Length	: 160.48 mm
Width	: 44.4 mm
Depth Antonna Tymo	: 22.8 mm
Orientation	: Touch
Power Drift-Start	: 0.211 W/kg
Power Drift-Finish	: 0.221 W/kg
Picture	: 4.739 : C:\alsas\bitmap\M580-of.bmp
Phantom Data	ADDEL CAM LAFE Ear
Type :	SAM-Left
Size (mm) :	280 x 280 x 280
Serial No. :	User Define
Description :	SAM-Left User Define
-	
Tissue Data	НЕУЛ
Serial No. :	290-01101
Frequency :	1900.00 MHz
Last Calib. Date :	08-Feb-2005
Ambient Temp. :	21.60 °C
Humidity :	58.00 RH%
Epsilon :	39.650 F/m 1 470 S/m
Density :	1000.00 kg/cu. m
Probe Data Name	Prohe 260 - BenO
Model :	E020
Type :	E-Field Triangle
Serial No. : Last Calib Date ·	260 14-Feb-2005
Frequency :	1900.00 MHz
Duty Cycle Factor:	8
Probe Sensitivity	4.7 1.20, 1.20, 1.20, $\mu V/(V/m)^2$
Compression Point:	95.00 mV
Offset :	2.44 mm
Measurement Data	
Crest Factor :	8
Scan Type :	Complete
Ambient Temp. :	22.50 °C
Set-up Date :	26-Aug-2005
Set-up Time :	10:17:44 AM 7x5x1 · Measurement $x=10$ mm $x=10$ mm $z=4$ mm
Zoom Scan :	5x5x8: Measurement x=8mm, y=8mm, z=4mm

Other Data DUT Position : Touch Separation : 0 Channel : Mid - 661







SAR Test Rep	ort - Head Left Cheek Ch810
Report Date	: 26-Oct-2005
By Operator	: 123
Starting Time	26 - Aug - 2005
End Time	: 26 - Aug - 2005 = 11:01:40  AM : 26 - Aug - 2005 = 11:16:21  AM
Scanning Time	: 875 secs
5	
Product Data	
Device Name	: M580
Type	· Clamshell Cell Phone
Model	: M580
Frequency	: 1900.00 MHz
Max. Transmit Pwr	: 1 W
Drift Time	: 0 min(s)
Width	$\cdot 100.48$ IIIII $\cdot 44.4$ mm
Depth	: 22.8 mm
Antenna Type	: Internal
Orientation	: Touch
Power Drift-Start	: 0.232 W/kg
Power Drift-Finish	1: 0.242 W/kg
Power Drift (%)	: 4.484 • C·\alsas\hitman\M580-of hmn
FICCUIE	
Phantom Data	
Name :	APREL-SAM Left Ear
Type :	SAM-Left
Size (mm) :	280 X 280 X 280 User Define
Location :	Left
Description :	SAM-Left User Define
-	
Tissue Data	
Serial No	HEAD 290-01101
Frequency :	1900.00 MHz
Last Calib. Date :	08-Feb-2005
Temperature :	22.50 °C
Ambient Temp. :	21.60 °C
Humidity :	58.00 RH%
Sigma :	1.470 S/m
Density :	1000.00 kg/cu. m
-	
Probe Data	
Name : Model	Probe 260 - Beny Folo
Type :	E-Field Triangle
Serial No. :	260
Last Calib. Date :	14-Feb-2005
Frequency :	1900.00 MHz
Duty Cycle Factor:	8
Probe Sensitivity	4.7 1 20 1 20 1 20 $11^{V/(V/m)^2}$
Compression Point:	95.00 mV
Offset :	2.44 mm
M	
Measurement Data	0
Scan Type	o Complete
Tissue Temp. :	22.50 °C
Ambient Temp. :	21.60 °C
Set-up Date :	26-Aug-2005
Set-up Time :	11:01:31 AM $5x4x1 + 10mm + 10mm + 10mm$
Area Scan : Zoom Scan	5x4x1 : Measurement x=10mm, y=10mm, z=4mm 5x5x8 · Measurement x=8mm y=8mm z=4mm
	JAJAO . MEABULEMENT A-OMMI, Y=OMMI, Z=4MMI

Other Data DUT Position : Touch Separation : 0 Channel : High - 810



1 gram SAR value : 0.622 W/kg 10 gram SAR value : 0.435 W/kg Area Scan Peak SAR : 0.726 W/kg Zoom Scan Peak SAR : 0.890 W/kg

SAR-Z Axis at Hotspot x:65.20 y:-5.80



## SAR Test Report Head Left Tilt Ch661 Report Date : 26-Oct-2005

By Operator Measurement Date Starting Time End Time Scanning Time	: 123 : 26-Aug-2005 : 26-Aug-2005 11:18:18 AM : 26-Aug-2005 11:36:08 AM : 1070 secs
Product Data Device Name Serial No. Type Model Frequency Max. Transmit Pwr Drift Time Length Width Depth Antenna Type Orientation Power Drift-Start Power Drift-Finish Power Drift (%) Picture	<pre>: M580 : open front : Clamshell Cell Phone : M580 : 1900.00 MHz : 1 W : 0 min(s) : 160.48 mm : 44.4 mm : 22.8 mm : Internal : 15° Tilt : 0.255 W/kg : 0.270 W/kg : 5.861 : C:\alsas\bitmap\M580-of.bmp</pre>
Phantom DataName:Type:Size (mm):Serial No.:Location:Description:	APREL-SAM Left Ear SAM-Left 280 x 280 x 280 User Define Left SAM-Left User Define
Tissue Data Type : Serial No. : Frequency : Last Calib. Date : Temperature : Ambient Temp. : Humidity : Epsilon : Sigma : Density :	HEAD 290-01101 1900.00 MHz 08-Feb-2005 22.50 °C 21.60 °C 58.00 RH% 39.650 F/m 1.470 S/m 1000.00 kg/cu. m
Probe Data Name : Model : Type : Serial No. : Last Calib. Date : Frequency : Duty Cycle Factor: Conversion Factor: Probe Sensitivity: Compression Point: Offset :	Probe 260 - BenQ E020 E-Field Triangle 260 14-Feb-2005 1900.00 MHz 8 4.7 1.20 1.20 1.20 $\mu V/(V/m)^2$ 95.00 mV 2.44 mm
Measurement Data Crest Factor : Scan Type : Tissue Temp. : Ambient Temp. : Set-up Date : Set-up Time : Area Scan : Zoom Scan :	8 Complete 22.50 °C 21.60 °C 26-Aug-2005 11:17:58 AM 5x4x1 : Measurement x=10mm, y=10mm, z=4mm 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data DUT Position : 15° Tilt Separation : 0 Channel : Mid - 661



1 gram SAR value : 0.231 W/kg 10 gram SAR value : 0.207 W/kg Area Scan Peak SAR : 0.282 W/kg Zoom Scan Peak SAR : 0.310 W/kg

SAR-Z Axis at Hotspot x:89.40 y:20.20



SAR Test Rep	ort - Head	Right	Cheek	Ch810	$\mathbf{BT}$	on
Report Date	: 26-Oct-2005	2				
By Operator	: 123					
Measurement Date	: 21-Oct-2005		NA.			
End Time	· 21-0ct-2005 (	)1:01:50 P )1:15:54 P	PM			
Scanning Time	: 844 secs					
5						
Product Data						
Device Name	: M580					
Type	: Clamshell Cell	Phone				
Model	: M580					
Frequency	: 1900.00 MHz					
Max. Transmit Pwr	: 1 W					
Length	: 0  (IIIII(S) : 160  / 8 mm					
Width	: 44.4 mm					
Depth	: 22.8 mm					
Antenna Type	: Internal					
Orientation	: Touch					
Power Drift-Start	: 0.201 W/Kg					
Power Drift (%)	: -4.615					
Picture	: C:\alsas\bitma	ap\M580-of	.bmp			
_						
Phantom Data	ADDEL CAM Dicht	Eam				
Nalle : Type ·	SAM-Right	. Edi				
Size (mm) :	280 x 280 x 280	)				
Serial No. :	User Define					
Location :	Right	<b>c</b> '				
Description :	Right P-User De	erine				
Tissue Data						
Type :	HEAD					
Serial No. :	290-01101					
Last Calib Date ·	1900.00 MHZ					
Temperature :	22.50 °C					
Ambient Temp. :	21.60 °C					
Humidity :	58.00 RH%					
Epsilon :	39.650 F/M 1 470 G/m					
Density :	1000.00 kg/cu.	m				
2	5,					
Probe Data		<u> </u>				
Name : Model ·	Probe 260 - Ber	nQ				
Type :	E-Field Triang	e				
Serial No. :	260					
Last Calib. Date :	14-Feb-2005					
Frequency :	1900.00 MHz					
Conversion Factor:	8 4 7					
Probe Sensitivity:	1.20 1.20 1.2	20 µV/(V	/m) <sup>2</sup>			
Compression Point:	95.00 mV		, .			
Offset :	2.44 mm					
Meagurement Data						
Crest Factor	8					
Scan Type :	Complete					
Tissue Temp. :	22.50 °C					
Ambient Temp. :	21.60 °C					
Set-up Date :	21-001-2005 11:17·58 ΔΜ					
Area Scan :	5x5x1 : Measure	ement x=10	mm, y=10m	nm, z=4mm		
Zoom Scan :	5x5x8 : Measure	ement x=8m	m, y=8mm,	z=4mm		

Other Data DUT Position : Touch Separation : 0 Channel : High - 810



1 gram SAR value : 0.585 W/kg 10 gram SAR value : 0.406 W/kg Area Scan Peak SAR : 0.649 W/kg Zoom Scan Peak SAR : 0.900 W/kg

SAR-Z Axis at Hotspot x:60.30 y:8.10



## SAR Test Report - Body GSM Ch512

Report Date By Operator Measurement Date Starting Time End Time Scanning Time	: 26-Oct-2005 : 123 : 26-Aug-2005 : 26-Aug-2005 07:03:25 PM : 26-Aug-2005 07:14:55 PM : 690 secs
Product Data Device Name Serial No. Type Model Frequency Max. Transmit Pwr Drift Time Length Width Depth Antenna Type Orientation Power Drift-Start Power Drift-Finish Power Drift (%) Picture	<pre>: M580 : rear : Clamshell Cell Phone : M580 : 1900.00 MHz : 1 W : 1 min(s) : 89.9 mm : 44.4 mm : 22.8 mm : Internal : Touch : 0.369 W/kg : 0.370 W/kg : 0.363 : C:\alsas\bitmap\Device-3.bmp</pre>
Phantom DataName:Type:Size (mm):Serial No.:Location:Description:	APREL-Uni Uni-Phantom 280 x 280 x 200 User Define Center Uni-Phantom User Define
Tissue Data Type : Serial No. : Frequency : Last Calib. Date : Temperature : Ambient Temp. : Humidity : Epsilon : Sigma : Density :	BODY BenQ-018 1900.00 MHz 10-Jun-2005 22.40 °C 21.60 °C 58.00 RH% 54.400 F/m 1.590 S/m 1000.00 kg/cu. m
Probe Data Name : Model : Type : Serial No. : Last Calib. Date : Frequency : Duty Cycle Factor: Conversion Factor: Probe Sensitivity: Compression Point: Offset :	Probe 260 - BenQ E020 E-Field Triangle 260 14-Feb-2005 1900.00 MHz 8 4.9 1.20 1.20 1.20 µV/(V/m) <sup>2</sup> 95.00 mV 2.44 mm
Measurement Data Crest Factor : Scan Type : Tissue Temp. : Ambient Temp. : Set-up Date : Set-up Time : Area Scan :	8 Complete 22.40 °C 21.60 °C 26-Aug-2005 5:02:26 PM 4x4x1 : Measurement x=10mm, y=10mm, z=4mm

Zoom Scan : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data				
DUT Position	:	Toucl	n	
Separation	:	0		
Channel	:	Mid ·	_	512



:	0.586	W/ka
:	0.436	W/kq
:	0.700	W/kg
:	0.960	W/kg
	::	: 0.586 : 0.436 : 0.700 : 0.960



SAR Test Repo	ort Body GSM Ch661
Report Date	: 26-Oct-2005
By Operator	: 123 · 26-Jug-2005
Starting Time	: 26-Aug-2005 : 26-Aug-2005 06:33:59 PM
End Time	: 26-Aug-2005 06:49:35 PM
Scanning Time	: 936 secs
Product Data	
Device Name	: M580
Serial No.	: rear
Type	: Clamshell Cell Phone
Model	: M580 • 1900 00 MH7
Max. Transmit Pwr	: 1 W
Drift Time	: 1 min(s)
Length	: 89.9 mm
Depth	• 22 8 mm
Antenna Type	: Internal
Orientation	: Touch
Power Drift-Start	0.409  W/kg
Power Drift (%)	: 0.398 W/Kg · -2 884
Picture	: C:\alsas\bitmap\Device-3.bmp
Phantom Data	
Name : Type ·	APREL-UNI Uni-Phantom
Size (mm) :	280 x 280 x 200
Serial No. :	User Define
Location :	Center Und Phanton Union Dafing
Description :	Uni-Phantom User Define
Tissue Data	
Type :	BODY
Serial No. : Frequency	1900 00 MH7
Last Calib. Date :	10-Jun-2005
Temperature :	22.40 °C
Ambient Temp. :	21.60 °C
Humidity : Engilon	58.00 RH%
Sigma :	1.590 S/m
Density :	1000.00 kg/cu. m
Droha Data	
Name :	Probe 260 - BenO
Model :	E020
Type :	E-Field Triangle
Serial No. :	260 14 Ech 2005
Frequency :	1900.00 MHz
Duty Cycle Factor:	8
Conversion Factor:	4.9
Probe Sensitivity:	1.20 1.20 1.20 $\mu V / (V/m)^2$
Offset	95.00 mV 2.44 mm
	2.11
Measurement Data	
Crest Factor :	8 Complete
Tissue Temp.	22.40 °C
Ambient Temp. :	21.60 °C
Set-up Date :	26-Aug-2005
Set-up Time :	5:02:26 PM
Zoom Scan	5x5x8 : Measurement x=8mm. v=8mm. z=4mm
• • • • • • • •	

Other Data DUT Position : Touch Separation : 0 Channel : Mid - 661



1 gra	am SAF	l valı	ıe	:	0.684	W/kg
10 gi	cam SA	AR val	Lue	:	0.493	W/kg
Area	Scan	Peak	SAR	:	0.743	W/kg
Zoom	Scan	Peak	SAR	:	1.020	W/kg



## SAR Test Report Body GSM Ch810

Report Date By Operator Measurement Date Starting Time End Time Scanning Time	: 26-Oct-2005 : 123 : 26-Aug-2005 : 26-Aug-2005 07:16:07 PM : 26-Aug-2005 07:27:37 PM : 690 secs
Product Data Device Name Serial No. Type Model Frequency Max. Transmit Pwr Drift Time Length Width Depth Antenna Type Orientation Power Drift-Start Power Drift-Finish Power Drift (%) Picture	<pre>: M580 : rear : Clamshell Cell Phone : M580 : 1900.00 MHz : 1 W : 1 min(s) : 89.9 mm : 44.4 mm : 22.8 mm : Internal : Touch : 0.395 W/kg : 0.409 W/kg : 3.544 : C:\alsas\bitmap\Device-3.bmp</pre>
Phantom DataName:Type:Size (mm):Serial No.:Location:Description:	APREL-Uni Uni-Phantom 280 x 280 x 200 User Define Center Uni-Phantom User Define
Tissue Data Type : Serial No. : Frequency : Last Calib. Date : Temperature : Ambient Temp. : Humidity : Epsilon : Sigma : Density :	BODY BenQ-018 1900.00 MHz 10-Jun-2005 22.40 °C 21.60 °C 58.00 RH% 54.400 F/m 1.590 S/m 1000.00 kg/cu. m
Probe Data Name : Model : Type : Serial No. : Last Calib. Date : Frequency : Duty Cycle Factor: Conversion Factor: Probe Sensitivity: Compression Point: Offset :	Probe 260 - BenQ E020 E-Field Triangle 260 14-Feb-2005 1900.00 MHz 8 4.9 1.20 1.20 1.20 µV/(V/m) <sup>2</sup> 95.00 mV 2.44 mm
Measurement Data Crest Factor : Scan Type : Tissue Temp. : Ambient Temp. : Set-up Date : Set-up Time : Area Scan :	8 Complete 22.40 °C 21.60 °C 26-Aug-2005 5:02:26 PM 4x4x1 : Measurement x=10mm, y=10mm, z=4mm

Zoom Scan : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data		
DUT Position	:	Touch
Separation	:	0
Channel	:	High - 810



1 gram SAR value	:	0.707	W/kg
10 gram SAR value	:	0.490	W/kg
Area Scan Peak SAR	:	0.737	W/kg
Zoom Scan Peak SAR	:	1.030	W/kg



Test Report	- Body GPRS CH512,
Report Date	: 26-Oct-2005
By Operator	: 123 26 June 2005
Starting Time	: 26-Aug-2005 • 26-Aug-2005 05•30•36 PM
End Time	: 26-Aug-2005 05:55:04 PM
Scanning Time	: 1468 secs
Product Data	MEQO
Serial No.	: rear
Туре	: Clamshell Cell Phone
Model	: M580
Frequency	: 1900.00 MHz
Drift Time	: 1 min(s)
Length	: 89.9 mm
Width	: 44.4 mm
Depth	: 22.8 mm
Orientation	· Touch
Power Drift-Start	: 0.455 W/kg
Power Drift-Finish	: 0.439 W/kg
Power Drift (%)	: -3.540
Picture	: C:\alsas\bitmap\Device-3.bmp
Phantom Data	
Name :	APREL-Uni
Type :	Uni-Phantom
Size (mm) :	280 x 280 x 200
Location :	Center
Description :	Uni-Phantom User Define
-	
Tissue Data	
Serial No	BODI BenO-018
Frequency :	1900.00 MHz
Last Calib. Date :	10-Jun-2005
Temperature :	22.40 °C
Humidity :	21.60 °C 58 00 RH%
Epsilon :	54.400 F/m
Sigma :	1.590 S/m
Density :	1000.00 kg/cu. m
Brobo Data	
Name :	Probe 260 - BenO
Model :	E020
Type :	E-Field Triangle
Serial No. :	260 14-Fob-2005
Frequency :	1900.00 MHz
Duty Cycle Factor:	4
Conversion Factor:	4.9
Probe Sensitivity:	$1.20  1.20  1.20  \mu V / (V/m)^{-2}$
Offset	95.00 IIIV 2 44 mm
·	2.11
Measurement Data	
Crest Factor :	4
Scan Type :	
Ambient Temp. :	21.60 °C
Set-up Date :	26-Aug-2005
Set-up Time :	5:02:26 PM
Area Scan :	/x5x1 : Measurement x=10mm, y=10mm, z=4mm
200111 SCall :	SASAO : Measurement x=8mm, y=8mm, z=4mm



## SAR Test Report-Body GPRS Ch661

Report Date	: 26-Oct-2005
By Operator	: 123 . 21 Oct 2005
Starting Time	· 21-0ct-2005 02·30·17 PM
End Time	: 21-Oct-2005 02:54:09 PM
Scanning Time	: 1432 secs
Product Data Device Name	: M580
Serial No.	: rear
Туре	: Clamshell Cell Phone
Model	: M580
Frequency	: 1900.00 MHz
Drift Time	$: \perp W$
Length	• 89 9 mm
Width	: 44.4 mm
Depth	: 22.8 mm
Antenna Type	: Internal
Orientation	: Touch
Power Drift-Start	: 0.493 W/kg
Power Drift-Finish	1: 0.495  W/kg
Power Drift (%)	: 0.398 • C·\algag\bitman\Device_3 hmn
FICCUIE	: C: (alsas bicinap bevice-s.binp
Phantom Data	
Name :	APREL-Uni
Type :	Uni-Phantom
Size (mm) :	280 x 280 x 200
Serial No. :	User Define
Description :	Cencer Ini-Dhantom User Define
Description .	UII-FHAILOM USEL DELINE
Tissue Data	
Type :	BODY
Serial No. :	BenQ-018
Frequency :	1900.00 MHz
Last Calib. Date :	10-Jun-2005
Ambient Temp	22.40 °C
Humidity :	58.00 RH%
Epsilon :	54.400 F/m
Sigma :	1.590 S/m
Density :	1000.00 kg/cu. m
- 1	
Probe Data	Ducha 260 Demo
Name : Model	Prode 260 - Beng Food
Type :	E-Field Triangle
Serial No. :	260
Last Calib. Date :	14-Feb-2005
Frequency :	1900.00 MHz
Duty Cycle Factor:	4
Conversion Factor:	4.9
Compression Point.	$\mu V = \frac{1.20}{1.20} + 1.20$
Offset :	2.44 mm
Measurement Data	
Crest Factor :	4
Scan Type :	Complete
Insue Temp. :	
Set-up Date	21-Oct-2005
Set-up Time :	2:29:51 PM
Area Scan :	6x5x1 : Measurement x=10mm, y=10mm, z=4mm

Zoom Scan : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data		
DUT Position	:	Touch
Separation	:	0
Channel	:	Mid - 661



1 gra	am SAI	valı ک	le	:	1.261	W/kg
10 gi	ram SA	AR val	lue	:	0.913	W/kg
Area	Scan	Peak	SAR	:	1.312	W/kg
Zoom	Scan	Peak	SAR	:	1.761	W/kg



SAR Test Rep	ort - Body GPRS Ch810
Report Date By Operator	: 26-Oct-2005 : 123
Measurement Date Starting Time	: 26-Aug-2005 · 26-Aug-2005 05·58·46 PM
End Time	: 26-Aug-2005 06:23:04 PM
Scanning Time	: 1458 secs
Product Data Device Name	• M580
Serial No.	: rear
Type Model	: Clamshell Cell Phone : M580
Frequency	: 1900.00 MHz
Drift Time	: 1 W : 1 min(s)
Length	: 89.9 mm
Depth	: 22.8 mm
Antenna Type Orientation	: Internal
Power Drift-Start	: 0.596 W/kg
Power Drift-Finish Power Drift (%)	: 0.584 W/kg : -2.002
Picture	: C:\alsas\bitmap\Device-3.bmp
Phantom Data	
Name : Type :	APREL-Uni Uni-Phantom
Size (mm) :	280 x 280 x 200
Location :	Center
Description :	Uni-Phantom User Define
Tissue Data	DODY
Serial No. :	BenQ-018
Frequency : Last Calib. Date :	1900.00 MHz 10-Лир-2005
Temperature :	22.40 °C
Ambient Temp. : Humidity :	21.60 °C 58.00 RH%
Epsilon :	54.400 F/m
Density :	1000.00 kg/cu. m
Probe Data	
Name : Model	Probe 260 - BenQ
Туре :	E-Field Triangle
Serial No. : Last Calib. Date :	260 14-Feb-2005
Frequency :	1900.00 MHz
Conversion Factor:	4 4.9
Probe Sensitivity:	1.20 1.20 1.20 $\mu V / (V/m)^2$
Offset :	2.44 mm
Measurement Data	
Crest Factor : Scan Type :	4 Complete
Tissue Temp. :	22.40 °C
Set-up Date :	26-Aug-2005
Set-up Time : Area Scan	5:02:26 PM 6x5x1 : Measurement x=10mm, v=10mm, z=4mm
Zoom Scan :	5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data DUT Position : Touch Separation : 0 Channel : High - 810



1 gra	am SAF	R valı	ıe	:	1.291	W/kg
10 gi	cam SA	AR val	Lue	:	0.838	W/kg
Area	Scan	Peak	SAR	:	1.362	W/kg
Zoom	Scan	Peak	SAR	:	1.971	W/kg



## SAR Test Report- Body GPRS CH661 BT on

Report Date By Operator Measurement Date Starting Time End Time	: 26-Oct-2005 : 123 : 21-Oct-2005 : 21-Oct-2005 02:59:27 PM : 21-Oct-2005 03:22:57 PM
Scanning Time	: 1410 secs
Product Data Device Name Serial No. Type Model Frequency Max. Transmit Pwr Drift Time Length Width Depth Antenna Type Orientation Power Drift-Start Power Drift-Finish Power Drift (%) Picture	<pre>: M580 : rear : Clamshell Cell Phone : M580 : 1900.00 MHz : 1 W : 0 min(s) : 89.9 mm : 44.4 mm : 22.8 mm : Internal : Touch : 0.513 W/kg : 0.496 W/kg : -3.314 : C:\alsas\bitmap\Device-3.bmp</pre>
Phantom DataName:Type:Size (mm):Serial No.:Location:Description:	APREL-Uni Uni-Phantom 280 x 280 x 200 User Define Center Uni-Phantom User Define
Tissue Data Type : Serial No. : Frequency : Last Calib. Date : Temperature : Ambient Temp. : Humidity : Epsilon : Sigma : Density :	BODY BenQ-018 1900.00 MHz 10-Jun-2005 22.40 °C 21.60 °C 58.00 RH% 54.400 F/m 1.590 S/m 1000.00 kg/cu. m
Probe Data Name : Model : Type : Serial No. : Last Calib. Date : Frequency : Duty Cycle Factor: Conversion Factor: Probe Sensitivity: Compression Point: Offset :	Probe 260 - BenQ E020 E-Field Triangle 260 14-Feb-2005 1900.00 MHz 4 4.9 1.20 1.20 1.20 $\mu V/(V/m)^2$ 95.00 mV 2.44 mm
Measurement Data Crest Factor : Scan Type : Tissue Temp. : Ambient Temp. : Set-up Date : Set-up Time : Area Scan :	4 Complete 22.40 °C 21.60 °C 21-Oct-2005 2:29:51 PM 6x5x1 : Measurement x=10mm, y=10mm, z=4mm

Zoom Scan : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data		
DUT Position	:	Touch
Separation	:	0
Channel	:	Mid - 661



1 gram SAR value	:	1.247	W/kg
10 gram SAR value	:	0.909	W/kg
Area Scan Peak SAF	2 :	1.313	W/kg
Zoom Scan Peak SAF	2 :	1.791	W/kg



## **Attachment 2: Probe Calibration & Dipole Calibration**

(Total 30 pages)

Report No:	Report No: Product Regulatory Laboratory	Page: 37 of 37
SF-NLS00294	EMC Test Team	Form No.: PRL17025-2-29F-02

## **NCL CALIBRATION LABORATORIES**

Calibration File No: DC-509 Project Number: BENQ-ALSAS 10U-5120

# CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the NCL CALIBRATION LABORATORIES by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

**BENQ Validation Dipole** 

Manufacturer: APREL Laboratories Part number: ALS-D-1900-S-2 Frequency: 1900 MHz Serial No: 210-00702

**Customer: BENQ** 

Calibrated: 4<sup>th</sup> February 2005 Released on: 4<sup>th</sup> February 2005

Released By:



NEPEAN, ONTARIO CANADA K2R 1E6 Division of APREL Lab. TEL: (613) 820-4988 FAX: (613) 820-4162 Division of APREL Laboratories.

## Conditions

Dipole 1900-210-00702 was new and taken from stock prior to calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

**Stuart Nicol** 

Stuart Nicol V Director Product Development

D. Brooks Member of Engineering Staff (Calibration Engineer)

This page has been reviewed for content and attested to by signature within this document.

Division of APREL Laboratories.

## **Calibration Results Summary**

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

### **Mechanical Dimensions**

Length:	68.0 mm
Height:	39.5 mm

## **Electrical Specification**

SWR:	1.08 U	
Return Loss:	-28.7 dB	
Impedance:	50.7 Ω	

## **System Validation Results**

Frequency	1 Gram	10 Gram	Peak
1900 MHz	37.96	19.81	70.56


### Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 1900-210-00702. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

### References

SSI-TP-018-ALSAS Dipole Calibration Procedure SSI-TP-016 Tissue Calibration Procedure IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"

### Conditions

Dipole 1900-210-00702 was new taken from stock.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	20 °C +/- 0.5°C

# **Dipole Calibration Results**

#### **Mechanical Verification**

APREL	APREL	Measured	Measured
Length	Height	Length	Height
68.0 mm	39.5 mm	68.2 mm	39.8 mm

#### **Tissue Validation**

Head Tissue 1900 MHz	Measured
Dielectric constant, ε <sub>r</sub>	40.0
Conductivity, σ [S/m]	1.40

#### **Electrical Calibration**

Test	Result
S11 R/L	-28.7 dB
SWR	1.08 U
Impedance	50.7 Ω

The Following Graphs are the results as displayed on the Vector Network Analyzer.

#### S11 Parameter Return Loss



#### SWR



### **Smith Chart Dipole Impedance**



### System Validation Results Using the Electrically Calibrated Dipole

Head Tissue Frequency	1 Gram	10 Gram	Peak Above Feed Point
1900 MHz	37.96	19.81	70.56



### **Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2004

#### NCL CALIBRATION LABORATORIES

Calibration File No.: CP-514

Client.: Ben-Q

# CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories Model No.: E-020 Serial No.: 260

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2 Project No: BEN-Q-ALSAS10U-5120

> Calibrated: 14<sup>th</sup> February 2005 Released on: 14<sup>th</sup> February 2005

51 SPECTRUM WAY Division of APREL Lab.	This Calibration Certific Released By:		Accompanied with the Calibration Results	Summary
NEPEAN, UNTARIO 1EL: (613) 820-4988 CANADA K2R 1E6 FAX: (613) 820-4161	:	51 SPECTRUM WAY NEPEAN, ONTARIO CANADA K2R 1E6	Division of APREL Lab. TEL: (613) 820-4988 FAX: (613) 820-4161	

#### Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 260.

#### References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques" SSI-TP-011 Tissue Calibration Procedure

#### Conditions

Probe 260 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol X ( Director Product Development

Y. Chen Member of Engineering Staff (Calibration Engineer)

#### Page 2 of 10

This page has been reviewed for content and attested to on Page 2 of this document.

## Calibration Results Summary

E-Field Probe E-020
260
1900 MHz
1.56 mm
2.5 mm
Ertalyte*
<5 mm
60 mm
290 mm

\*Resistive to recommended tissue recipes per IEEE-1528

## Sensitivity in Air

Channel X: Channel Y:	1.2 μV/(V/m) <sup>2</sup> 1.2 μV/(V/m) <sup>2</sup>
Channel Z:	1.2 µV/(V/m) <sup>2</sup>
Diode Compression Point:	95 mV

Sensitivity in	Head Tissue
----------------	-------------

Frequency	:	1900 MHz	
Epsilon:	40.0 (+/-5%)	Sigma:	1.40 S/m (+/-10%)
ConvF			
Channel X:	4.7		
Channel Y:	4.7		
Channel Z:	4.7		

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

### **Boundary Effect:**

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

### **Spatial Resolution:**

The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

## **Receiving Pattern 1900 MHz (Air)**







### Isotropicity in Tissue:

0.10 dB

# **Dynamic Range**



## Video Bandwidth



Video Bandwidth at 500 Hz1 dBVideo Bandwidth at 1.02 KHz:3 dB

### **Conversion Factor Uncertainty Assessment**

Frequency:		1900MHz	
Epsilon:	40.0 (+/-5%)	Sigma:	1.40 S/m (+/-10%)
ConvF			
Channel X:	4.7	7%(K=2)	
Channel Y:	4.7	7%(K=2)	
Channel Z:	4.7	7%(K=2)	

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 M $\Omega$ .

### **Boundary Effect:**

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

## **Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2004.

### NCL CALIBRATION LABORATORIES

Calibration File No.: CP-519

Client.: Ben-Q

# CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the NCL CALIBRATION LABORATORIES by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories Model No.: E-020 Serial No.: 260

**Body Calibration** 

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2 Project No: BEN-Q-ALSAS10U-5120

> Calibrated: 14<sup>th</sup> February 2005 Released on: 14<sup>th</sup> February 2005

This Calibration Certificate is Incomplete Unless? ccompanied with the Calibration Results Summary Released By: **CALIBRATION LABORATORIES** 1 SPECTRUM WAY

51 SPECTRUM WAY NEPEAN, ONTARIO CANADA K2R 1E6 Division of APREL Lab. TEL: (613) 820-4988 FAX: (613) 820-4161

#### Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 260.

#### References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques" SSI-TP-011 Tissue Calibration Procedure

#### Conditions

Probe 260 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol Director Product Development

Y. Chen Member of Engineering Staff (Calibration Engineer)

#### Page 2 of 10

This page has been reviewed for content and attested to on Page 2 of this document.

## Calibration Results Summary

Probe Type:	E-Field Probe E-020	
Serial Number:	260	
Frequency:	1900 MHz	
Sensor Offset:	1.56 mm	
Sensor Length:	2.5 mm	
Tip Enclosure:	Ertalyte*	
Tip Diameter:	<5 mm	
Tip Length:	60 mm	
Total Length:	290 mm	

\*Resistive to recommended tissue recipes per IEEE-1528

## Sensitivity in Air

Channel X: Channel Y:	1.2 μV/(V/m) <sup>2</sup> 1.2 μV/(V/m) <sup>2</sup>
Channel Z:	1.2 µV/(V/m) <sup>2</sup>
Diode Compression Point:	95 mV

Frequency:		1900 MHz	1900 MHz		
Epsilon:	53.3 (+/-5%)	Sigma:	1.52 S/m (+/-10%)		
ConvF					
Channel X:	4.9				
Channel Y:	4.9				
Channel Z:	4.9				

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

### **Boundary Effect:**

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

### **Spatial Resolution:**

The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

## **Receiving Pattern 1900 MHz (Air)**







### Isotropicity in Tissue:

0.10 dB

# **Dynamic Range**



## Video Bandwidth



Video Bandwidth at 500 Hz1 dBVideo Bandwidth at 1.02 KHz:3 dB

### **Conversion Factor Uncertainty Assessment**

Frequency:		1900MHz		
Epsilon:	53.3 (+/-5%)	Sigma:	1.52 S/m (+/-10%)	
ConvF				
Channel X:	4.9	7%(K=2)		
Channel Y:	4.9	7%(K=2)		
Channel Z:	4.9	7%(K=2)		

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 M $\Omega$ .

### **Boundary Effect:**

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

## **Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2004.