

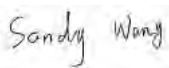

## SAR EVALUATION REPORT

For

### Ezfone Telecommunication Ltd.

Flat 9, 16th Floor, Lemmi Center, 50 Hoi Yuen Road,  
Kwun Tong, Kowloon, Hong Kong, China

**FCC ID: YLXC01-0724**

<b>Report Type:</b> Original Report	<b>Product Type:</b> GSM Mobile Phone
<b>Test Engineer:</b> <u>Sandy Wang</u>	
<b>Report Number:</b> <u>R1DG130723001-20</u>	
<b>Report Date:</b> <u>2013-08-16</u>	
<b>Reviewed By:</b> <u>Alvin Huang</u> RF Leader	
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

Attestation of Test Results			
EUT Information	Company Name	Ezfone Telecommunication Ltd	
	EUT Description	Mobile Phone	
	FCC ID	YLXC01-0724	
	Model Number	C01	
	Test Date	2013-08-04 to 2013-08-05	
Frequency	Max. SAR Level(s) Reported		Limit (W/Kg)
Cellular Band	0.788 W/kg 1g Head SAR 0.707 W/kg 1g Body SAR		1.6
PCS Band	0.486 W/kg 1g Head SAR 0.166 W/kg 1g Body SAR		
Applicable Standards	ANSI/IEEE C95.1: 2005 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields,3 kHz to 300 GHz.		
	ANSI/IEEE C95.3: 2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields,100 kHz—300 GHz.		
	IEEE1528: 2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques		
	KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies		
<p><b>Note:</b> This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in IEEE 1528-2003 and RF exposure KDB procedures.</p> <p><b>The results and statements contained in this report pertain only to the device(s) evaluated.</b></p>			

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1DG130723001-20	Original Report	2013-08-16

## EUT DESCRIPTION

This report has been prepared on behalf of Ezfone Telecommunication Ltd., and their product, FCC ID: YLXC01-0724, Model: C01 or the EUT (Equipment Under Test) as referred to in the rest of this report. The EUT is a GSM Mobile Phone.

### Technical Specification

<b>Product Type</b>	Portable
<b>Exposure Category:</b>	Population / Uncontrolled
<b>Antenna Type(s):</b>	Internal Antenna
<b>Body-Worn Accessories:</b>	Headset
<b>Face-Head Accessories:</b>	None
<b>Multi-slot Class:</b>	Class12
<b>Operation Mode :</b>	GSM Voice and GPRS data
<b>Frequency Band:</b>	Cellular Band : 824-849 MHz(TX) ; 869-894 MHz(RX) PCS Band : 1850-1910 MHz(TX) ; 1930-1990 MHz(RX)
<b>Conducted RF Power:</b>	Cellular Band : 32.27 dBm PCS Band : 29.21 dBm
<b>Dimensions (L*W*H):</b>	102mm (L)×52mm (W)× 11mm (H)
<b>Weight:</b>	68g
<b>Power Source:</b>	3.7VDC 600mAh Rechargeable Battery
<b>Normal Operation:</b>	Head and Body-worn

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## REFERENCE, STANDARDS, AND GUIDELINES

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### **FCC:**

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

### **CE:**

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

**SAR Limits****FCC Limit (1g Tissue)**

<b>EXPOSURE LIMITS</b>	<b>SAR (W/kg)</b>	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

**CE Limit (10g Tissue)**

<b>EXPOSURE LIMITS</b>	<b>SAR (W/kg)</b>	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 10 g of tissue)	2.0	10
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC) & 2 W/kg (CE) applied to the EUT.

## **FACILITIES AND ACCREDITATION**

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The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect data is located at 6/F, the 3rd Phase of WanLi Industrial Building, Shi Hua Road, Fu Tian Free Trade Zone, Shenzhen, Guangdong, P.R. of China



## DESCRIPTION OF TEST SYSTEM

These measurements were performed with ALSAS 10 Universal Integrated SAR Measurement system from APREL Laboratories.

### 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 modeling to provide a platform which is repeatable with minimum uncertainty.

### 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.

### 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.

### 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 (including FCC) utilize a physical step of 5x5x8 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 35mm in the Z axis.



## 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:

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

## Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

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.

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

## Isotropic E-Field Probe Specification

<b>Calibration Method</b>	Frequency Dependent Below 1 GHz Calibration in air performed in a TEM Cell Above 1 GHz Calibration in air performed in waveguide
<b>Sensitivity</b>	$0.70 \mu\text{V}/(\text{V}/\text{m})^2$ to $0.85 \mu\text{V}/(\text{V}/\text{m})^2$
<b>Dynamic Range</b>	0.0005 W/kg to 100 W/kg
<b>Isotropic Response</b>	Better than 0.1 dB
<b>Diode Compression Point (DCP)</b>	Calibration for Specific Frequency
<b>Probe Tip Diameter</b>	< 2.9 mm
<b>Sensor Offset</b>	1.56 (+/- 0.02 mm)
<b>Probe Length</b>	289 mm
<b>Video Bandwidth</b>	@ 500 Hz: 1 dB @ 1.02 kHz: 3 dB
<b>Boundary Effect</b>	Less than 2.1% for distance greater than 0.58 mm
<b>Spatial Resolution</b>	The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe. The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe

## 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.

## 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 $\mu\text{V}$  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.

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

## 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.



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

## 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.

## Universal Device Positioner

The universal device positioner allows 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.

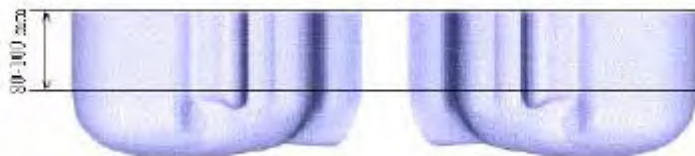


### Phantom Types

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

### 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.



**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.



## 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.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (s/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

## Recommended Tissue Dielectric Parameters for Head and Body

Frequency (MHz)	Head Tissue		Body Tissue	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (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

## EQUIPMENT LIST AND CALIBRATION

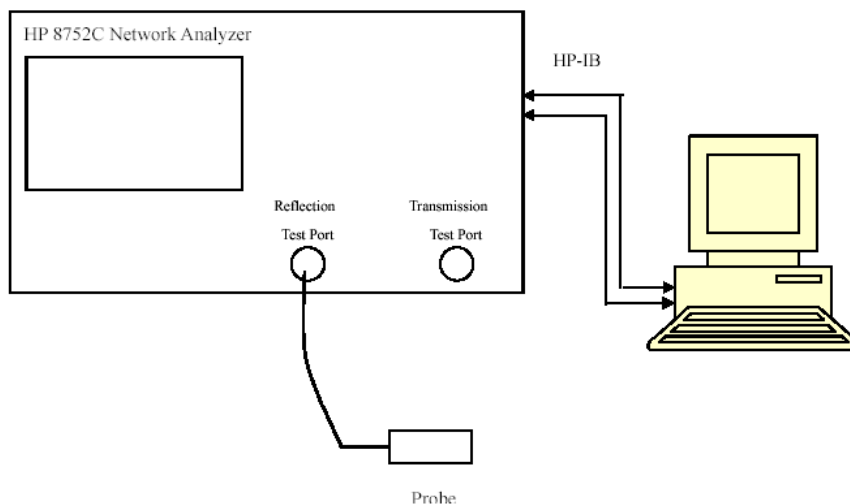
### Equipments List & Calibration Information

Equipment	Model	Calibration Date	S/N
CRS F3 robot	ALS-F3	N/A	RAF0805352
CRS F3 Software	ALS-F3-SW	N/A	N/A
CRS C500C controller	ALS-C500	N/A	RCF0805379
Probe mounting device & Boundary Detection Sensor System	ALS-PMDPS-3	N/A	120-00270
Universal Work Station	ALS-UWS	N/A	100-00157
Data Acquisition Package	ALS-DAQ-PAQ-3	2013-05-12	110-00212
Miniature E-Field Probe	ALS-E-020	2012-08-08	500-00283
Dipole, 835MHz	ALS-D-835-S-2	2011-08-25	180-00558
Dipole, 1900MHz	ALS-D-1900-S-2	2011-08-25	210-00710
Dipole Spacer	ALS-DS-U	N/A	250-00907
Device holder/Positioner	ALS-H-E-SET-2	N/A	170-00510
Left ear SAM phantom	ALS-P-SAM-L	N/A	130-00311
Right ear SAM phantom	ALS-P-SAM-R	N/A	140-00359
UniPhantom	ALS-P-UP-1	N/A	150-00413
Simulated Tissue 835 MHz Head	ALS-TS-835-H	Each Time	270-01002
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	270-02101
Simulated Tissue 1900 MHz Head	ALS-TS-1900-H	Each Time	295-01103
Simulated Tissue 1900 MHz Body	ALS-TS-1900-B	Each Time	295-02102
Power Amplifier	5S1G4	N/A	71377
Synthesized Sweeper	HP 8341B	2013-05-16	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU 200	2012-12-06	1100.0008.02
EMI Test Receiver	ESCI	2012-08-08	101122



## SAR MEASUREMENT SYSTEM VERIFICATION

### Liquid Verification



Liquid Verification Setup Block Diagram

### Liquid Verification Results

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$ (S/m)	
824.2	Head	41.08	0.90	41.50	0.90	-1.012	0.000	$\pm 5$
	Body	55.09	0.95	55.20	0.97	-0.199	-2.062	$\pm 5$
836.6	Head	41.04	0.91	41.50	0.90	-1.108	1.111	$\pm 5$
	Body	55.16	0.97	55.20	0.97	-0.072	0.000	$\pm 5$
848.8	Head	40.80	0.93	41.50	0.90	-1.687	3.333	$\pm 5$
	Body	55.25	0.99	55.20	0.97	0.091	2.062	$\pm 5$
1850.2	Head	40.36	1.40	40.00	1.40	0.900	0.000	$\pm 5$
	Body	54.03	1.49	53.30	1.52	1.370	-1.974	$\pm 5$
1880.0	Head	40.37	1.42	40.00	1.40	0.925	1.429	$\pm 5$
	Body	53.78	1.53	53.30	1.52	0.901	0.658	$\pm 5$
1909.8	Head	40.38	1.43	40.00	1.40	0.925	2.143	$\pm 5$
	Body	53.83	1.53	53.30	1.52	0.994	0.658	$\pm 5$

\*Liquid Verification was performed on 2013-8-4.

Please refer to the following tables.

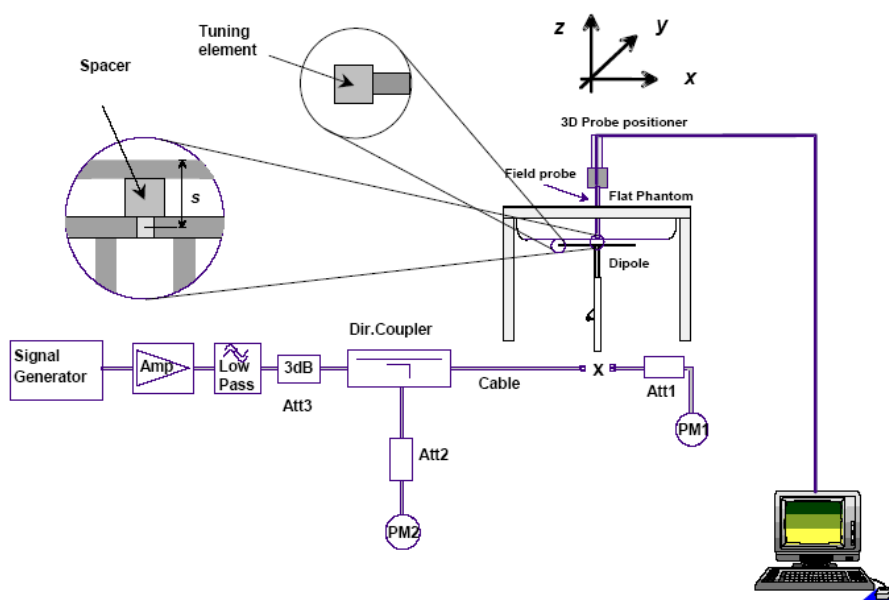
850 MHz Head				850 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	41.080089	19.639607		824.0	55.090305	20.714492
824.5	41.048281	19.640161		824.5	55.093443	20.614003
825.0	41.031621	19.640715		825.0	55.096576	20.626521
825.5	40.926481	19.641269		825.5	55.099719	20.638955
826.0	40.944839	19.641824		826.0	55.102857	20.774017
826.5	40.966732	19.642377		826.5	55.105995	20.837748
827.0	40.943219	19.642931		827.0	55.109133	20.752247
827.5	40.990540	19.643485		827.5	55.112271	20.630383
828.0	41.010146	19.644039		828.0	55.115409	20.664945
828.5	41.016572	19.644594		828.5	55.118547	20.622368
829.0	41.067503	19.645147		829.0	55.121685	20.726523
829.5	41.015996	19.645702		829.5	55.124822	20.669352
830.0	41.052364	19.646256		830.0	55.127960	20.547249
830.5	41.012393	19.646810		830.5	55.131098	20.611637
831.0	40.985391	19.647364		831.0	55.134236	20.596812
831.5	41.004946	19.647918		831.5	55.137374	20.804236
832.0	40.966764	19.648472		832.0	55.140512	20.781900
832.5	40.941588	19.649026		832.5	55.143650	20.558599
833.0	40.982124	19.649580		833.0	55.146788	20.491963
833.5	41.013543	19.650134		833.5	55.149926	20.603430
834.0	41.010968	19.650688		834.0	55.153064	20.755287
834.5	41.009548	19.651244		834.5	55.156202	20.648249
835.0	41.034377	19.651797		835.0	55.159340	20.591708
835.5	41.035377	19.652652		835.5	55.162478	20.839415
836.0	41.038977	19.653507		836.0	55.165616	20.846338
836.5	41.035009	19.654362		836.5	55.162754	20.704145
837.0	41.010806	19.655218		837.0	55.171892	20.531228
837.5	41.005013	19.656076		837.5	55.175030	20.567494
838.0	41.028186	19.656928		838.0	55.178168	20.851777
838.5	40.986716	19.657785		838.5	55.181306	20.866981
839.0	40.976647	19.658639		839.0	55.184444	20.788993
839.5	40.979117	19.659494		839.5	55.187582	20.723951
840.0	40.990184	19.660349		840.0	55.190720	20.791094
840.5	40.979546	19.661204		840.5	55.193858	20.836458
841.0	40.962818	19.662060		841.0	55.196996	20.791586
841.5	40.992260	19.662915		841.5	55.200134	20.728323
842.0	40.993962	19.663770		842.0	55.203272	20.904163
842.5	40.997658	19.664625		842.5	55.206410	20.872676
843.0	40.991753	19.655447		843.0	55.209548	20.833074
843.5	40.915456	19.656298		843.5	55.212686	20.788585
844.0	40.991708	19.657154		844.0	55.215824	20.806243
844.5	40.945999	19.658008		844.5	55.218962	20.832150
845.0	40.872017	19.658867		845.0	55.222099	20.741568
845.5	40.887319	19.659719		845.5	55.225237	20.687954
846.0	40.841902	19.680650		846.0	55.228375	20.860955
846.5	40.882841	19.681505		846.5	55.231513	20.922359
847.0	40.863110	19.682361		847.0	55.234651	20.871218
847.5	40.866294	19.683216		847.5	55.237789	20.791519
848.0	40.839896	19.684071		848.0	55.240927	20.881676
848.5	40.844491	19.684926		848.5	55.244065	20.959760
849.0	40.804759	19.685781		849.0	55.247203	20.959942

1900 MHz Head				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1850.0	40.364447	13.576934		1850.0	54.031205	14.516338
1851.2	40.366675	13.546958		1851.2	53.963124	14.473755
1852.4	40.366927	13.514239		1852.4	53.981968	14.474859
1853.6	40.367173	13.537610		1853.6	53.958551	14.451132
1854.8	40.367422	13.531566		1854.8	53.861387	14.470615
1856.0	40.367670	13.455679		1856.0	53.964410	14.507036
1857.2	40.367920	13.595537		1857.2	53.957581	14.533021
1858.4	40.368171	13.491739		1858.4	53.939595	14.454237
1859.6	40.368419	13.545676		1859.6	53.921266	14.448580
1860.8	40.368668	13.546996		1860.8	53.817057	14.501376
1862.0	40.368917	13.563538		1862.0	53.844733	14.328579
1863.2	40.369166	13.585968		1863.2	53.790714	14.341384
1864.4	40.369416	13.620956		1864.4	53.825466	14.358467
1865.6	40.369664	13.615525		1865.6	53.831939	14.329502
1866.8	40.369914	13.604342		1866.8	53.906949	14.320072
1868.0	40.370213	13.622849		1868.0	53.975393	14.336145
1869.2	40.370412	13.683609		1869.2	53.984455	14.358571
1870.4	40.370663	13.676350		1870.4	53.897953	14.410022
1871.6	40.370911	13.650280		1871.6	53.840333	14.410731
1872.8	40.371159	13.680335		1872.8	53.878767	14.439721
1874.0	40.371409	13.622988		1874.0	53.805232	14.448030
1875.2	40.371658	13.657051		1875.2	53.868395	14.511287
1876.4	40.371918	13.655018		1876.4	53.771510	14.434068
1877.6	40.372156	13.719518		1877.6	53.873793	14.514109
1878.8	40.372406	13.615121		1878.8	53.901580	14.645945
1880.0	40.372654	13.560344		1880.0	53.783901	14.664900
1881.2	40.372904	13.609084		1881.2	53.742141	14.661936
1882.4	40.373154	13.631682		1882.4	53.837683	14.633314
1883.6	40.373403	13.600455		1883.6	53.803184	14.589337
1884.8	40.373651	13.601033		1884.8	53.828081	14.612078
1886.0	40.373901	13.600359		1886.0	53.863292	14.544272
1887.2	40.374150	13.595506		1887.2	53.844067	14.520438
1888.4	40.374400	13.590588		1888.4	53.933844	14.554747
1889.6	40.374648	13.585809		1889.6	53.864335	14.559359
1890.8	40.374897	13.580962		1890.8	53.910010	14.616188
1892.0	40.375146	13.576118		1892.0	53.897974	14.412371
1893.2	40.375395	13.571268		1893.2	53.870426	14.373292
1894.4	40.375646	13.566421		1894.4	53.843064	14.422374
1895.6	40.375893	13.561574		1895.6	53.835912	14.756175
1896.8	40.376143	13.556727		1896.8	53.825813	14.754282
1898.0	40.376392	13.551880		1898.0	53.826143	14.734842
1899.2	40.376642	13.547033		1899.2	53.903144	14.735282
1900.4	40.376892	13.542186		1900.4	53.868060	14.633939
1901.6	40.377140	13.537339		1901.6	53.871543	14.723285
1902.8	40.377410	13.532492		1902.8	53.840634	14.683307
1904.0	40.377638	13.527654		1904.0	53.922345	14.652124
1905.2	40.377887	13.522798		1905.2	53.834102	14.620645
1906.4	40.378148	13.517951		1906.4	53.824014	14.545579
1907.6	40.378385	13.513104		1907.6	53.749694	14.662370
1908.8	40.378635	13.508257		1908.8	53.833974	14.597798
1910.0	40.378885	13.503410		1910.0	53.830497	14.561420

## System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of  $\pm 10\%$ . The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

### System Verification Setup Block Diagram



### Probe and dipole antenna List and Detail

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
APREL	Probe	ALS-E-020	500-00283	2012-08-08	2013-08-07
APREL	Dipole antenna(835MHz)	ALS-D-835-S-2	180-00558	2011-08-25	2014-08-24
APREL	Dipole antenna(1900MHz)	ALS-D-1900-S-2	210-00710	2011-08-25	2014-08-24

### System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2013-08-04	835	Head	1g	9.904	9.590	3.170	$\pm 10$
		Body	1g	9.712	9.684	0.288	$\pm 10$
	1900	Head	1g	39.993	39.648	0.863	$\pm 10$
		Body	1g	40.219	39.769	1.119	$\pm 10$

\*All SAR values are normalized to 1 Watt forward power.

**SAR SYSTEM VALIDATION DATA****Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 835 MHz Head Liquid****Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558****Product Data**

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 9.991 W/kg  
Power Drift-Finish : 9.975 W/kg  
Power Drift (%) : -0.160

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Size (mm) : 280 x 280 x 200  
Serial No. : System Default  
Location : Center  
Description : Default  
Phantom Data

**Tissue Data**

Type : Head  
Serial No. : 270-01002  
Frequency : 835.0 MHz  
Last Calib. Date : 4-Aug-2013  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 41.03 F/m  
Sigma : 0.91 S/m  
Density : 1000.00 kg/cu. m

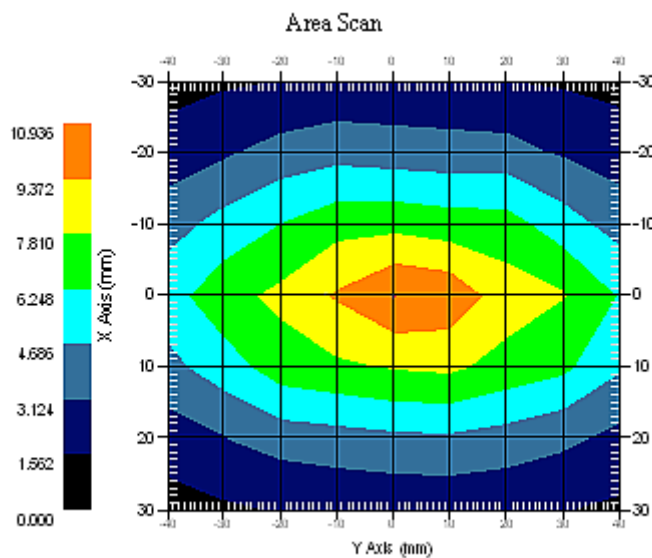
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 08-Aug-2012  
Frequency Band : 835  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 21.00 °C  
Ambient Temp. : 21.00 °C  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 9.904 W/kg  
10 gram SAR value : 6.390 W/kg  
Area Scan Peak SAR : 10.936 W/kg  
Zoom Scan Peak SAR : 19.079 W/kg



### 835 MHz System Validation with Head Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 835 MHz Body Liquid****Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558****Product Data**

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 10.018 W/kg  
Power Drift-Finish : 10.079W/kg  
Power Drift (%) : 0.609

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Size (mm) : 280 x 280 x 200  
Serial No. : System Default  
Location : Center  
Description : Default  
Phantom Data

**Tissue Data**

Type : Body  
Serial No. : 270-02101  
Frequency : 835.0 MHz  
Last Calib. Date : 4-Aug-2013  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 55.16 F/m  
Sigma : 0.96 S/m  
Density : 1000.00 kg/cu. m

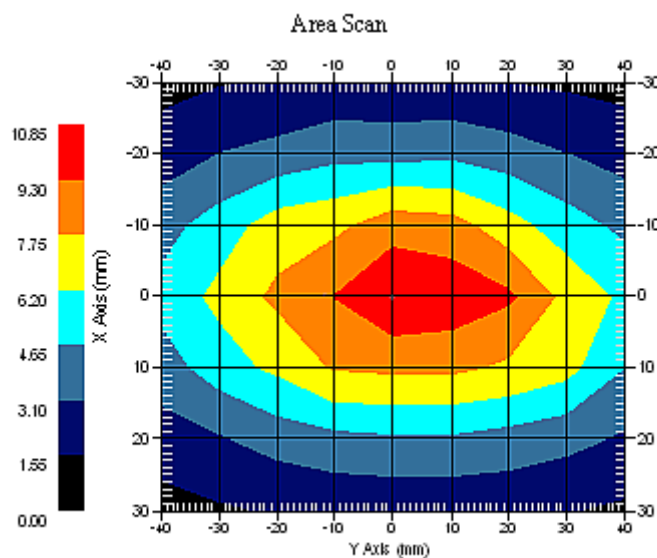
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 08-Aug-2012  
Frequency Band : 835  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 21.00 °C  
Ambient Temp. : 21.00 °C  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 9.712 W/kg  
10 gram SAR value : 6.236 W/kg  
Area Scan Peak SAR : 10.850 W/kg  
Zoom Scan Peak SAR : 18.923 W/kg



### 835 MHz System Validation with Body Tissue



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1900 MHz Head Liquid****Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00710****Product Data**

Device Name : Dipole 1900MHz  
Serial No. : 210-00710  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency Band : 1900  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 40.110 W/kg  
Power Drift-Finish : 40.769 W/kg  
Power Drift (%) : 1.645

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Size (mm) : 280 x 280 x 200  
Serial No. : System Default  
Location : Center  
Description : Default

**Tissue Data**

Type : Head  
Serial No. : 295-01103  
Frequency : 1900.00 MHz  
Last Calib. Date : 4-Aug-2013  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 40.38 F/m  
Sigma : 1.43 S/m  
Density : 1000.00 kg/cu. M

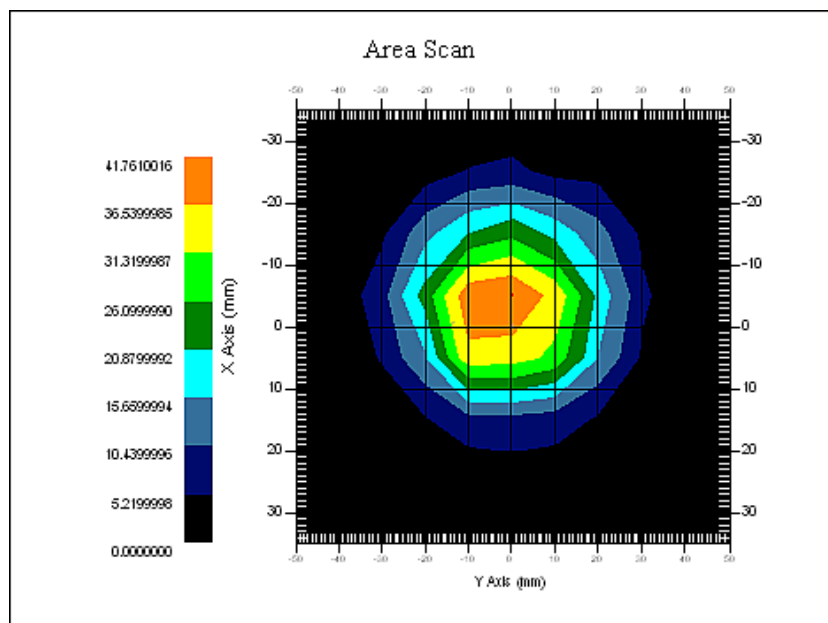
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 08-Aug-2012  
Frequency Band : 1900  
Duty Cycle Factor : 1  
Conversion Factor : 5.20  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 20.00 °C  
Ambient Temp. : 20.00 °C  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 39.993 W/kg  
10 gram SAR value : 20.138W/kg  
Area Scan Peak SAR : 41.760 W/kg  
Zoom Scan Peak SAR : 88.805 W/kg



### 1900 MHz System Validation with Head Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1900 MHz Body Liquid****Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00710****Product Data**

Device Name : Dipole 1900MHz  
Serial No. : 210-00710  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency Band : 1900  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 39.417 W/kg  
Power Drift-Finish : 39.942 W/kg  
Power Drift (%) : 2.347

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Size (mm) : 280 x 280 x 200  
Serial No. : System Default  
Location : Center  
Description : Default

**Tissue Data**

Type : Body  
Serial No. : 295-02102  
Frequency : 1900.00 MHz  
Last Calib. Date : 4-Aug-2013  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 53.87 F/m  
Sigma : 1.55 S/m  
Density : 1000.00 kg/cu. m

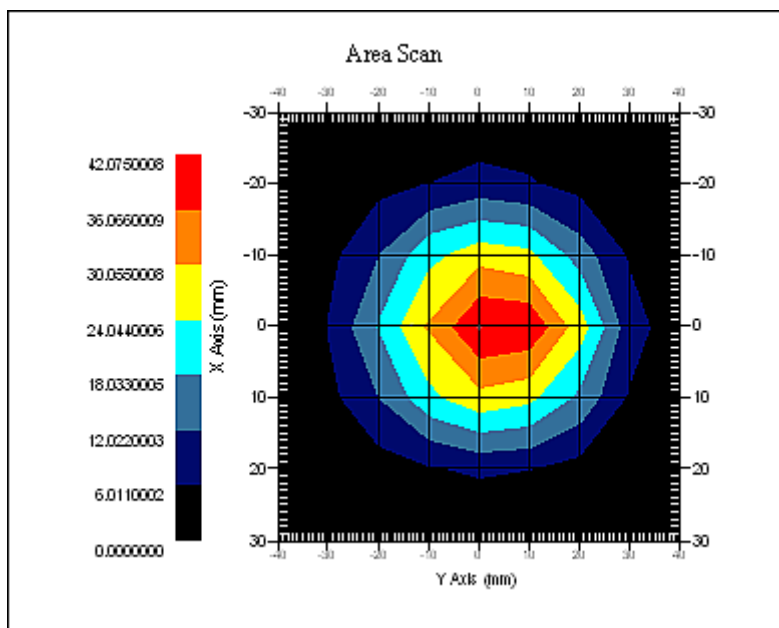
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 08-Aug-2012  
Frequency Band : 1900  
Duty Cycle Factor : 1  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 20.00 °C  
Ambient Temp. : 21.00 °C  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 40.219 W/kg  
10 gram SAR value : 21.006 W/kg  
Area Scan Peak SAR : 42.074 W/kg  
Zoom Scan Peak SAR : 90.082 W/kg



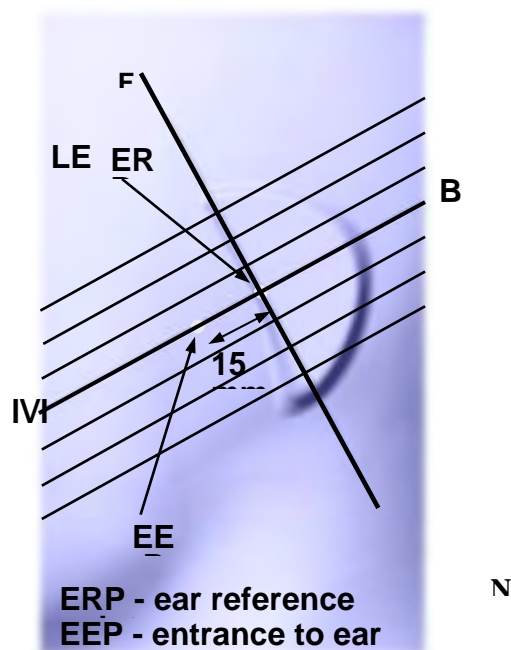
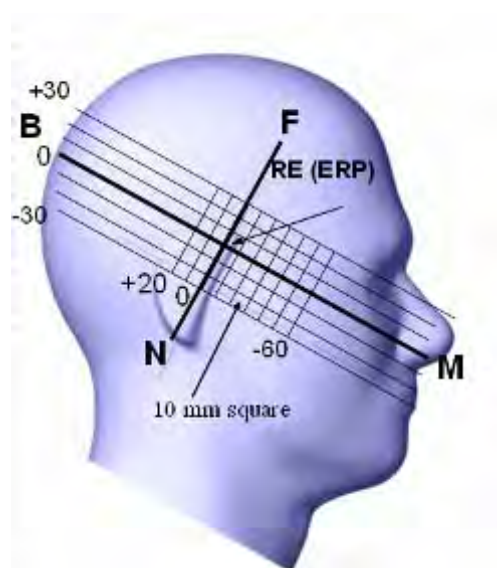
### 1900 MHz System Validation with Body Tissue

## EUT TEST STRATEGY AND METHODOLOGY

### Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point". The "test device reference point" should be located at the same level as the center of the earpiece region. The "vertical centerline" should bisect the front surface of the handset at its top and bottom edges. A "ear reference point" is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the "phantom reference plane" defined by the three lines joining the center of each "ear reference point" (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane". This is called the "initial ear position". While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:



## Cheek/Touch Position

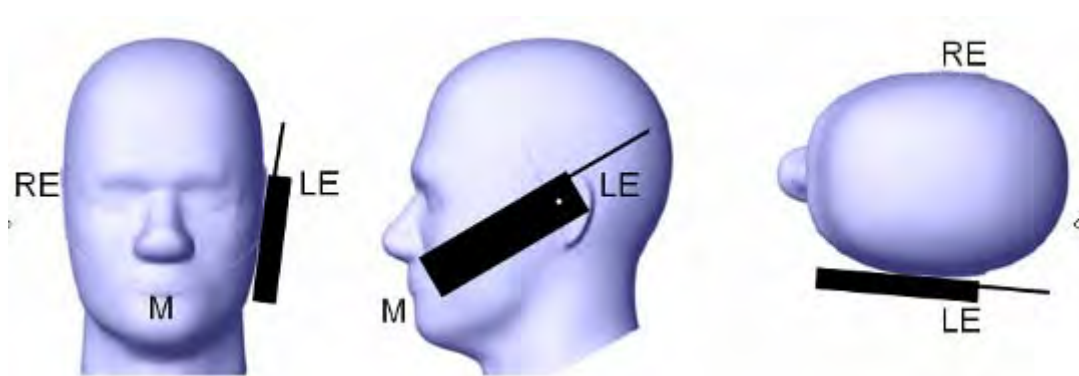
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

- When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
- (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

### Cheek /Touch Position



## Ear/Tilt Position

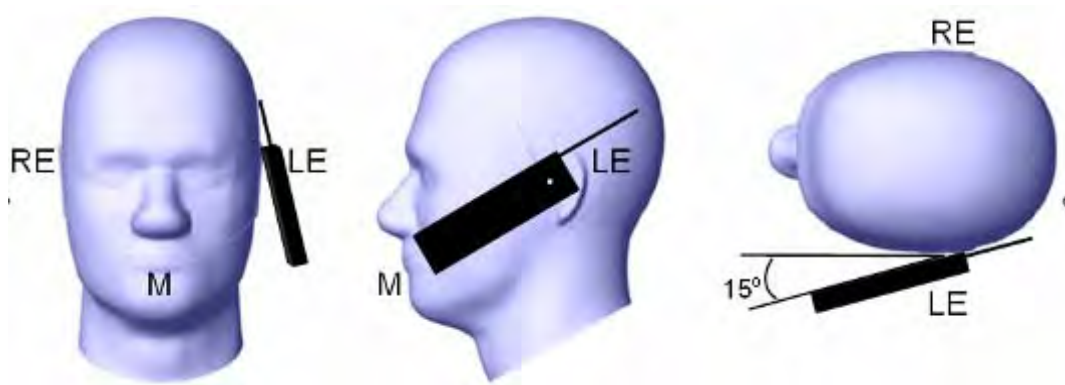
With the handset aligned in the “Cheek/Touch Position”:

1) If the earpiece of the handset is not in full contact with the phantom’s ear spacer (in the “Cheek/Touch position”) and the peak SAR location for the “Cheek/Touch” position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the “initial ear position” by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both “ear reference points” (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the “test device reference point” until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both “ear reference points” until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the “Cheek/Touch” and “Ear/Tilt” positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

### **Ear /Tilt 15° Position**



### **Test positions for body-worn and other configurations**

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. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. 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 distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

## SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 10 mm x 10 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 35 mm x 35 mm x 35 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

- 1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 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.
- 2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-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. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.



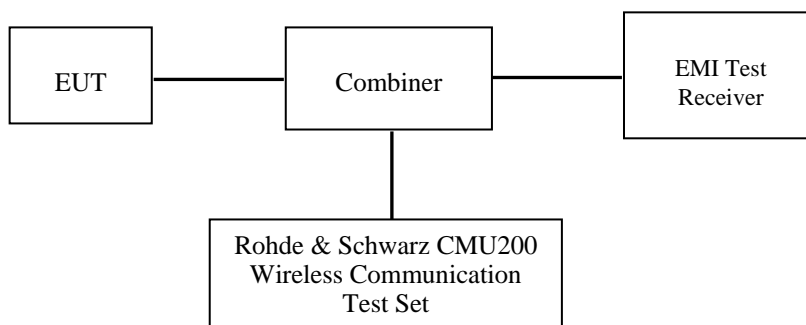
## CONDUCTED OUTPUT POWER MEASUREMENT

### Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

### Test Procedure

The RF output of the transmitter was connected to the input of the EMI Test Receiver through sufficient attenuation.



### GSM

#### Maximum Output Power among production units

Max Target Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 850	33.00	33.00	33.00
GPRS 1 slot	33.00	33.00	33.00
GPRS 2 slot	31.00	31.00	31.00
GPRS 3 slot	29.00	29.00	29.00
GPRS 4 slot	27.00	27.00	27.00
PCS 1900	30.00	30.00	30.00
GPRS 1 slot	30.00	30.00	30.00
GPRS 2 slot	28.00	28.00	28.00
GPRS 3 slot	26.00	26.00	26.00
GPRS 4 slot	24.00	24.00	24.00

**Test Results:****GSM**

Band	Frequency (MHz)	Conducted Peak Output Power	
		Meas. Power (dBm)	Meas. Power (W)
GSM 850	824.2	32.27	1.687
	836.6	32.06	1.607
	848.8	32.09	1.618
PCS 1900	1850.2	29.21	0.834
	1880.0	28.92	0.780
	1909.8	28.68	0.738

**Note:**

1. Rohde & Schwarz Radio Communication Tester (CMU200) was used for the measurement of GSM peak and average output power for active timeslots.
2. For GSM voice, 1 timeslot has been activated with power level 5 (850 MHz band) and 0 (1900 MHz band).
3. IEEE Std 1528-2003 require the middle channel to be tested first. When the maximum output power variation across the required test channels is  $> \frac{1}{2}$  dB, instead of the middle channel, the highest output power channel must be used.

**GPRS**

Band	Channel No.	Frequency (MHz)	RF Peak Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	31.95	30.21	28.30	25.93
	190	836.6	32.11	30.39	28.47	26.22
	251	848.8	32.19	30.53	28.61	26.37
PCS 1900	512	1850.2	29.13	27.39	25.79	23.41
	661	1880.0	28.89	27.10	25.53	23.31
	810	1909.8	29.07	26.97	25.39	23.40

For SAR, the time based average power is relevant, the difference in between depends on the duty cycle of the TDMA signal.

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.25 dB	-3 dB
Crest Factor	8	4	2.66	2

**The time based average power**

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	22.95	24.21	24.05	22.93
	190	836.6	23.11	24.39	24.22	23.22
	251	848.8	23.19	24.53	24.36	23.37
PCS 1900	512	1850.2	20.13	21.39	21.54	20.41
	661	1880.0	19.89	21.10	21.28	20.31
	810	1909.8	20.07	20.97	21.14	20.40

**Note:**

1. Rohde & Schwarz Radio Communication Tester (CMU200) was used for the measurement of GSM peak and average output power for active timeslots.
2. For GSM voice, 1 timeslot has been activated with power level 5 (850 MHz band) and 0 (1900 MHz band).
3. For GPRS, 1, 2, 3 and 4 timeslots has been activated separately with power level 5(850 MHz band) and 0(1900 MHz band).
4. IEEE Std 1528-2003 require the middle channel to be tested first. When the maximum output power variation across the required test channels is  $> \frac{1}{2}$  dB, instead of the middle channel, the highest output power channel must be used.

## SAR MEASUREMENT RESULTS

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This page summarizes the results of the performed dosimetric evaluation.

### SAR Test Data

#### Environmental Conditions

<b>Temperature:</b>	21-22° C
<b>Relative Humidity:</b>	50-53%
<b>ATM Pressure:</b>	1001-1002 mbar

*\* Testing was performed by Sandy Wang on 2013-8-4 to 2013-8-5.*

**GSM 850:**

EUT Position	Frequency (MHz)		Test Mode	Power Drift (%)	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	FCC 1g SAR (W/Kg)		
	Channel	MHz					Scaled Factor	Meas. SAR	Scaled SAR
Left Head Cheek	128(Low)	824.2	GSM	-3.647	32.27	33.00	1.183	0.653	0.772
	190(Middle)	836.6	GSM	-2.194	32.06	33.00	1.242	0.626	0.777
	251(High)	848.8	GSM	-2.712	32.09	33.00	1.233	0.639	<b>0.788</b>
Left Head Tilt	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	4.278	32.06	33.00	1.242	0.414	0.514
	251(High)	848.8	GSM	/	/	/	/	/	/
Right Head Cheek	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	-2.454	32.06	33.00	1.242	0.617	0.766
	251(High)	848.8	GSM	/	/	/	/	/	/
Right Head Tilt	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	1.283	32.06	33.00	1.242	0.408	0.507
	251(High)	848.8	GSM	/	/	/	/	/	/
Body-Front-Headset (15mm)	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	0.761	32.06	33.00	1.242	0.425	0.528
	251(High)	848.8	GSM	/	/	/	/	/	/
Body-Back-Headset (15mm)	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	1.247	32.06	33.00	1.242	0.432	0.537
	251(High)	848.8	GSM	/	/	/	/	/	/
Body-Front (15mm)	128(Low)	824.2	GPRS	/	/	/	/	/	/
	190(Middle)	836.6	GPRS	1.000	30.39	31.00	1.151	0.536	0.617
	251(High)	848.8	GPRS	/	/	/	/	/	/
Body-Back (15mm)	128(Low)	824.2	GPRS	/	/	/	/	/	/
	190(Middle)	836.6	GPRS	2.414	30.39	31.00	1.151	0.614	<b>0.707</b>
	251(High)	848.8	GPRS	/	/	/	/	/	/

**Note:**

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
3. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3DL+2UL is the worse case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.
5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
6. IEEE Std 1528-2003 require the middle channel to be tested first. When the maximum output power variation across the required test channels is  $> \frac{1}{2}$  dB, instead of the middle channel, the highest output power channel must be used.

**PCS Band:**

EUT Position	Frequency (MHz)		Test Mode	Power Drift (%)	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	FCC 1g SAR (W/Kg)		
	Channel	MHz					Scaled Factor	Meas. SAR	Scaled SAR
Left Head Cheek	512(Low)	1850.2	GSM	0.992	29.21	30.00	1.199	0.368	0.441
	661(Middle)	1880.0	GSM	3.825	28.92	30.00	1.282	0.348	0.446
	810(High)	1909.8	GSM	3.911	28.68	30.00	1.355	0.359	<b>0.486</b>
Left Head Tilt	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	-1.316	28.92	30.00	1.282	0.245	0.314
	810(High)	1909.8	GSM	/	/	/	/	/	/
Right Head Cheek	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	-0.515	28.92	30.00	1.282	0.336	0.431
	810(High)	1909.8	GSM	/	/	/	/	/	/
Right Head Tilt	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	1.734	28.92	30.00	1.282	0.240	0.308
	810(High)	1909.8	GSM	/	/	/	/	/	/
Body-Front-Headset (15mm)	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	3.846	28.92	30.00	1.282	0.091	0.117
	810(High)	1909.8	GSM	/	/	/	/	/	/
Body-Back-Headset (15mm)	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	-1.136	28.92	30.00	1.282	0.096	0.123
	810(High)	1909.8	GSM	/	/	/	/	/	/
Body-Front (15mm)	512(Low)	1850.2	GPRS	/	/	/	/	/	/
	661(Middle)	1880.0	GPRS	1.106	25.53	26.00	1.114	0.110	0.123
	810(High)	1909.8	GPRS	/	/	/	/	/	/
Body-Back (15mm)	512(Low)	1850.2	GPRS	/	/	/	/	/	/
	661(Middle)	1880.0	GPRS	-1.879	25.53	26.00	1.114	0.149	<b>0.166</b>
	810(High)	1909.8	GPRS	/	/	/	/	/	/

**Note:**

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
3. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 2DL+3UL is the worst case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.
5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

## EUT SCAN RESULTS

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**

### Left Head Cheek (824.2 MHz Low Channel)

#### Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.329 W/kg  
Power Drift-Finish : 0.317W/kg  
Power Drift (%) : -3.647

#### Tissue Data

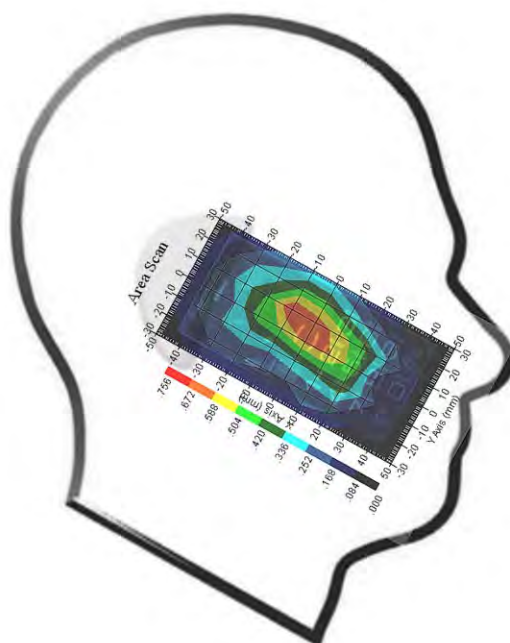
Type : Head  
Frequency : 824.2 MHz  
Epsilon : 41.08 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

#### Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.653 W/kg  
10 gram SAR value : 0.319 W/kg  
Area Scan Peak SAR : 0.679 W/kg  
Zoom Scan Peak SAR : 0.950 W/kg

**Plot 1#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (836.6 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.319 W/kg  
Power Drift-Finish : 0.312W/kg  
Power Drift (%) : -2.194

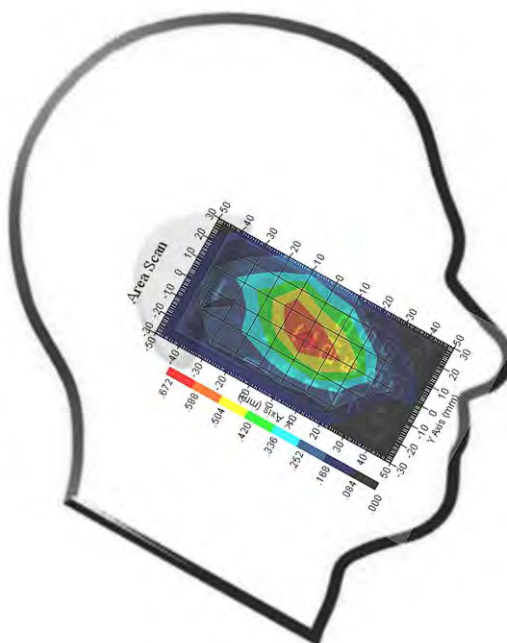
## Tissue Data

Type : Head  
Frequency : 836.6 MHz  
Epsilon : 41.04 F/m  
Sigma : 0.91 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.626 W/kg  
10 gram SAR value : 0.322 W/kg  
Area Scan Peak SAR : 0.670 W/kg  
Zoom Scan Peak SAR : 0.950 W/kg

**Plot 2#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (848.8 MHz High Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.295 W/kg  
Power Drift-Finish : 0.287W/kg  
Power Drift (%) : -2.712

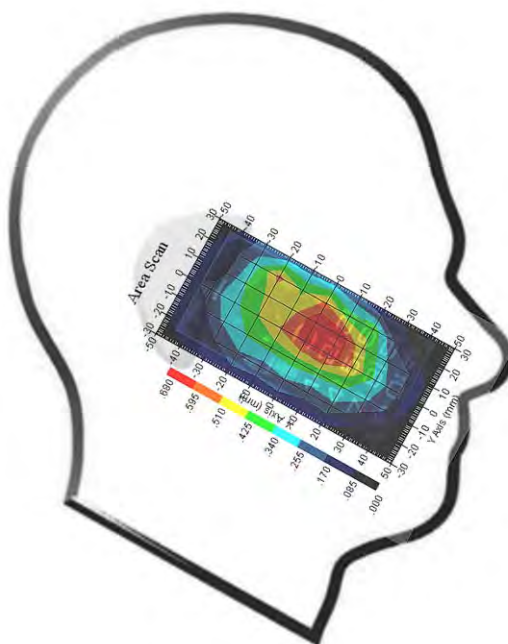
## Tissue Data

Type : Head  
Frequency : 848.8 MHz  
Epsilon : 40.80 F/m  
Sigma : 0.93 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.639 W/kg  
10 gram SAR value : 0.323 W/kg  
Area Scan Peak SAR : 0.677 W/kg  
Zoom Scan Peak SAR : 1.105 W/kg

**Plot 3#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Tilt (836.6 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.187 W/kg  
Power Drift-Finish : 0.195 W/kg  
Power Drift (%) : 4.278

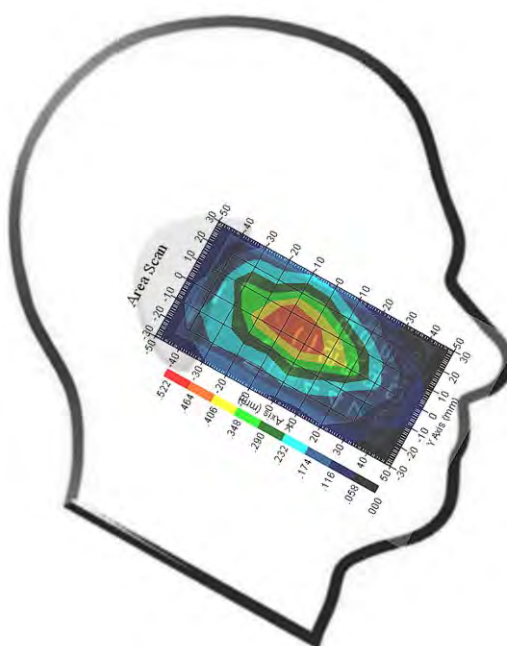
## Tissue Data

Type : Head  
Frequency : 836.6 MHz  
Epsilon : 41.04 F/m  
Sigma : 0.91 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.414 W/kg  
10 gram SAR value : 0.219 W/kg  
Area Scan Peak SAR : 0.465 W/kg  
Zoom Scan Peak SAR : 0.750 W/kg

**Plot 4#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Cheek (836.6 MHz Middle Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.326 W/kg  
Power Drift-Finish : 0.318 W/kg  
Power Drift (%) : -2.454

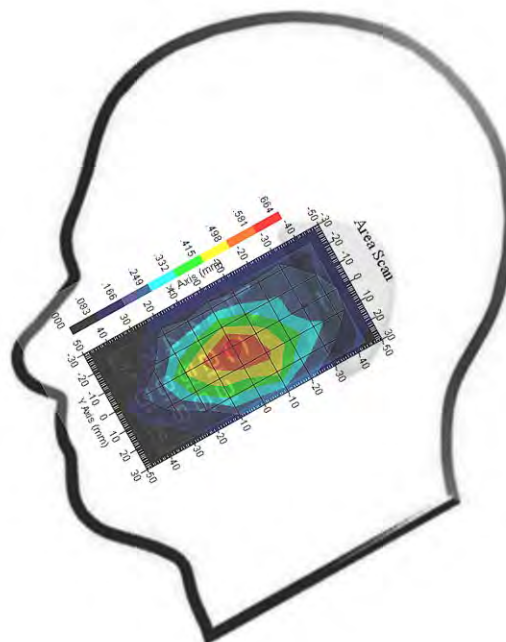
**Tissue Data**

Type : Head  
Frequency : 836.6 MHz  
Epsilon : 41.04 F/m  
Sigma : 0.91 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.617 W/kg  
10 gram SAR value : 0.315 W/kg  
Area Scan Peak SAR : 0.661 W/kg  
Zoom Scan Peak SAR : 0.940 W/kg

**Plot 5#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Tilt (836.6 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.203 W/kg  
Power Drift-Finish : 0.215 W/kg  
Power Drift (%) : 1.283

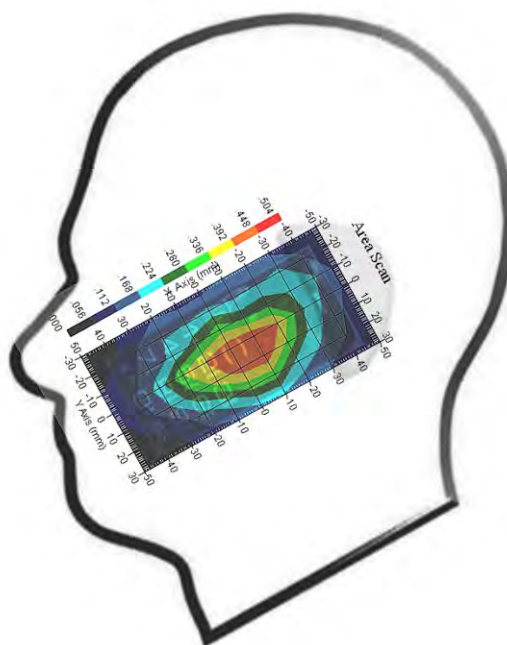
## Tissue Data

Type : Head  
Frequency : 836.6 MHz  
Epsilon : 41.04 F/m  
Sigma : 0.91 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.408 W/kg  
10 gram SAR value : 0.202 W/kg  
Area Scan Peak SAR : 0.429 W/kg  
Zoom Scan Peak SAR : 0.720 W/kg

**Plot 6#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn Front-Headset (836.6 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.391 W/kg  
Power Drift-Finish : 0.394 W/kg  
Power Drift (%) : 0.761

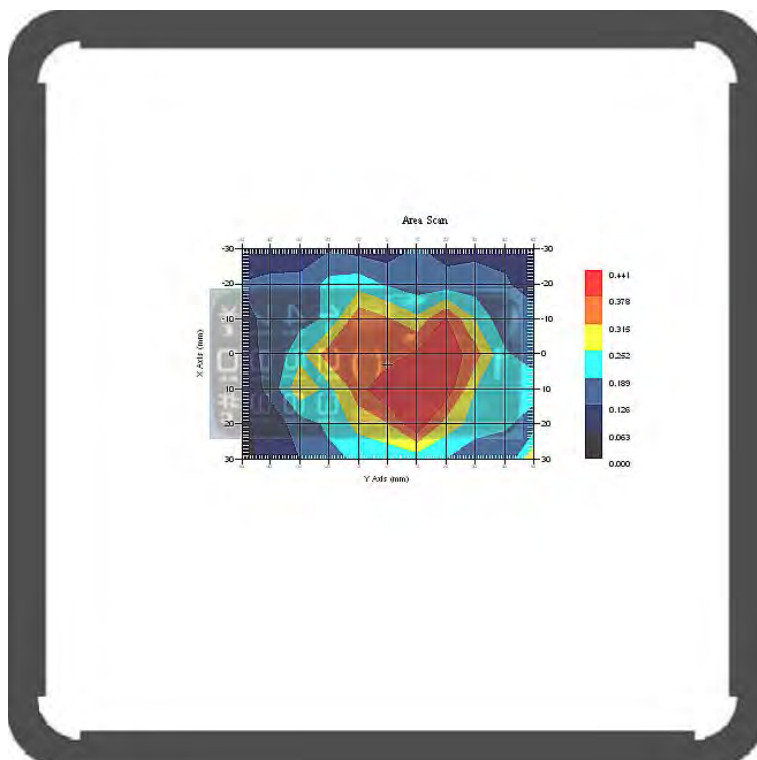
## Tissue Data

Type : Body  
Frequency : 836.6 MHz  
Epsilon : 55.16 F/m  
Sigma : 0.97 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.425 W/kg  
10 gram SAR value : 0.259 W/kg  
Area Scan Peak SAR : 0.440 W/kg  
Zoom Scan Peak SAR : 0.715 W/kg

**Plot 7#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn Back-Headset (836.6 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.401 W/kg  
Power Drift-Finish : 0.406 W/kg  
Power Drift (%) : 1.247

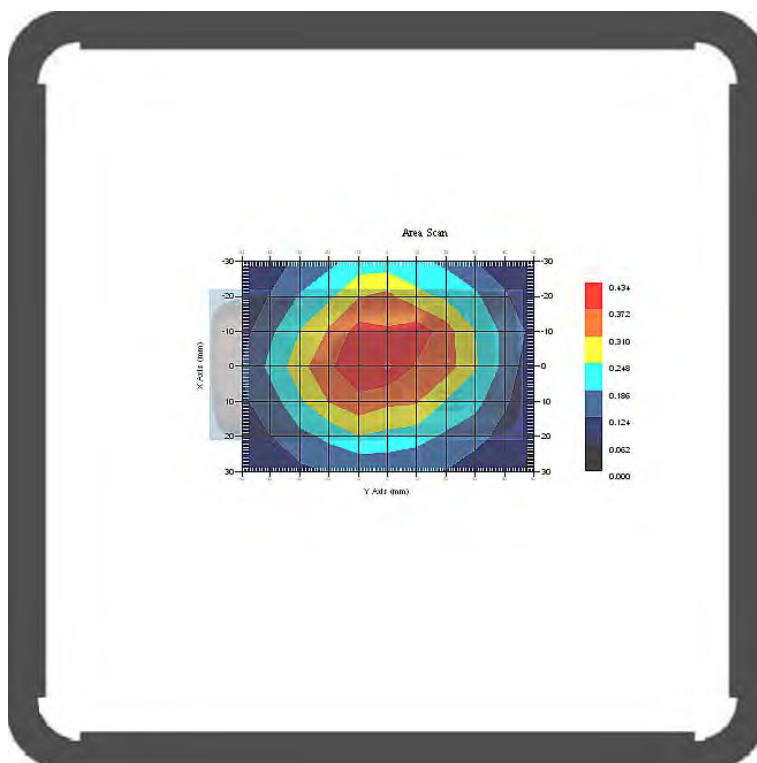
## Tissue Data

Type : Body  
Frequency : 836.6 MHz  
Epsilon : 55.16 F/m  
Sigma : 0.97 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.432 W/kg  
10 gram SAR value : 0.261 W/kg  
Area Scan Peak SAR : 0.434 W/kg  
Zoom Scan Peak SAR : 0.640 W/kg

**Plot 8#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn-Front (836.6 MHz Middle Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.500W/kg  
Power Drift-Finish : 0.505 W/kg  
Power Drift (%) : 1.000

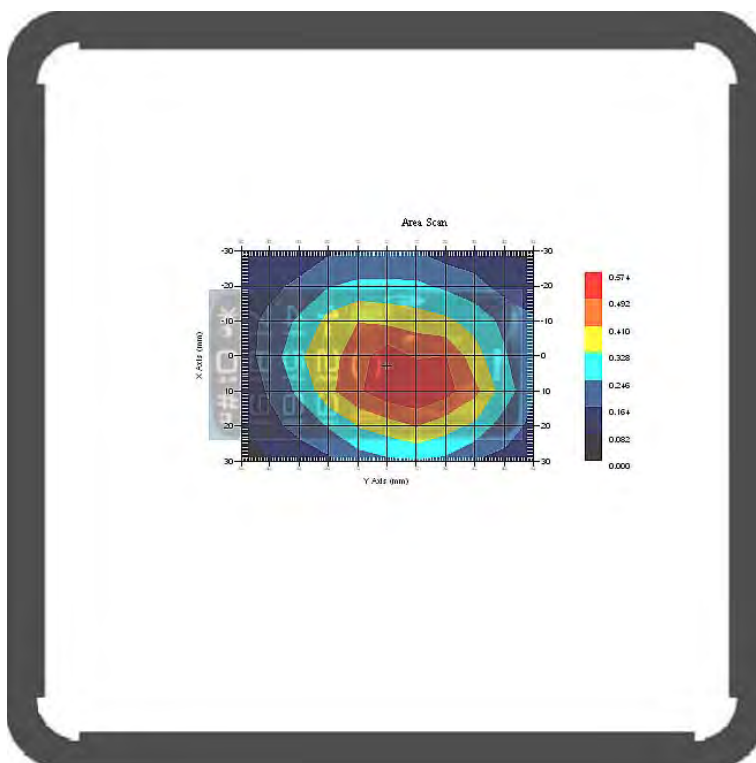
## Tissue Data

Type : Body  
Frequency : 836.6 MHz  
Epsilon : 55.16 F/m  
Sigma : 0.97 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 4  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.536 W/kg  
10 gram SAR value : 0.354 W/kg  
Area Scan Peak SAR : 0.574 W/kg  
Zoom Scan Peak SAR : 0.760 W/kg

**Plot 9#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn-Back (836.6 MHz Middle Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.580 W/kg  
Power Drift-Finish : 0.594 W/kg  
Power Drift (%) : 2.414

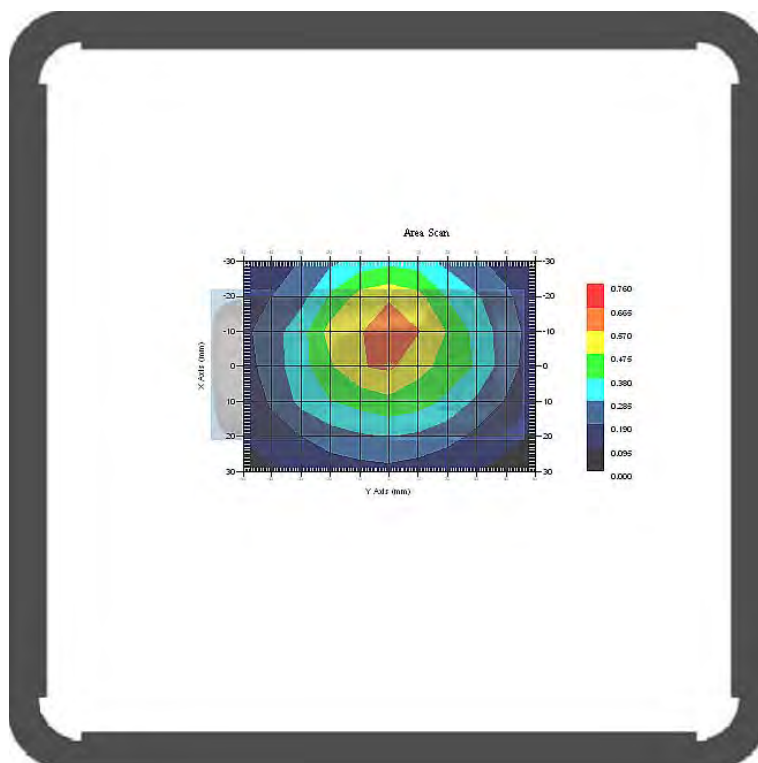
## Tissue Data

Type : Body  
Frequency : 836.6 MHz  
Epsilon : 55.16 F/m  
Sigma : 0.97 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 4  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.614 W/kg  
10 gram SAR value : 0.453 W/kg  
Area Scan Peak SAR : 0.667 W/kg  
Zoom Scan Peak SAR : 0.910 W/kg

**Plot 10#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (1850.2MHz Low Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.208 W/kg  
Power Drift-Finish : 0.210 W/kg  
Power Drift (%) : 0.992

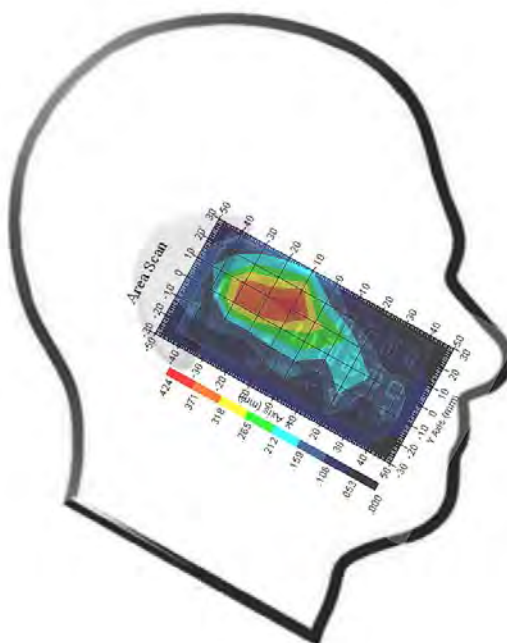
**Tissue Data**

Type : Head  
Frequency : 1850.2 MHz  
Epsilon : 40.36 F/m  
Sigma : 1.40 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.368 W/kg  
10 gram SAR value : 0.177 W/kg  
Area Scan Peak SAR : 0.412 W/kg  
Zoom Scan Peak SAR : 0.550 W/kg

**Plot 11#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (1880.0 MHz Middle Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.183 W/kg  
Power Drift-Finish : 0.190 W/kg  
Power Drift (%) : 3.825

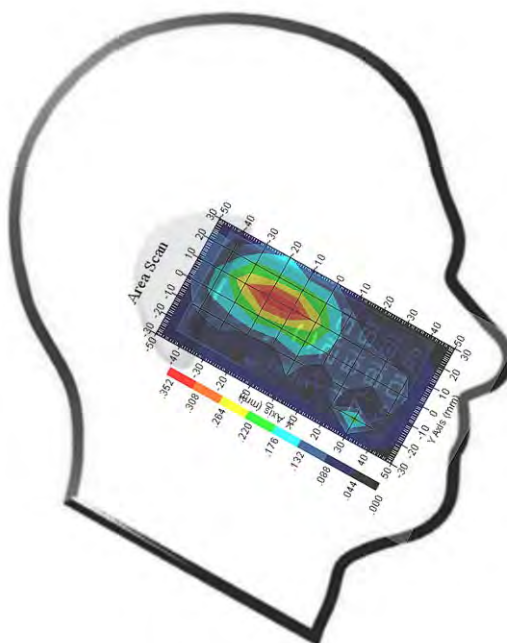
**Tissue Data**

Type : Head  
Frequency : 1880.0 MHz  
Epsilon : 40.37 F/m  
Sigma : 1.42 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.348 W/kg  
10 gram SAR value : 0.175 W/kg  
Area Scan Peak SAR : 0.352 W/kg  
Zoom Scan Peak SAR : 0.530 W/kg

**Plot 12#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (1909.8 MHz High Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.179 W/kg  
Power Drift-Finish : 0.186 W/kg  
Power Drift (%) : 3.911

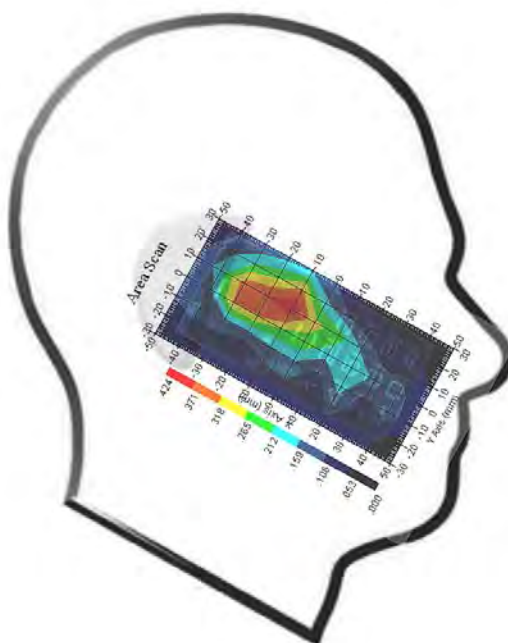
## Tissue Data

Type : Head  
Frequency : 1909.8 MHz  
Epsilon : 40.38 F/m  
Sigma : 1.43 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.359 W/kg  
10 gram SAR value : 0.180 W/kg  
Area Scan Peak SAR : 0.422 W/kg  
Zoom Scan Peak SAR : 0.538 W/kg

**Plot 13#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Tilt (1880.0 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.152 W/kg  
Power Drift-Finish : 0.150 W/kg  
Power Drift (%) : -1.316

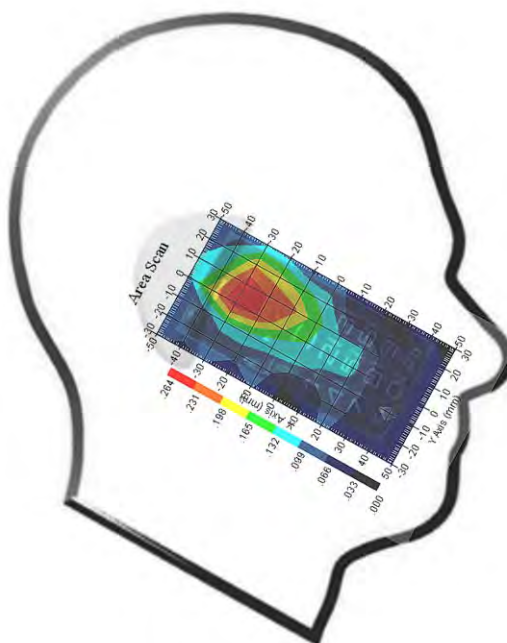
## Tissue Data

Type : Head  
Frequency : 1880.0 MHz  
Epsilon : 40.37 F/m  
Sigma : 1.42 S/m  
Density : 1000.00 kg/cu. M

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.245 W/kg  
10 gram SAR value : 0.122 W/kg  
Area Scan Peak SAR : 0.261 W/kg  
Zoom Scan Peak SAR : 0.418 W/kg

**Plot 14#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Cheek (1880.0 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.194 W/kg  
Power Drift-Finish : 0.193 W/kg  
Power Drift (%) : -0.515

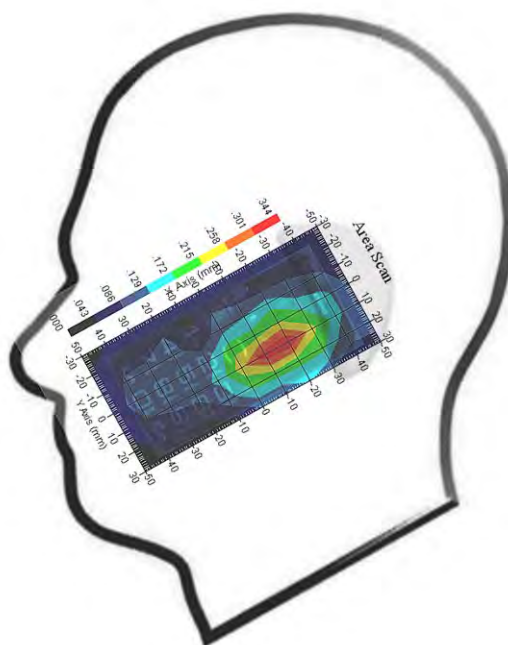
## Tissue Data

Type : Head  
Frequency : 1880.0 MHz  
Epsilon : 40.37 F/m  
Sigma : 1.42 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.336 W/kg  
10 gram SAR value : 0.170 W/kg  
Area Scan Peak SAR : 0.344 W/kg  
Zoom Scan Peak SAR : 0.510 W/kg

**Plot 15#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Tilt (1880.0 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.173 W/kg  
Power Drift-Finish : 0.176 W/kg  
Power Drift (%) : 1.734

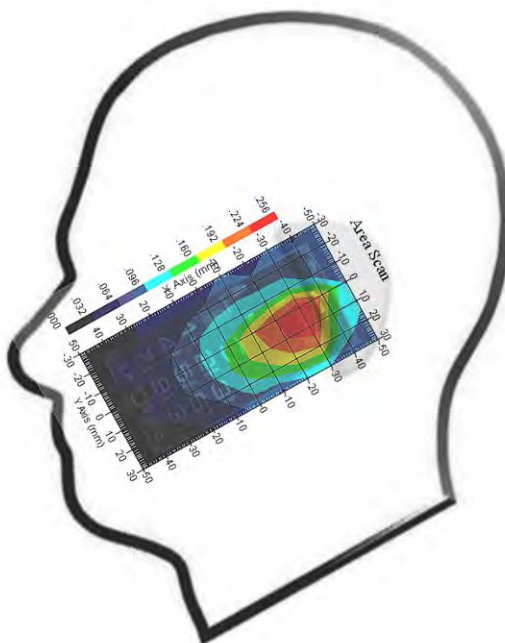
## Tissue Data

Type : Head  
Frequency : 1880.0 MHz  
Epsilon : 40.37 F/m  
Sigma : 1.42 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.240 W/kg  
10 gram SAR value : 0.117 W/kg  
Area Scan Peak SAR : 0.255 W/kg  
Zoom Scan Peak SAR : 0.420 W/kg

**Plot 16#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn Front-Headset (1880.0 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.078 W/kg  
Power Drift-Finish : 0.081 W/kg  
Power Drift (%) : 3.846

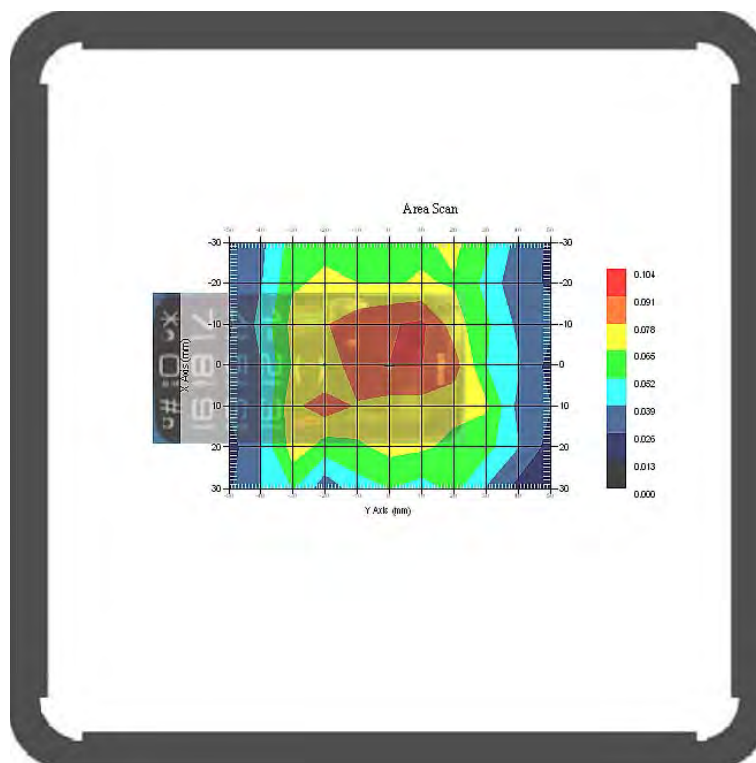
## Tissue Data

Type : Body  
Frequency : 1880.0 MHz  
Epsilon : 53.78 F/m  
Sigma : 1.53 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.091 W/kg  
10 gram SAR value : 0.049 W/kg  
Area Scan Peak SAR : 0.101 W/kg  
Zoom Scan Peak SAR : 0.190 W/kg

**Plot 17#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body- worn Back- Headset (1880.0 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.088 W/kg  
Power Drift-Finish : 0.087 W/kg  
Power Drift (%) : -1.136

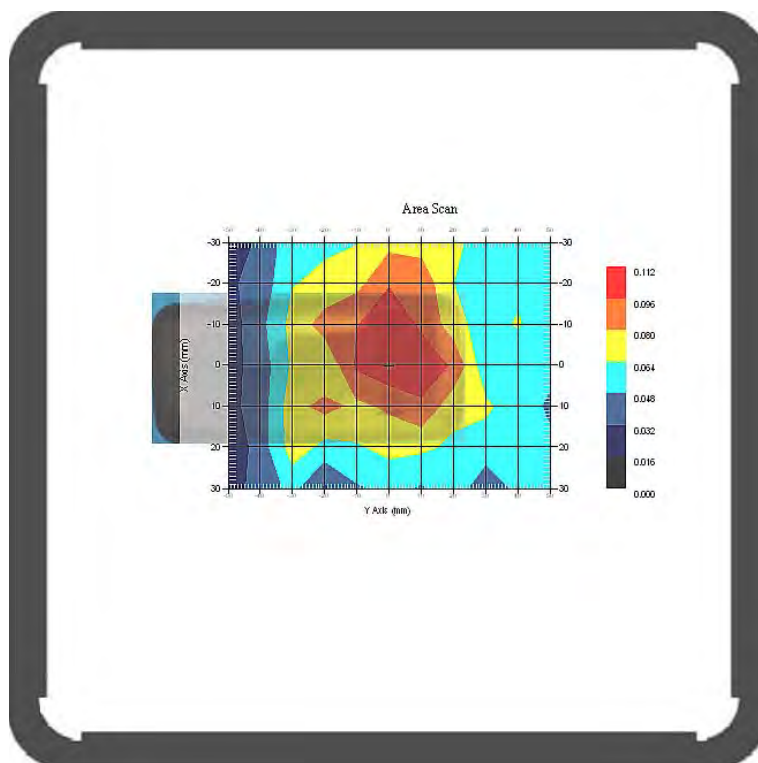
## Tissue Data

Type : Body  
Frequency : 1880.0 MHz  
Epsilon : 53.78 F/m  
Sigma : 1.53 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.096 W/kg  
10 gram SAR value : 0.054 W/kg  
Area Scan Peak SAR : 0.110 W/kg  
Zoom Scan Peak SAR : 0.195 W/kg

**Plot 18#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body- worn Front (1880.0 MHz Middle Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 2.67  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.095 W/kg  
Power Drift-Finish : 0.096 W/kg  
Power Drift (%) : 1.106

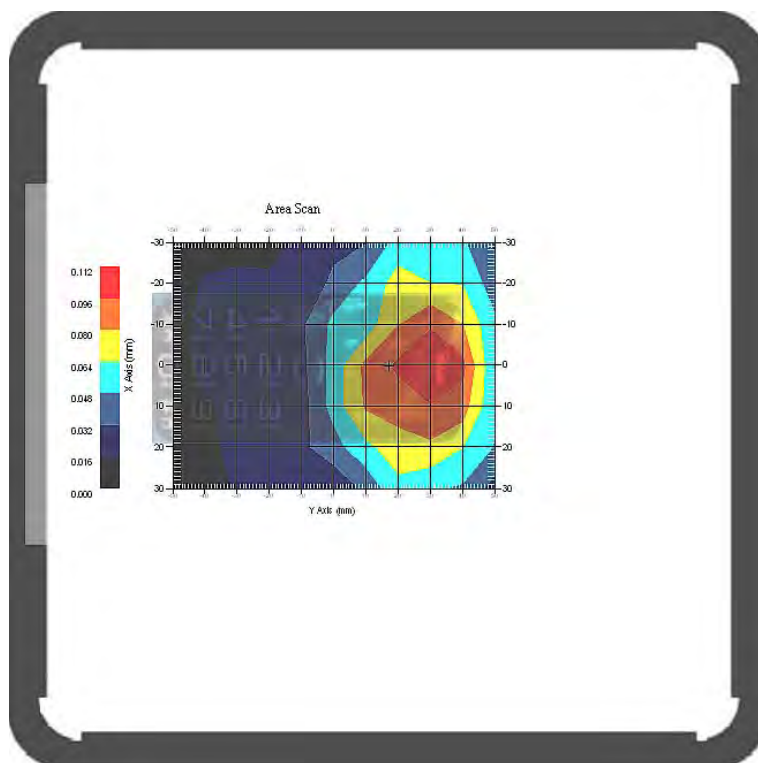
## Tissue Data

Type : Body  
Frequency : 1880.0 MHz  
Epsilon : 53.78 F/m  
Sigma : 1.53 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 2.67  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.110 W/kg  
10 gram SAR value : 0.073 W/kg  
Area Scan Peak SAR : 0.112 W/kg  
Zoom Scan Peak SAR : 0.210 W/kg

**Plot 19#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body- worn Back (1880.0 MHz Middle Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 2.67  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.110 W/kg  
Power Drift-Finish : 0.108 W/kg  
Power Drift (%) : -1.879

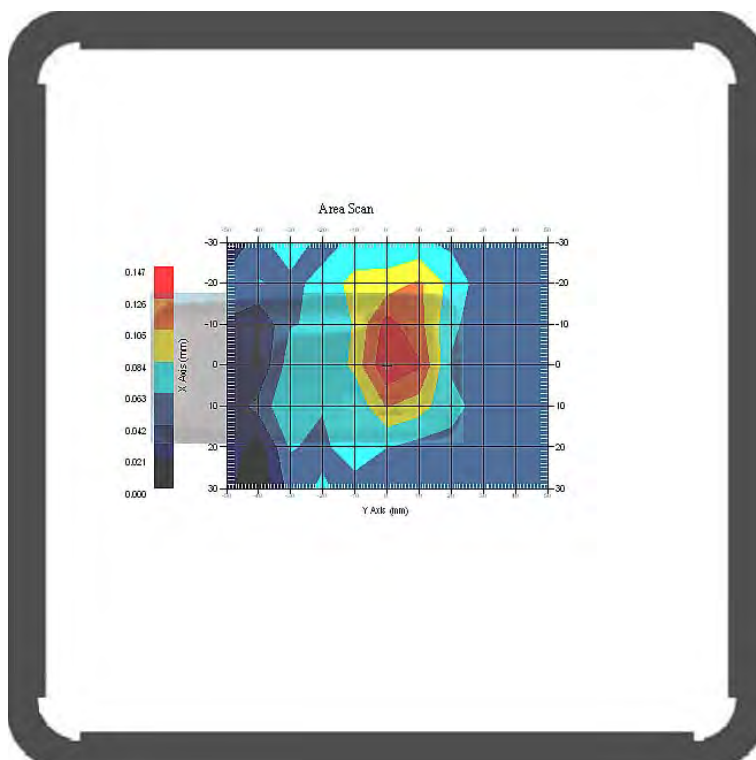
## Tissue Data

Type : Body  
Frequency : 1880.0 MHz  
Epsilon : 53.78 F/m  
Sigma : 1.53 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 2.67  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V/m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.149 W/kg  
10 gram SAR value : 0.090 W/kg  
Area Scan Peak SAR : 0.143 W/kg  
Zoom Scan Peak SAR : 0.250 W/kg

**Plot 20#**

## APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

**Measurement Uncertainty for 300MHz to 3GHz**

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
<b>Measurement System</b>							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	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
RF Ambient Condition -Noise	0.006	rectangular	$\sqrt{3}$	1	1	0.003	0.003
RF Ambient Condition - Reflections	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech. Restrictions	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
<b>Restriction</b>							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test Sample Positioning	0.023	normal	1	1	1	0.023	0.023
Device Holder Uncertainty	6.215	normal	1	1	1	6.215	6.215
Drift of Output Power	4.627	rectangular	$\sqrt{3}$	1	1	2.67	2.67
<b>Phantom and Setup</b>							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	5.0	rectangular	$\sqrt{3}$	0.7	0.5	2.0	1.4
Liquid Conductivity(meas.)	1.938	normal	1	0.7	0.5	1.36	0.97
Liquid Permittivity(target)	5.0	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	3.093	normal	1	0.6	0.5	1.86	1.55
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

## APPENDIX B PROBE CALIBRATION CERTIFICATES

### NCL CALIBRATION LABORATORIES

Calibration File No.: 1427-1430

Client.: BACL Lab

## 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

Record of Calibration

Head and Body

Manufacturer: APREL Laboratories

Model No.: E-020

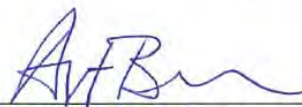
Serial No.: 500-00283

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole  
Project No: BACL-5673

Calibrated: 8<sup>th</sup> August 2012  
Released on: 9<sup>th</sup> August 2012

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: \_\_\_\_\_



Art Brennan, Quality Manager

### **NCL** CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr,  
OTTAWA, ONTARIO  
CANADA K2K 3J1

Division of APREL Lab.  
TEL: (613) 435-8300  
FAX: (613) 435-8306

**NCL Calibration Laboratories**

Division of APREL Inc.

**Introduction**

This Calibration Report reproduces the results of the calibration performed in line with the references listed below. Calibration is performed using accepted methodologies as per the references listed below. Probes are calibrated for air, and tissue and the values reported are the results from the physical quantification of the probe through meteorological practices.

**Calibration Method**

Probes are calibrated using the following methods.

<1000MHz

TEM Cell for sensitivity in air

Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz

Waveguide\* method to determine sensitivity in air and tissue

\*Waveguide is numerically (simulation) assessed to determine the field distribution and power

The boundary effect for the probe is assessed using a standard flat phantom where the probe output is compared against a numerically simulated series of data points

**References**

- IEEE Standard 1528 (2003) including Amendment 1  
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- EN 62209-1 (2006)  
Human Exposure to RF Fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures-Part 1: Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices
- IEC 62209-2 Ed. 1.0 (2010-03)  
Human exposure to RF fields from hand-held and body-mounted wireless devices - Human models, instrumentation, and procedures - Part 2: specific absorption rate (SAR) for wireless communication devices (30 MHz - 6 GHz)
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

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Page 2 of 10

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



**NCL Calibration Laboratories**

Division of APREL Inc.

**Conditions**

Probe 500-00283 was a recalibration with the exception frequency of 450 MHz .which was a new calibration

**Ambient Temperature of the Laboratory:** 22 °C +/- 1.5°C  
**Temperature of the Tissue:** 21 °C +/- 1.5°C  
**Relative Humidity:** < 60%

**Primary Measurement Standards**

Instrument	Serial Number	Cal due date
Power meter Anritsu MA2408A	90025437	Nov.4, 2012
Power Sensor Anritsu MA2481D	103555	Nov 4, 2012
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2012
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2013

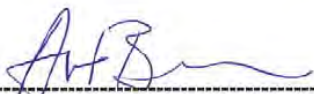
**Secondary Measurement Standards**


Signal Generator Agilent E4438C -506 MY55182336 June 7, 2013

**Attestation**

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

**We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.**

  
-----  
**Art Brennan, Quality Manager**

  
-----  
**Dan Brooks, Test Engineer**

**NCL Calibration Laboratories**

Division of APREL Inc.

**Probe Summary**

<b>Probe Type:</b>	E-Field Probe E020
<b>Serial Number:</b>	500-00283
<b>Frequency:</b>	As presented on page 5
<b>Sensor Offset:</b>	1.56
<b>Sensor Length:</b>	2.5
<b>Tip Enclosure:</b>	Composite*
<b>Tip Diameter:</b>	< 2.9 mm
<b>Tip Length:</b>	55 mm
<b>Total Length:</b>	289 mm

\*Resistive to recommended tissue recipes per IEEE-1528

**Sensitivity in Air**

<b>Channel X:</b>	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
<b>Channel Y:</b>	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
<b>Channel Z:</b>	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
<b>Diode Compression Point:</b>	95 mV

**NCL Calibration Laboratories**

Division of APREL Inc.

## Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Calibration Uncertainty	Tolerance Uncertainty for 5%*	Conversion Factor
450 H	Head	43.98	0.9	3.5	3.4	6
450 B	Body	57.07	0.92	3.5	3.4	6
750 H	Head	X	X	X	X	X
750 B	Body	X	X	X	X	X
835 H	Head	42.35	0.938	3.5	3.4	6.6
835 B	Body	56.65	1.018	3.5	3.4	6.6
900 H	Head	41.35	0.98	3.5	3.4	6
900 B	Body	56.08	1.05	3.5	3.4	6
1450 H	Head	X	X	X	X	X
1450 B	Body	X	X	X	X	X
1500 H	Head	X	X	X	X	X
1500 B	Body	X	X	X	X	X
1640 H	Head	X	X	X	X	X
1640 B	Body	X	X	X	X	X
1750 H	Head	X	X	X	X	X
1750 B	Body	X	X	X	X	X
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
1900 H	Head	38.72	1.35	3.5	2.7	5.2
1900 B	Body	51.62	1.48	3.5	2.7	5
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	Head	X	X	X	X	X
2100 B	Body	X	X	X	X	X
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	Head	38.06	1.87	3.5	3.5	4.9
2450 B	Body	50.22	2.03	3.5	3.5	4.3
2600 H	Head	X	X	X	X	X
2600 B	Body	X	X	X	X	X
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	X	X	X	X	X
3600 B	Body	X	X	X	X	X
5200 H	Head	X	X	X	X	X
5200 B	Body	X	X	X	X	X
5600 H	Head	X	X	X	X	X
5600 B	Body	X	X	X	X	X
5800 H	Head	X	X	X	X	X
5800 B	Body	X	X	X	X	X

Page 5 of 10

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



**NCL Calibration Laboratories**

Division of APREL Inc.

**Boundary Effect:**

Uncertainty resulting from the boundary effect is less than 2.1% for the distance between the tip of the probe and the tissue boundary, when less than 0.58mm.

**Spatial Resolution:**

The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe.  
The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe.

**DAQ-PAQ Contribution**

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 0.58mm the worst case evaluated uncertainty (increase in the probe sensitivity) is less than 2.1%.

**NOTES:**

\*The maximum deviation from the centre frequency when comparing the lower to upper range is listed.

---

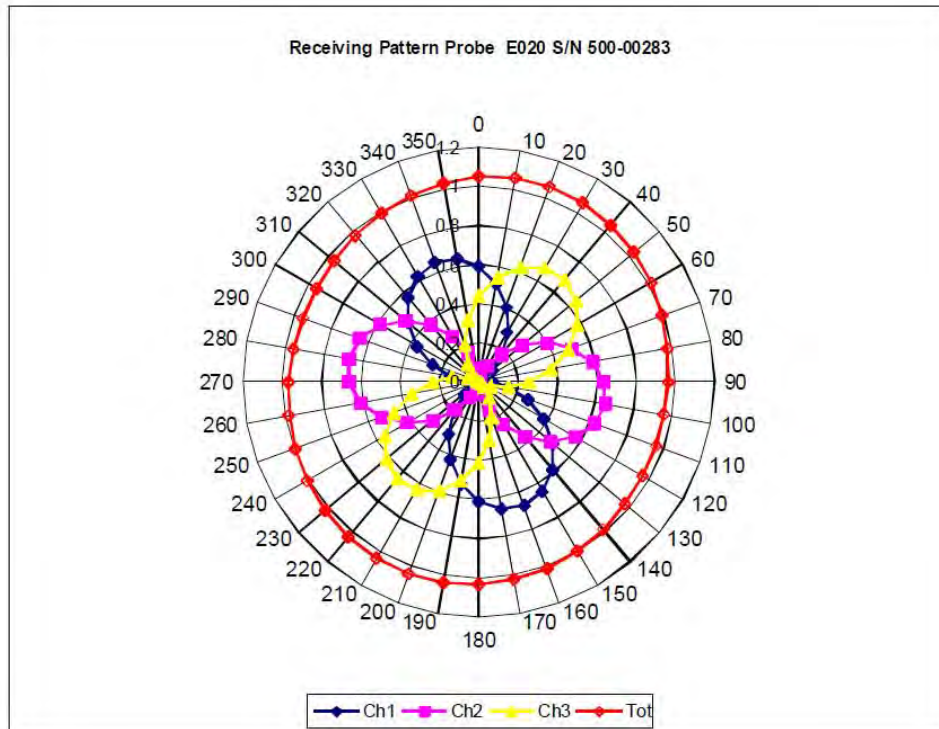
Page 6 of 10

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## NCL Calibration Laboratories

Division of APREL Inc.

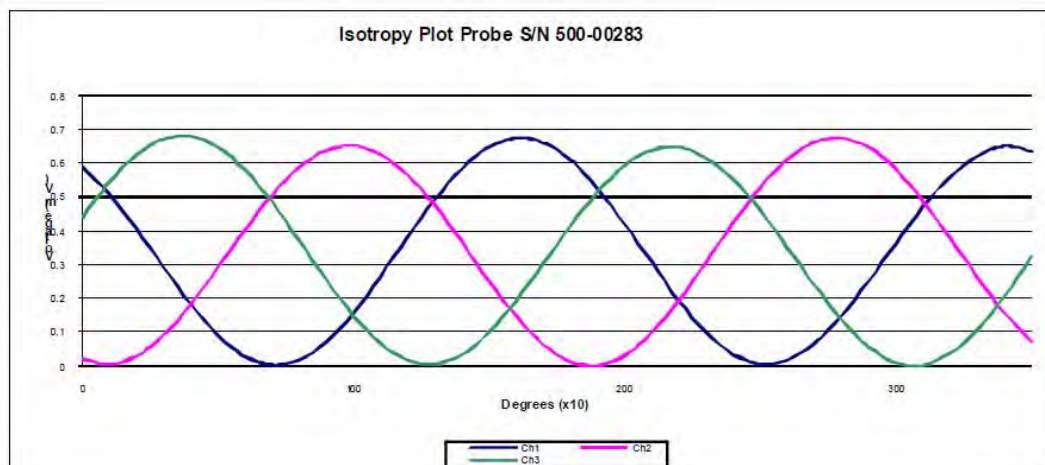
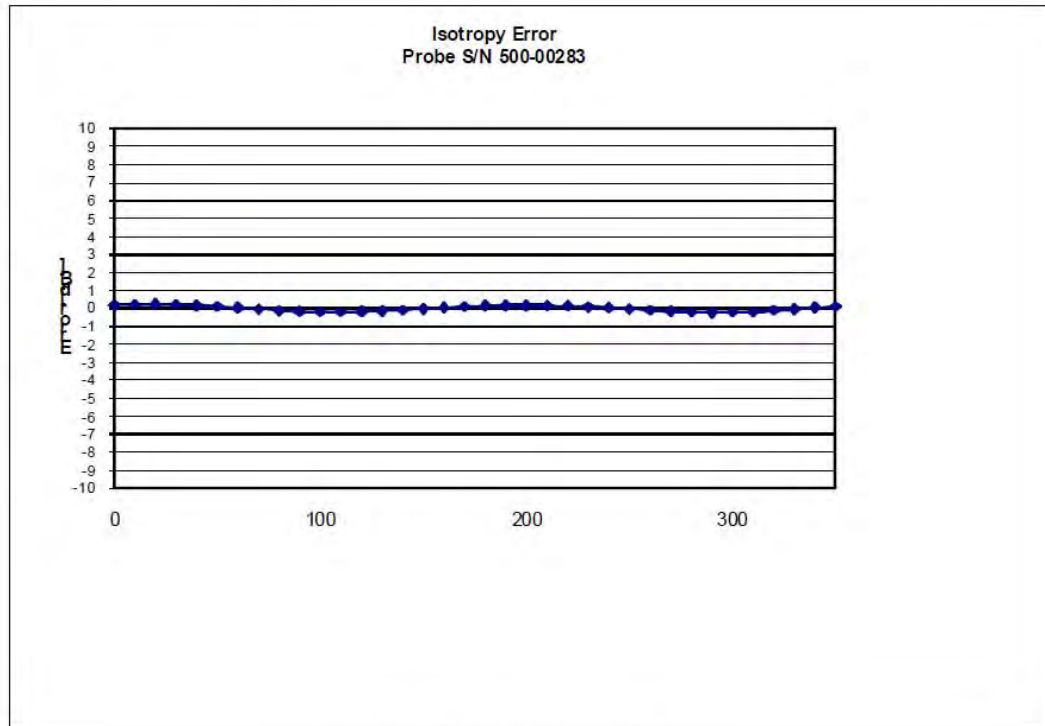
### Receiving Pattern Air



## NCL Calibration Laboratories

Division of APREL Inc.

### Isotropy Error Air



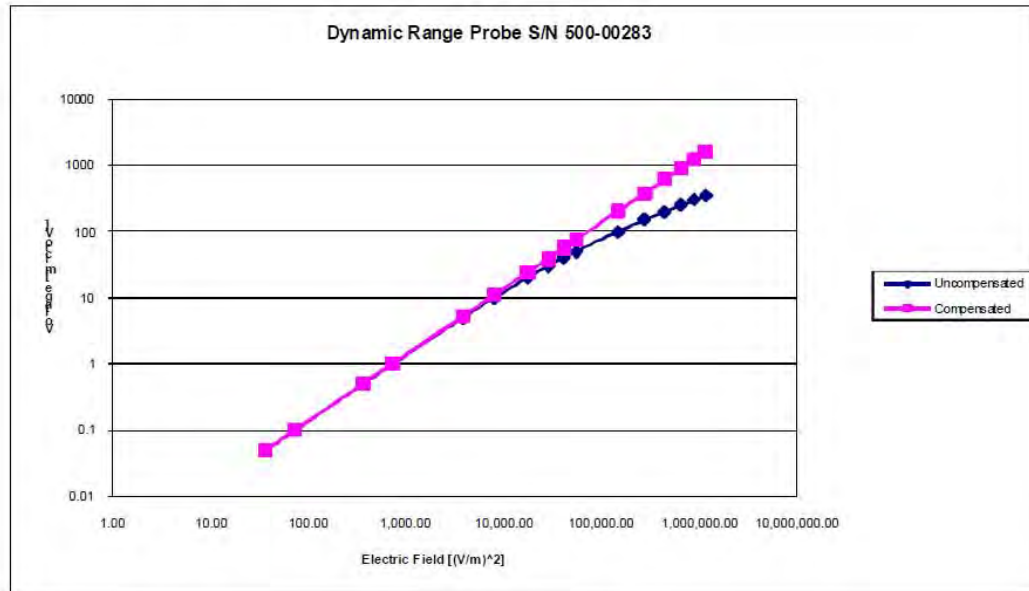
Isotropy Tissue:

0.10 dB

## NCL Calibration Laboratories

Division of APREL Inc.

### Dynamic Range

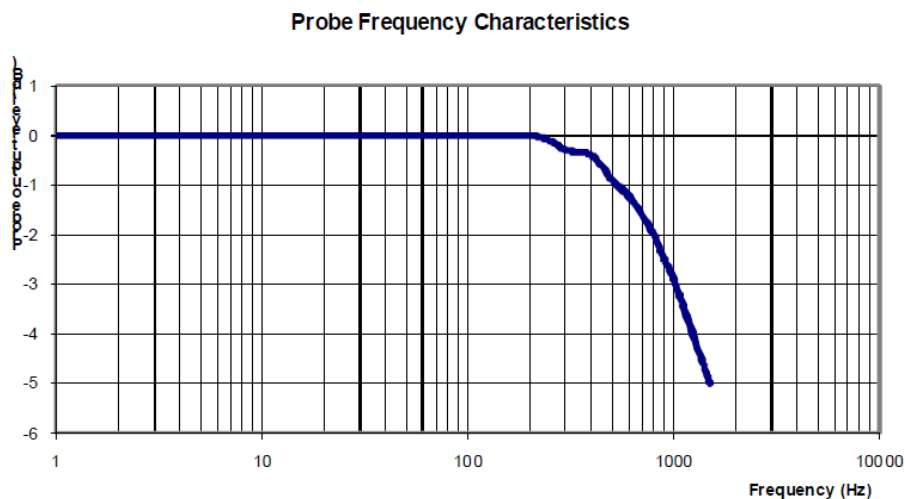


Page 9 of 10

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**NCL Calibration Laboratories**

Division of APREL Inc.

**Video Bandwidth**

Video Bandwidth at 500 Hz                      1 dB  
Video Bandwidth at 1.02 KHz:                3 dB

**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 2012.

## APPENDIX C DIPOLE CALIBRATION CERTIFICATES

### NCL CALIBRATION LABORATORIES

Calibration File No: DC-1327  
Project Number: BAC-dipole-cal-5618

## 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.

Validation Dipole(Head and Body)

Manufacturer: APREL Laboratories

Part number: ALS-D-835-S-2

Frequency: 835 MHz

Serial No: 180-00558

Customer: Bay Area Compliance Laboratory

Calibrated: 25<sup>th</sup> August 2011

Released on: 25<sup>th</sup> August 2011

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: \_\_\_\_\_

**NCL** CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr.  
Kanata, ONTARIO  
CANADA K2K 3J1

Division of APREL Lab.  
TEL: (613) 435-8300  
FAX: (613)435-8306

**NCL Calibration Laboratories**

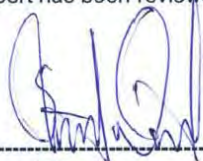
Division of APREL Laboratories.

**Conditions**

Dipole 180-00558 was received in good condition and a re-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 device has been accurately conducted and that all information contained within this report has been reviewed for accuracy.



Stuart Nicol



C. Teodorian

**Primary Measurement Standards**

Instrument	Serial Number	Cal due date
Power meter Anritsu MA2408A	245025437	Nov.4, 2011
Power Sensor Anritsu MA2481D	103555	Nov 4, 2011
Attenuator HP 8495A (70dB) 1	944A10711	Aug.8, 2012
Network Analyzer Agilent E5071C	1334746J	Feb. 8, 2012
<b>Secondary Measurement Standards</b>		
Signal Generator Agilent E4438C	-506 MY55182336	June 7, 2012

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



**NCL Calibration Laboratories**

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**

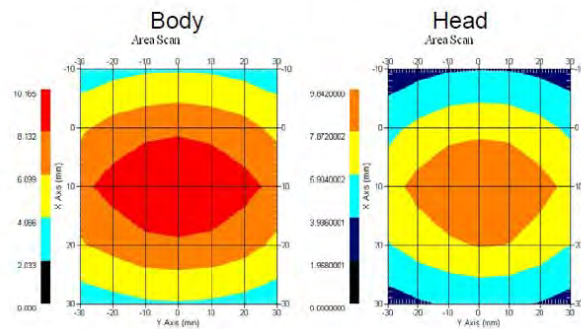
**Length:** 162.2 mm  
**Height:** 89.4 mm

**Electrical Specification**

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	835 MHz	1.0417 U	-35.395dB	49.020 $\Omega$
Body	835 MHz	1.1177 U	-25.424dB	55.435 $\Omega$

**System Validation Results**

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	835 MHz	9.590	6.003	15.013
Body	835 MHz	9.684	6.263	14.23



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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**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 180-00558. 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 180-00558 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 uncertainty**

The calibration uncertainty for the dipole is made up of various parameters presented below.

<b>Mechanical</b>	1%
<b>Positioning Error</b>	1.22%
<b>Electrical</b>	1.7%
<b>Tissue</b>	2.2%
<b>Dipole Validation</b>	2.2%
<b>TOTAL</b>	<b>8.32% (16.64% K=2)</b>

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Dipole Calibration Results****Mechanical Verification**

APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	162.2 mm	89.4 mm

Tissue Type	Return Loss:	SWR:	Impedance:
Head	-35.395 dB	1.0417 U	49.020 $\Omega$
Body	-25.454 dB	1.1177 U	55.435 $\Omega$

**Tissue Validation**

	Dielectric constant, $\epsilon_r$	Conductivity, $\sigma$ [S/m]
Head Tissue 835MHz	41.78	0.92
Body Tissue 835MHz	56.37	0.95

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## Division of APREL Laboratories.

### S11 Parameter Return Loss

[illegible]

NI-MTIC Network Analyzer

File Edit View Tools Help Window

1 Active CH: Wave - CH0: 869.999999 2 200.000000 0 1.000000

2 S11 Log Mag / ref -13.0000 [1.00]

869.000000 Freq -15.271 dB  
870.000000 Freq -13.825 dB  
870.000000 Freq -13.825 dB

Trigger

Hold  
Single  
Continuous  
Find  
All Channels  
Configure  
Keep Channels  
Trigger Source  
Trigger Event  
Trigger Scope  
Active Channel

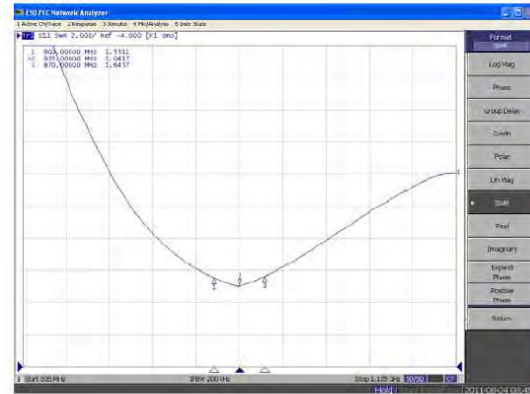
Start: 869.999999 Fwd: 200.000 Swd: 1.000000

6

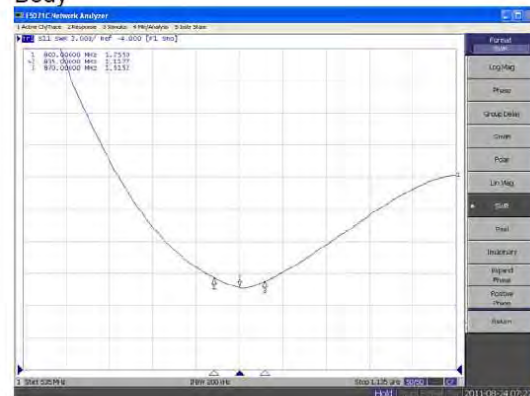
## NCL Calibration Laboratories

Division of APREL Laboratories.

### SWR Head



### Body

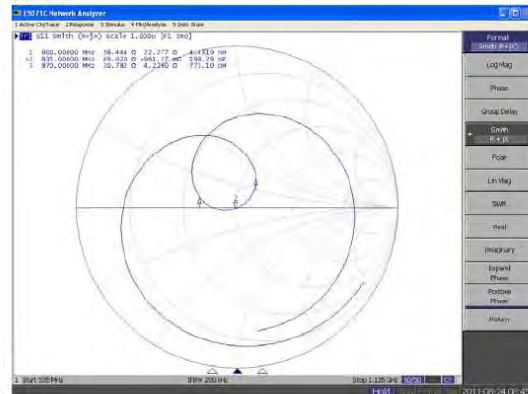
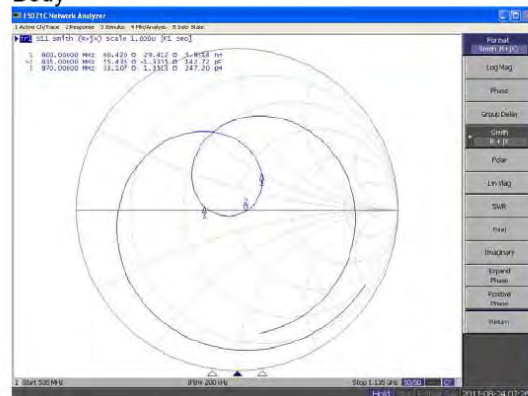


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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Smith Chart Dipole Impedance****Head****Body**

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**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 2011.

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## 835MHz Dipole Calibration By BACL at 2012-12-12

### Mechanical Verification

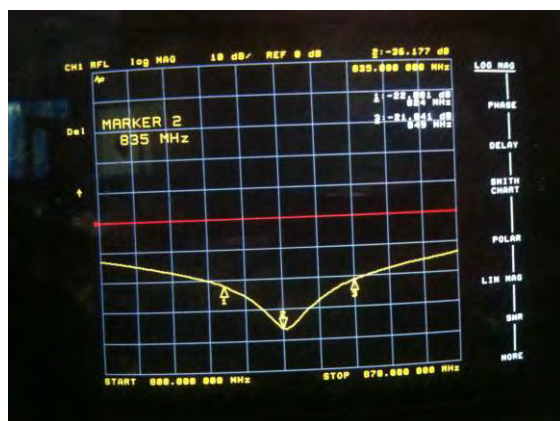
APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	161.2 mm	89.5 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-36.177 dB	50.207 $\Omega$
Body	-24.964 dB	49.594 $\Omega$

### Test Graphs:

#### Head Tissue

Return Loss :

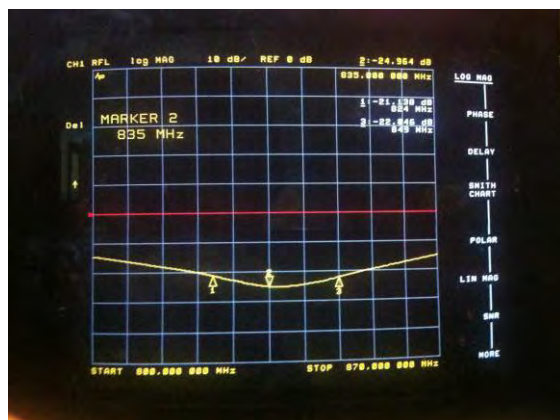


Impedance :



#### Body Tissue

Return Loss :



Impedance :



## NCL CALIBRATION LABORATORIES

Calibration File No: DC-1331  
Project Number: BAC-dipole -cal-5615

# 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.

Validation Dipole (Head & Body)

Manufacturer: APREL Laboratories

Part number: ALS-D-1900-S-2

Frequency: 1900 MHz

Serial No: 210-00710

Customer: Bay Area Compliance Laboratory

Calibrated: 25<sup>th</sup> August, 2011  
Released on: 25<sup>th</sup> August, 2011

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: \_\_\_\_\_

**NCL** CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr.  
Kanata, ONTARIO  
CANADA K2K 3J1

Division of APREL Lab.  
TEL: (613) 435-8300  
FAX: (613) 435-8306



**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Conditions**

Dipole 210-00710 was received in good condition and was a re-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 device has been accurately conducted and that all information contained within this report has been reviewed for accuracy.



Stuart Nicol



C. Teodorian

**Primary Measurement Standards**

Instrument	Serial Number	Cal due date
Power meter Anritsu MA2408A	245025437	Nov.4, 2011
Power Sensor Anritsu MA2481D	103555	Nov 4, 2011
Attenuator HP 8495A (70dB) 1	944A10711	Aug.8, 2012
Network Analyzer Agilent E5071C	1334746J	Feb. 8, 2012

**Secondary Measurement Standards**

Signal Generator Agilent E4438C	-506 MY55182336	June 7, 2012
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**NCL Calibration Laboratories**

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**

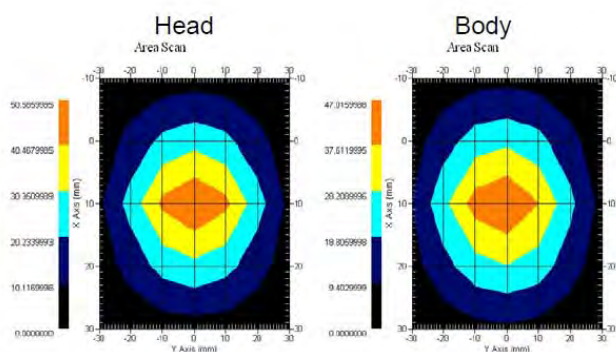
**Length:** 67.1 mm  
**Height:** 38.9 mm

**Electrical Specification**

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	1900MHz	1.0417 U	-35.395dB	49.020 $\Omega$
Body	1900MHz	1.1177 U	-25.424dB	55.435 $\Omega$

**System Validation Results**

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	1900 MHz	39.648	20.311	73.365
Body	1900 MHz	39.769	20.176	75.866



**NCL Calibration Laboratories**

Division of APREL Laboratories.

**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 210-00710. 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 210-00710 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 uncertainty**

The calibration uncertainty for the dipole is made up of various parameters presented below.

<b>Mechanical</b>	1%
<b>Positioning Error</b>	1.22%
<b>Electrical</b>	1.7%
<b>Tissue</b>	2.2%
<b>Dipole Validation</b>	2.2%
<b>TOTAL</b>	<b>8.32% (16.64% K=2)</b>

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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Dipole Calibration Results****Mechanical Verification**

APREL Length	APREL Height	Measured Length	Measured Height
68.0 mm	39.5 mm	67.1mm	38.9 mm

**Electrical Validation**

Tissue Type	Return Loss:	SWR:	Impedance:
Head	-29.360 dB	1.0732 U	47.869 $\Omega$
Body	-22.799 dB	1.1566 U	48.022 $\Omega$

**Tissue Validation**

	Dielectric constant, $\epsilon_r$	Conductivity, $\sigma$ [S/m]
Head Tissue 1900MHz	38.4	1.43
Body Tissue 1900MHz	51.87	1.59

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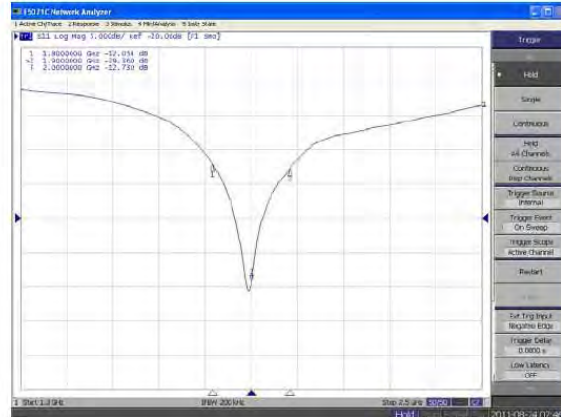
## NCL Calibration Laboratories

Division of APREL Laboratories.

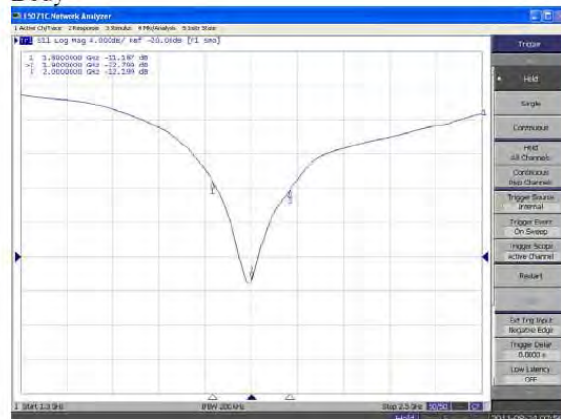
The Following Graphs are the results as displayed on the Vector Network Analyzer.

### S11 Parameter Return Loss

#### Head



#### Body



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## NCL Calibration Laboratories

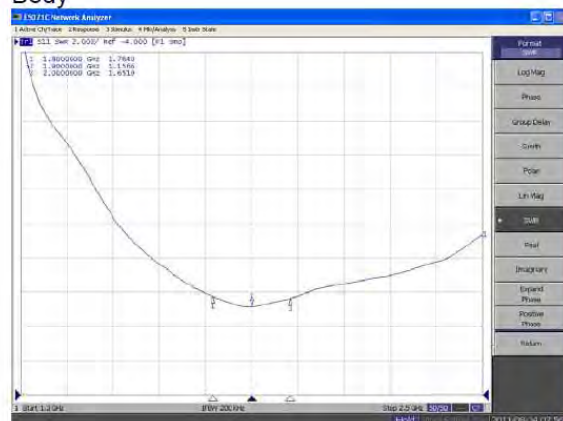
Division of APREL Laboratories.

### SWR

#### Head



#### Body



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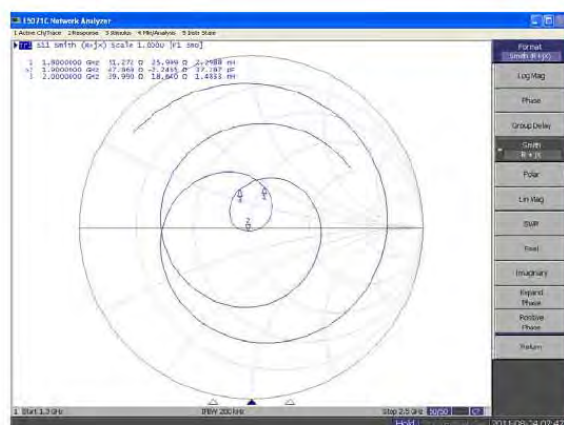
7

**NCL Calibration Laboratories**

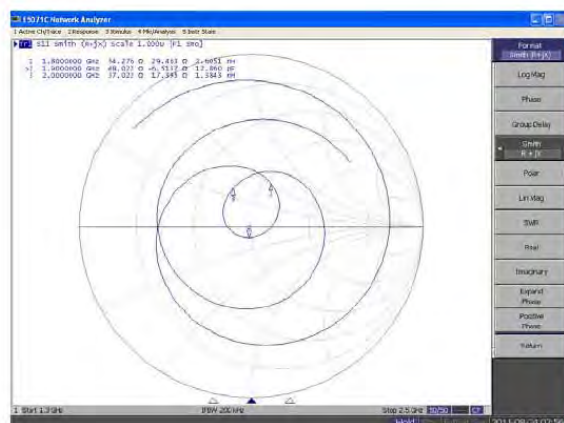
Division of APREL Laboratories.

**Smith Chart Dipole Impedance**

Head



Body



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### **NCL Calibration Laboratories**

Division of APREL Laboratories.

### **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 2011

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## 1900MHz Dipole Calibration By BACL at 2012-12-12

### Mechanical Verification

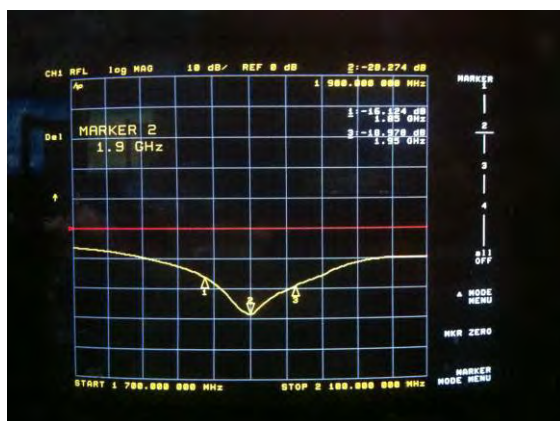
APREL Length	APREL Height	Measured Length	Measured Height
68.0 mm	39.5 mm	68.2 mm	39.2 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-28.284 dB	49.471 $\Omega$
Body	-22.445 dB	51.588 $\Omega$

### Test Graphs:

#### Head Tissue

Return Loss :

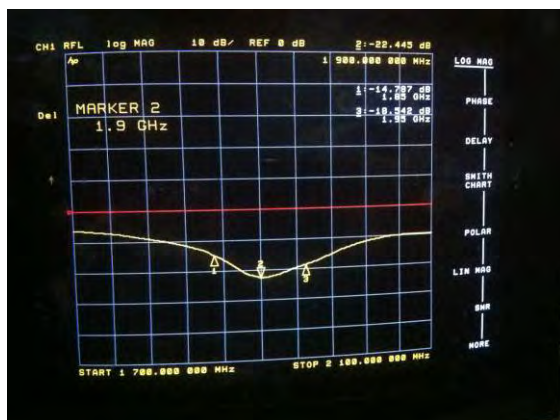


Impedance :



#### Body Tissue

Return Loss :

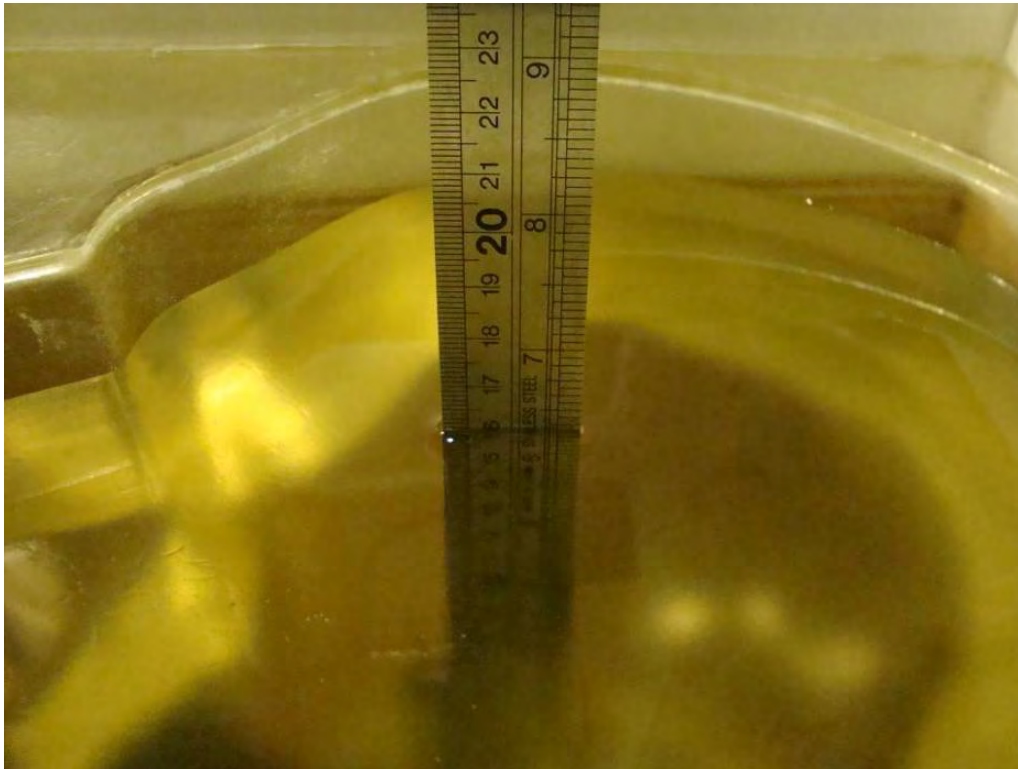


Impedance :

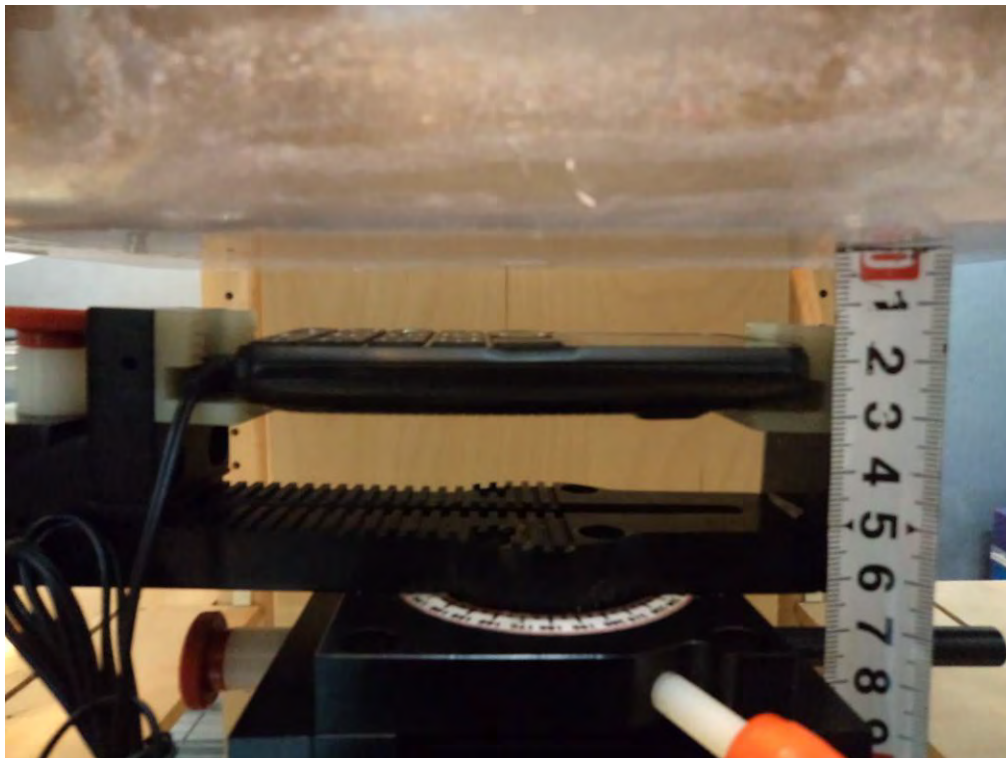


## APPENDIX D EUT TEST POSITION PHOTOS

Liquid depth  $\geq 15\text{cm}$



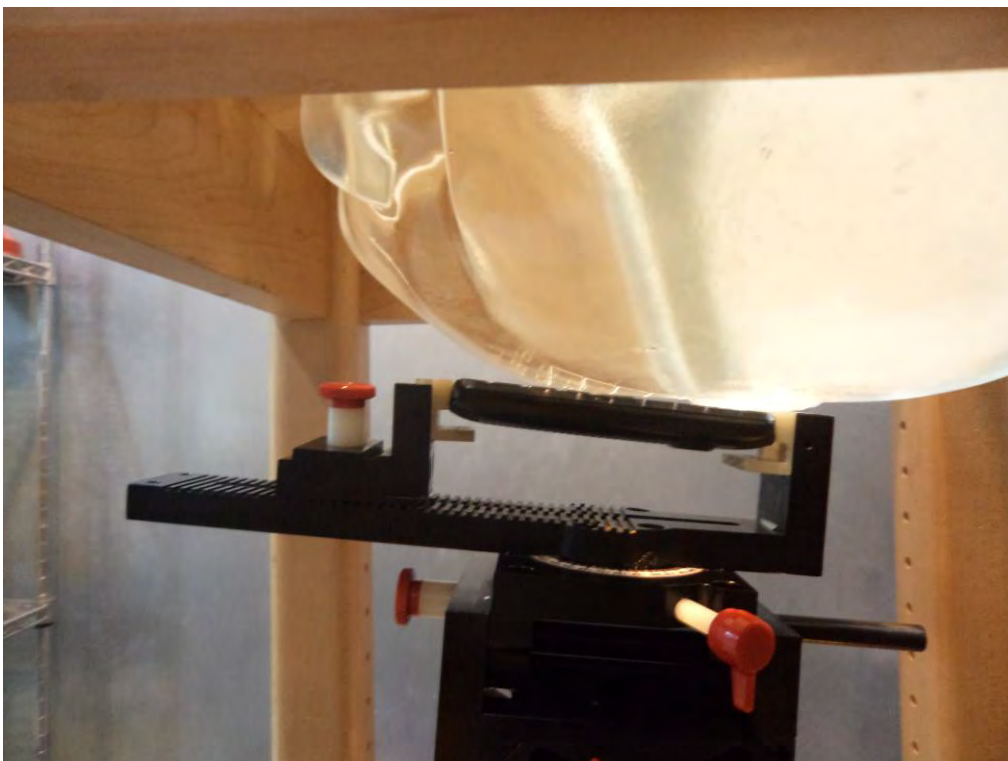
Body-worn Headset Front Setup Photo



**Body-worn Headset Back Setup Photo**



**Left Head Touch Setup Photo**





**Left Head Tilt Setup Photo**



**Right Head Touch Setup Photo**



**Right Head Tilt Setup Photo**



## APPENDIX E EUT PHOTOS

**EUT – Front View**



**EUT – Back View**





**EUT – Left Side View**



**EUT – Right Side View**



**EUT – Top View**



**EUT – Bottom View**

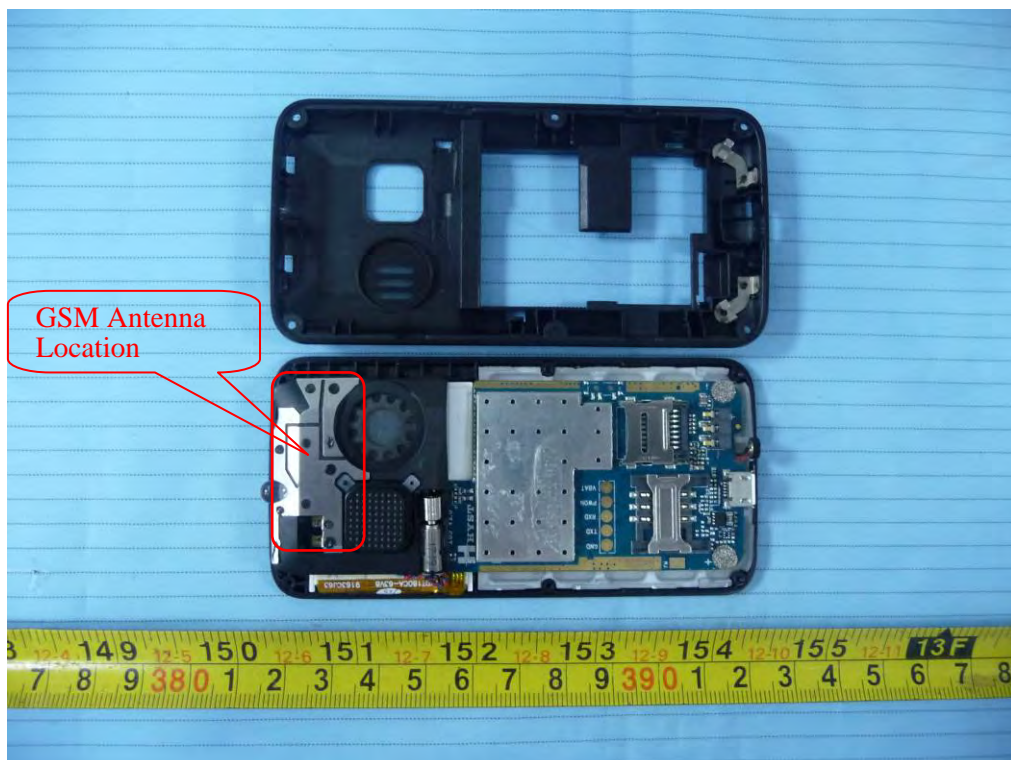




### EUT – Uncovered View



### EUT –Antenna View



**EUT – Headset View**



## APPENDIX F INFORMATIVE REFERENCES

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- [1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.
- [2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, Office of Engineering & Technology, Washington, DC, 1997.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.
- [4] Niels Kuster, Ralph Kastle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.
- [5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM \_ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.
- [10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.
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