



## SAR EVALUATION REPORT

For

**ITALCOM GROUP**

1728 Coral Way, Coral Gables, Miami, Florida 518048, USA

**FCC ID: YPVITALCOMXYN**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Mobile Phone
<b>Test Engineer:</b> <u>Cabin Hu</u>	<u>Cabin . Hu</u>
<b>Report Number:</b> <u>RSZ110708001-20</u>	
<b>Report Date:</b> <u>2011-07-28</u>	
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, NIST, or any agency of the Federal Government.

\* This report contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “★” (Rev.2)

<b>Attestation of Test Results</b>			
<b>EUT Information</b>	<b>Company Name</b>	ITALCOM GROUP	
	<b>EUT Description</b>	Mobile Phone	
	<b>Model Number:</b>	XYN	
	<b>FCC ID:</b>	YPVITALCOMXYN	
	<b>Date Test</b>	2011.07.27—2011.07.28	
<b>Band</b>	<b>Max. SAR Level(s) Measured</b>	<b>Limit (W/Kg)</b>	
Cellular	0.661 W/kg, 1g Head Tissue 0.496 W/kg, 1g Body Tissue	1.6	
PCS	0.194 W/kg, 1g Head Tissue 0.179 W/kg, 1g Body Tissue		
<b>Applicable Standards</b>	<b>ANSI / IEEE C95.1 : 1999</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fileds,3 kHz to 300 GHz		
	<b>ANSI / IEEE C95.3 : 2002</b> IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.		
	<b>OET BULLETIN 65 SUPPLEMENT C</b> Evaluating Compliance with FCC Guidelines for Human Exposure To Radiofrequency Electromagnetic Fields		
	<b>IEEE1528: 2003</b> IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques		
<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 FCC OET 65 Supplement C and IEEE 1528-2003.</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	RSZ110708001-20	Original Report	2011-07-28

## EUT DESCRIPTION

This Bay Area Compliance Laboratories Corp. test report has been prepared on behalf of ITALCOM GROUP, and their product model: XYN, FCC ID: YPVITALCOMXYN or the EUT (Equipment Under Test) as referred to in the rest of this report.

### 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>Head Accessories:</b>	None
<b>GPRS Class:</b>	N/A (GSM only)
<b>Capability Class</b>	N/A
<b>DTM Multi-Slot Class</b>	EUT does not support DTM
<b>Mode of Operation</b>	GSM Voice
<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>Maximum Conducted Power Tested:</b>	32.10 dBm (Cellular Band) 29.02 dBm (PCS Band)
<b>Dimensions (L*W*H):</b>	98mm (L) × 52mm (W) × 13mm (H)
<b>Weight:</b>	66 g
<b>Power Source:</b>	3.7VDC/ 600mAh Rechargeable Battery
<b>Normal Operation:</b>	Head and Body-worn

## REFERENCE, STANDARDS AND GUIDELINES

### 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 1 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

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

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

## 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

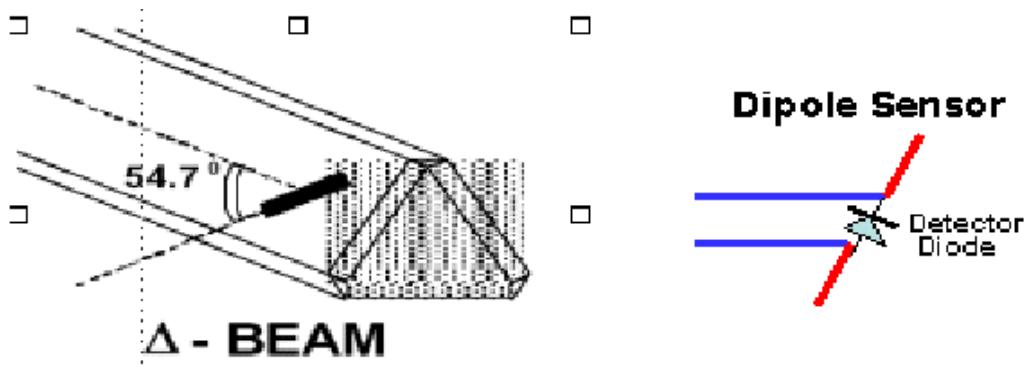
The overall uncertainty for the methodology and algorithms used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

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

## 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 aid of 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.

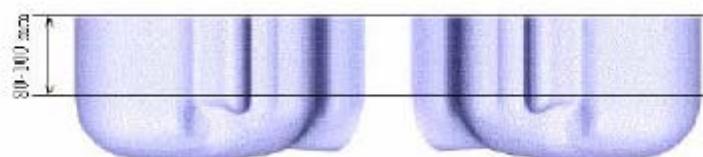


## Phantom Types

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 one 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

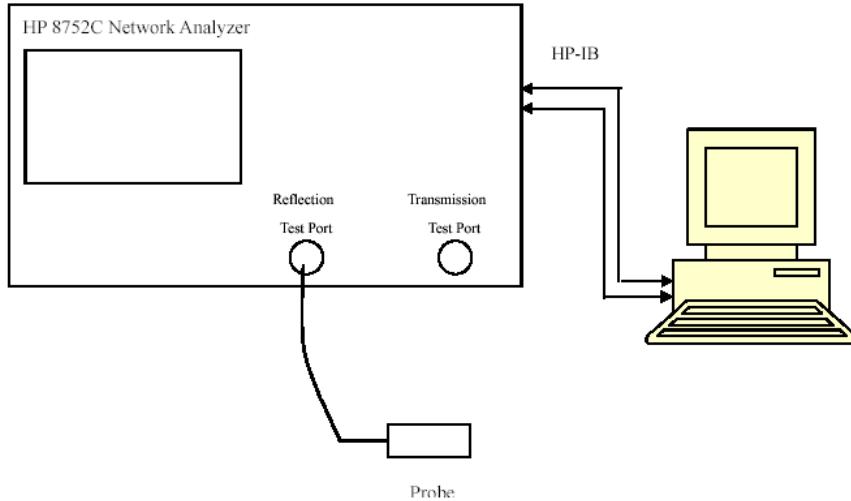
## EQUIPMENT LIST AND CALIBRATION

### Equipments List & Calibration Info

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	N/A	110-00212
Miniature E-Field Probe	ALS-E-020	2011-07-14	500-00283
Dipole, 835 MHz	ALS-D-835-S-2	2010-11-04	210-00564
Dipole, 1900 MHz	ALS-D-1900-S-2	2010-11-04	210-00715
Dipole Spacer	ALS-DS-U	N/A	250-00907
R&S, universal Radio Communication Tester	CMU200	2011-06-28	1100.0008.02
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	280-01054
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	280-02151
Simulated Tissue 1900 MHz Head	ALS-TS-1800-H	Each Time	290-01105
Simulated Tissue 1900 MHz Body	ALS-TS-1800-B	Each Time	290-02201
Signal Generator	HP8648C	2010-09-18	3426A01345
Power Amplifier	5S1G4	N/A	71377
Spectrum Analyzer	FSEM30	2011-07-05	849720/019

## SAR MEASUREMENT SYSTEM VERIFICATION

### Liquid Verification



Liquid Verification Setup Block Diagram

### Liquid Verification Results

Frequency (MHz)	Liquid Type	Liquid Parameter		Result
		$\epsilon_r$	$\sigma$ (S/m)	
835	Head	41.16	0.90	In Tolerance
835	Body	55.34	0.99	In Tolerance
1900	Head	40.05	1.45	In Tolerance
1900	Body	53.88	1.49	In Tolerance

\*Liquid Verification was performed on 2011-07-27

Please refer to the following tables.

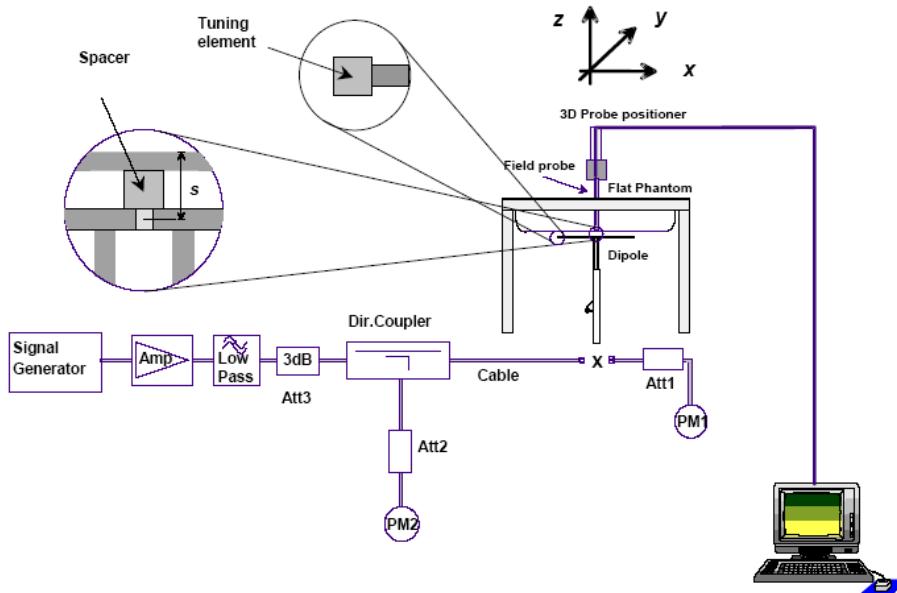
850 MHz Head				850 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824	41.196809	19.483208		824	55.359190	21.331874
824.5	41.165717	19.473958		824.5	55.332898	21.340491
825	41.149023	19.439583		825	55.321411	21.343613
825.5	41.043671	19.429564		825.5	55.257794	21.371684
826	41.062066	19.406907		826	55.242364	21.303725
826.5	41.084003	19.378031		826.5	55.330058	21.348075
827	41.060442	19.414494		827	55.352963	21.338393
827.5	41.107859	19.420840		827.5	55.366068	21.332314
828	41.127504	19.403127		828	55.312087	21.295648
828.5	41.133944	19.452302		828.5	55.306901	21.329776
829	41.184978	19.510155		829	55.326140	21.310280
829.5	41.133367	19.501491		829.5	55.340504	21.337026
830	41.169808	19.468491		830	55.386470	21.329639
830.5	41.129756	19.425201		830.5	55.310899	21.323540
831	41.102700	19.504388		831	55.271880	21.325888
831.5	41.122294	19.486598		831.5	55.327646	21.403349
832	41.084035	19.411522		832	55.289719	21.261480
832.5	41.058805	19.458624		832.5	55.254573	21.273533
833	41.099426	19.403667		833	55.294417	21.279391
833.5	41.130909	19.466293		833.5	55.373647	21.331006
834	41.128329	19.444269		834	55.321324	21.239256
834.5	41.126906	19.463698		834.5	55.365408	21.270879
835	41.158785	19.452918		835	55.337073	21.285883
835.5	41.185787	19.443483		835.5	55.368806	21.256023
836	41.116394	19.424621		836	55.308111	21.272339
836.5	41.111396	19.486594		836.5	55.313764	21.318345
837	41.128166	19.459205		837	55.327895	21.256749
837.5	41.122362	19.407033		837.5	55.415041	21.271557
838	41.145580	19.476494		838	55.392884	21.273220
838.5	41.104028	19.444816		838.5	55.353483	21.286932
839	41.093938	19.450965		839	55.307564	21.297670
839.5	41.096413	19.391470		839.5	55.368519	21.272952
840	41.107503	19.417535		840	55.333769	21.241216
840.5	41.096842	19.403199		840.5	55.341521	21.220510
841	41.080081	19.385452		841	55.315993	21.212630
841.5	41.109583	19.421688		841.5	55.363215	21.209481
842	41.111288	19.378113		842	55.317330	21.247632
842.5	41.114992	19.359775		842.5	55.366673	21.221774
843	41.109075	19.416223		843	55.342361	21.202600
843.5	41.032623	19.405237		843.5	55.320352	21.231489
844	41.109030	19.371370		844	55.297952	21.217044
844.5	41.063228	19.413388		844.5	55.293893	21.249829
845	40.989096	19.391615		845	55.279492	21.199776
845.5	41.004429	19.395666		845.5	55.298592	21.180172
846	40.958920	19.365880		846	55.227185	21.206547
846.5	40.999942	19.352380		846.5	55.298533	21.209940
847	40.980171	19.376687		847	55.325417	21.154839
847.5	40.983362	19.373966		847.5	55.314234	21.168640
848	40.956910	19.338925		848	55.263973	21.165253
848.5	40.961515	19.376603		848.5	55.262241	21.175343
849	40.921702	19.365841		849	55.303670	21.157778

1900 MHz Head				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1850	40.285338	13.812149		1850	53.788904	13.952822
1851	40.299870	13.807234		1851	53.775482	13.974799
1852	40.296776	13.779107		1852	53.799759	13.955439
1853	40.231388	13.755756		1853	53.749320	13.898657
1854	40.221349	13.766171		1854	53.766381	13.941798
1856	40.233659	13.787513		1856	53.751384	13.957769
1857	40.258787	13.769757		1857	53.761404	13.910113
1858	40.242120	13.784407		1858	53.756489	13.961909
1859	40.218160	13.772539		1859	53.758853	13.947276
1860	40.228784	13.751426		1860	53.792241	13.942054
1862	40.208519	13.740434		1862	53.779808	13.910976
1863	40.212515	13.748308		1863	53.781769	13.945307
1864	40.213084	13.721148		1864	53.756776	13.929279
1865	40.173400	13.703838		1865	53.804820	13.944258
1866	40.151302	13.709531		1866	53.773929	13.929956
1868	40.183331	13.702868		1868	53.756280	13.925990
1869	40.173263	13.722736		1869	53.826274	13.973264
1870	40.163010	13.693173		1870	53.798001	13.986543
1871	40.161361	13.726261		1871	53.823715	13.976762
1872	40.179028	13.740969		1872	53.836483	13.993811
1874	40.186481	13.759033		1874	53.827116	14.023507
1875	40.174390	13.746121		1875	53.849105	14.009583
1876	40.156764	13.783089		1876	53.853246	14.045714
1877	40.158526	13.767594		1877	53.850941	14.050226
1878	40.153850	13.780934		1878	53.890947	14.072218
1880	40.165929	13.820744		1880	53.915346	14.048551
1881	40.130663	13.810171		1881	53.885520	14.104596
1882	40.135220	13.833072		1882	53.878485	14.083377
1883	40.150857	13.814989		1883	53.895671	14.092495
1884	40.166471	13.830899		1884	53.936240	14.102599
1886	40.152264	13.853368		1886	53.923133	14.135859
1887	40.143301	13.835420		1887	53.937512	14.117437
1888	40.132164	13.852843		1888	53.914386	14.111164
1889	40.112247	13.841894		1889	53.911503	14.134930
1890	40.107543	13.830549		1890	53.896780	14.113383
1892	40.107639	13.865514		1892	53.929777	14.119039
1893	40.072212	13.839828		1893	53.933342	14.129428
1894	40.082707	13.828077		1894	53.901678	14.093601
1895	40.089052	13.877542		1895	53.891170	14.116953
1896	40.062243	13.855681		1896	53.871277	14.130251
1898	40.042300	13.854101		1898	53.870412	14.155924
1899	40.028711	13.823881		1899	53.903274	14.112834
1900	40.045837	13.841771		1900	53.876086	14.118084
1901	40.062090	13.829452		1901	53.891961	14.113195
1902	40.054954	13.838232		1902	53.888607	14.103759
1904	40.053747	13.837042		1904	53.883874	14.133078
1905	40.039477	13.844225		1905	53.869828	14.096061
1906	40.059915	13.838389		1906	53.845303	14.083881
1907	40.062160	13.847307		1907	53.869098	14.075333
1908	40.060663	13.864744		1908	53.836041	14.086191
1910	40.110146	13.880157		1910	53.849410	14.098567

## 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



### System Accuracy Check Results

Frequency (MHz)	Liquid Type	1 g SAR (W/Kg)	Target Value (W/Kg)	Result
835	Head	9.837	9.51	In Tolerance
1900	Head	39.042	38.90	In Tolerance
835	Body	9.635	9.50	In Tolerance
1900	Body	40.843	39.70	In Tolerance

- Note: The system verification date is 2011-07-27  
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: 210-00564**

## Product Data

Device Name : Dipole 835 MHz  
Serial No. : 210-00564  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency : 835.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 10.748 W/kg  
Power Drift-Finish : 10.922 W/kg  
Power Drift (%) : 1.695

## 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 : 835.00 MHz  
Last Calib. Date : 27-Jul-2011  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 41.16 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

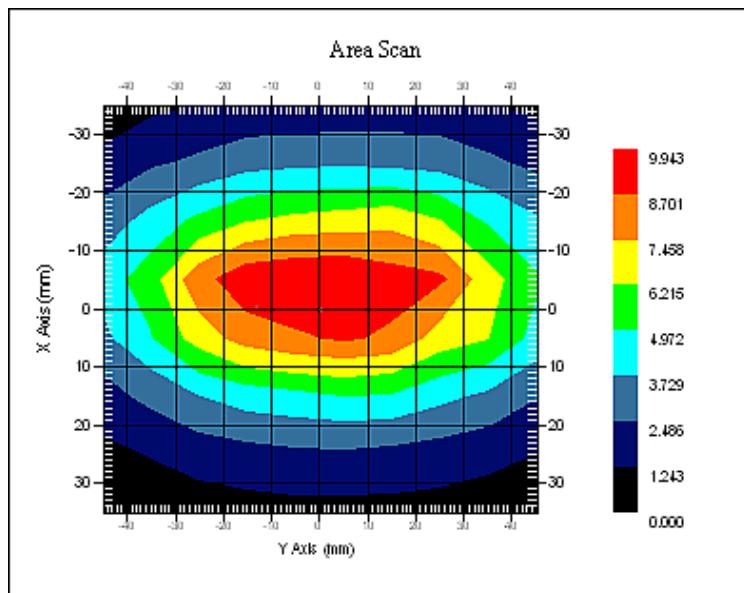
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Jul-2011  
Frequency : 835.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/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 : 9.837 W/kg  
10 gram SAR value : 6.105 W/kg  
Area Scan Peak SAR : 9.942 W/kg  
Zoom Scan Peak SAR : 15.511 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: 210-00564**

## Product Data

Device Name : Dipole 835 MHz  
Serial No. : 210-00564  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency : 835.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 10.954 W/kg  
Power Drift-Finish : 10.642 W/kg  
Power Drift (%) : -2.710

## 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 : 835.00 MHz  
Last Calib. Date : 27-Jul-2011  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 55.34 F/m  
Sigma : 0.99 S/m  
Density : 1000.00 kg/cu. m

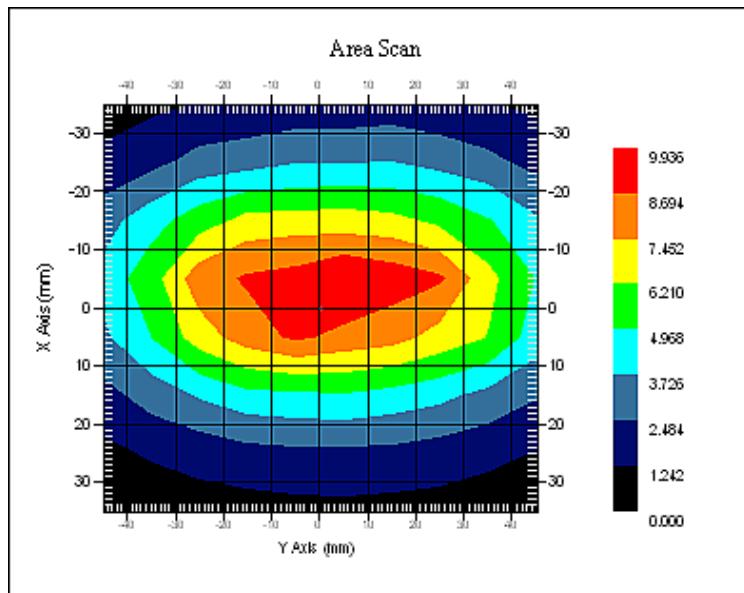
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Jul-2011  
Frequency : 835.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/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 : 9.635 W/kg  
10 gram SAR value : 6.135 W/kg  
Area Scan Peak SAR : 9.938W/kg  
Zoom Scan Peak SAR : 14.952 W/kg



### 835 MHz System Validation with Body Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1900 MHz, Head Tissue****Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00715**

## Product Data

Device Name : Dipole 1900MHz  
Serial No. : 210-00715  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency : 1900.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 40.684 W/kg  
Power Drift-Finish : 39.805 W/kg  
Power Drift (%) : -1.813

## 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 : 27-Jul-2011  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 40.05 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. M

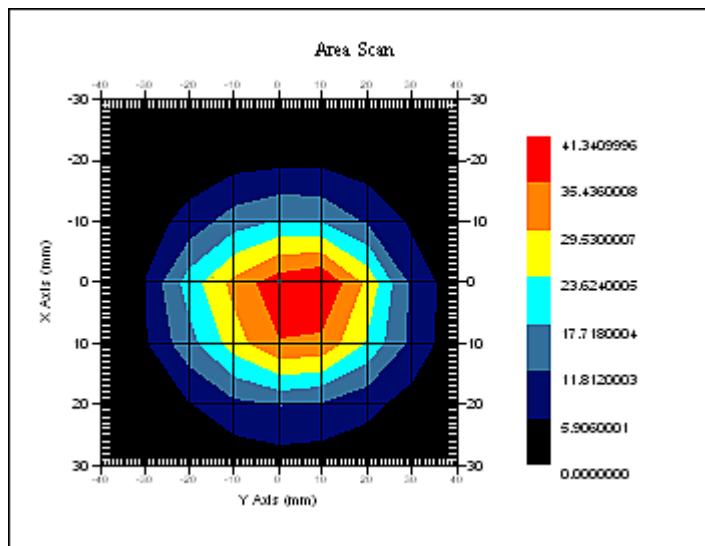
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Jul-2011  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20 µV/(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. : 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 : 39.042 W/kg  
10 gram SAR value : 20.164 W/kg  
Area Scan Peak SAR : 41.367 W/kg  
Zoom Scan Peak SAR : 71.343 W/kg



### 1900 MHz System Validation with Head Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1900 MHz, Body Tissue****Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00715**

## Product Data

Device Name : Dipole 1900MHz  
Serial No. : 210-00715  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency : 1900.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 39.743 W/kg  
Power Drift-Finish : 40.343 W/kg  
Power Drift (%) : 2.754

## 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 : 27-Jul-2011  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 53.88 F/m  
Sigma : 1.49 S/m  
Density : 1000.00 kg/cu. m

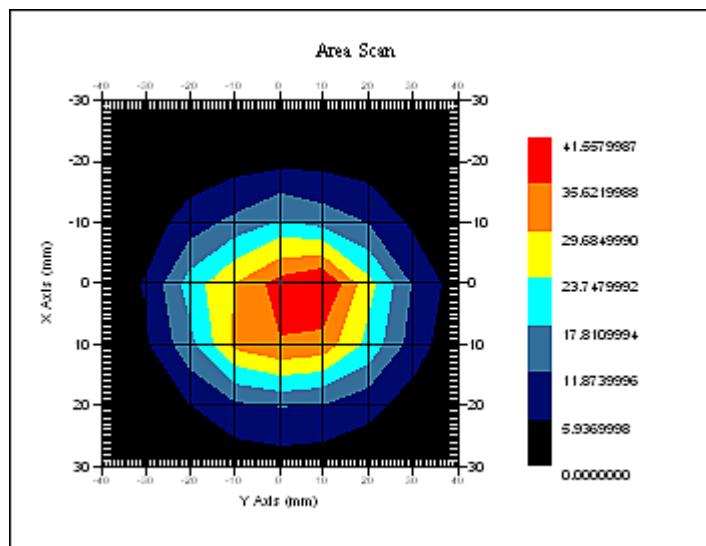
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Jul-2011  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20 µV/(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 : 40.843 W/kg  
10 gram SAR value : 19.648 W/kg  
Area Scan Peak SAR : 41.581 W/kg  
Zoom Scan Peak SAR : 78.225 W/kg



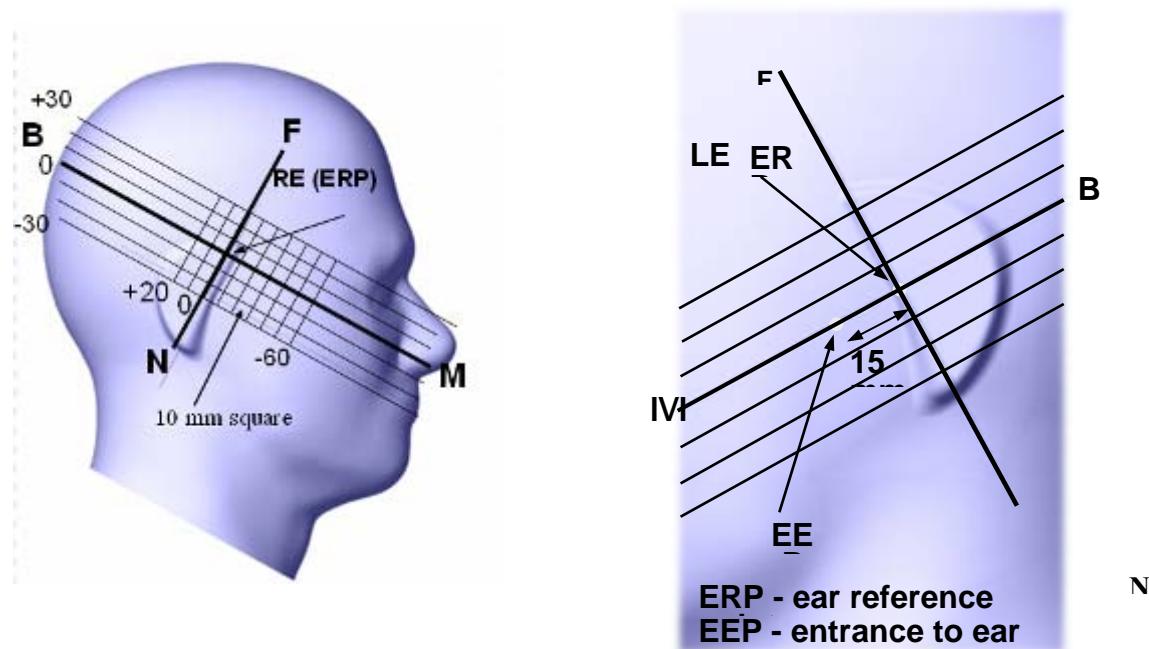
### 1900 MHz System Validation with Body Tissue

## 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  $\frac{1}{4}$  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

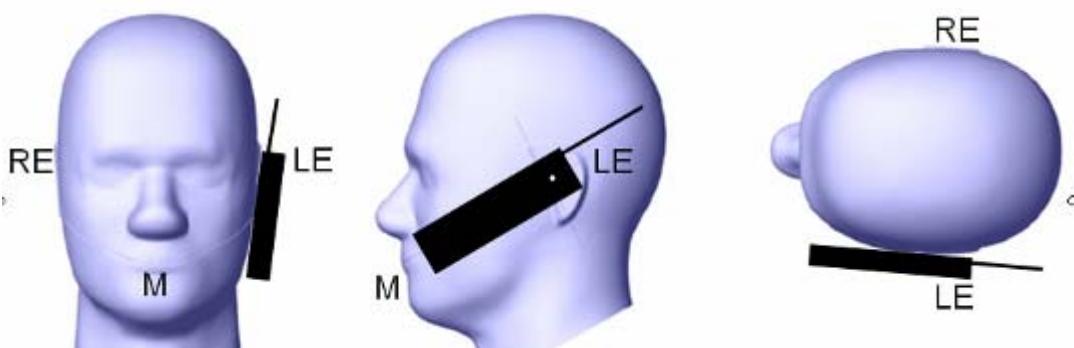
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

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

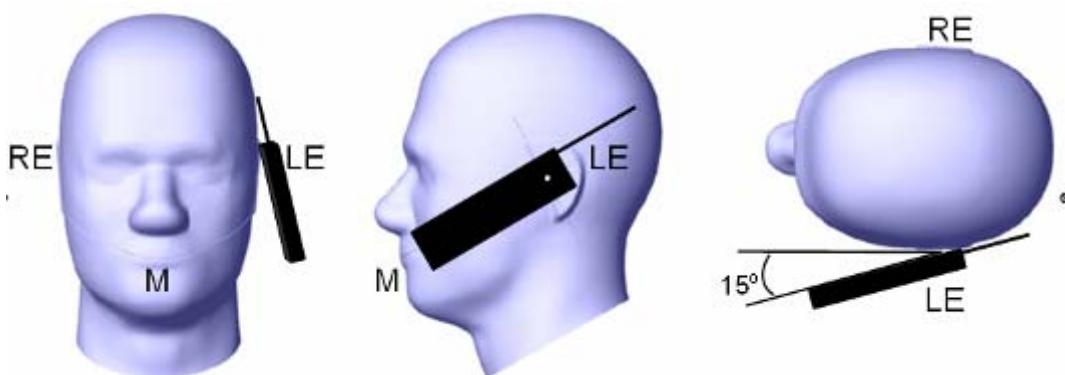
With the handset aligned in the “Cheek/Touch Position”:

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 isby 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, 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 7x 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.

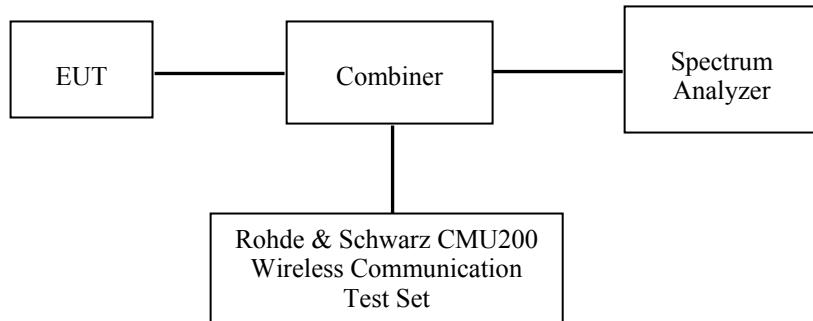
All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

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

### Test Block Diagram and Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.



### Test Results

Band	Frequency (MHz)	Conducted Output Power (GSM)	
		(dBm)	(Watt)
Cellular	824.2	32.01	1.589
	836.6	32.03	1.596
	848.8	32.10	1.622
PCS	1850.2	28.10	0.646
	1880.0	28.41	0.693
	1909.8	29.02	0.798

## SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation. The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device, could be found in this section.

### SAR Test Data

#### Environmental Conditions

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

\* Testing was performed by Cabin Hu on 2011-07-27---2011-07-28.

#### Cellular Band:

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Liquid	1g SAR Value (W/Kg)	FCC Limit (W/Kg)
	Channel	MHz					
Left Head Cheek	128 (Low)	824.2	GSM	Integral	Head	0.578	1.6
	190 (Middle)	836.6	GSM	Integral	Head	0.610	1.6
	251 (High)	848.8	GSM	Integral	Head	0.661	1.6
Left Head Tilt	128 (Low)	824.2	GSM	Integral	Head	/	1.6
	190 (Middle)	836.6	GSM	Integral	Head	/	1.6
	251 (High)	848.8	GSM	Integral	Head	0.361	1.6
Right Head Cheek	128 (Low)	824.2	GSM	Integral	Head	/	1.6
	190 (Middle)	836.6	GSM	Integral	Head	/	1.6
	251 (High)	848.8	GSM	Integral	Head	0.598	1.6
Right Head Tilt	128 (Low)	824.2	GSM	Integral	Head	/	1.6
	190 (Middle)	836.6	GSM	Integral	Head	/	1.6
	251 (High)	848.8	GSM	Integral	Head	0.355	1.6
Body-Worn Back	251 (High)	848.8	GSM	Integral	Body	0.496	1.6

**PCS Band:**

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Liquid	1g SAR Value (W/Kg)	FCC Limit (W/Kg)
	Channel	MHz					
Left Head Cheek	512 (Low)	1850.2	GSM	Integral	Head	0.155	1.6
	661 (Middle)	1880.0	GSM	Integral	Head	0.165	1.6
	810 (High)	1909.8	GSM	Integral	Head	0.194	1.6
Left Head Tilt	512 (Low)	1850.2	GSM	Integral	Head	/	1.6
	661 (Middle)	1880.0	GSM	Integral	Head	/	1.6
	810 (High)	1909.8	GSM	Integral	Head	0.105	1.6
Right Head Cheek	512 (Low)	1850.2	GSM	Integral	Head	/	1.6
	661 (Middle)	1880.0	GSM	Integral	Head	/	1.6
	810 (High)	1909.8	GSM	Integral	Head	0.175	1.6
Right Head Tilt	512 (Low)	1850.2	GSM	Integral	Head	/	1.6
	661 (Middle)	1880.0	GSM	Integral	Head	/	1.6
	810 (High)	1909.8	GSM	Integral	Head	0.103	1.6
Body-Worn Back	810 (High)	1909.8	GSM	Integral	Body	0.179	1.6

**Note:** The device does not have multi-slots capability, only GSM voice with 1 slot is available.

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (835 MHz Low Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.435 W/kg  
Power Drift-Finish : 0.424 W/kg  
Power Drift (%) : -2.455

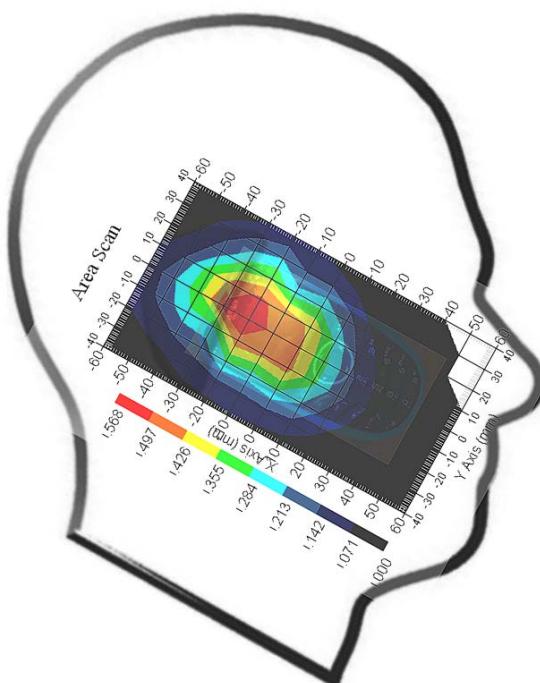
**Tissue Data**

Type : HEAD  
Frequency : 835.00 MHz  
Epsilon : 41.16 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 835.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.578 W/kg  
10 gram SAR value : 0.515 W/kg  
Area Scan Peak SAR : 0.568 W/kg  
Zoom Scan Peak SAR : 0.860 W/kg

**Plot 1#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (835 MHz Middle Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.562 W/kg  
Power Drift-Finish : 0.557 W/kg  
Power Drift (%) : -2.013

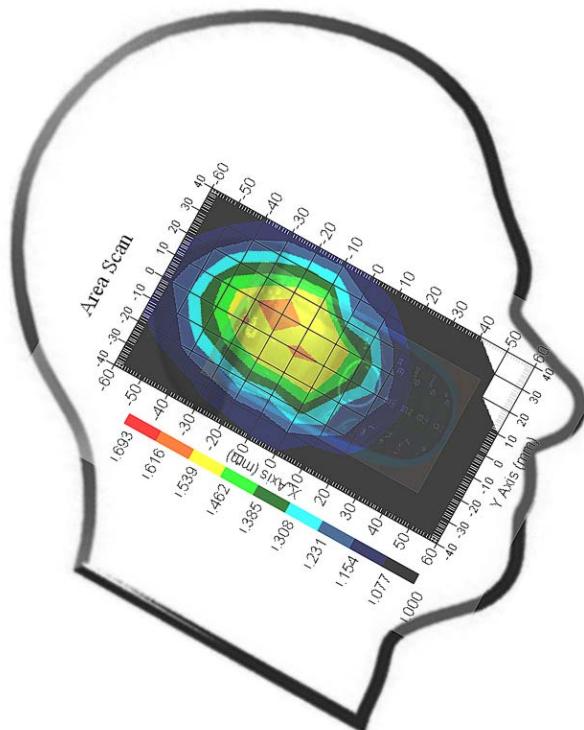
**Tissue Data**

Type : HEAD  
Frequency : 835.00 MHz  
Epsilon : 41.16 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 835.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.610 W/kg  
10 gram SAR value : 0.496 W/kg  
Area Scan Peak SAR : 0.619 W/kg  
Zoom Scan Peak SAR : 1.000 W/kg

**Plot 2#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (835 MHz High Channel)**

## Measurement Data

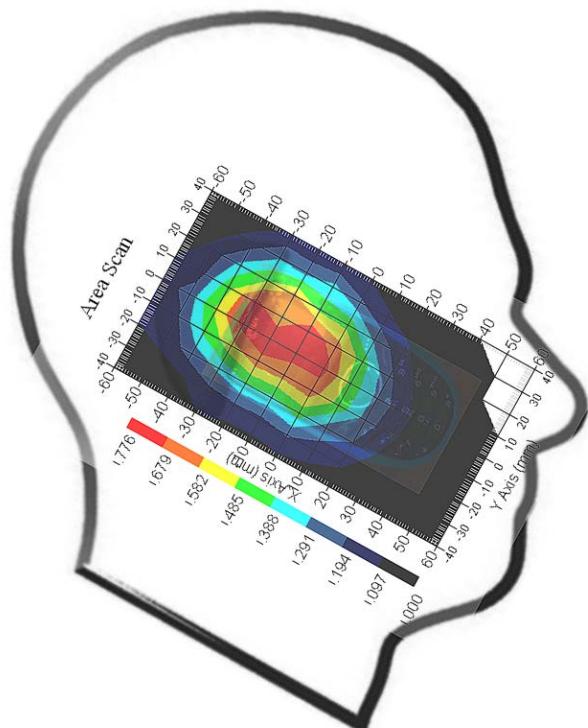
Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.601 W/kg  
Power Drift-Finish : 0.597 W/kg  
Power Drift (%) : -0.655

## Tissue Data

Type : HEAD  
Frequency : 835.00 MHz  
Epsilon : 41.16 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency : 835.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm  
  
1 gram SAR value : 0.661 W/kg  
10 gram SAR value : 0.561 W/kg  
Area Scan Peak SAR : 0.774 W/kg  
Zoom Scan Peak SAR : 1.261 W/kg

**Plot 3#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Tilt (835 MHz High Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.387 W/kg  
Power Drift-Finish : 0.372 W/kg  
Power Drift (%) : -3.898

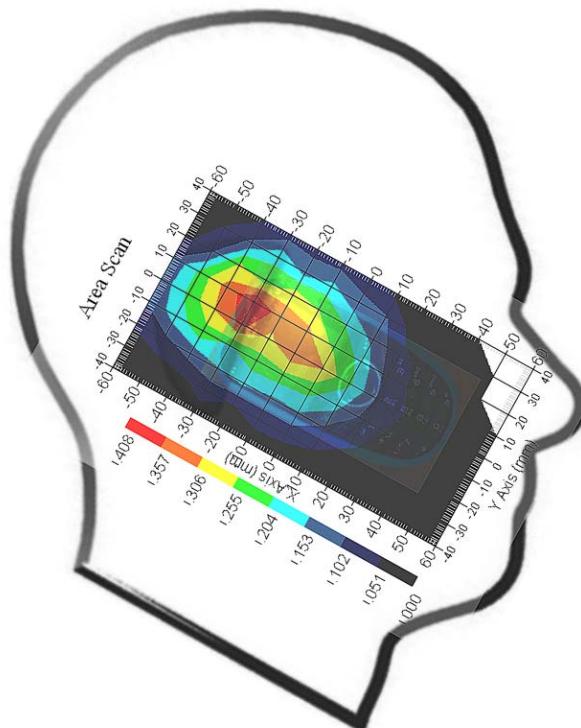
**Tissue Data**

Type : HEAD  
Frequency : 835.00 MHz  
Epsilon : 41.16 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 835.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.361 W/kg  
10 gram SAR value : 0.218 W/kg  
Area Scan Peak SAR : 0.408 W/kg  
Zoom Scan Peak SAR : 0.570 W/kg

**Plot 4#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Cheek (835 MHz High Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.500 W/kg  
Power Drift-Finish : 0.518 W/kg  
Power Drift (%) : 3.654

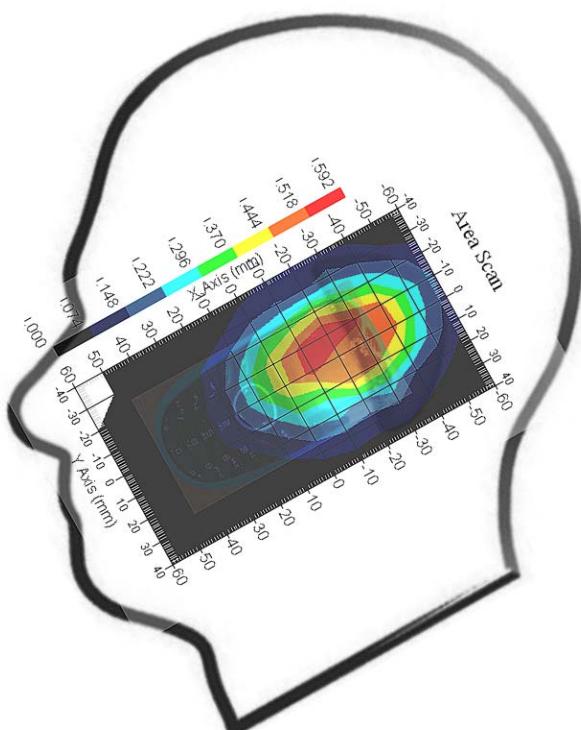
## Tissue Data

Type : HEAD  
Frequency : 835.00 MHz  
Epsilon : 41.16 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency : 835.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.598 W/kg  
10 gram SAR value : 0.342 W/kg  
Area Scan Peak SAR : 0.591 W/kg  
Zoom Scan Peak SAR : 0.820 W/kg

**Plot 5#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Tilt (835 MHz High Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.395 W/kg  
Power Drift-Finish : 0.386 W/kg  
Power Drift (%) : -2.288

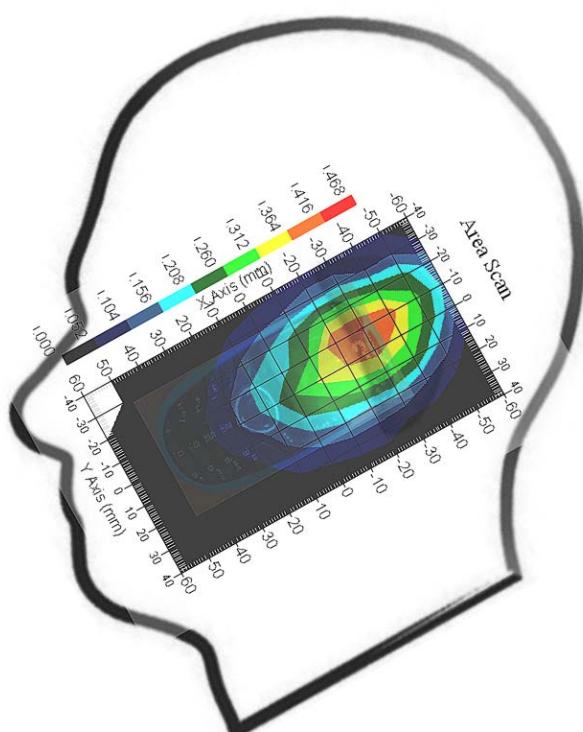
**Tissue Data**

Type : HEAD  
Frequency : 835.00 MHz  
Epsilon : 41.16 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 835.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.355 W/kg  
10 gram SAR value : 0.244 W/kg  
Area Scan Peak SAR : 0.419 W/kg  
Zoom Scan Peak SAR : 0.670 W/kg

**Plot 6#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn Back (835 MHz High Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 9x13x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.541 W/kg  
Power Drift-Finish : 0.526 W/kg  
Power Drift (%) : -2.792

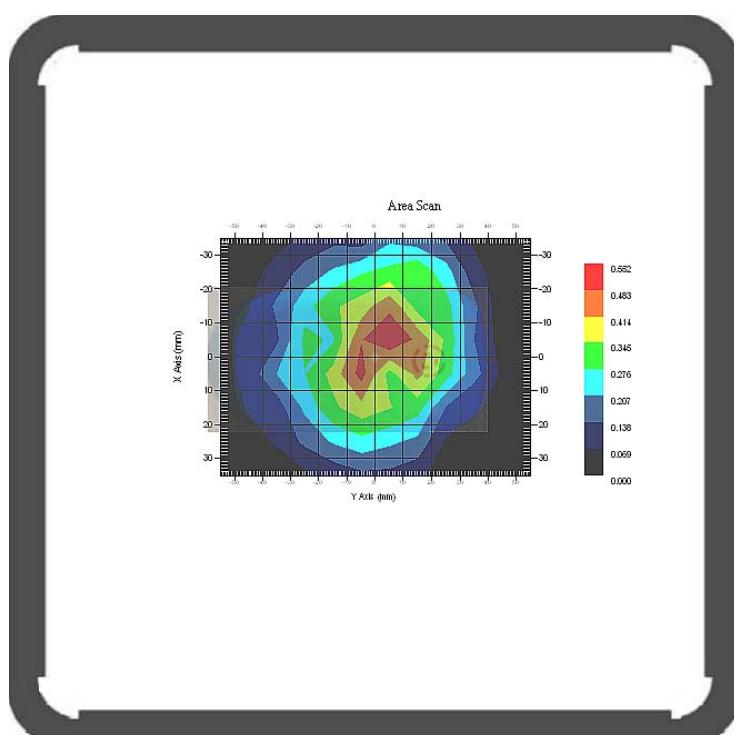
**Tissue Data**

Type : BODY  
Frequency : 835.00 MHz  
Epsilon : 55.34 F/m  
Sigma : 0.99 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 835.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.496 W/kg  
10 gram SAR value : 0.316 W/kg  
Area Scan Peak SAR : 0.550 W/kg  
Zoom Scan Peak SAR : 0.740 W/kg

**Plot 7#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (1900 MHz Low Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : 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 : 0.076 W/kg  
Power Drift (%) : -2.019

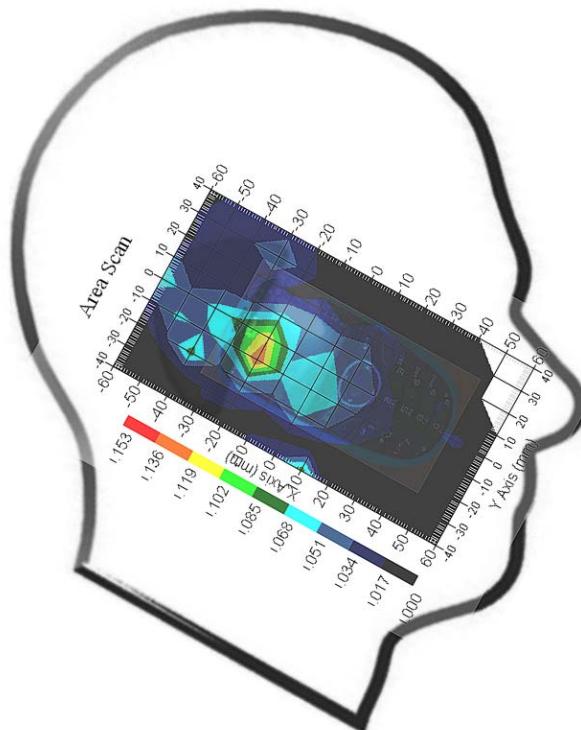
**Tissue Data**

Type : HEAD  
Frequency : 1900.00 MHz  
Epsilon : 40.05 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.155 W/kg  
10 gram SAR value : 0.085 W/kg  
Area Scan Peak SAR : 0.148 W/kg  
Zoom Scan Peak SAR : 0.400 W/kg

**Plot 10#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (1900 MHz Middle Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.112 W/kg  
Power Drift-Finish : 0.110 W/kg  
Power Drift (%) : -1.671

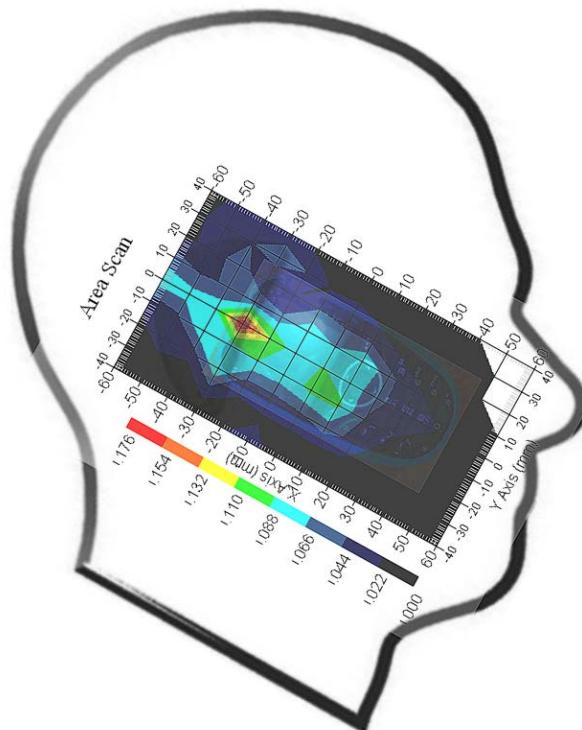
## Tissue Data

Type : HEAD  
Frequency : 1900.00 MHz  
Epsilon : 40.05 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.165 W/kg  
10 gram SAR value : 0.086 W/kg  
Area Scan Peak SAR : 0.173 W/kg  
Zoom Scan Peak SAR : 0.311 W/kg

**Plot 9#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (1900 MHz High Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.146 W/kg  
Power Drift-Finish : 0.144 W/kg  
Power Drift (%) : -1.469

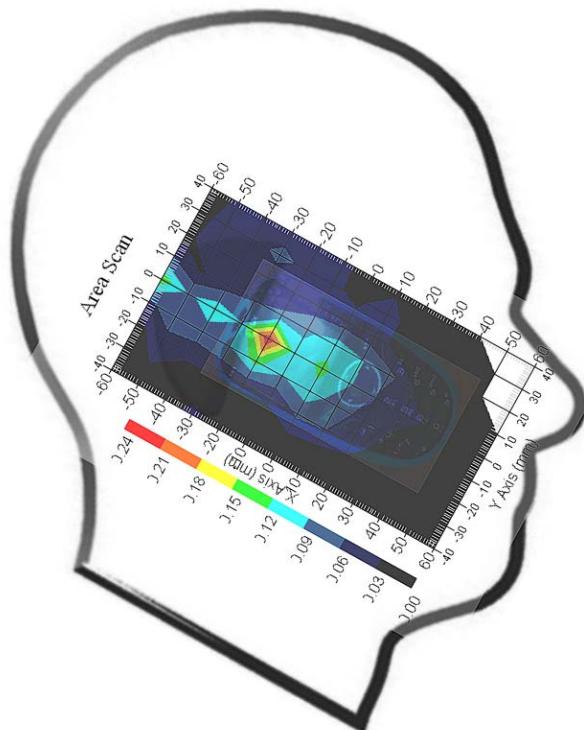
## Tissue Data

Type : HEAD  
Frequency : 1900.00 MHz  
Epsilon : 40.05 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.194 W/kg  
10 gram SAR value : 0.133 W/kg  
Area Scan Peak SAR : 0.227 W/kg  
Zoom Scan Peak SAR : 0.590 W/kg

**Plot 10#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Tilt (1900 MHz High Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.172 W/kg  
Power Drift-Finish : 0.175 W/kg  
Power Drift (%) : 1.128

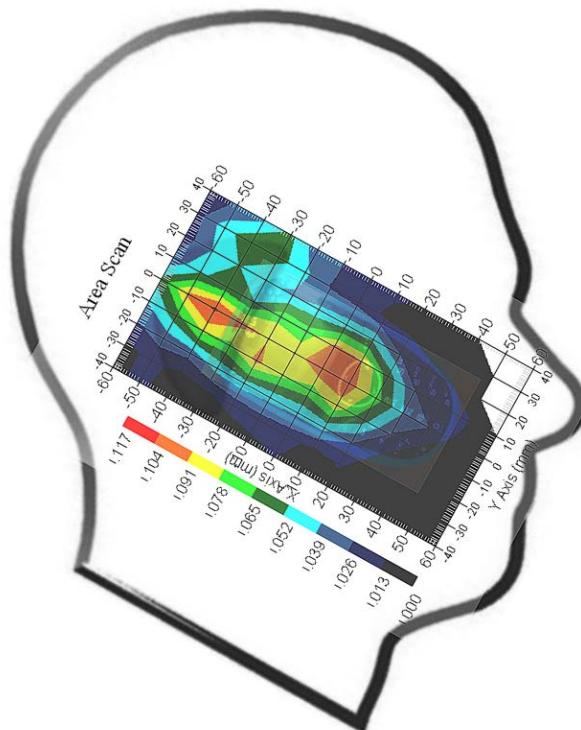
**Tissue Data**

Type : HEAD  
Frequency : 1900.00 MHz  
Epsilon : 40.05 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.105 W/kg  
10 gram SAR value : 0.099 W/kg  
Area Scan Peak SAR : 0.116 W/kg  
Zoom Scan Peak SAR : 0.570 W/kg

**Plot 11#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Cheek (1900 MHz High Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.123 W/kg  
Power Drift-Finish : 0.125 W/kg  
Power Drift (%) : 2.232

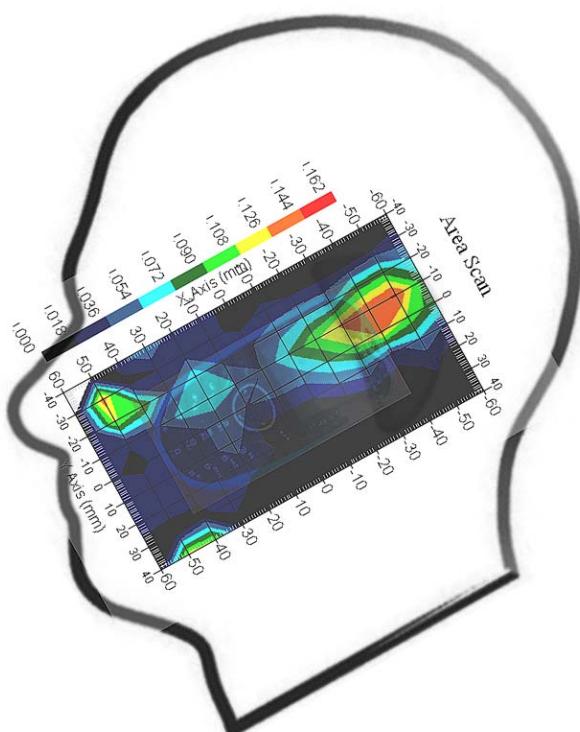
**Tissue Data**

Type : HEAD  
Frequency : 1900.00 MHz  
Epsilon : 40.05 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.175 W/kg  
10 gram SAR value : 0.078 W/kg  
Area Scan Peak SAR : 0.156 W/kg  
Zoom Scan Peak SAR : 0.370 W/kg

**Plot 12#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Tilt (1900 MHz High Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 13x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.116 W/kg  
Power Drift-Finish : 0.114 W/kg  
Power Drift (%) : -1.478

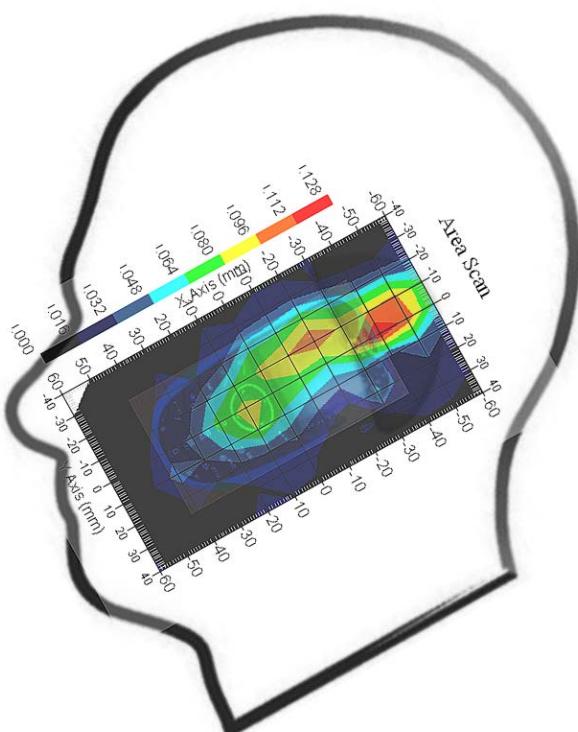
**Tissue Data**

Type : HEAD  
Frequency : 1900.00 MHz  
Epsilon : 40.05 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 5.2  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.103 W/kg  
10 gram SAR value : 0.062 W/kg  
Area Scan Peak SAR : 0.118 W/kg  
Zoom Scan Peak SAR : 0.280 W/kg

**Plot 13#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn Back (1900 MHz High Channel)**

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 9x13x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.141 W/kg  
Power Drift-Finish : 0.142 W/kg  
Power Drift (%) : 0.290

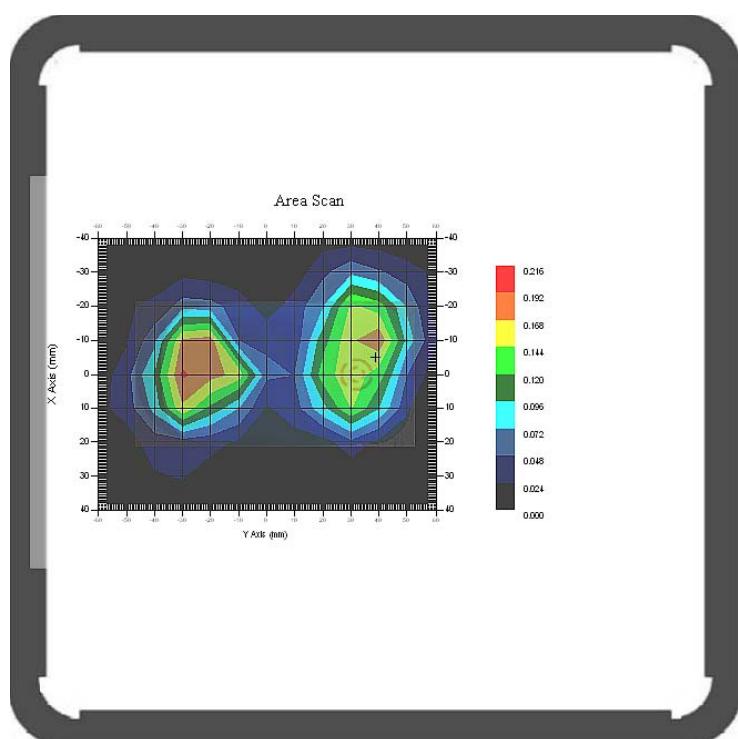
## Tissue Data

Type : BODY  
Frequency : 1900.00 MHz  
Epsilon : 53.88 F/m  
Sigma : 1.49 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency : 1900.00 MHz  
Duty Cycle Factor : 8  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.179 W/kg  
10 gram SAR value : 0.088 W/kg  
Area Scan Peak SAR : 0.196 W/kg  
Zoom Scan Peak SAR : 0.530 W/kg

**Plot 14#**

## APPENDIX A – MEASUREMENT UNCERTAINTY

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

Measurement uncertainty for 300 MHz to 3 GHz

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_i^1 (1-g)$	$c_i^1 (10-g)$	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	$\sqrt{3}$	$(1-cp)^{1/2}$	$\frac{(1-cp)^1}{\sqrt{2}}$	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	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
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	4.0	normal	1	1	1	4.0	4.0
Device Holder Uncertainty	2.0	normal	1	1	1	2.0	2.0
Drift of Output Power	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
<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.)	2.5	normal	1	0.7	0.5	1.8	1.3
Liquid Permittivity(target)	5.0	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	2.5	normal	1	0.6	0.5	1.5	1.3
Combined Uncertainty		RSS				9.7	9.4
Combined Uncertainty (coverage factor=2)		Normal(k=2)				19.4	18.8

**APPENDIX B – PROBE CALIBRATION CERTIFICATES****NCL CALIBRATION LABORATORIES****Calibration File No.: 1251-1258****Client.: BACL Lab****C E R T I F I C A T E   O F   C A L I B R A T I O N**

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-5607**Calibrated:** 14<sup>th</sup> July 2011  
**Released on:** 14<sup>th</sup> July 2011**Approved By:** Stuart Nicol

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

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

**NCL CALIBRATION LABORATORIES**303 Terry Fox Drive, Suite 102  
Kanata, Ontario  
CANADA K2K 3J1Division of APREL  
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 metrological 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

**NCL Calibration Laboratories**

Division of APREL Inc.

**Conditions**

Probe 500-00283 was a new probe taken from stock.

**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**

<b>Instrument</b>	<b>Serial Number</b>	<b>Cal due date</b>
Power meter Anritsu MA2408A	90025437	Nov.4, 2011
Power Sensor Anritsu MA2481D	103555	Nov 4, 2011
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2011
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2012

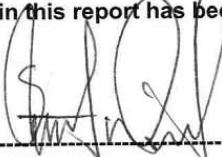
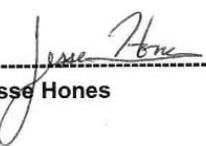
**Secondary Measurement Standards**

Signal Generator Agilent E4438C -506 MY55182336 June 7, 2012

**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 probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.**

  
-----  
Stuart Nicol  
-----  
Jesse Hones

---

Page 3 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.

**Probe Summary**

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

\*Resistive to recommended tissue recipes per IEEE-1528

**Sensitivity in Air**

**Channel X:** 1.2  $\mu$ V/(V/m)<sup>2</sup>  
**Channel Y:** 1.2  $\mu$ V/(V/m)<sup>2</sup>  
**Channel Z:** 1.2  $\mu$ V/(V/m)<sup>2</sup>

**Diode Compression Point:** 95 mV

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

**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	X	X	X	X	X
450 B	Body	X	X	X	X	X
750 H	Head	X	X	X	X	X
750 B	Body	X	X	X	X	X
<b>835 H</b>	<b>Head</b>	<b>42.35</b>	<b>0.938</b>	<b>3.5</b>	<b>3.4</b>	<b>6.6</b>
<b>835 B</b>	<b>Body</b>	<b>56.65</b>	<b>1.018</b>	<b>3.5</b>	<b>3.4</b>	<b>6.6</b>
<b>900 H</b>	<b>Head</b>	<b>41.35</b>	<b>0.98</b>	<b>3.5</b>	<b>3.4</b>	<b>6</b>
<b>900 B</b>	<b>Body</b>	<b>56.08</b>	<b>1.05</b>	<b>3.5</b>	<b>3.4</b>	<b>6</b>
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
<b>1750 H</b>	<b>Head</b>	<b>38.72</b>	<b>1.35</b>	<b>3.5</b>	<b>3.4</b>	<b>5.1</b>
<b>1750 B</b>	<b>Body</b>	<b>51.62</b>	<b>1.48</b>	<b>3.5</b>	<b>3.4</b>	<b>4.8</b>
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
<b>1900 H</b>	<b>Head</b>	<b>38.72</b>	<b>1.35</b>	<b>3.5</b>	<b>2.7</b>	<b>5.2</b>
<b>1900 B</b>	<b>Body</b>	<b>51.62</b>	<b>1.48</b>	<b>3.5</b>	<b>2.7</b>	<b>5</b>
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
<b>2450 H</b>	<b>Head</b>	<b>38.06</b>	<b>1.87</b>	<b>3.5</b>	<b>3.5</b>	<b>4.9</b>
<b>2450B</b>	<b>Body</b>	<b>50.22</b>	<b>2.03</b>	<b>3.5</b>	<b>3.5</b>	<b>4.3</b>
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

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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  $5\text{ M}\Omega$ .

**Boundary Effect:**

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

**NOTES:**

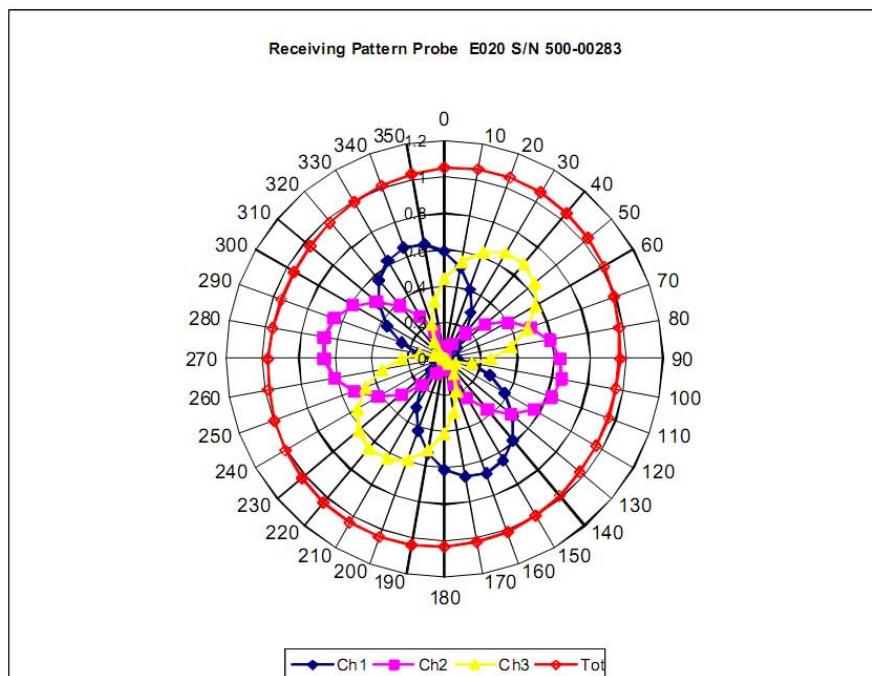
\*The maximum deviation from the centre frequency when comparing the lower to upper range is listed.

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**NCL Calibration Laboratories**

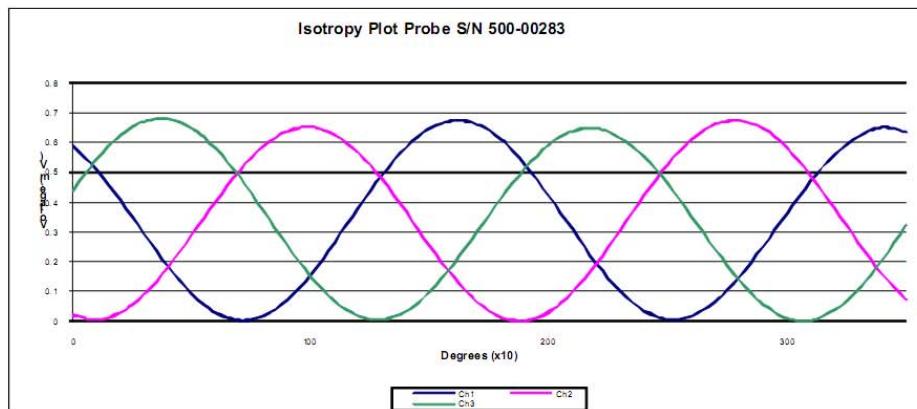
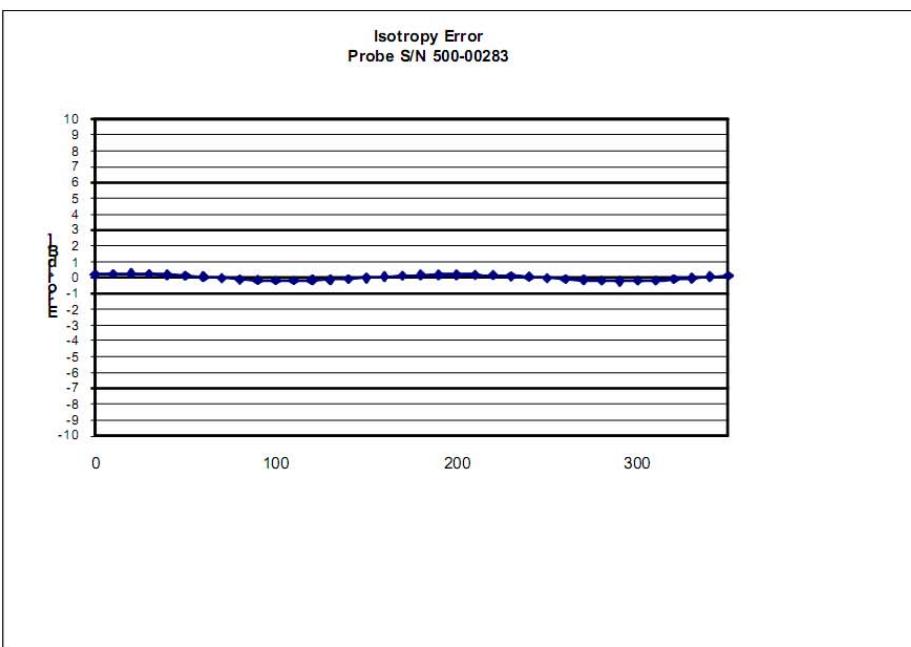
Division of APREL Inc.

**Receiving Pattern Air**

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**NCL Calibration Laboratories**

Division of APREL Inc.

**Isotropy Error Air****Isotropicity Tissue:**

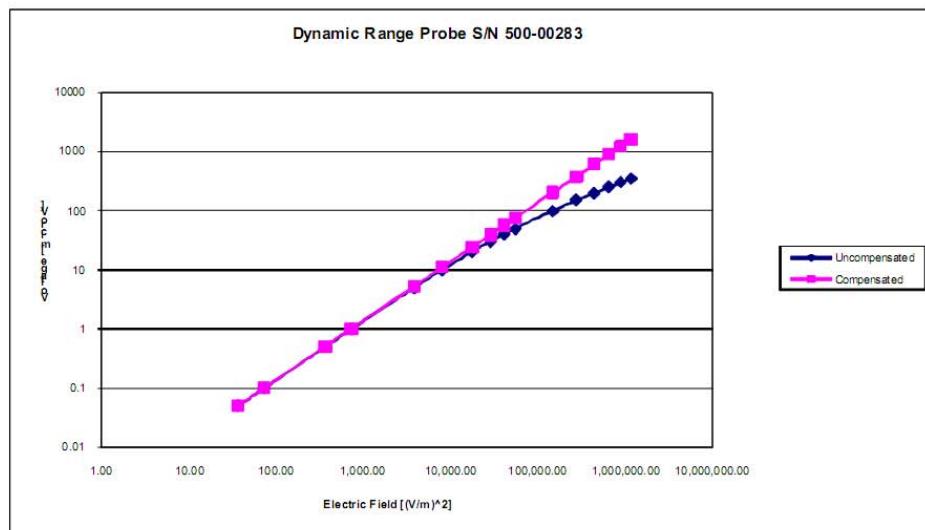
0.10 dB

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**NCL Calibration Laboratories**  
Division of APREL Inc.

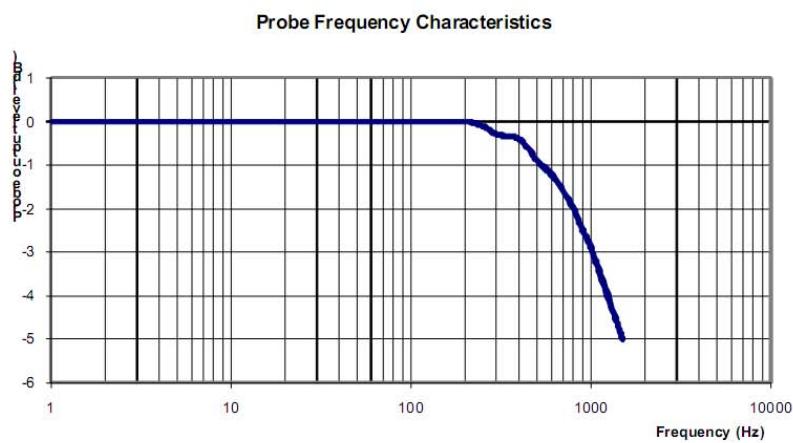
### Dynamic Range



Page 9 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.

**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 2011.

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Page 10 of 10  
This page has been reviewed for content and attested to on Page 2 of this document.

**APPENDIX C – DIPOLE CALIBRATION CERTIFICATES****NCL CALIBRATION LABORATORIES**

Calibration File No: DC-1176  
Project Number: BACB-5547

**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

Manufacturer: APREL Laboratories

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

Frequency: 835 MHz

Serial No: 210-00564

Customer: Bay Area Compliance Laboratory

Calibrated: 4<sup>th</sup> November 2010  
Released on: 5<sup>th</sup> November 2010

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

Released By:



**NCL** CALIBRATION LABORATORIES

51 SPECTRUM WAY  
NEPEAN, ONTARIO  
CANADA K2B 1E6

Division of APREL Lab.  
TEL: (613) 620-4990  
FAX: (613) 620-4102

**NCL Calibration Laboratories**  
Division of APREL Laboratories.

**Conditions**

Dipole 210-00564 was new and taken from stock prior to calibration.

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

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



Stuart Nicol



C. Teodorian

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**

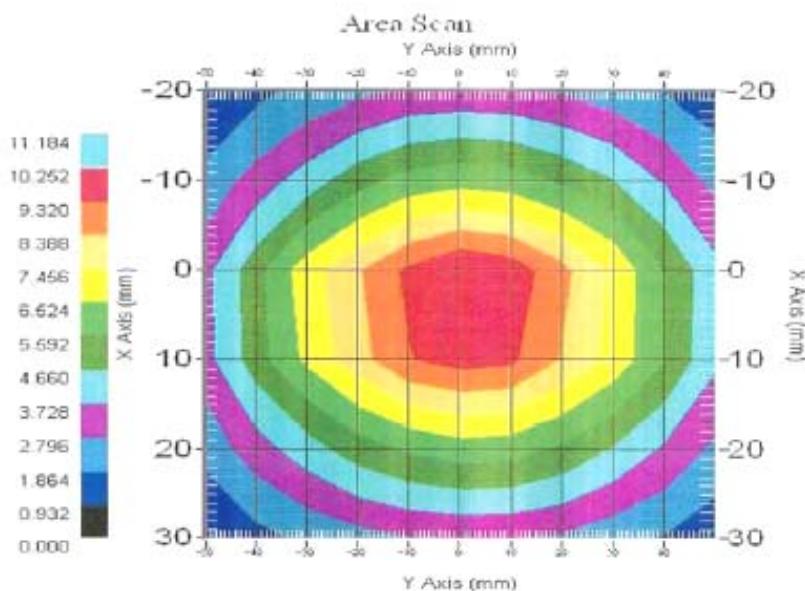
**Length:** 162.2 mm  
**Height:** 89.4 mm

**Electrical Specification**

**SWR:** 1.085 U  
**Return Loss:** -29.149 dB  
**Impedance:** 50.605  $\Omega$

**System Validation Results**

Frequency	1 Gram	10 Gram	Peak
835 MHz	9.51	6.15	14.19



**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 210-00564. 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 210-00564 was new taken from stock.

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

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
161.0 mm	89.8 mm	162.2 mm	89.4 mm

**Tissue Validation**

Head Tissue 835MHz	Measured
Dielectric constant, $\epsilon_r$	41.10
Conductivity, $\sigma$ [S/m]	0.91

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

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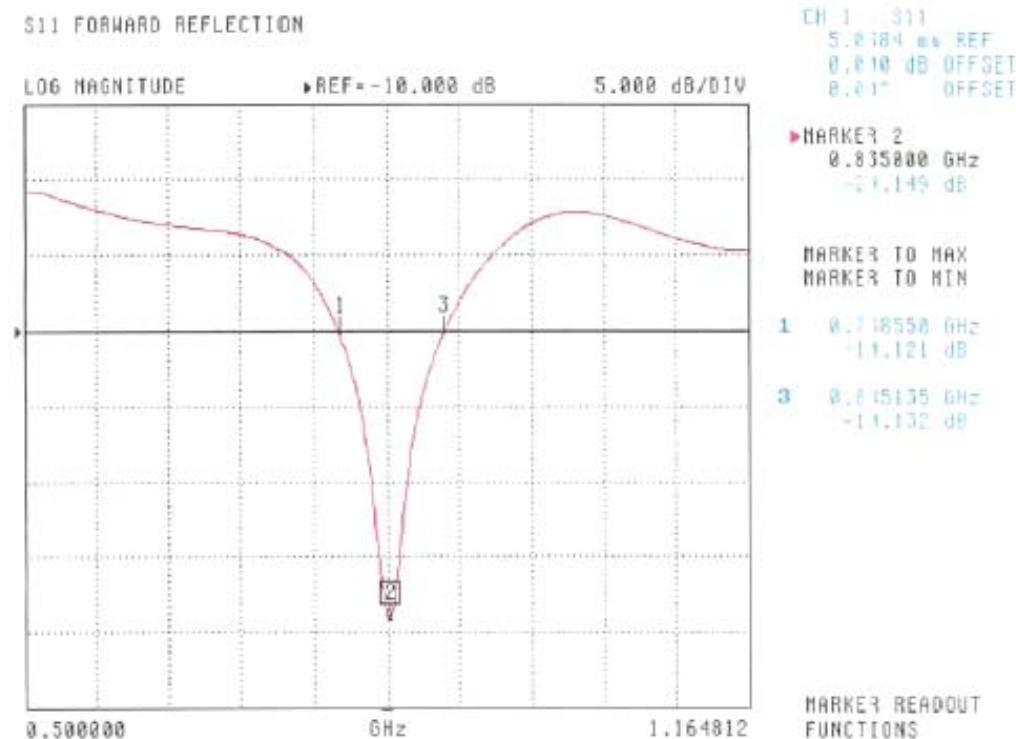
**NCL Calibration Laboratories**  
Division of APREL Laboratories.

**Electrical Calibration**

Test	Result
S11 RL	-29.149 dB
SWR	1.085 U
Impedance	50.605 Ω

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

**S11 Parameter Return Loss**



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

**NCL Calibration Laboratories**  
Division of APREL Laboratories.

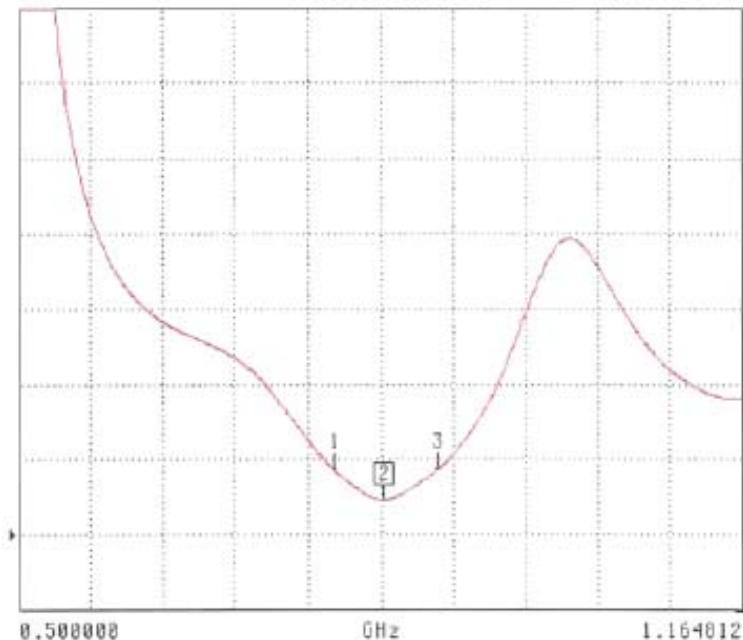
**SWR**

S11 FORWARD REFLECTION

SWR

REF = 172.166 mV

2.000 U/DIV



CH 1 : S11  
5.0184 dB REF  
0.010 dB OFFSET  
0.01% DOPPLER

► MARKER 2  
0.835000 GHz  
1.0850

MARKER TO MAX  
MARKER TO MIN

1 0.718558 GHz  
1.9320  
3 0.615135 GHz  
1.9240

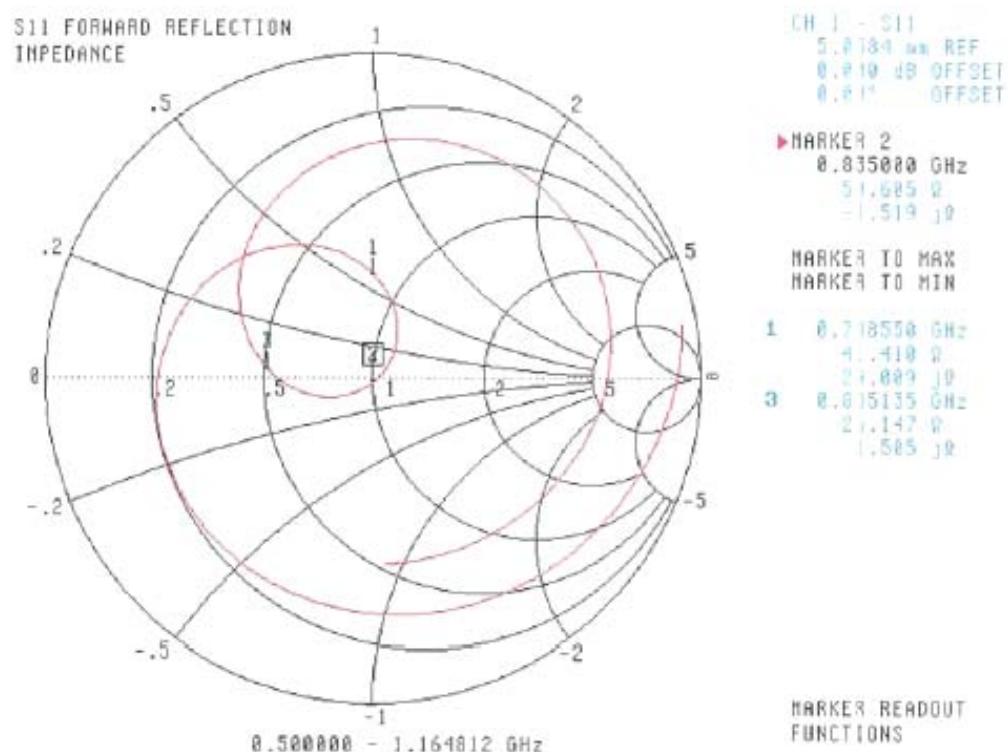
MARKER READOUT  
FUNCTIONS

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

7

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Smith Chart Dipole Impedance**

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

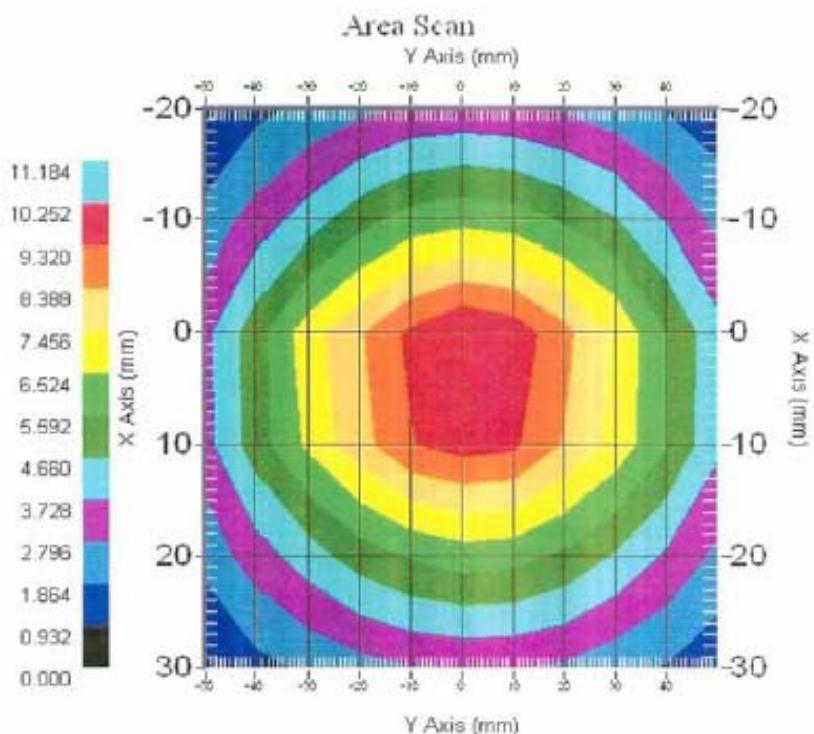
8

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**System Validation Results Using the Electrically Calibrated Dipole**

Head Tissue Frequency	1 Gram	10 Gram	Peak Above Feed Point
835 MHz	9.51	6.15	14.19



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.

**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 2010.

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

**NCL CALIBRATION LABORATORIES**

Calibration File No: DC-1177  
Project Number: BACB-5548

**C E R T I F I C A T E   O F   C A L I B R A T I O N**

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

Manufacturer: APREL Laboratories

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

Frequency: 1900 MHz

Serial No: 210-00715

Customer: Bay Area Compliance Laboratory

Calibrated: 4<sup>th</sup> November 2010  
Released on: 5<sup>th</sup> November 2010

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

Released By: 

**NCL CALIBRATION LABORATORIES**

51 SPECTRUM WAY  
NEPEAN, ONTARIO  
CANADA K2B 1E6

Division of APREL Lab.  
TEL: (613) 820-4988  
FAX: (613) 820-4162

**NCL Calibration Laboratories**

Division of APREL Laboratories.

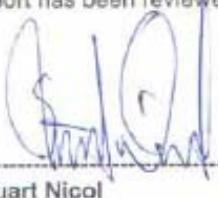
**Conditions**

Dipole 210-00715 was new and taken from stock prior to calibration.

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

**Temperature of the Tissue:** 21 °C +/- 0.5°C

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

  
Stuart Nicol  
C. Teodorian

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**

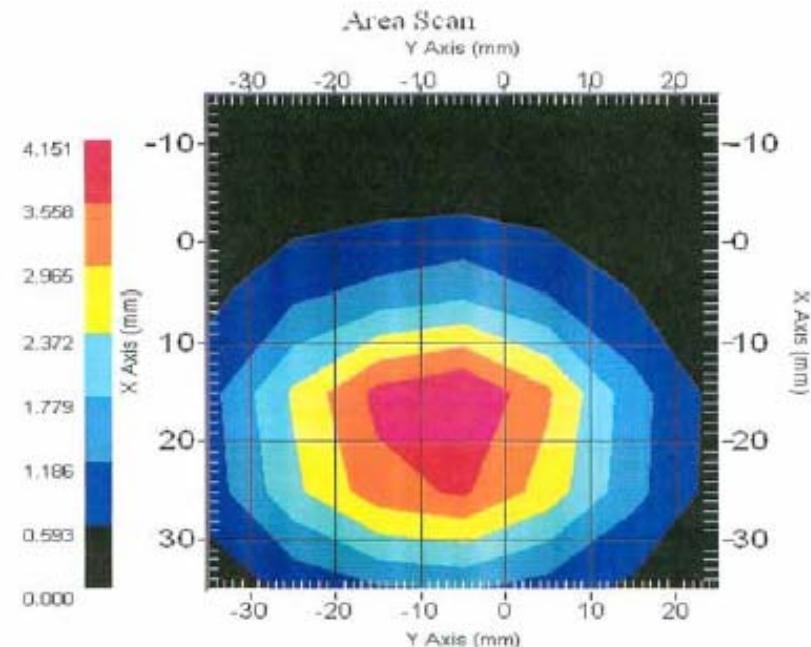
**Length:** 67.1 mm  
**Height:** 38.9 mm

**Electrical Specification**

**SWR:** 1.081 U  
**Return Loss:** -29.769 dB  
**Impedance:** 50.034  $\Omega$

**System Validation Results**

Frequency	1 Gram	10 Gram	Peak
1900 MHz	38.9	20.4	69.8



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.

**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 210-00715. 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 210-00715 was new taken from stock.

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

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

4

**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

**Tissue Validation**

Head Tissue 1900 MHz	Measured
Dielectric constant, $\epsilon_r$	40.09
Conductivity, $\sigma$ [S/m]	1.39

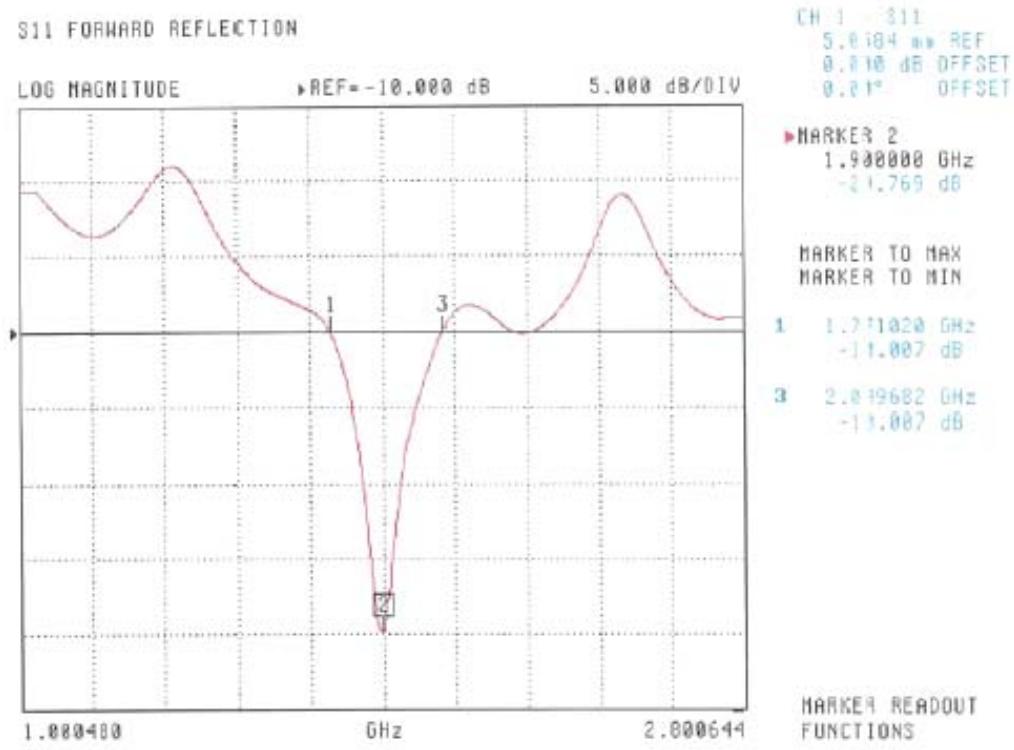
**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Electrical Calibration**

Test	Result
S11 R/L	-29.769 dB
SWR	1.081 U
Impedance	50.034 Ω

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

**S11 Parameter Return Loss**

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

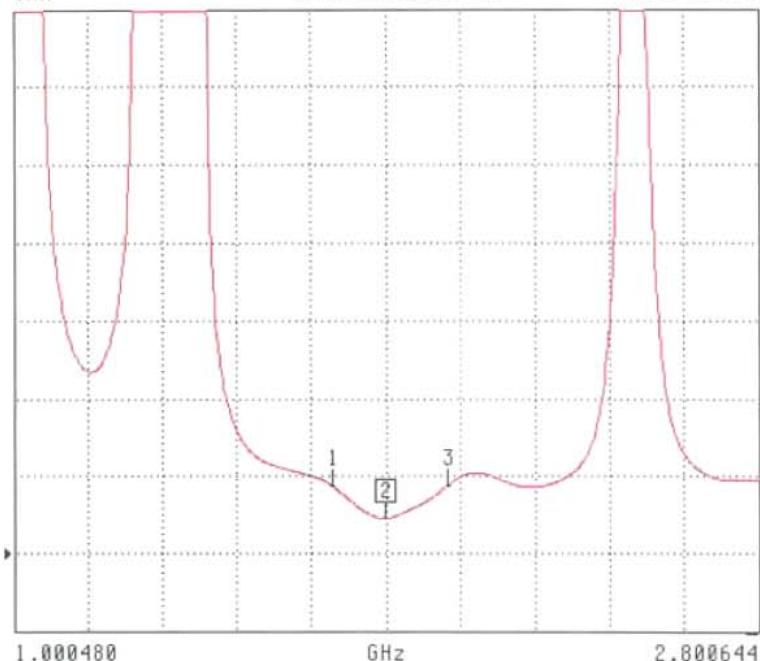
**NCL Calibration Laboratories**

Division of APREL Laboratories.

**SWR****S11 FORWARD REFLECTION****SWR**

REF = 172.168 mU

2.000 U/DIV



CH 1 - S11  
5.0184 mm REF  
0.010 dB OFFSET  
0.01° OFFSET

► MARKER 2  
1.900000 GHz  
1.001 U

MARKER TO MAX  
MARKER TO MIN

1 1.71020 GHz  
1.939 U

3 2.019682 GHz  
1.942 U

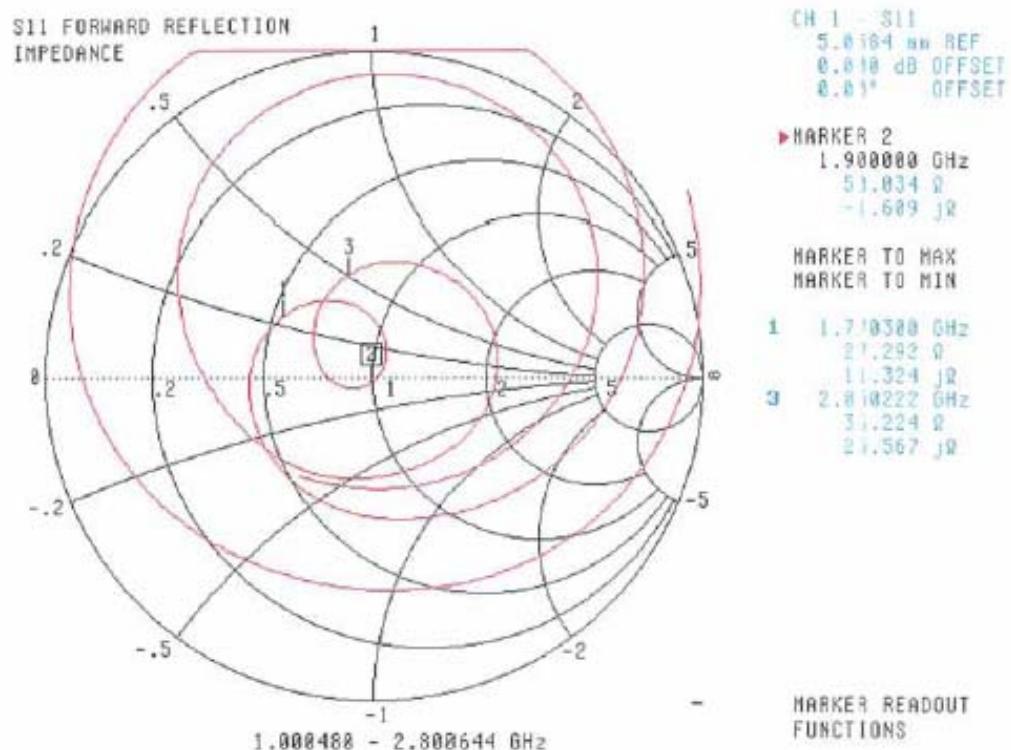
MARKER READOUT  
FUNCTIONS

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

7

**NCL Calibration Laboratories**  
Division of APREL Laboratories.

### Smith Chart Dipole Impedance



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

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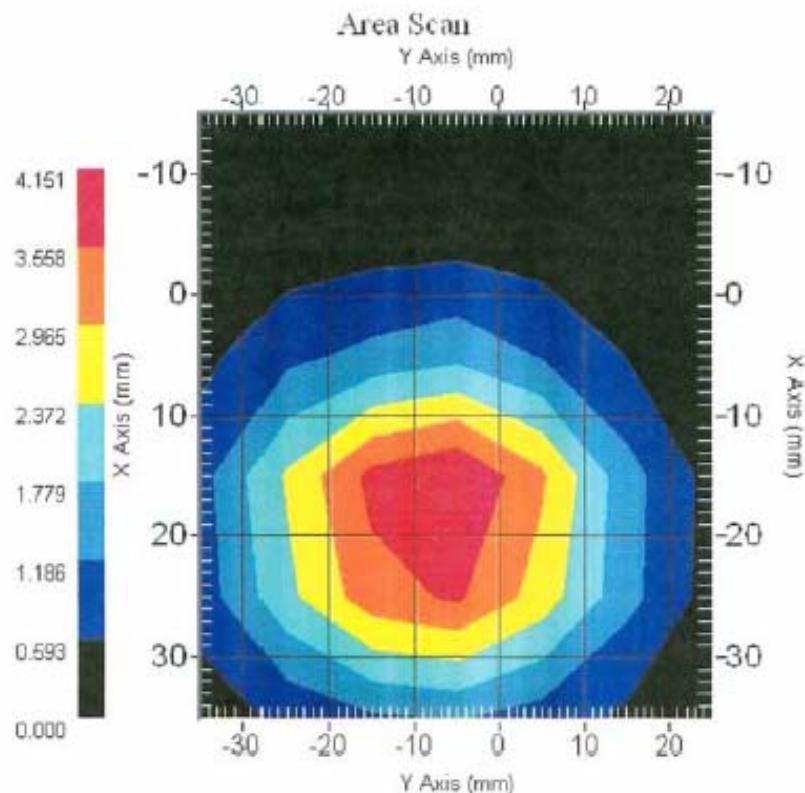
NCL Calibration Laboratories

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Division of APREL Laboratories.

## System Validation Results Using the Electrically Calibrated Dipole

Head Tissue Frequency	1 Gram	10 Gram	Peak Above Feed Point
1900 MHz	38.9	20.4	69.8



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.

**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 2010.

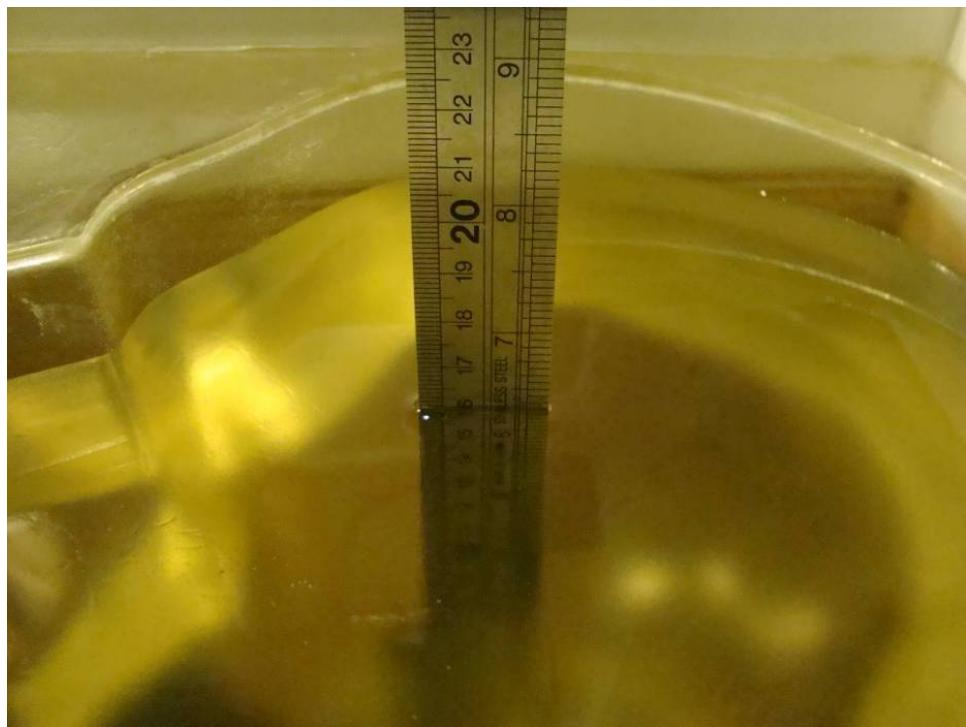
10

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

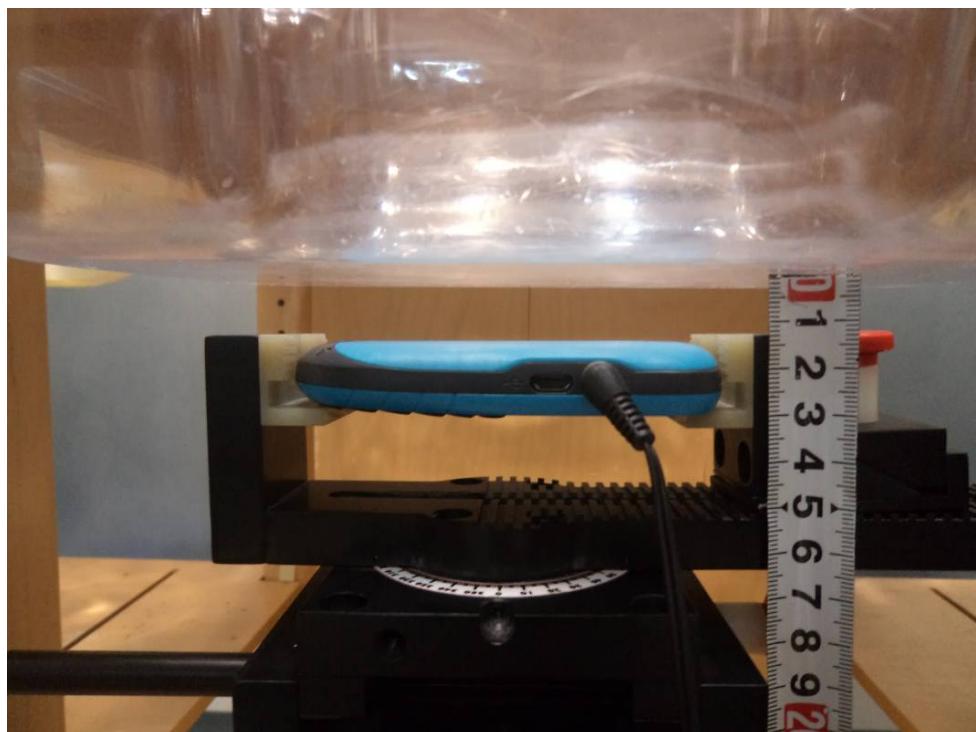
## APPENDIX D – EUT TEST POSITION PHOTOS

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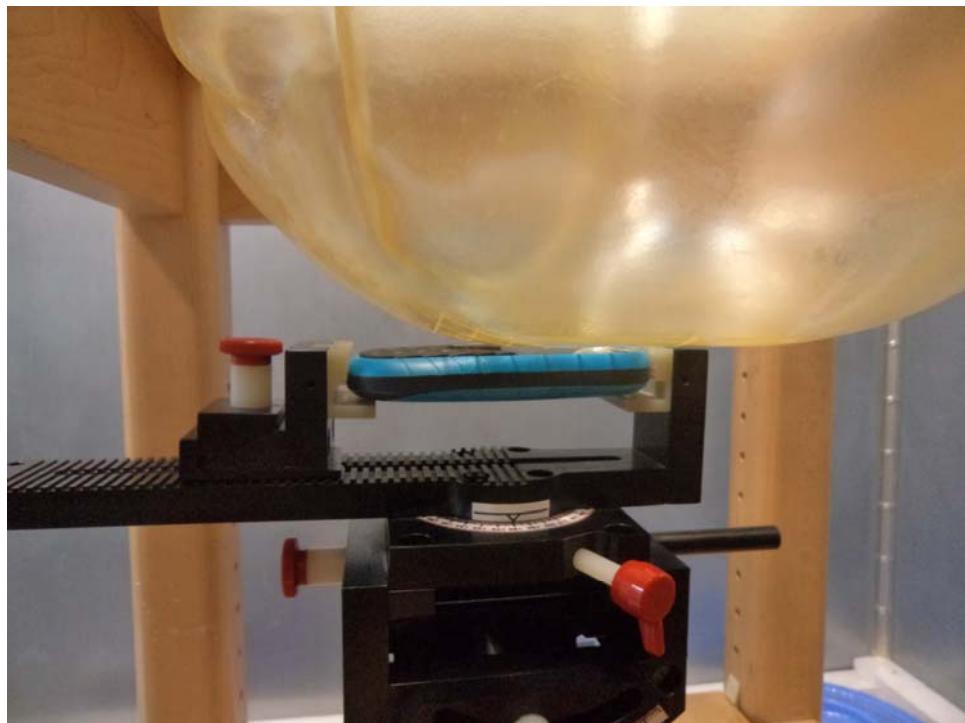
**Liquid depth  $\geq$  15cm**



**Body-worn Back Setup Photo**



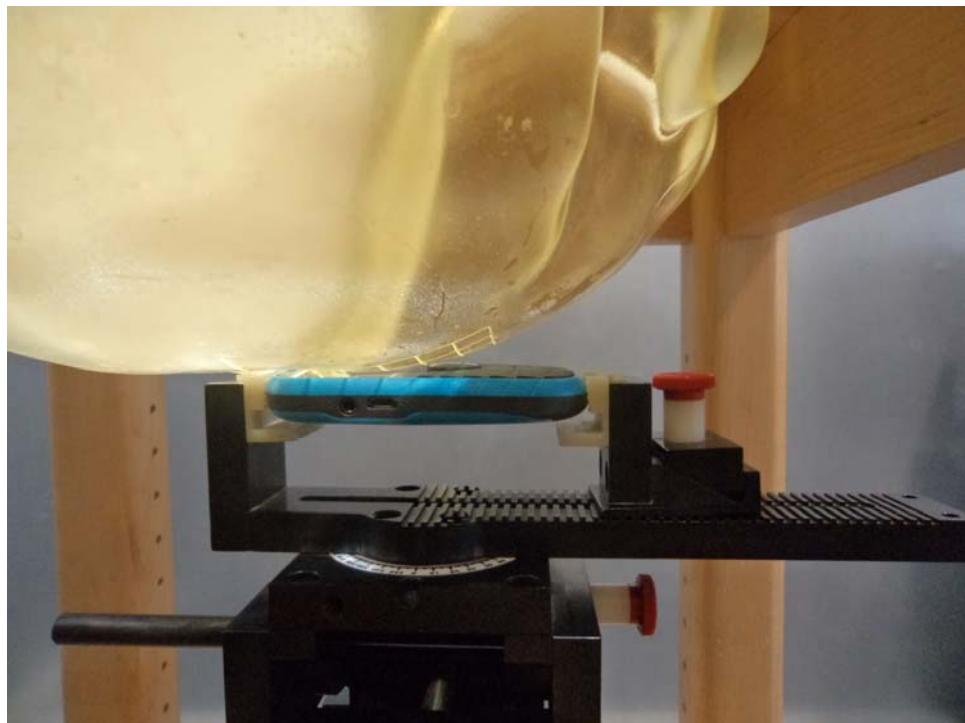
**Left Head Touch Setup Photo**



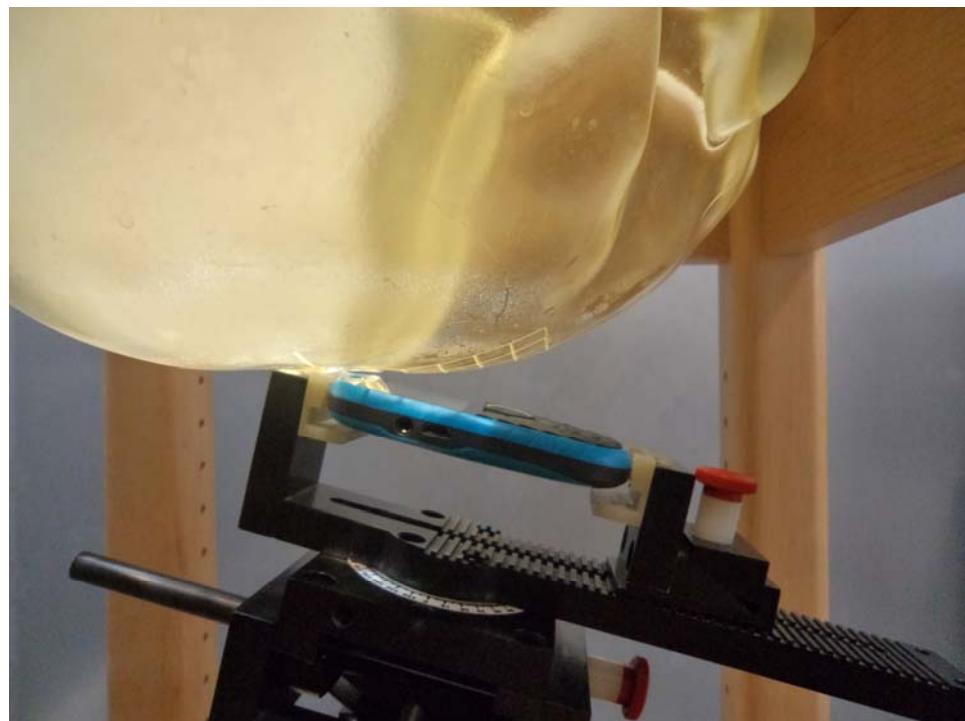
**Left Head Tilt Setup Photo**



**Right Head Touch Setup Photo**



**Right Head Tilt Setup Photo**



## APPENDIX E – EUT PHOTOS

EUT – Front Side View



EUT – Back Side View



**EUT – Uncovered View****EUT- Top Side View**

**EUT - Headset View**



## APPENDIX F - INFORMATIVE REFERENCES

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\*\*\*\*\* END OF REPORT \*\*\*\*\*