

## SAR EVALUATION REPORT

For

### Shenzhen Sang Fei Consumer Communications Co., Ltd.

11 Science and Technology Road, Shenzhen Hi-Tech Industrial Park, Nanshan District,  
Shenzhen, Guangdong, China

**FCC ID: VQRCTE133P97681EK**

<b>Report Type:</b> Original Report	<b>Product Type:</b> GSM Mobile Phone
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<b>Report Number:</b> RSZ120813003-20A1	
<b>Report Date:</b> 2012-08-21	
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\* This report contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

Attestation of Test Results		
<b>EUT Information</b>	<b>Company Name</b>	Shenzhen Sang Fei Consumer Communications Co., Ltd.
	<b>EUT Description</b>	GSM Mobile Phone
	<b>FCC ID</b>	VQRCTE133P97681EK
	<b>Model Number</b>	E133
	<b>Test Date</b>	2012.08.17--2012.08.18
<b>Frequency</b>	<b>Max. SAR Level(s) Measured</b>	<b>Limit(W/Kg)</b>
<b>Cellular Band</b>	0.995 W/kg 1g Head SAR 0.974 W/kg 1g Body SAR	<b>1.6</b>
<b>PCS Band</b>	0.797 W/kg 1g Head SAR 0.619 W/kg 1g Body SAR	
<b>Applicable Standards</b>	<b>ANSI / IEEE C95.1 : 2005</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields,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**

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<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	RSZ120813003-20A1	Original Report	2012-08-21

## EUT DESCRIPTION

This report has been prepared on behalf of Shenzhen Sang Fei Consumer Communications Co., Ltd. and their product, FCC ID: VQRCTE133P97681EK, Model: E133 or the EUT (Equipment Under Test) as referred to in the rest of this report. The EUT is a GSM Mobile Phone.

### Technical Specification

<b>Product Type</b>	Portable
<b>Exposure Category:</b>	Population / Uncontrolled
<b>Antenna Type(s):</b>	Internal Antenna
<b>Body-Worn Accessories:</b>	Headset
<b>Face-Head Accessories:</b>	None
<b>Multi-slot Class:</b>	Class 12
<b>Operation Mode :</b>	GSM Voice , GPRS Data and Bluetooth
<b>Frequency Band:</b>	Cellular Band : 824-849 MHz(TX) ; 869-894 MHz(RX) PCS Band : 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) Bluetooth: 2400MHz-2483.5MHz
<b>Conducted RF Power:</b>	Cellular Band : 32.45dBm PCS Band : 29.03dBm Bluetooth : 4.35dBm
<b>Dimensions (L*W*H):</b>	105mm (L)×61mm (W)× 15mm (H)
<b>Weight:</b>	85.7g
<b>Power Source:</b>	3.7VDC/ 800mAh Rechargeable Battery
<b>Normal Operation:</b>	Head and Body-worn

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## REFERENCE, STANDARDS, AND GUIDELINES

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### **FCC:**

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

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

### **CE:**

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

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

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

**SAR Limits**

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(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)

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

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

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

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

## FACILITIES AND ACCREDITATION

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

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<sup>3</sup> in the X & Y axis, and 35mm in the Z axis.



**ALSAS-10U Interpolation and Extrapolation Uncertainty**

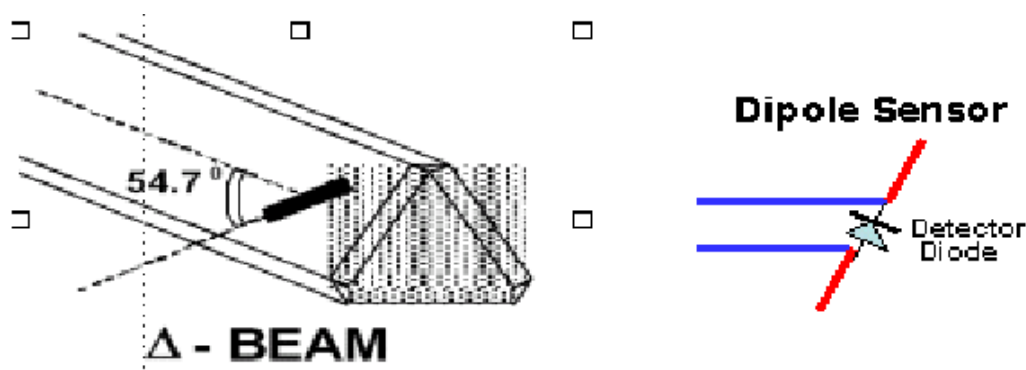
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

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

**Isotropic E-Field Probe**

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

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



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

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

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

## Isotropic E-Field Probe Specification

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

## Boundary Detection Unit and Probe Mounting Device

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

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

## Daq-Paq (Analog to Digital Electronics)

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

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

**Axis Articulated Robot**

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



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

**ALSAS Universal Workstation**

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

**Universal Device Positioner**

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

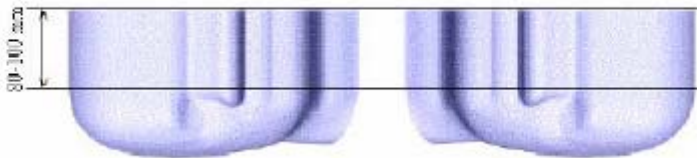


**Phantom Types**

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

**APREL SAM Phantoms**

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



### **APREL Laboratories Universal Phantom**

The Universal Phantom is used on the ALSAS-10U as a system validation phantom. The Universal Phantom has been fully validated both experimentally from 800MHz to 6GHz and numerically using XFDTD numerical software.

The shell thickness is 2mm overall, with a 4mm spacer located at the NF/MB intersection providing an overall thickness of 6mm in line with the requirements of IEEE-1528.

The design allows for fast and accurate measurements, of handsets, by allowing the conservative SAR to be evaluated at on frequency for both left and right head experiments in one measurement.



### Tissue Dielectric Parameters for Head and Body Phantoms

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

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

### Recommended Tissue Dielectric Parameters for Head and Body

Frequency (MHz)	Head Tissue		Body Tissue	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

## EQUIPMENT LIST AND CALIBRATION

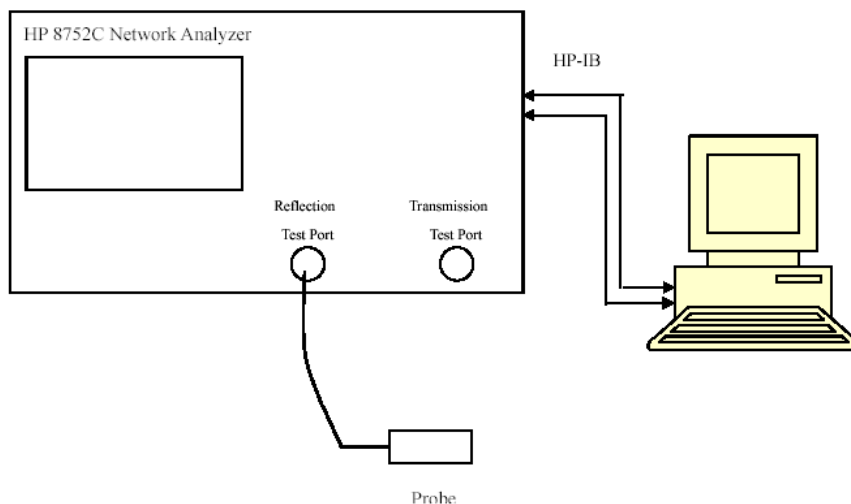
### Equipments List & Calibration Information

Equipment	Model	Calibration Date	S/N
CRS F3 robot	ALS-F3	N/A	RAF0805352
CRS F3 Software	ALS-F3-SW	N/A	N/A
CRS C500C controller	ALS-C500	N/A	RCF0805379
Probe mounting device & Boundary Detection Sensor System	ALS-PMDPS-3	N/A	120-00270
Universal Work Station	ALS-UWS	N/A	100-00157
Data Acquisition Package	ALS-DAQ-PAQ-3	2012-05-13	110-00212
Miniature E-Field Probe	ALS-E-020	2012-08-09	500-00283
Dipole, 835MHz	ALS-D-835-S-2	2011-08-25	180-00558
Dipole, 1900MHz	ALS-D-1900-S-2	2011-08-25	210-00710
Dipole Spacer	ALS-DS-U	N/A	250-00907
Device holder/Positioner	ALS-H-E-SET-2	N/A	170-00510
Left ear SAM phantom	ALS-P-SAM-L	N/A	130-00311
Right ear SAM phantom	ALS-P-SAM-R	N/A	140-00359
UniPhantom	ALS-P-UP-1	N/A	150-00413
Simulated Tissue 835 MHz Head	ALS-TS-835-H	Each Time	270-01002
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	270-02101
Simulated Tissue 1900 MHz Head	ALS-TS-1900-H	Each Time	295-01103
Simulated Tissue 1900 MHz Body	ALS-TS-1900-B	Each Time	295-02102
Power Amplifier	5S1G4	N/A	71377
Synthesized Sweeper	HP 8341B	2012-05-17	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU 200	2011.12.16	1100.0008.02
EMI Test Receiver	ESCI	2011-11-17	101122



# SAR MEASUREMENT SYSTEM VERIFICATION

## Liquid Verification



Liquid Verification Setup Block Diagram

## Liquid Verification Results

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)			
824.2	Head	40.66	0.91	41.50	0.90	-2.066	1.099	±5
	Body	55.13	0.95	55.20	0.97	-0.127	-2.105	±5
836.6	Head	40.97	0.93	41.50	0.90	-1.294	3.226	±5
	Body	55.32	0.96	55.20	0.97	0.217	-1.042	±5
848.8	Head	40.35	0.91	41.50	0.90	-2.850	1.125	±5
	Body	55.61	0.97	55.20	0.97	0.737	0.169	±5
1850.2	Head	40.77	1.38	40.00	1.40	1.889	-1.449	±5
	Body	53.81	1.50	53.30	1.52	0.948	-1.333	±5
1880.0	Head	40.96	1.41	40.00	1.40	2.344	0.709	±5
	Body	53.55	1.52	53.30	1.52	0.467	0.523	±5
1909.8	Head	40.71	1.40	40.00	1.40	1.744	0.398	±5
	Body	53.93	1.51	53.30	1.52	1.168	-0.662	±5

\*Liquid Verification was performed on 2012-8-17

Please refer to the following tables.

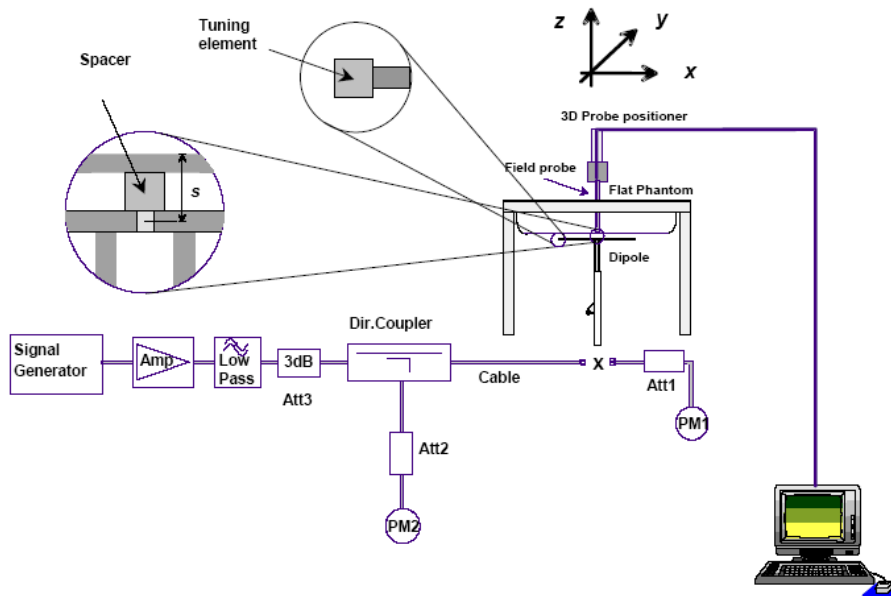
850 MHz Head				1900 MHz Head		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	40.662356	19.856813		1850.0	40.771259	13.414090
824.5	40.665351	19.858654		1851.2	40.775464	13.428064
825.0	40.668423	19.859842		1852.4	40.778546	13.430339
825.5	40.671495	19.861030		1853.6	40.781628	13.432614
826.0	40.674567	19.862218		1854.8	40.784710	13.434889
826.5	40.677639	19.863406		1856.0	40.787792	13.437164
827.0	40.680711	19.869992		1857.2	40.790874	13.439439
827.5	40.683783	19.876578		1858.4	40.793956	13.441714
828.0	40.696855	19.883164		1859.6	40.804239	13.443989
828.5	40.699927	19.889750		1860.8	40.814522	13.446264
829.0	40.702999	19.896336		1862.0	40.824805	13.448539
829.5	40.716071	19.902922		1863.2	40.835088	13.450814
830.0	40.723215	19.909508		1864.4	40.845371	13.453089
830.5	40.730359	19.916094		1865.6	40.855654	13.455364
831.0	40.757503	19.922680		1866.8	40.865937	13.457639
831.5	40.774647	19.929266		1868.0	40.876220	13.459914
832.0	40.801564	19.935685		1869.2	40.886503	13.462189
832.5	40.838481	19.942104		1870.4	40.896786	13.464464
833.0	40.855398	19.948523		1871.6	40.907069	13.466739
833.5	40.882315	19.954942		1872.8	40.917352	13.469014
834.0	40.905431	19.961361		1874.0	40.927635	13.471289
834.5	40.938547	19.967780		1875.2	40.937918	13.473564
835.0	40.951663	19.974199		1876.4	40.948201	13.475839
835.5	40.968951	19.992433		1877.6	40.958484	13.488064
836.0	40.961123	19.985423		1878.8	40.968767	13.480339
836.5	40.951114	19.976418		1880.0	40.962369	13.489209
837.0	40.941105	19.967413		1881.2	40.964131	13.487542
837.5	40.931096	19.942135		1882.4	40.954039	13.475119
838.0	40.925469	19.916857		1883.6	40.943947	13.462696
838.5	40.919842	19.891579		1884.8	40.933855	13.450273
839.0	40.914215	19.866301		1886.0	40.923763	13.437850
839.5	40.895411	19.841023		1887.2	40.913671	13.425427
840.0	40.876607	19.815745		1888.4	40.903579	13.413004
840.5	40.857803	19.790467		1889.6	40.893487	13.400581
841.0	40.838999	19.751215		1890.8	40.883395	13.388158
841.5	40.801113	19.711963		1892.0	40.873303	13.375735
842.0	40.763227	19.672711		1893.2	40.863211	13.363312
842.5	40.725341	19.633459		1894.4	40.853119	13.350889
843.0	40.687455	19.594207		1895.6	40.843027	13.338466
843.5	40.649569	19.554955		1896.8	40.832935	13.326043
844.0	40.611683	19.515703		1898.0	40.822843	13.313620
844.5	40.573797	19.476451		1899.2	40.812751	13.301197
845.0	40.535911	19.437199		1900.4	40.802659	13.288774
845.5	40.498025	19.397947		1901.6	40.792567	13.276351
846.0	40.460139	19.358695		1902.8	40.782475	13.263928
846.5	40.461123	19.345423		1904.0	40.772383	13.251505
847.0	40.451114	19.326418		1905.2	40.762291	13.239082
847.5	40.391105	19.327413		1906.4	40.752199	13.226659
848.0	40.331096	19.302135		1907.6	40.742107	13.214236
848.5	40.325469	19.296857		1908.8	40.732015	13.201813
849.0	40.351256	19.281336		1910.0	40.714368	13.184549

850 MHz Body				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	55.132698	20.729640		1850.0	53.810269	14.580533
824.5	55.138461	20.725468		1851.2	53.805431	14.578654
825.0	55.142568	20.721153		1852.4	53.801359	14.576691
825.5	55.146675	20.716838		1853.6	53.797287	14.574728
826.0	55.150782	20.712523		1854.8	53.793215	14.572765
826.5	55.154889	20.708208		1856.0	53.789143	14.570802
827.0	55.158996	20.703893		1857.2	53.783071	14.568839
827.5	55.168103	20.699578		1858.4	53.776999	14.566876
828.0	55.177210	20.695263		1859.6	53.770927	14.564913
828.5	55.186317	20.690948		1860.8	53.764855	14.562950
829.0	55.195424	20.686633		1862.0	53.753783	14.560987
829.5	55.204531	20.682318		1863.2	53.742711	14.559024
830.0	55.213638	20.678003		1864.4	53.731639	14.557061
830.5	55.222745	20.673688		1865.6	53.720567	14.555098
831.0	55.231852	20.669373		1866.8	53.705495	14.553135
831.5	55.240959	20.665058		1868.0	53.690423	14.551172
832.0	55.250066	20.660743		1869.2	53.675351	14.549209
832.5	55.259173	20.656428		1870.4	53.660279	14.547246
833.0	55.268280	20.652113		1871.6	53.645207	14.545283
833.5	55.277387	20.647798		1872.8	53.630135	14.543320
834.0	55.286494	20.643483		1874.0	53.615063	14.541357
834.5	55.295601	20.639168		1875.2	53.599991	14.539394
835.0	55.304708	20.634853		1876.4	53.584919	14.548654
835.5	55.313815	20.630538		1877.6	53.569847	14.546691
836.0	55.322922	20.626223		1878.8	53.554775	14.544728
836.5	55.323694	20.637350		1880.0	53.552687	14.541558
837.0	55.358841	20.627273		1881.2	53.596889	14.520023
837.5	55.370017	20.625311		1882.4	53.610624	14.509917
838.0	55.381193	20.623349		1883.6	53.624359	14.499811
838.5	55.392369	20.621387		1884.8	53.638094	14.489705
839.0	55.403545	20.619425		1886.0	53.651829	14.479599
839.5	55.414721	20.616463		1887.2	53.665564	14.469493
840.0	55.425897	20.613501		1888.4	53.679299	14.459387
840.5	55.437073	20.610539		1889.6	53.693034	14.449281
841.0	55.448249	20.607577		1890.8	53.706769	14.439175
841.5	55.459425	20.604615		1892.0	53.720504	14.425069
842.0	55.470601	20.601653		1893.2	53.734239	14.410963
842.5	55.481777	20.598691		1894.4	53.747974	14.396857
843.0	55.492953	20.595729		1895.6	53.761709	14.382751
843.5	55.504129	20.592767		1896.8	53.775444	14.368645
844.0	55.515305	20.589805		1898.0	53.789179	14.344539
844.5	55.526481	20.586843		1899.2	53.802914	14.325433
845.0	55.537657	20.583881		1900.4	53.816649	14.306327
845.5	55.548833	20.580919		1901.6	53.830384	14.287221
846.0	55.560009	20.577957		1902.8	53.844119	14.268115
846.5	55.571185	20.574995		1904.0	53.857854	14.249009
847.0	55.582361	20.572033		1905.2	53.871589	14.229903
847.5	55.593537	20.569071		1906.4	53.885324	14.210797
848.0	55.604713	20.566109		1907.6	53.899059	14.220023
848.5	55.615889	20.563147		1908.8	53.912794	14.209917
849.0	55.612547	20.552633		1910.0	53.934237	14.220478

### System Accuracy Verification

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

### System Verification Setup Block Diagram



### Probe and dipole antenna List and Detail

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
APREL	Probe	ALS-E-020	500-00283	2012-08-09	2013-08-08
APREL	Dipole antenna(835MHz)	ALS-D-835-S-2	210-00558	2011-08-25	2014-08-24
APREL	Dipole antenna(1900MHz)	ALS-D-1900-S-2	210-00710	2011-08-25	2014-08-24

### System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)	Target Value (W/Kg)	Delta (%)	Tolerance (%)	
2012-8-17	835	Head	1g	9.115	9.590	-5.211	$\pm 10$
		Body	1g	9.448	9.684	-2.498	$\pm 10$
	1900	Head	1g	39.255	39.648	-1.001	$\pm 10$
		Body	1g	40.077	39.769	0.769	$\pm 10$

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

**SAR SYSTEM VALIDATION DATA****Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 836.6MHz Head Liquid****Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558**

## Product Data

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 10.251 W/kg  
Power Drift-Finish : 9.926 W/kg  
Power Drift (%) : -3.274

## 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 : 836.60 MHz  
Last Calib. Date : 17-Aug-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 40.97 F/m  
Sigma : 0.93 S/m  
Density : 1000.00 kg/cu. m

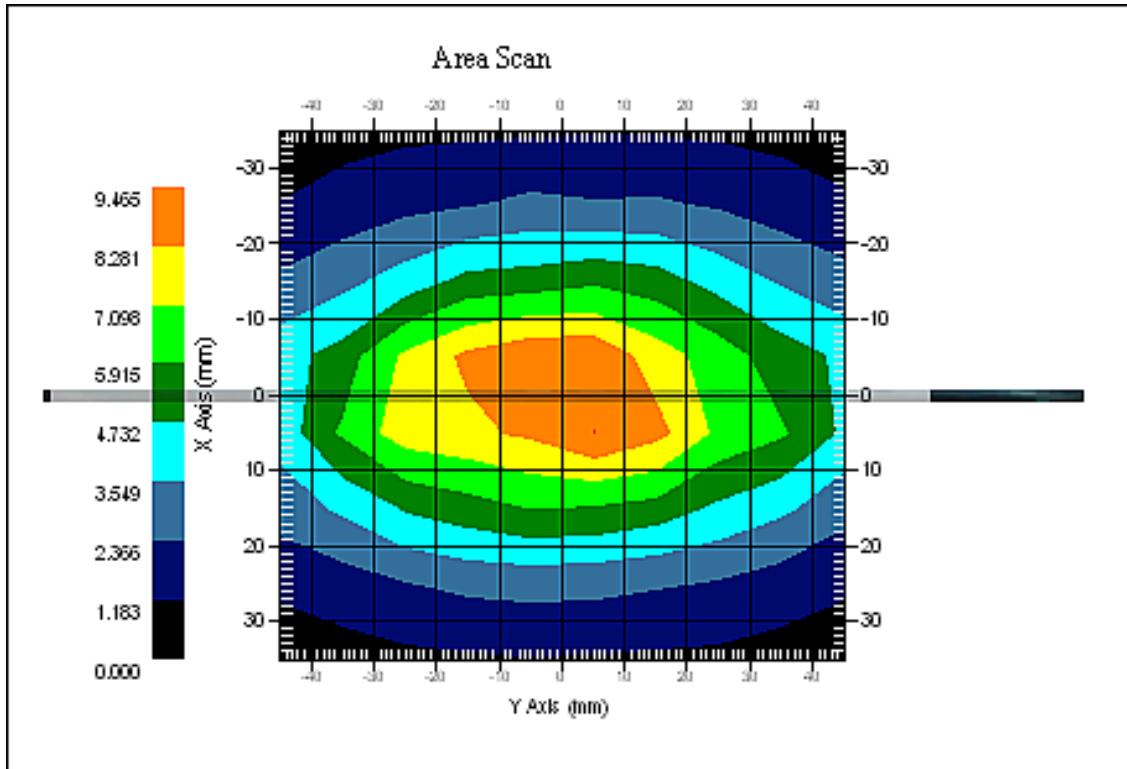
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 835.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

## Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 21.00 °C  
Ambient Temp. : 21.00 °C  
Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 9.115 W/kg  
10 gram SAR value : 5.469 W/kg  
Area Scan Peak SAR : 9.465 W/kg  
Zoom Scan Peak SAR : 13.512 W/kg



835 MHz System Validation with Head Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 836.6MHz Body Liquid****Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558**

## Product Data

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 10.127 W/kg  
Power Drift-Finish : 9.853 W/kg  
Power Drift (%) : -2.781

## 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 : 836.60 MHz  
Last Calib. Date : 17-Aug-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 55.32 F/m  
Sigma : 0.96 S/m  
Density : 1000.00 kg/cu. m

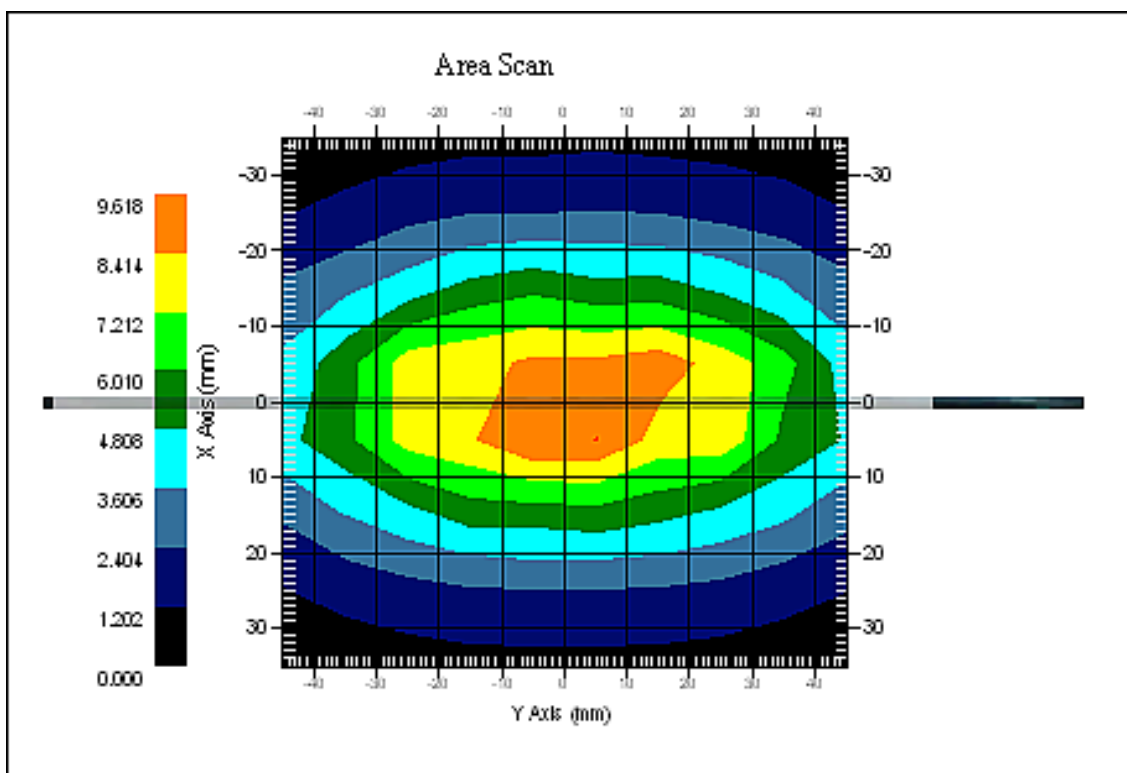
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 835.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

## Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 21.00 °C  
Ambient Temp. : 21.00 °C  
Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 9.448 W/kg  
10 gram SAR value : 6.059 W/kg  
Area Scan Peak SAR : 9.618 W/kg  
Zoom Scan Peak SAR : 14.313 W/kg



**835 MHz System Validation with Body Tissue**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1880.0 MHz Head Liquid****Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00710**

## Product Data

Device Name : Dipole 1900MHz  
Serial No. : 210-00710  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency Band : 1900.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 47.549 W/kg  
Power Drift-Finish : 46.224 W/kg  
Power Drift (%) : -2.866

## 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 : 1880.00 MHz  
Last Calib. Date : 17-Aug-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 40.96 F/m  
Sigma : 1.41 S/m  
Density : 1000.00 kg/cu. M

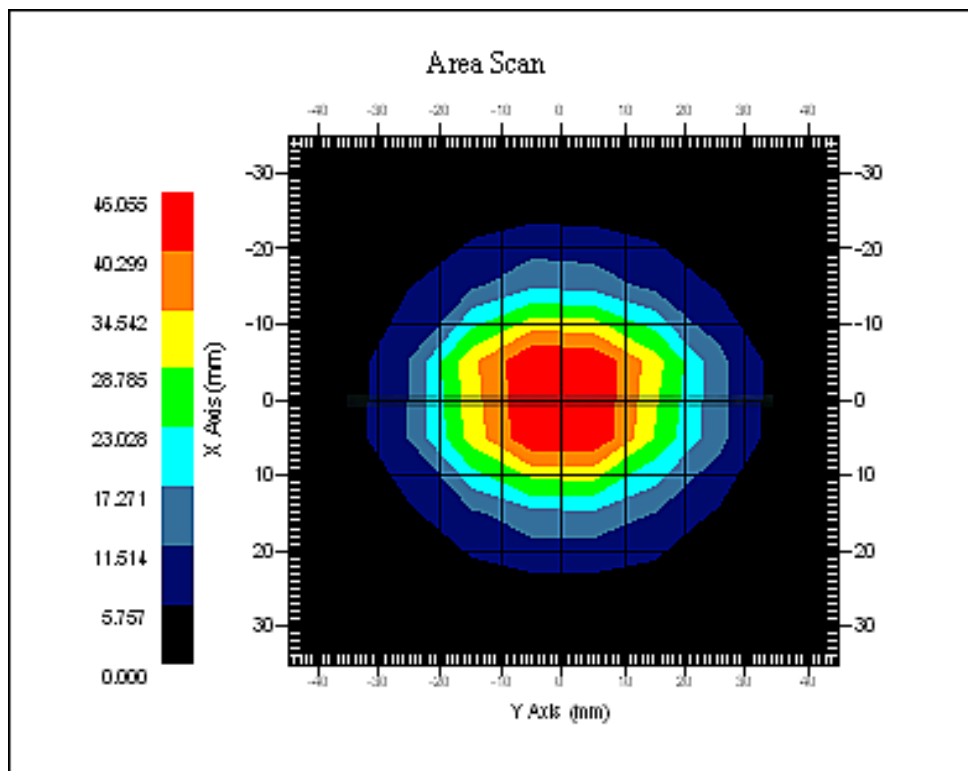
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 1900.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 5.20  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

## Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 20.00 °C  
Ambient Temp. : 20.00 °C  
Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 39.255 W/kg  
10 gram SAR value : 22.808 W/kg  
Area Scan Peak SAR : 46.055 W/kg  
Zoom Scan Peak SAR : 86.777 W/kg



1900 MHz System Validation with Head Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1880.0 MHz Body Liquid****Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00710**

## Product Data

Device Name : Dipole 1900MHz  
Serial No. : 210-00710  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency Band : 1900.00 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 46.696 W/kg  
Power Drift-Finish : 46.983 W/kg  
Power Drift (%) : 0.611

## 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 : 1880.00 MHz  
Last Calib. Date : 17-Aug-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 53.55 F/m  
Sigma : 1.52 S/m  
Density : 1000.00 kg/cu. m

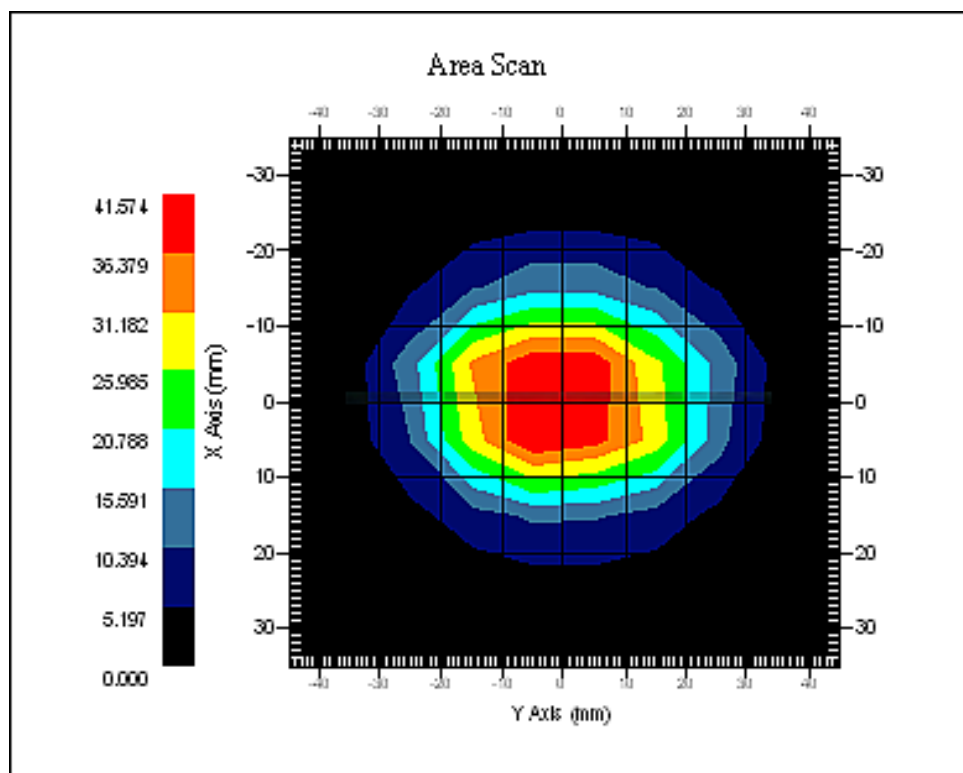
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 1900.00 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 5.0  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

## Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Tissue Temp. : 20.00 °C  
Ambient Temp. : 21.00 °C  
Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 40.077 W/kg  
10 gram SAR value : 22.609 W/kg  
Area Scan Peak SAR : 41.574 W/kg  
Zoom Scan Peak SAR : 84.175 W/kg



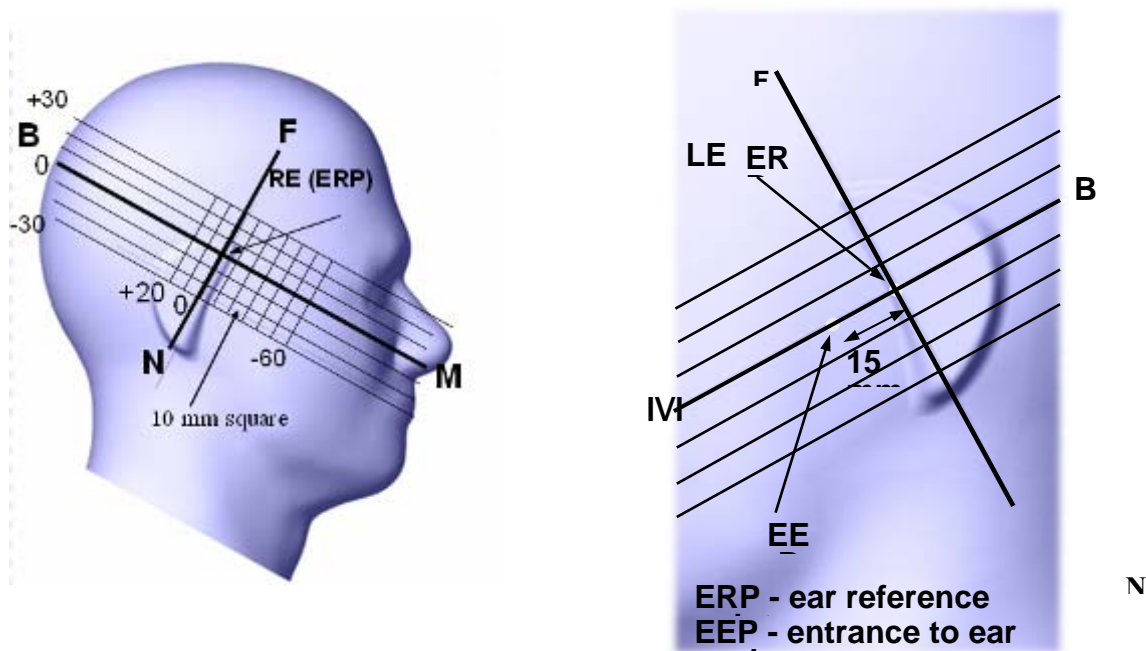
**1900 MHz System Validation with Body Tissue**

## EUT TEST STRATEGY AND METHODOLOGY

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

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

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



## Cheek/Touch Position

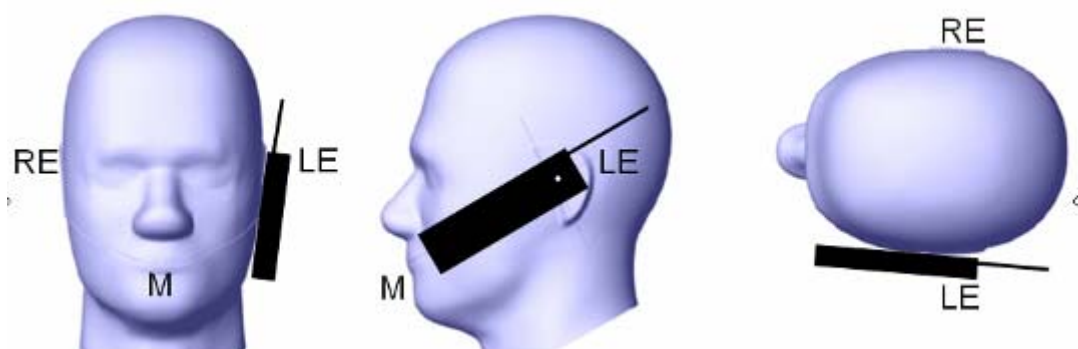
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

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

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

### Cheek /Touch Position



## Ear/Tilt Position

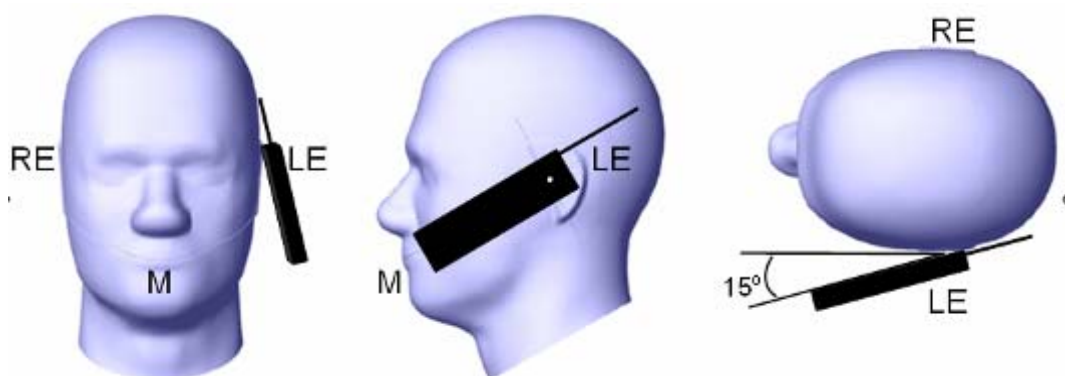
With the handset aligned in the “Cheek/Touch Position”:

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

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

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

### Ear /Tilt 15° Position



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

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

## SAR Evaluation Procedure

The evaluation was performed with the following procedure:

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

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

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

- 1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
- 2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the "Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

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

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



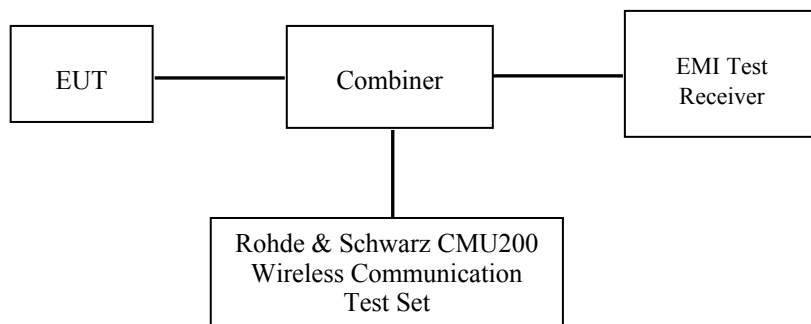
## CONDUCTED OUTPUT POWER MEASUREMENT

### Provision Applicable

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

### Test Procedure

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



### Test Results:

#### GSM

Band	Frequency (MHz)	Conducted Output Power	
		GSM (dBm)	GSM (W)
Cellular	824.2	32.30	1.698
	836.6	32.45	1.758
	848.8	32.38	1.730
PCS	1850.2	29.03	0.800
	1880.0	28.94	0.783
	1909.8	28.91	0.778

**GPRS**

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
Cellular	128	824.2	32.28	31.72	29.94	28.78
	190	836.6	32.43	31.80	29.91	28.75
	251	848.8	32.34	31.68	29.76	28.61
PCS	512	1850.2	28.99	28.33	26.79	25.86
	661	1880.0	28.90	28.24	26.69	25.77
	810	1909.8	28.85	28.17	26.64	25.75

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

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

**The time based average power**

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
Cellular	128	824.2	23.28	25.72	25.69	25.78
	190	836.6	23.43	25.80	25.66	25.75
	251	848.8	23.34	25.68	25.51	25.61
PCS	512	1850.2	19.99	22.33	22.54	22.86
	661	1880.0	19.90	22.24	22.44	22.77
	810	1909.8	19.85	22.17	22.39	22.75

**Note:**

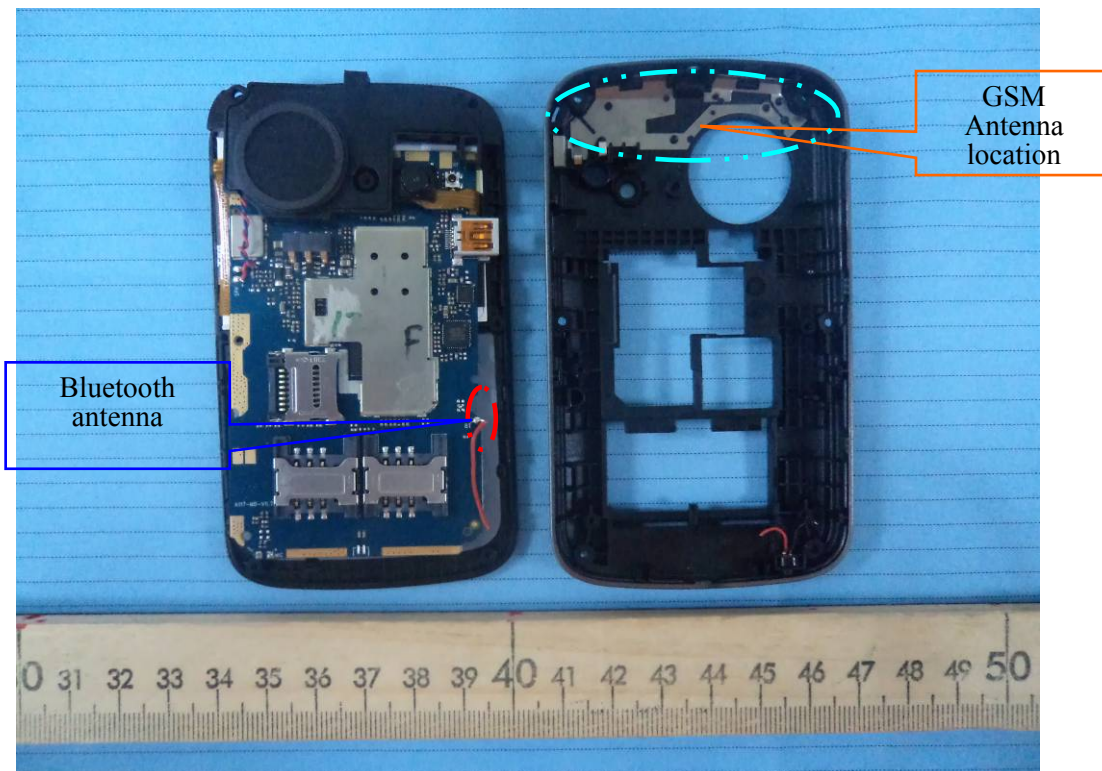
1. Rohde & Schwarz Radio Communication Tester (CMU200) was used for the measurement of GSM peak and average output power for active timeslots.
2. For GSM voice, 1 timeslot has been activated with power level 5 (850 MHz band) and 0 (1900 MHz band).
3. For GPRS, 1, 2, 3 and 4 timeslots has been activated separately with power level 5(850 MHz band) and 0 (1900 MHz band).

## SAR SIMULTANEOUS TRANSMISSION EVALUATION

### KDB648474 SIMULTANEOUS TRANSMISSION CONSIDERATION

Stand-alone and simultaneous SAR evaluation for a cell phone with multiple transmitters is base on the antennas distance of each radio.

#### BT and GSM Antenna Location:



#### Antenna Information

<b>Antenna-to-antenna separation distances :</b>	5.1cm from GSM main antenna-to-BT antenna
<b>Simultaneous transmission :</b>	GSM voice can transmit simultaneously with Bluetooth GPRS Data can transmit simultaneously with Bluetooth

#### CONCLUSION:

Individual transmitter	Stand-alone SAR	Simultaneous SAR
Bluetooth	Not required	Not required
GSM	Required	Simultaneous SAR of BT and GSM is not required

**Note:**

- 1) The distance between BT and GSM antenna is  $4.2\text{cm} > 2.5\text{cm}$ . The max output power of Bluetooth antenna is  $(4.35\text{dBm}) 2.723\text{mW} < P_{\text{Ref}}(12\text{mW})$ . According to KDB648474, stand-alone SAR is not required for BT antenna and simultaneous SAR evaluation is not required for Bluetooth and GSM antennas.
- 2) When the sum of the 1-g SAR is  $< 1.6\text{W/kg}$  for GSM and WiFi, the simultaneous SAR is not required.
- 3)  $P_{\text{Ref}}$  is defined as the maximum conducted power available at the antenna according to source-based time-averaging requirements of Section 2.1093(d)(5).

## SAR MEASUREMENT RESULTS

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This page summarizes the results of the performed dosimetric evaluation.

### Environmental Conditions

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

\* Testing was performed by Sandy Wang on 2012-08-17---2012-08-18.

**Test result:****Cellular Band:**

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Phantom Type	Power Drift (%)	FCC 1g SAR (W/Kg)	
	Channel	MHz					Measurement	Limit
Left Head Cheek	128(Low)	824.2	GSM	Integral	SAM	-2.276	0.947	1.6
	190(Middle)	836.6	GSM	Integral	SAM	3.044	0.995	1.6
	251(High)	848.8	GSM	Integral	SAM	-1.869	0.972	1.6
Left Head Tilt	128(Low)	824.2	GSM	Integral	SAM	/	/	1.6
	190(Middle)	836.6	GSM	Integral	SAM	3.028	0.613	1.6
	251(High)	848.8	GSM	Integral	SAM	/	/	1.6
Right Head Cheek	128(Low)	824.2	GSM	Integral	SAM	-3.639	0.985	1.6
	190(Middle)	836.6	GSM	Integral	SAM	-1.927	0.980	1.6
	251(High)	848.8	GSM	Integral	SAM	3.150	0.955	1.6
Right Head Tilt	128(Low)	824.2	GSM	Integral	SAM	/	/	1.6
	190(Middle)	836.6	GSM	Integral	SAM	-2.583	0.563	1.6
	251(High)	848.8	GSM	Integral	SAM	/	/	1.6
Body-Worn-Headset Front (1.5cm)	128(Low)	824.2	GSM	Integral	Universal	/	/	1.6
	190(Middle)	836.6	GSM	Integral	Universal	-1.717	0.413	1.6
	251(High)	848.8	GSM	Integral	Universal	/	/	1.6
Body-Worn-Headset Back (1.5cm)	128(Low)	824.2	GSM	Integral	Universal	/	/	1.6
	190(Middle)	836.6	GSM	Integral	Universal	2.413	0.605	1.6
	251(High)	848.8	GSM	Integral	Universal	/	/	1.6
Body-Worn Front (1.5cm)	128(Low)	824.2	GPRS	Integral	Universal	-4.043	0.675	1.6
	190(Middle)	836.6	GPRS	Integral	Universal	/	/	1.6
	251(High)	848.8	GPRS	Integral	Universal	/	/	1.6
Body-Worn Back (1.5cm)	128(Low)	824.2	GPRS	Integral	Universal	1.999	0.937	1.6
	190(Middle)	836.6	GPRS	Integral	Universal	-3.016	0.959	1.6
	251(High)	848.8	GPRS	Integral	Universal	1.669	0.974	1.6

**Note:**

1. The EUT is a Class B mobile phone which can be attached to both GPRS and GSM services, using one service at a time.
2. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3 DL+2UL is the worse case.
3. The EUT transmit and receive through the same GSM antenna while testing SAR.
4. When the 1-g SAR is  $\leq 0.8W/kg$ , testing for other channels are optional.

**PCS Band:**

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Liquid Type	Power Drift (%)	FCC 1g SAR (W/Kg)	
	Channel	MHz					Measurement	Limit
Left Head Cheek	512(Low)	1850.2	GSM	Integral	SAM	-0.541	0.784	1.6
	661(Middle)	1880.0	GSM	Integral	SAM	/	/	1.6
	810(High)	1909.8	GSM	Integral	SAM	/	/	1.6
Left Head Tilt	512(Low)	1850.2	GSM	Integral	SAM	-3.597	0.704	1.6
	661(Middle)	1880.0	GSM	Integral	SAM	/	/	1.6
	810(High)	1909.8	GSM	Integral	SAM	/	/	1.6
Right Head Cheek	512(Low)	1850.2	GSM	Integral	SAM	1.003	0.797	1.6
	661(Middle)	1880.0	GSM	Integral	SAM	/	/	1.6
	810(High)	1909.8	GSM	Integral	SAM	/	/	1.6
Right Head Tilt	512(Low)	1850.2	GSM	Integral	SAM	3.248	0.721	1.6
	661(Middle)	1880.0	GSM	Integral	SAM	/	/	1.6
	810(High)	1909.8	GSM	Integral	SAM	/	/	1.6
Body-Worn-Headset Front (1.5cm)	512(Low)	1850.2	GSM	Integral	Universal	-1.509	0.222	1.6
	661(Middle)	1880.0	GSM	Integral	Universal	/	/	1.6
	810(High)	1909.8	GSM	Integral	Universal	/	/	1.6
Body-Worn-Headset Back (1.5cm)	512(Low)	1850.2	GSM	Integral	Universal	-1.176	0.268	1.6
	661(Middle)	1880.0	GSM	Integral	Universal	/	/	1.6
	810(High)	1909.8	GSM	Integral	Universal	/	/	1.6
Body-Worn Front (1.5cm)	512(Low)	1850.2	GPRS	Integral	Universal	-1.682	0.419	1.6
	661(Middle)	1880.0	GPRS	Integral	Universal	/	/	1.6
	810(High)	1909.8	GPRS	Integral	Universal	/	/	1.6
Body-Worn Back (1.5cm)	512(Low)	1850.2	GPRS	Integral	Universal	-1.549	0.619	1.6
	661(Middle)	1880.0	GPRS	Integral	Universal	/	/	1.6
	810(High)	1909.8	GPRS	Integral	Universal	/	/	1.6

**Note:**

1. The EUT is a Class B mobile phone which can be attached to both GPRS and GSM services, using one service at a time.
2. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1 DL+4UL is the worse case.
3. The EUT transmit and receive through the same GSM antenna while testing SAR.
4. When the 1-g SAR is  $\leq 0.8W/kg$ , testing for other channels are optional.

### EUT SCAN RESULTS

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

Left Head Cheek (824.2 MHz Low Channel)

Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.776 W/kg  
Power Drift-Finish : 0.758 W/kg  
Power Drift (%) : -2.276

Tissue Data

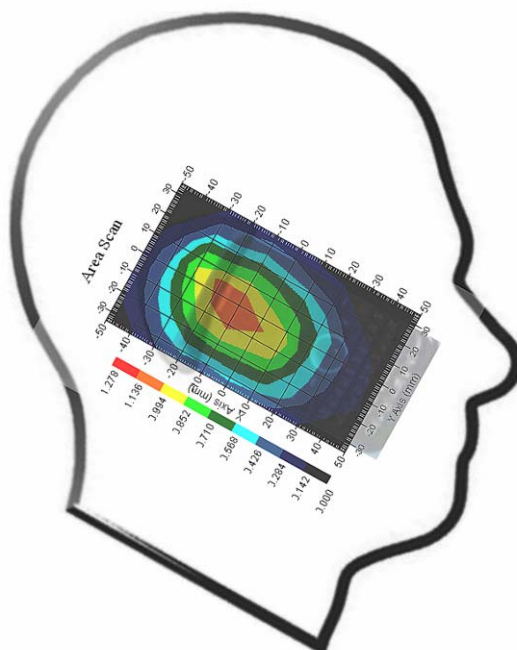
Type : Head  
Frequency : 824.20 MHz  
Epsilon : 40.66 F/m  
Sigma : 0.91 S/m  
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.947 W/kg  
10 gram SAR value : 0.711 W/kg  
Area Scan Peak SAR : 1.038 W/kg  
Zoom Scan Peak SAR : 1.621 W/kg

Plot 1#





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

**Left Head Cheek (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.860 W/kg  
Power Drift-Finish : 0.887 W/kg  
Power Drift (%) : 3.044

Tissue Data

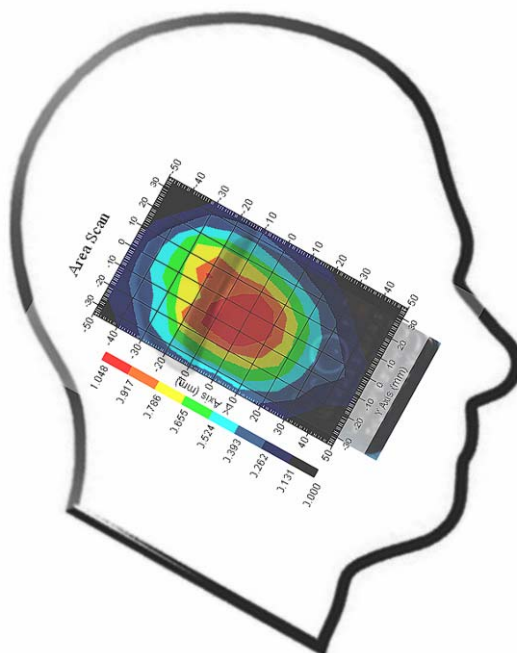
Type : Head  
Frequency : 836.60 MHz  
Epsilon : 40.97 F/m  
Sigma : 0.93 S/m  
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.995 W/kg  
10 gram SAR value : 0.662 W/kg  
Area Scan Peak SAR : 1.045 W/kg  
Zoom Scan Peak SAR : 1.531 W/kg

**Plot 2#**



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

**Left Head Cheek (848.8 MHz High Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.675 W/kg  
 Power Drift-Finish : 0.662 W/kg  
 Power Drift (%) : -1.869

Tissue Data

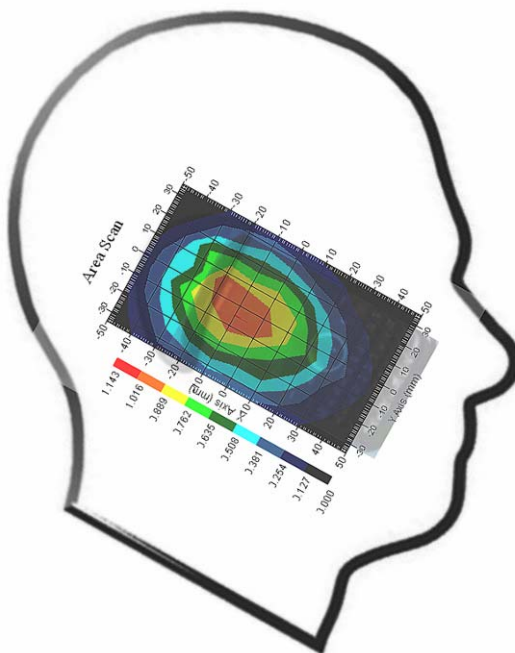
Type : Head  
 Frequency : 848.80 MHz  
 Epsilon : 40.35 F/m  
 Sigma : 0.91 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.972 W/kg  
 10 gram SAR value : 0.556 W/kg  
 Area Scan Peak SAR : 1.017 W/kg  
 Zoom Scan Peak SAR : 2.091 W/kg

**Plot 3#**



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

**Left Head Tilt (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.542 W/kg  
 Power Drift-Finish : 0.558 W/kg  
 Power Drift (%) : 3.028

Tissue Data

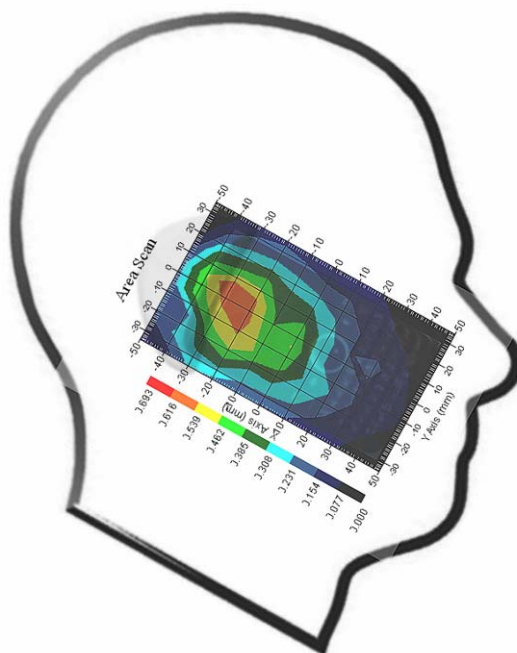
Type : Head  
 Frequency : 836.60 MHz  
 Epsilon : 40.97 F/m  
 Sigma : 0.93 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.613 W/kg  
 10 gram SAR value : 0.333 W/kg  
 Area Scan Peak SAR : 0.618 W/kg  
 Zoom Scan Peak SAR : 0.830 W/kg

**Plot 4#**



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

**Right Head Cheek (824.2 MHz Low Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.655 W/kg  
 Power Drift-Finish : 0.632 W/kg  
 Power Drift (%) : -3.639

Tissue Data

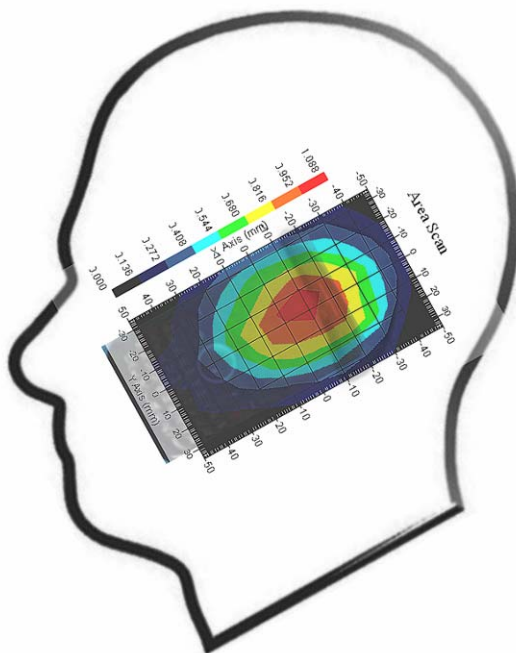
Type : Head  
 Frequency : 824.20 MHz  
 Epsilon : 40.66 F/m  
 Sigma : 0.91 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.985 W/kg  
 10 gram SAR value : 0.571 W/kg  
 Area Scan Peak SAR : 1.087 W/kg  
 Zoom Scan Peak SAR : 1.926 W/kg

**Plot 5#**



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

**Right Head Cheek (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.764 W/kg  
Power Drift-Finish : 0.750 W/kg  
Power Drift (%) : -1.927

Tissue Data

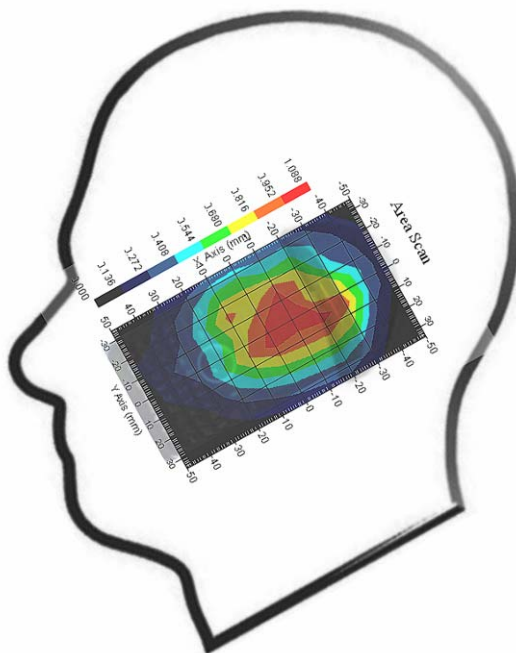
Type : Head  
Frequency : 836.60 MHz  
Epsilon : 40.97 F/m  
Sigma : 0.93 S/m  
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.980 W/kg  
10 gram SAR value : 0.550 W/kg  
Area Scan Peak SAR : 1.088 W/kg  
Zoom Scan Peak SAR : 1.431 W/kg

**Plot 6#**



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

**Right Head Cheek (848.8 MHz High Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.615 W/kg  
 Power Drift-Finish : 0.635 W/kg  
 Power Drift (%) : 3.150

Tissue Data

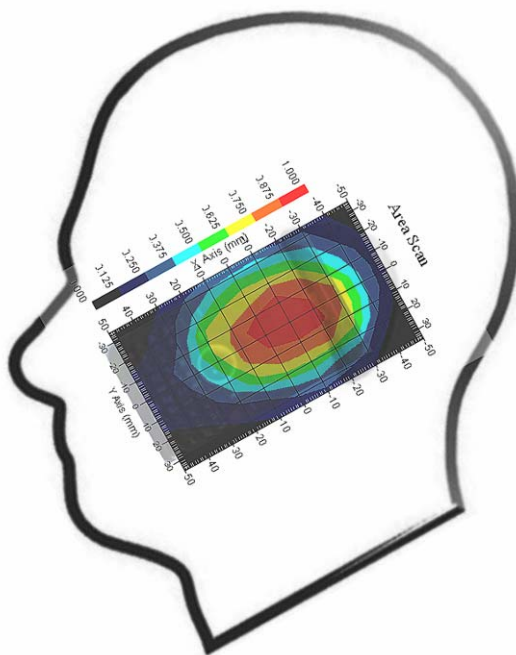
Type : Head  
 Frequency : 848.80 MHz  
 Epsilon : 40.35 F/m  
 Sigma : 0.91 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.955 W/kg  
 10 gram SAR value : 0.518 W/kg  
 Area Scan Peak SAR : 0.997 W/kg  
 Zoom Scan Peak SAR : 1.658 W/kg

**Plot 7#**



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

**Right Head Tilt (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.556 W/kg  
 Power Drift-Finish : 0.542 W/kg  
 Power Drift (%) : -2.583

Tissue Data

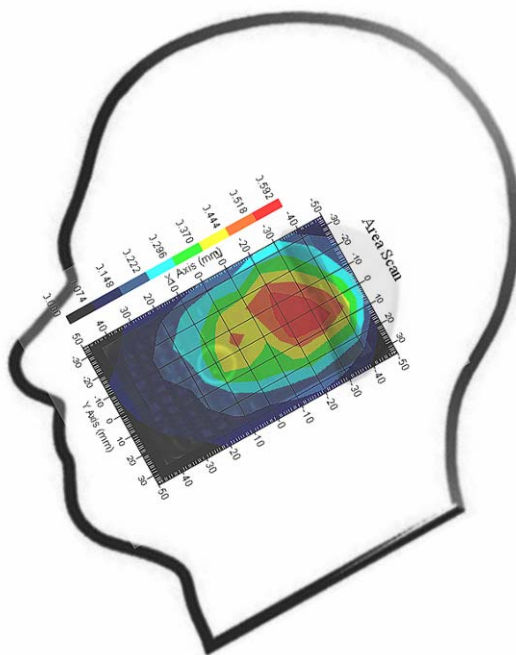
Type : Head  
 Frequency : 836.60 MHz  
 Epsilon : 40.97 F/m  
 Sigma : 0.93 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.563 W/kg  
 10 gram SAR value : 0.322 W/kg  
 Area Scan Peak SAR : 0.592 W/kg  
 Zoom Scan Peak SAR : 0.817 W/kg

**Plot 8#**



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

**Body-worn Front Headset (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.474 W/kg  
 Power Drift-Finish : 0.466 W/kg  
 Power Drift (%) : -1.717

Tissue Data

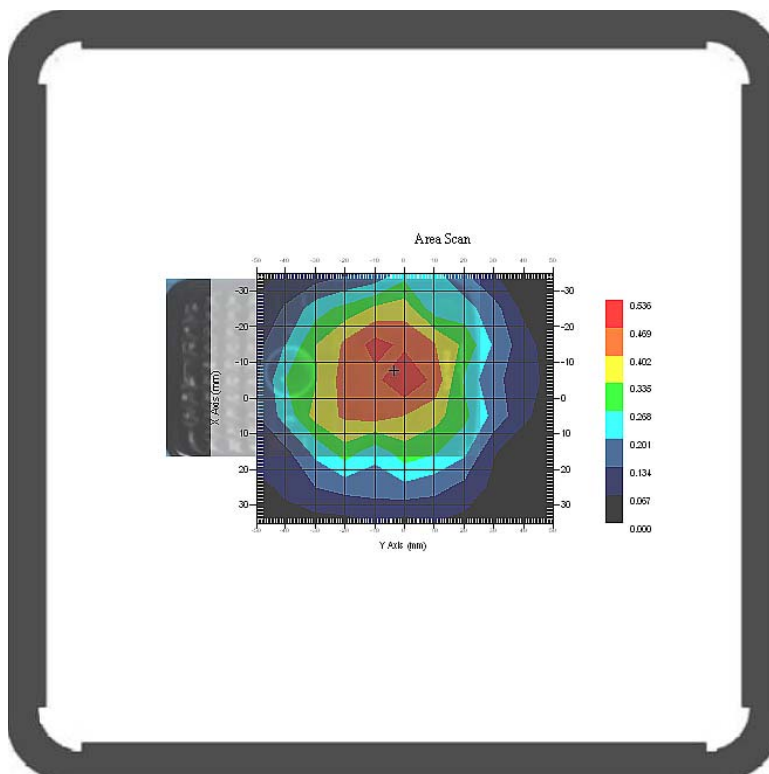
Type : Body  
 Frequency : 836.6 MHz  
 Epsilon : 55.32 F/m  
 Sigma : 0.96 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.413 W/kg  
 10 gram SAR value : 0.338 W/kg  
 Area Scan Peak SAR : 0.535 W/kg  
 Zoom Scan Peak SAR : 0.690 W/kg

**Plot 9#**





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

**Body-worn Back Headset (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.647 W/kg  
 Power Drift-Finish : 0.663 W/kg  
 Power Drift (%) : 2.413

Tissue Data

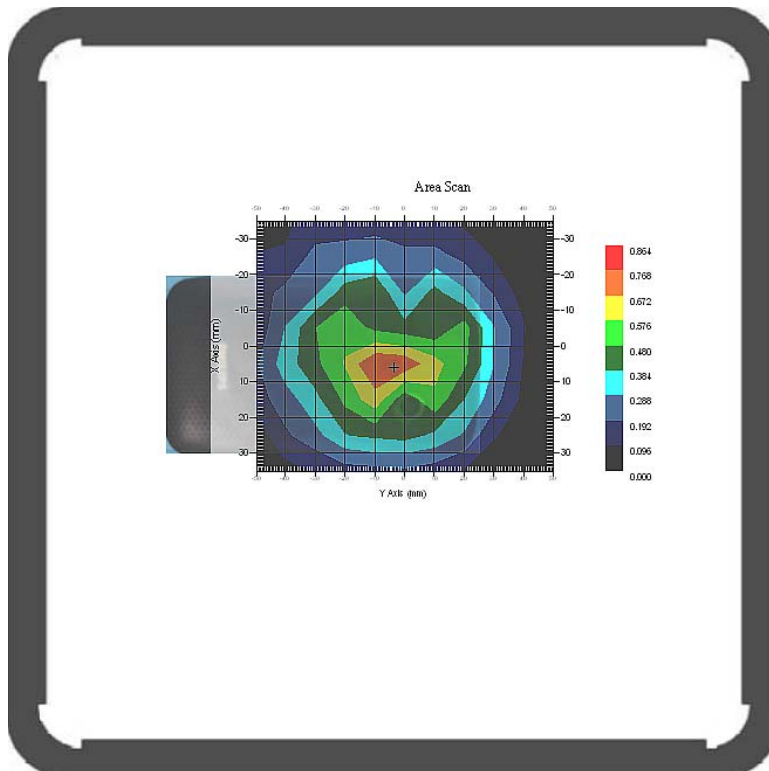
Type : Body  
 Frequency : 836.6 MHz  
 Epsilon : 55.32 F/m  
 Sigma : 0.96 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.605 W/kg  
 10 gram SAR value : 0.408 W/kg  
 Area Scan Peak SAR : 0.769 W/kg  
 Zoom Scan Peak SAR : 1.060 W/kg

**Plot 10#**



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

**Body-worn Front (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GPRS  
 Crest Factor : 2  
 Scan Type : Complete  
 Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.584 W/kg  
 Power Drift-Finish : 0.560 W/kg  
 Power Drift (%) : -4.043

Tissue Data

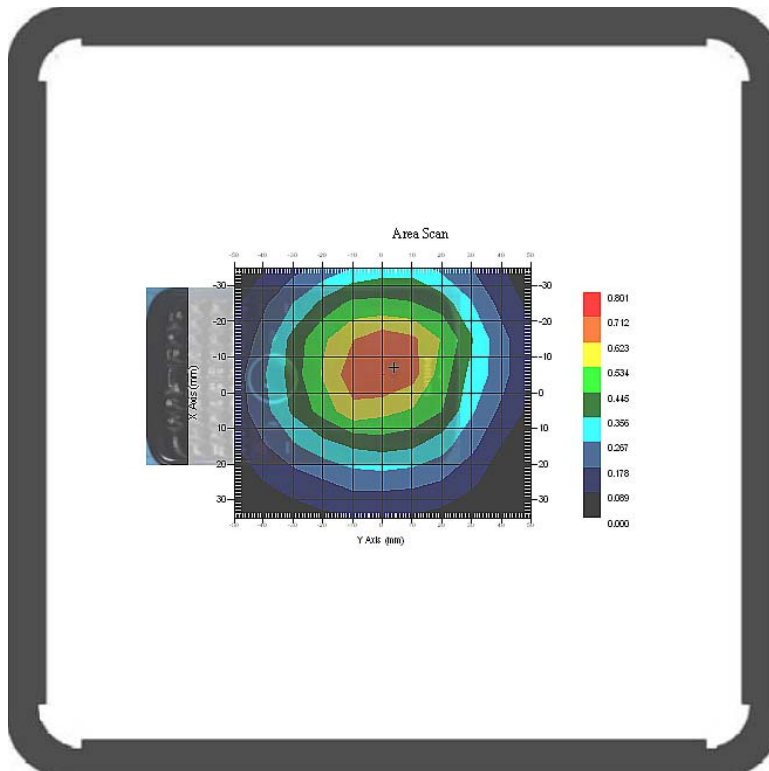
Type : Body  
 Frequency : 836.6 MHz  
 Epsilon : 55.32 F/m  
 Sigma : 0.96 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.675 W/kg  
 10 gram SAR value : 0.448 W/kg  
 Area Scan Peak SAR : 0.713 W/kg  
 Zoom Scan Peak SAR : 0.920 W/kg

**Plot 11#**



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

**Body-worn Back (824.2 MHz Low Channel)**

Measurement Data

Test mode : GPRS  
 Crest Factor : 2  
 Scan Type : Complete  
 Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.845 W/kg  
 Power Drift-Finish : 0.861 W/kg  
 Power Drift (%) : 1.999

Tissue Data

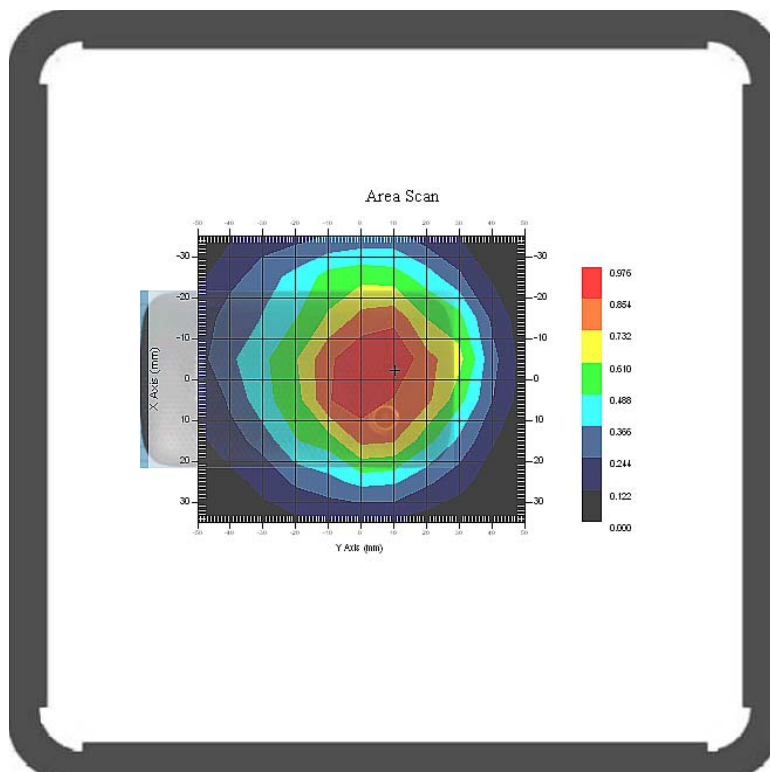
Type : Body  
 Frequency : 824.2 MHz  
 Epsilon : 55.13 F/m  
 Sigma : 0.95 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.937 W/kg  
 10 gram SAR value : 0.589 W/kg  
 Area Scan Peak SAR : 0.974 W/kg  
 Zoom Scan Peak SAR : 1.288 W/kg

**Plot 12#**



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

**Body-worn Back (836.6 MHz Middle Channel)**

Measurement Data

Test mode : GPRS  
 Crest Factor : 2  
 Scan Type : Complete  
 Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.854 W/kg  
 Power Drift-Finish : 0.829 W/kg  
 Power Drift (%) : -3.016

Tissue Data

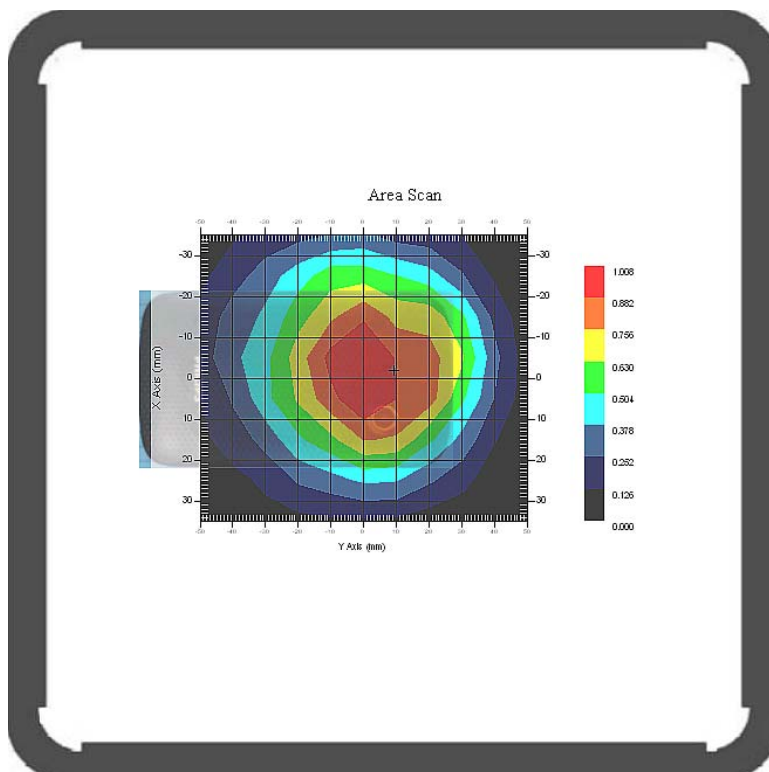
Type : Body  
 Frequency : 836.60 MHz  
 Epsilon : 55.32 F/m  
 Sigma : 0.96 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.959 W/kg  
 10 gram SAR value : 0.618 W/kg  
 Area Scan Peak SAR : 1.006 W/kg  
 Zoom Scan Peak SAR : 1.427 W/kg

**Plot 13#**



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

**Body-worn Back (848.8 MHz High Channel)**

Measurement Data

Test mode : GPRS  
 Crest Factor : 2  
 Scan Type : Complete  
 Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.884 W/kg  
 Power Drift-Finish : 0.899 W/kg  
 Power Drift (%) : 1.669

Tissue Data

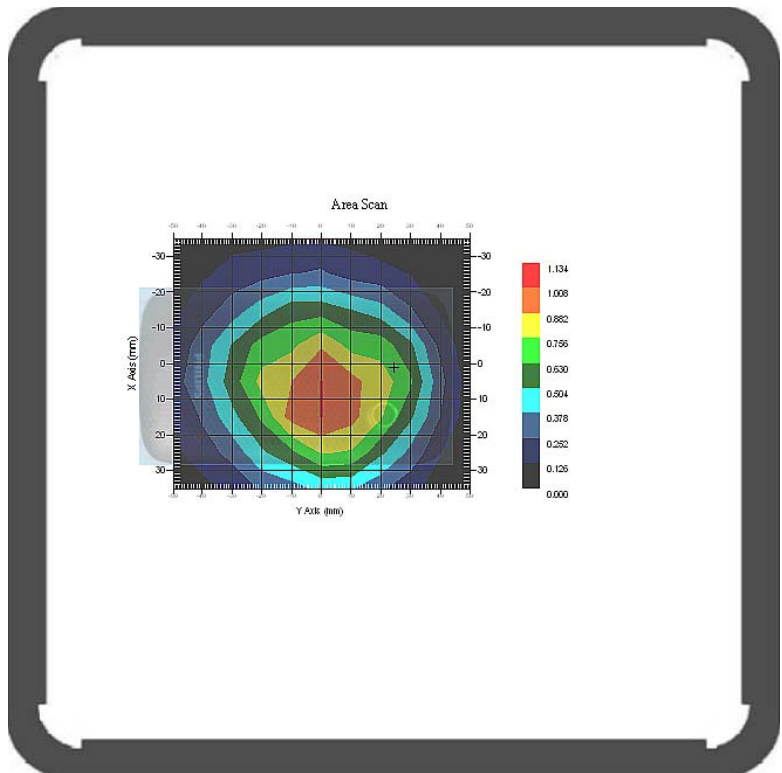
Type : Body  
 Frequency : 836.60 MHz  
 Epsilon : 55.61 F/m  
 Sigma : 0.97 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.974 W/kg  
 10 gram SAR value : 0.630 W/kg  
 Area Scan Peak SAR : 1.012 W/kg  
 Zoom Scan Peak SAR : 1.361 W/kg

**Plot 14#**



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

**Left Head Cheek (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.372 W/kg  
 Power Drift-Finish : 0.370 W/kg  
 Power Drift (%) : -0.541

Tissue Data

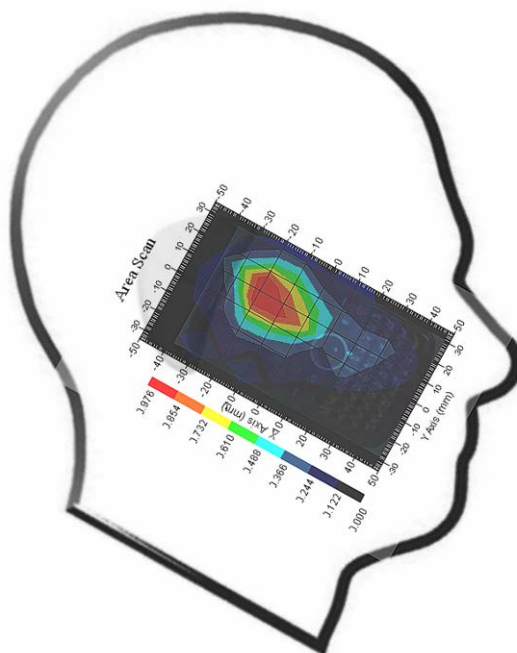
Type : Head  
 Frequency : 1850.20 MHz  
 Epsilon : 40.77 F/m  
 Sigma : 1.38 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.784 W/kg  
 10 gram SAR value : 0.402 W/kg  
 Area Scan Peak SAR : 0.983 W/kg  
 Zoom Scan Peak SAR : 1.641 W/kg

**Plot 15#**



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

**Left Head Tilt (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.576 W/kg  
 Power Drift-Finish : 0.556 W/kg  
 Power Drift (%) : -3.597

Tissue Data

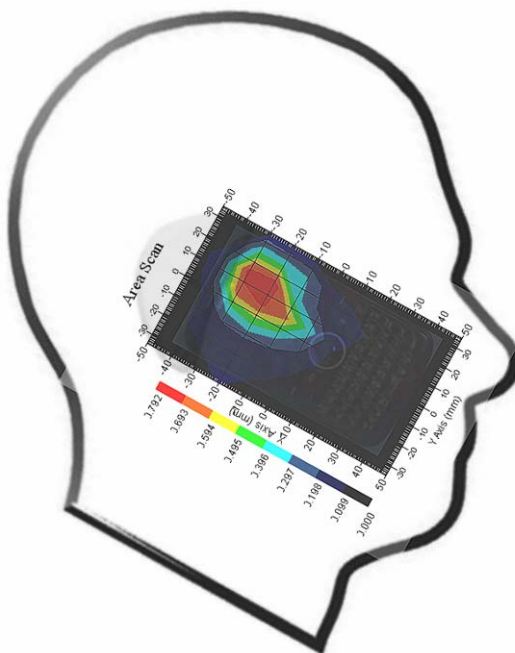
Type : Head  
 Frequency : 1850.20 MHz  
 Epsilon : 40.77 F/m  
 Sigma : 1.38 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.704 W/kg  
 10 gram SAR value : 0.339 W/kg  
 Area Scan Peak SAR : 0.780 W/kg  
 Zoom Scan Peak SAR : 1.531 W/kg

**Plot 16#**



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

**Right Head Cheek (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.395 W/kg  
 Power Drift-Finish : 0.399 W/kg  
 Power Drift (%) : 1.003

Tissue Data

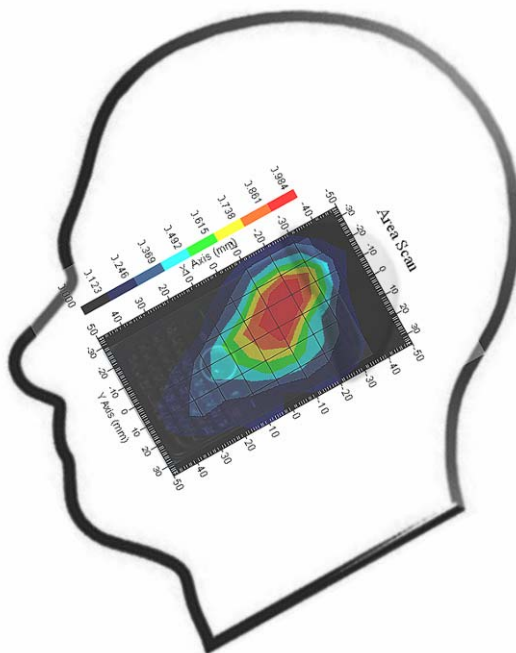
Type : Head  
 Frequency : 1850.20 MHz  
 Epsilon : 40.77 F/m  
 Sigma : 1.38 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.797 W/kg  
 10 gram SAR value : 0.421 W/kg  
 Area Scan Peak SAR : 0.992 W/kg  
 Zoom Scan Peak SAR : 1.698 W/kg

**Plot 17#**





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

**Right Head Tilt (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.566 W/kg  
 Power Drift-Finish : 0.585 W/kg  
 Power Drift (%) : 3.248

Tissue Data

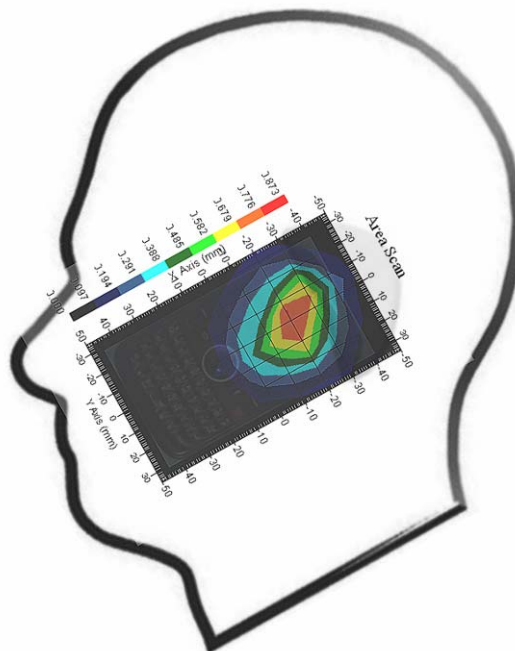
Type : Head  
 Frequency : 1850.20 MHz  
 Epsilon : 40.77 F/m  
 Sigma : 1.38 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.721 W/kg  
 10 gram SAR value : 0.347 W/kg  
 Area Scan Peak SAR : 0.796 W/kg  
 Zoom Scan Peak SAR : 1.578 W/kg

**Plot 18#**



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

**Body- worn Front (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.269 W/kg  
 Power Drift-Finish : 0.265 W/kg  
 Power Drift (%) : -1.509

Tissue Data

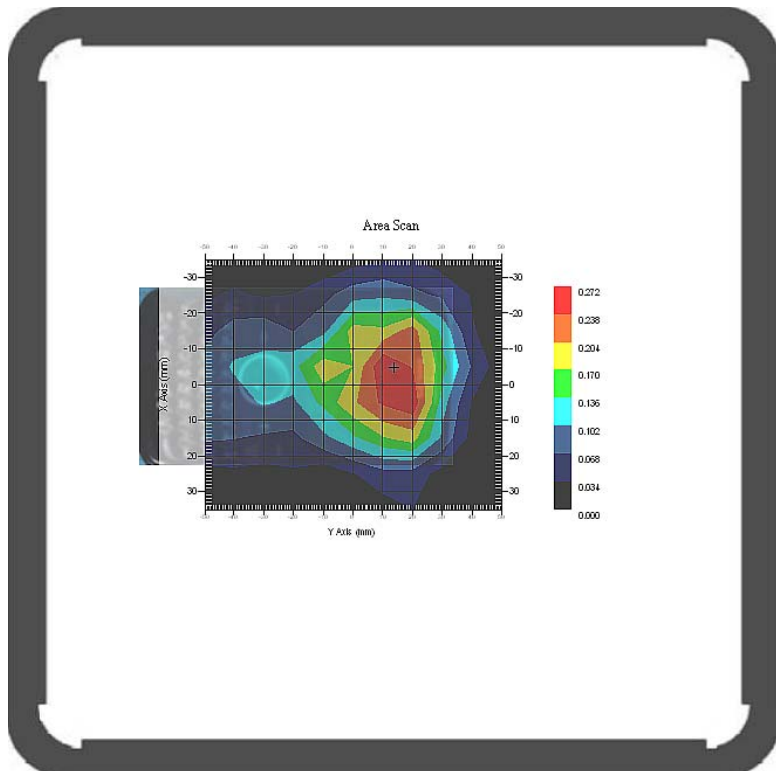
Type : Body  
 Frequency : 1850.20 MHz  
 Epsilon : 53.81 F/m  
 Sigma : 1.50 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.222 W/kg  
 10 gram SAR value : 0.122 W/kg  
 Area Scan Peak SAR : 0.268 W/kg  
 Zoom Scan Peak SAR : 0.500 W/kg

**Plot 19#**



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

**Body- worn Back (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GSM  
 Crest Factor : 8  
 Scan Type : Complete  
 Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.258 W/kg  
 Power Drift-Finish : 0.255 W/kg  
 Power Drift (%) : -1.176

Tissue Data

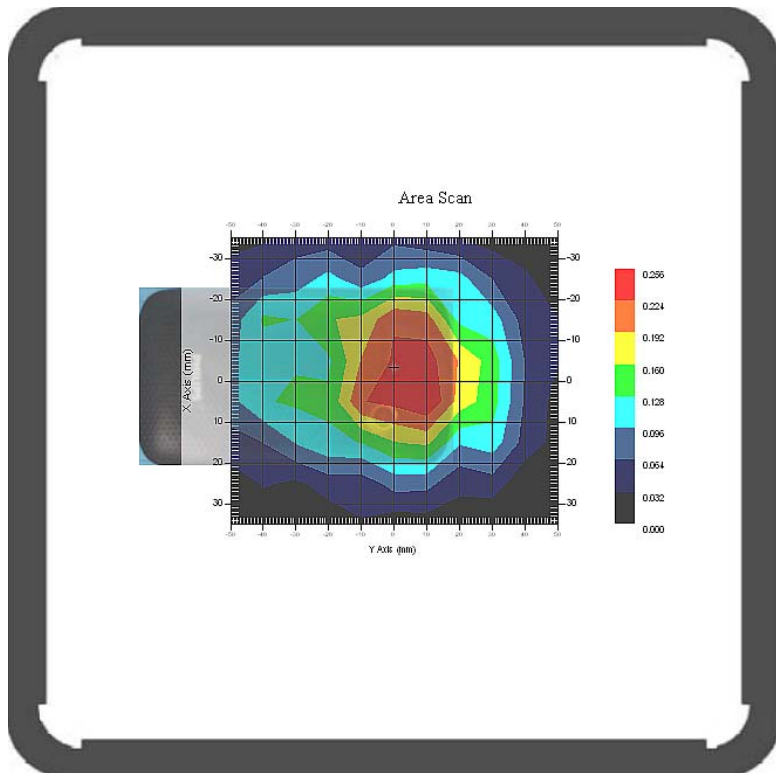
Type : Body  
 Frequency : 1850.20 MHz  
 Epsilon : 53.81 F/m  
 Sigma : 1.50 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.268 W/kg  
 10 gram SAR value : 0.145 W/kg  
 Area Scan Peak SAR : 0.255 W/kg  
 Zoom Scan Peak SAR : 0.540 W/kg

**Plot 20#**



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

**Body- worn Front (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GPRS  
 Crest Factor : 2  
 Scan Type : Complete  
 Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
 Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
 Power Drift-Start : 0.519 W/kg  
 Power Drift-Finish : 0.511 W/kg  
 Power Drift (%) : -1.682

Tissue Data

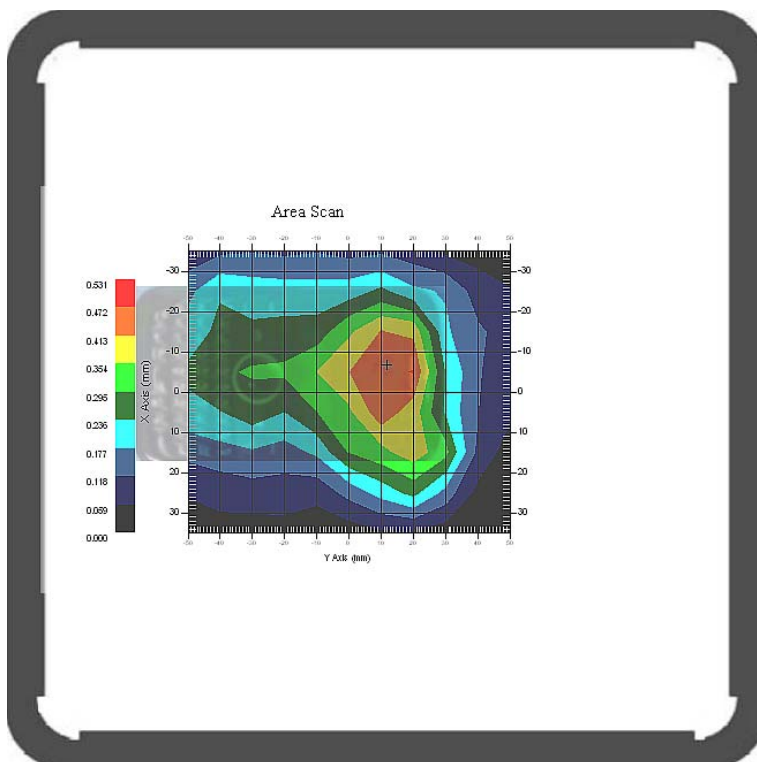
Type : Body  
 Frequency : 1850.20 MHz  
 Epsilon : 53.81 F/m  
 Sigma : 1.50 S/m  
 Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.419 W/kg  
 10 gram SAR value : 0.233 W/kg  
 Area Scan Peak SAR : 0.474 W/kg  
 Zoom Scan Peak SAR : 0.760 W/kg

**Plot 21#**



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

**Body- worn Back (1850.20 MHz Low Channel)**

Measurement Data

Test mode : GPRS  
Crest Factor : 2  
Scan Type : Complete  
Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.590 W/kg  
Power Drift-Finish : 0.581 W/kg  
Power Drift (%) : -1.549

Tissue Data

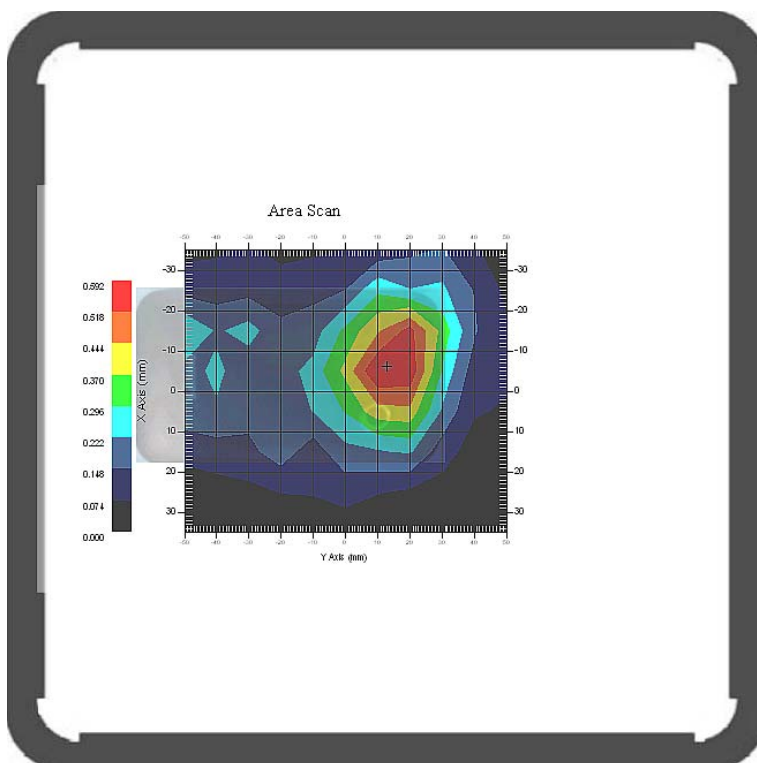
Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.81 F/m  
Sigma : 1.50 S/m  
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.619 W/kg  
10 gram SAR value : 0.314 W/kg  
Area Scan Peak SAR : 0.591 W/kg  
Zoom Scan Peak SAR : 1.301 W/kg

**Plot 22#**



### APPENDIX A MEASUREMENT UNCERTAINTY

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

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

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_i^1$ (1-g)	$c_i^1$ (10-g)	Standard Uncertainty y (1-g) %	Standard Uncertainty y (10-g) %
<b>Measurement System</b>							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.95	rectangular	$\sqrt{3}$	1	1	0.55	0.55
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	2.6	normal	1	1	1	2.6	2.6
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.)	2.6	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.)	2.7	normal	1	0.6	0.5	1.6	1.4
Combined Uncertainty		RSS				9.1	8.8
Combined Uncertainty (coverage factor=2)		Normal(k=2)				18.2	17.6

## APPENDIX B PROBE CALIBRATION CERTIFICATES

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### NCL CALIBRATION LABORATORIES

Calibration File No.: 1427-1430

Client.: BACL Lab

## CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe

Record of Calibration

Head and Body

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 500-00283

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

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

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

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



Art Brennan, Quality Manager

### **NCL** CALIBRATION LABORATORIES

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

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



## **NCL Calibration Laboratories**

Division of APREL Inc.

### **Introduction**

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

### **Calibration Method**

Probes are calibrated using the following methods.

<1000MHz

TEM Cell for sensitivity in air

Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz

Waveguide\* method to determine sensitivity in air and tissue

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

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

### **References**

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

---

Page 2 of 10

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



**NCL Calibration Laboratories**

Division of APREL Inc.

**Conditions**

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

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

**Primary Measurement Standards**

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

**Secondary Measurement Standards**


Signal Generator Agilent E4438C -506 MY55182336 June 7, 2013

**Attestation**

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

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

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

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

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**

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

\*Resistive to recommended tissue recipes per IEEE-1528

**Sensitivity in Air**

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

**NCL Calibration Laboratories**

Division of APREL Inc.

Calibration for Tissue (Head H, Body B)

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

**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 MΩ.

**Boundary Effect:**

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

**NOTES:**

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

---

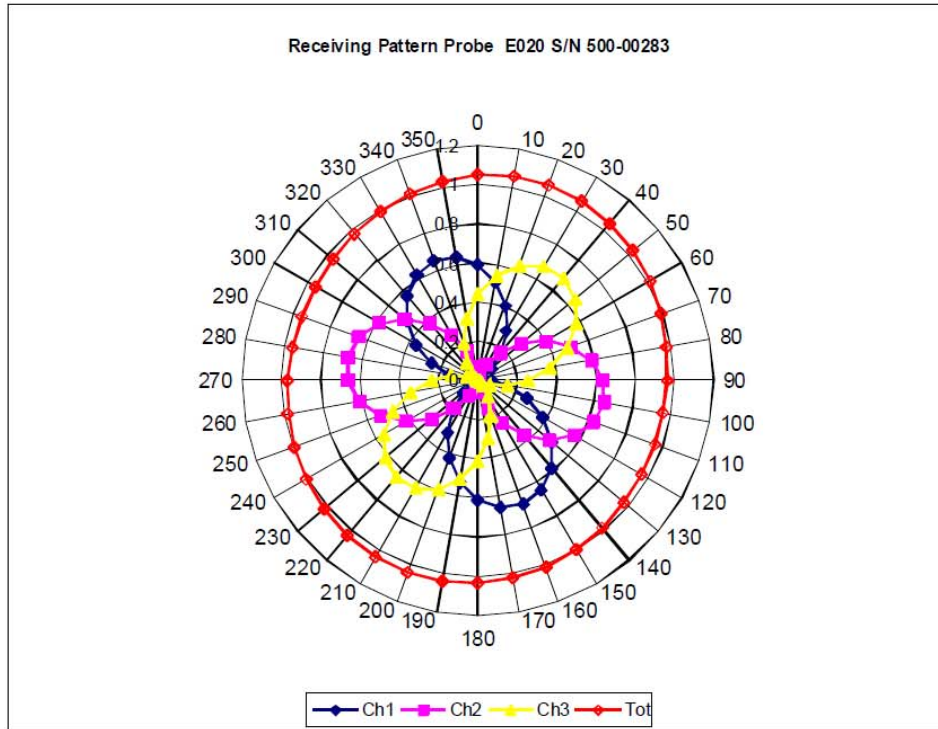
Page 6 of 10

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

**NCL Calibration Laboratories**

Division of APREL Inc.

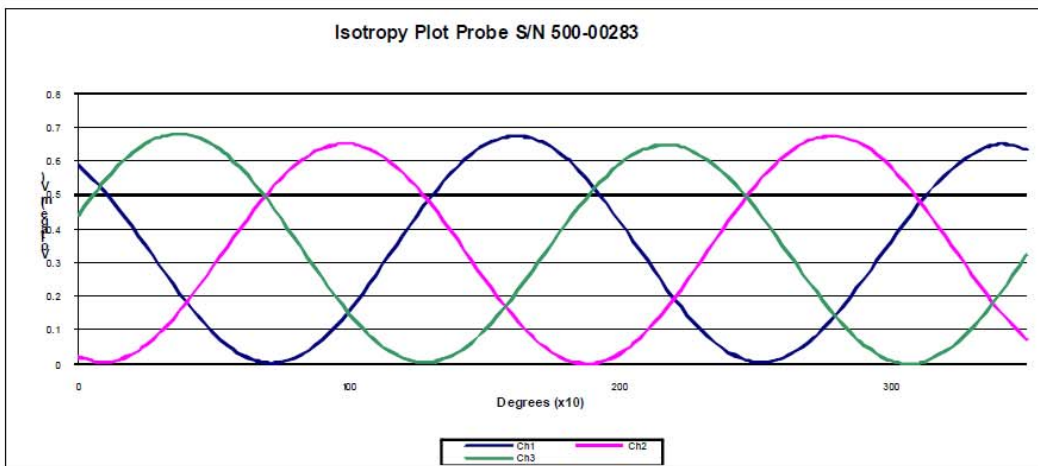
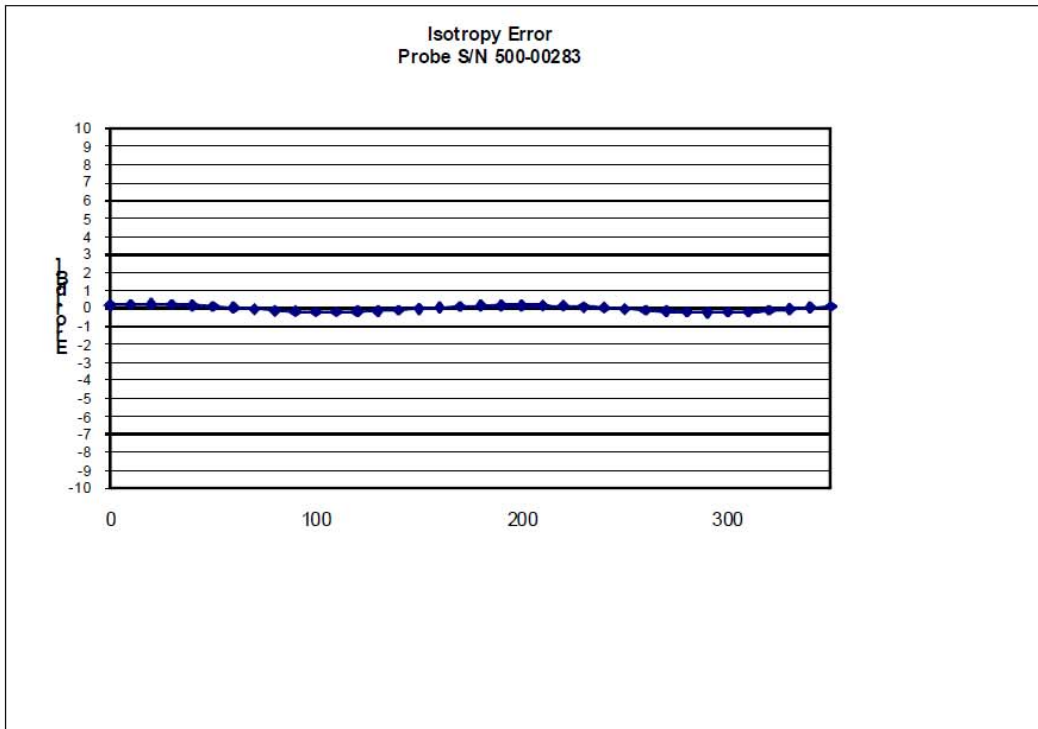
**Receiving Pattern Air**



**NCL Calibration Laboratories**

Division of APREL Inc.

**Isotropy Error Air**

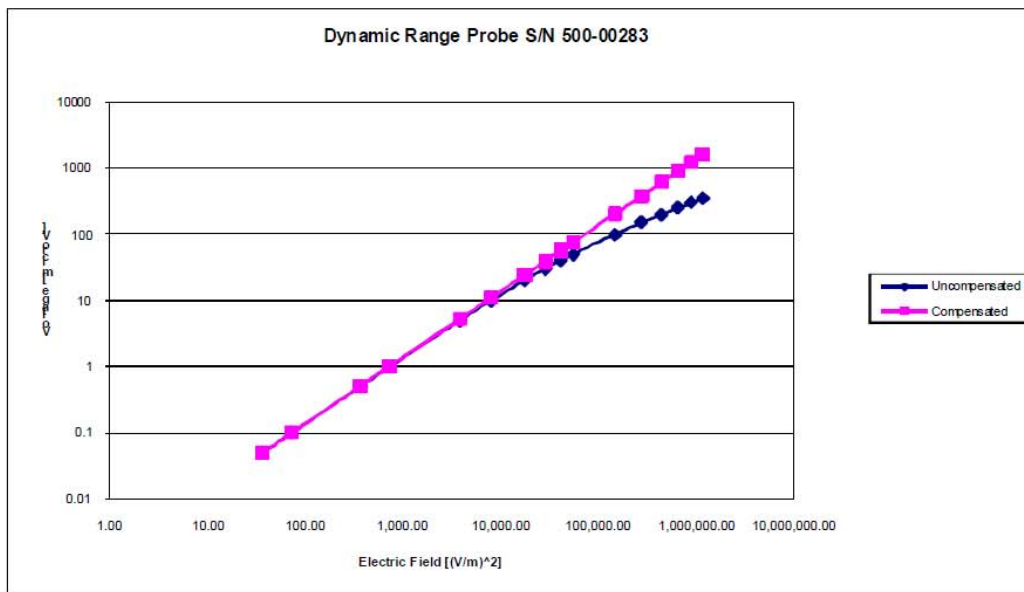


**Isotropicity Tissue:** 0.10 dB

**NCL Calibration Laboratories**

Division of APREL Inc.

**Dynamic Range**

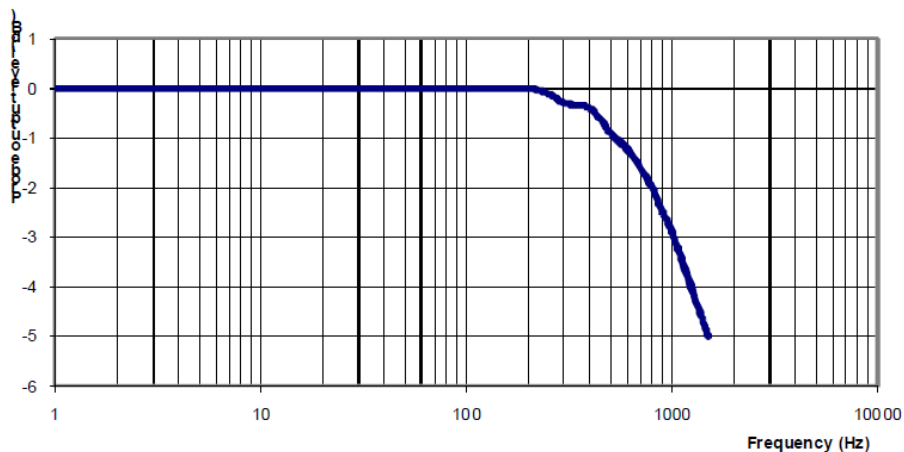


**NCL Calibration Laboratories**

Division of APREL Inc.

**Video Bandwidth**

Probe Frequency Characteristics



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

**Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2012.



## APPENDIX C DIPOLE CALIBRATION CERTIFICATES

---

### NCL CALIBRATION LABORATORIES

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

## CERTIFICATE OF CALIBRATION

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

Validation Dipole(Head and Body)

Manufacturer: APREL Laboratories

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

Frequency: 835 MHz

Serial No: 180-00558

Customer: Bay Area Compliance Laboratory

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

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

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

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

### **NCL** CALIBRATION LABORATORIES

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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Conditions**

Dipole 180-00558 was received in good condition and a re-calibration.

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

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

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



-----  
**Stuart Nicol**



-----  
**C. Teodorian**

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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Calibration Results Summary**

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

**Mechanical Dimensions**

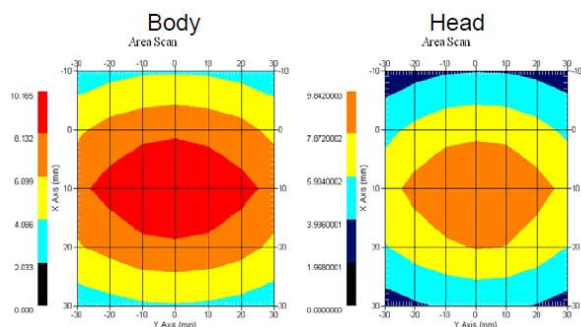
**Length:** 162.2 mm  
**Height:** 89.4 mm

**Electrical Specification**

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

**System Validation Results**

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



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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Introduction**

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 180-00558. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

**References**

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

**Conditions**

Dipole 180-00558 was new taken from stock.

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

**Dipole Calibration uncertainty**

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

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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Dipole Calibration Results**

**Mechanical Verification**

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

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

**Tissue Validation**

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

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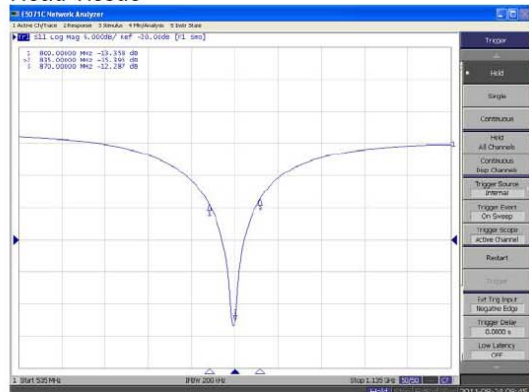
**NCL Calibration Laboratories**

Division of APREL Laboratories.

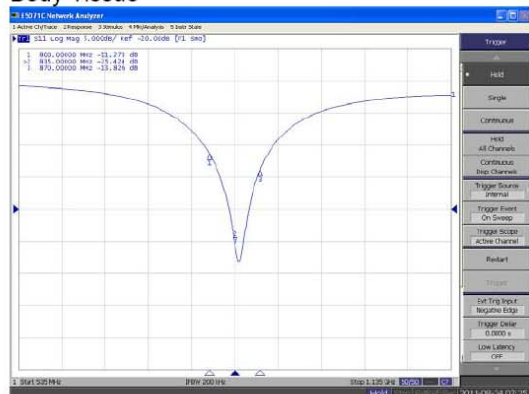
The Following Graphs are the results as displayed on the Vector Network Analyzer.

**S11 Parameter Return Loss**

**Head Tissue**



**Body Tissue**

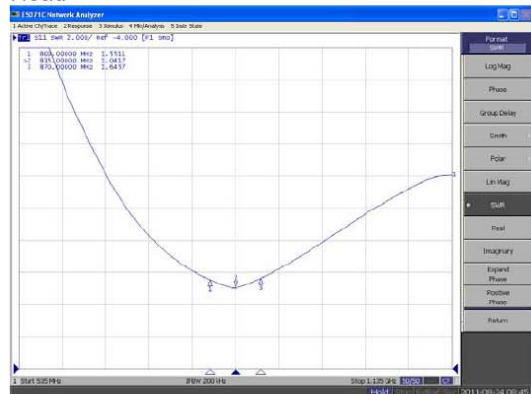


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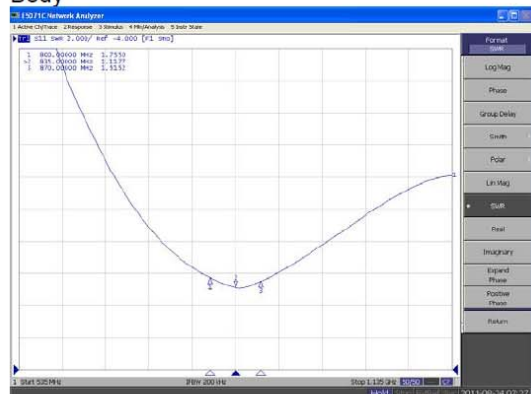
**NCL Calibration Laboratories**

Division of APREL Laboratories.

**SWR  
Head**



**Body**



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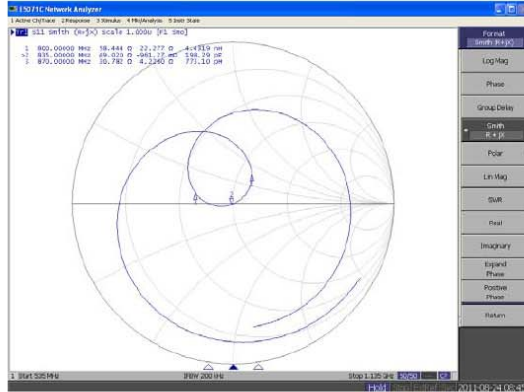


**NCL Calibration Laboratories**

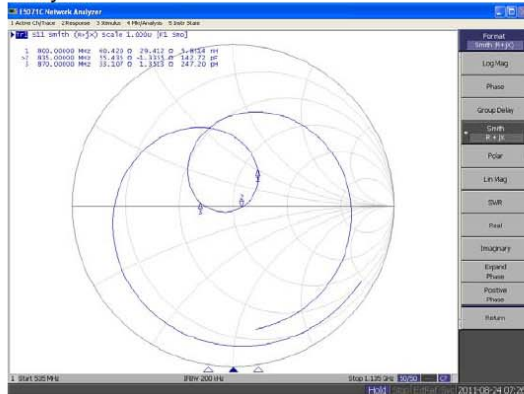
Division of APREL Laboratories.

**Smith Chart Dipole Impedance**

Head



Body



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



**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2011.

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

9

**NCL CALIBRATION LABORATORIES**

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

**CERTIFICATE OF CALIBRATION**

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

Validation Dipole (Head & Body)

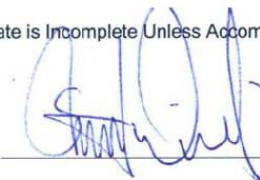
Manufacturer: APREL Laboratories  
Part number: ALS-D-1900-S-2  
Frequency: 1900 MHz  
Serial No: 210-00710

Customer: Bay Area Compliance Laboratory

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

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

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



**NCL CALIBRATION LABORATORIES**

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

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

**NCL Calibration Laboratories**

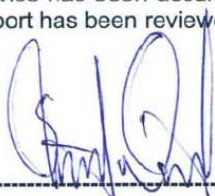
Division of APREL Laboratories.

**Conditions**

Dipole 210-00710 was received in good condition and was a re-calibration.

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

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



-----  
**Stuart Nicol**



-----  
**C. Teodorian**

**Primary Measurement Standards**

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

**Secondary Measurement Standards**

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

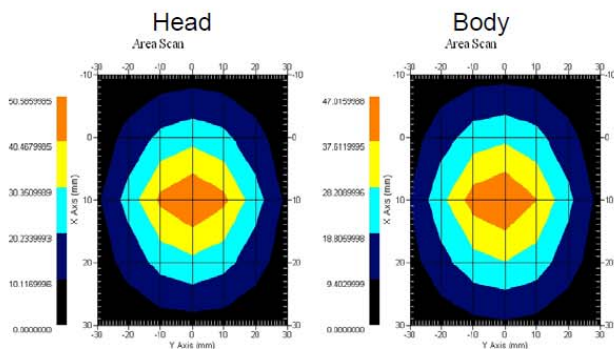
**Length:** 67.1 mm  
**Height:** 38.9 mm

**Electrical Specification**

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

**System Validation Results**

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



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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Introduction**

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 210-00710. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

**References**

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

**Conditions**

Dipole 210-00710 was new taken from stock.

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

**Dipole Calibration uncertainty**

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

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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Dipole Calibration Results**

**Mechanical Verification**

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

**Electrical Validation**

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

**Tissue Validation**

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

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

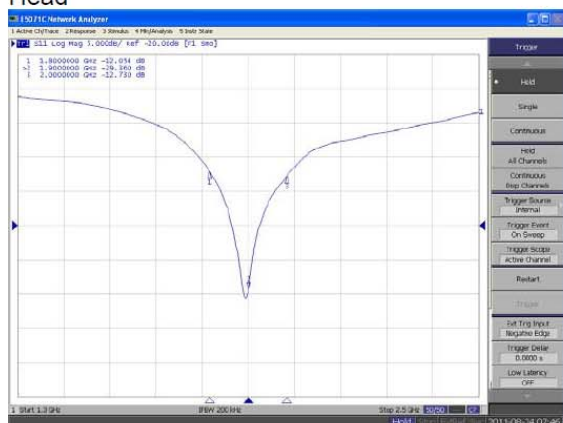
**NCL Calibration Laboratories**

Division of APREL Laboratories.

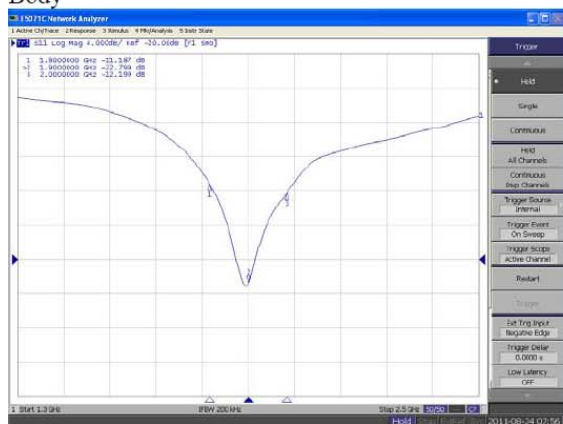
The Following Graphs are the results as displayed on the Vector Network Analyzer.

**S11 Parameter Return Loss**

Head



Body



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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**SWR**

**Head**



**Body**



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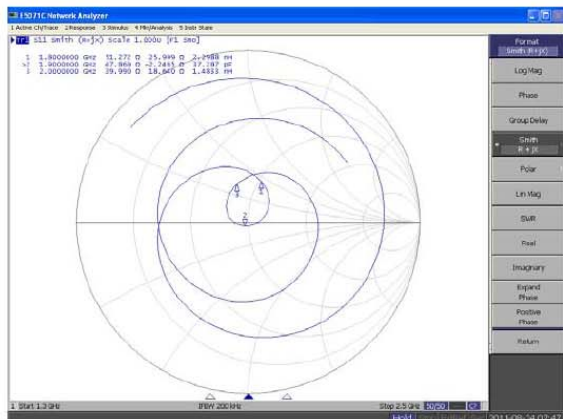


**NCL Calibration Laboratories**

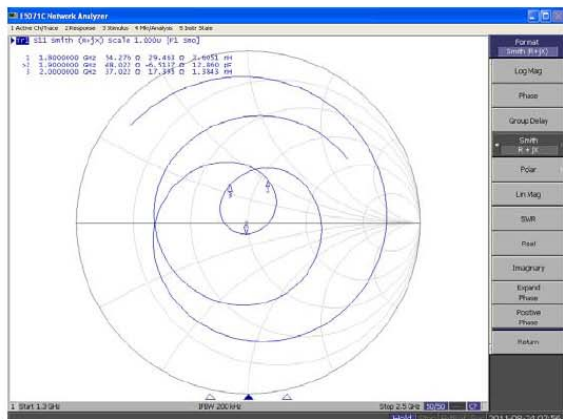
Division of APREL Laboratories.

**Smith Chart Dipole Impedance**

Head



Body



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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2011

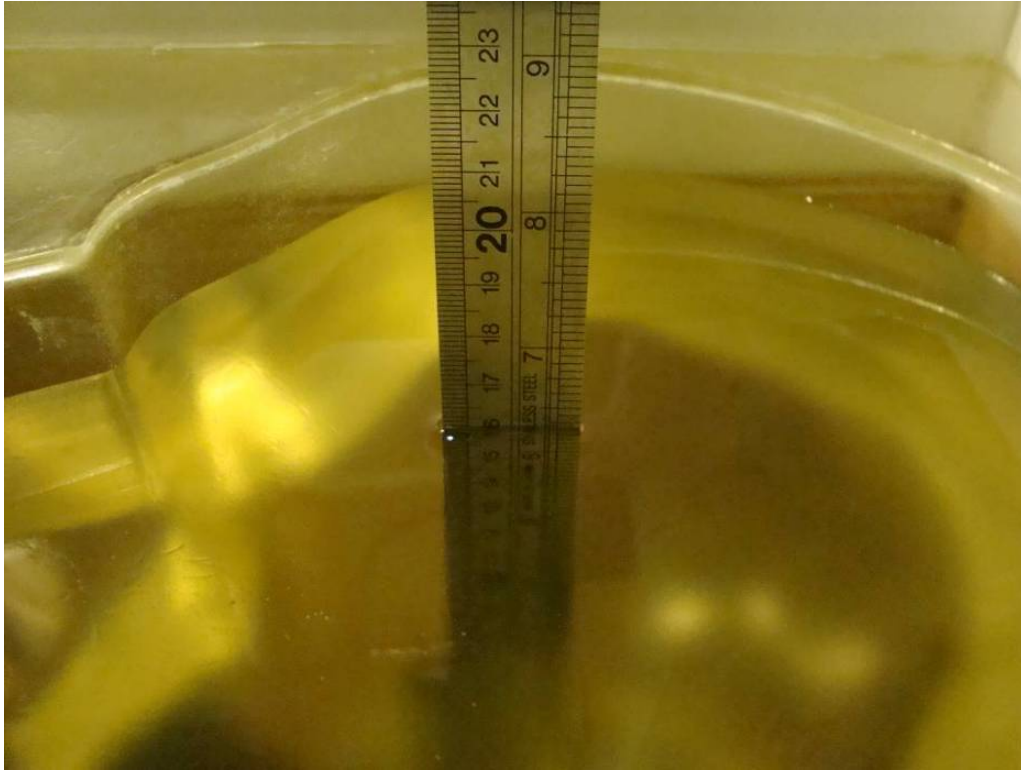
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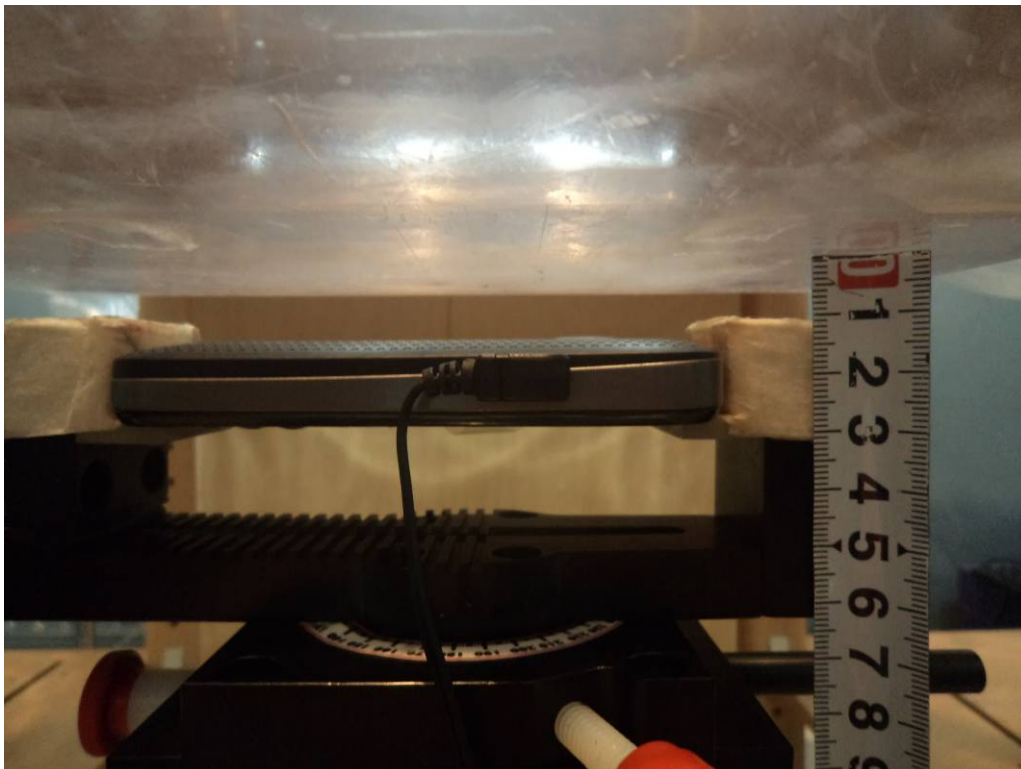
## APPENDIX D EUT TEST POSITION PHOTOS

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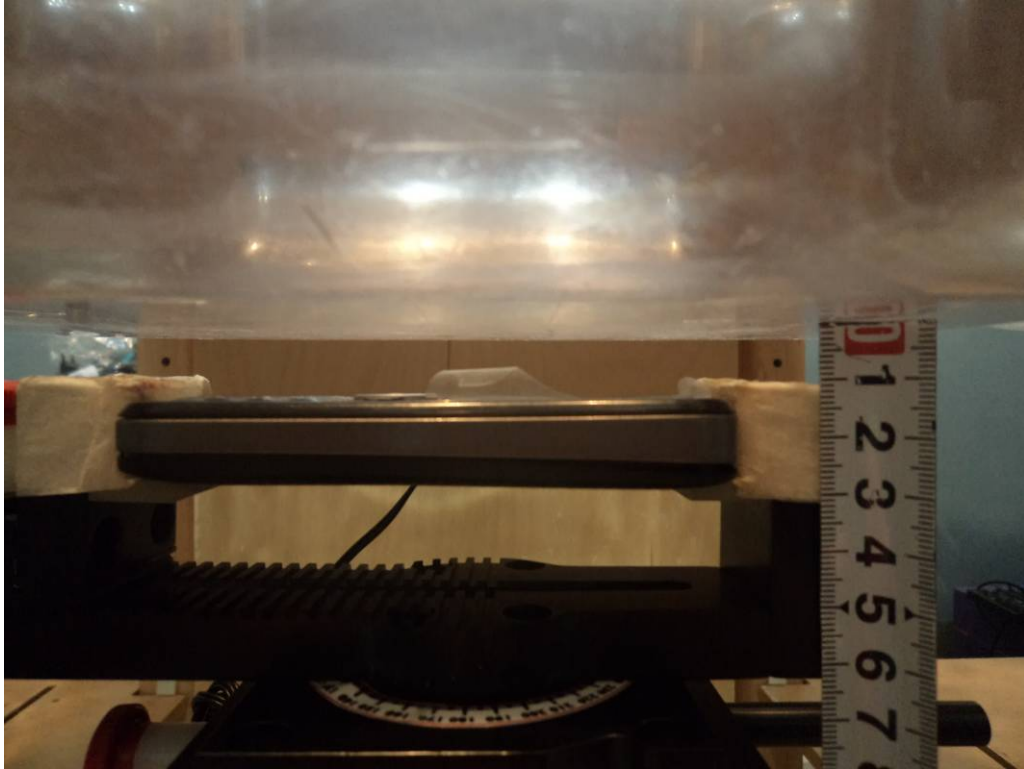
Liquid depth  $\geq 15\text{cm}$



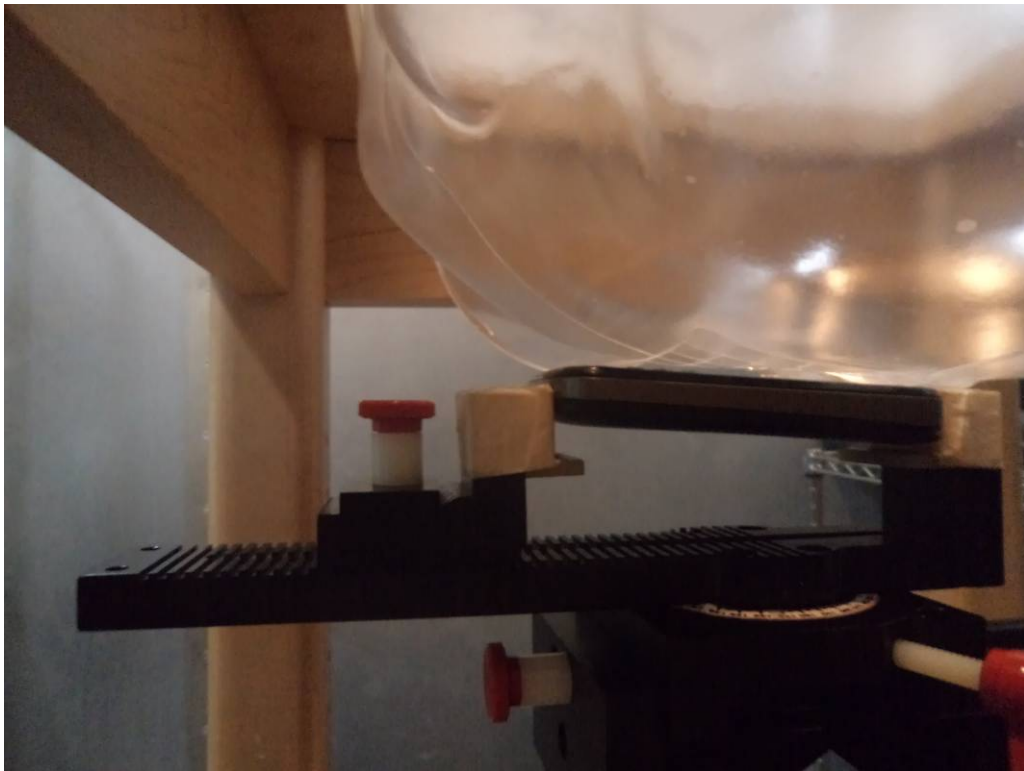
Body-worn Back-Headset Setup Photo



**Body-worn Front-Headset Setup Photo**



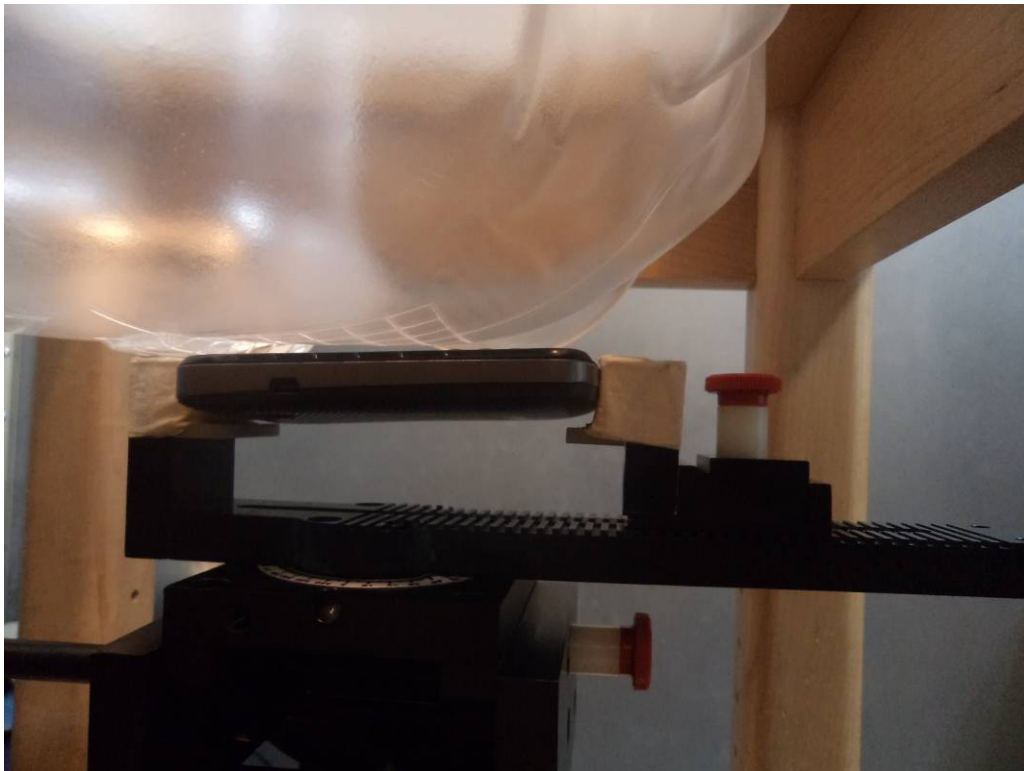
**Left Head Touch Setup Photo**



**Left Head Tilt Setup Photo**



**Right Head Touch Setup Photo**





**Right Head Tilt Setup Photo**



### APPENDIX E EUT PHOTOS

**EUT – Front Side View**



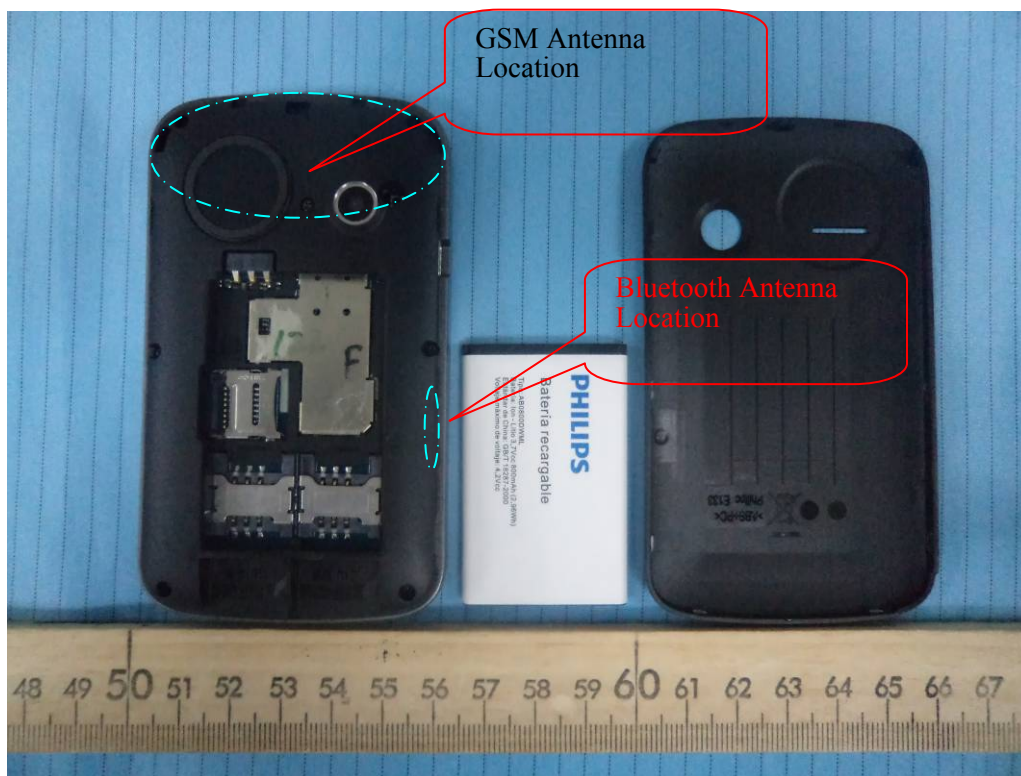
**EUT – Back Side View**



**EUT-Left Side View**



**EUT – Uncovered View**





**EUT – Headset View**



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## APPENDIX F INFORMATIVE REFERENCES

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