

## SAR EVALUATION REPORT

For

### Onglory Rich Limited

Room 208A, 2/F Unit A, 2 Chong Yip Street, Meyer Industrial  
Building, Kuwn Tong, Kln, HK

**FCC ID: R6DTL700**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Mobile Phone
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<b>Report Number:</b> <u>R1DG121116004-20</u>	
<b>Report Date:</b> <u>2012-12-20</u>	
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\* This report may contain data that are not covered by the NVLAP accreditation and shall be marked with an asterisk "★"

Attestation of Test Results		
EUT Information	Company Name	Onglory Rich Limited
	EUT Description	Mobile Phone
	FCC ID	R6DTL700
	Model Number	TL700
	Test Date	2012-11-25 to 2012-11-26 and 2012-12-20
Frequency	Max. SAR Level(s) Measured	Limit(W/Kg)
Cellular Band	0.107 W/kg 1g Head SAR 0.446 W/kg 1g Body SAR	1.6
PCS Band	0.051 W/kg 1g Head SAR 0.239 W/kg 1g Body SAR	
WiFi(802.11b)	0.015 W/kg 1g Head SAR 0.004 W/kg 1g Body SAR	
Hot Spot	0.450 W/kg 1g Body SAR	
Applicable Standards	ANSI / IEEE C95.1 : 2005 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fileds,3 kHz to 300 GHz.	
	ANSI / IEEE C95.3 : 2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.	
	OET BULLETIN 65 SUPPLEMENT C Evaluating Compliance with FCC Guidelines for Human Exposure To Radiofrequency Electromagnetic Fields	
	IEEE1528:2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	
<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>		

## **TABLE OF CONTENTS**

<b>DOCUMENT REVISION HISTORY .....</b>	<b>4</b>
<b>EUT DESCRIPTION .....</b>	<b>5</b>
TECHNICAL SPECIFICATION .....	5
<b>REFERENCE, STANDARDS, AND GUIDELINES .....</b>	<b>6</b>
SAR LIMITS .....	7
<b>FACILITIES AND ACCREDITATION .....</b>	<b>8</b>
<b>DESCRIPTION OF TEST SYSTEM .....</b>	<b>9</b>
<b>EQUIPMENT LIST AND CALIBRATION .....</b>	<b>16</b>
EQUIPMENTS LIST & CALIBRATION INFORMATION .....	16
<b>SAR MEASUREMENT SYSTEM VERIFICATION .....</b>	<b>17</b>
LIQUID VERIFICATION .....	17
SYSTEM ACCURACY VERIFICATION .....	21
SAR SYSTEM VALIDATION DATA .....	22
SAR SYSTEM VALIDATION DATA .....	32
<b>EUT TEST STRATEGY AND METHODOLOGY .....</b>	<b>34</b>
TEST POSITIONS FOR DEVICE OPERATING NEXT TO A PERSON'S EAR .....	34
CHEEK/TOUCH POSITION .....	35
EAR/TILT POSITION .....	35
TEST POSITIONS FOR BODY-WORN AND OTHER CONFIGURATIONS .....	36
SAR EVALUATION PROCEDURE .....	37
<b>CONDUCTED OUTPUT POWER MEASUREMENT .....</b>	<b>38</b>
PROVISION APPLICABLE .....	38
TEST PROCEDURE .....	38
TEST RESULTS: .....	38
<b>SAR MEASUREMENT RESULTS .....</b>	<b>41</b>
SAR TEST DATA .....	41
EUT SCAN RESULTS .....	50
<b>APPENDIX A – MEASUREMENT UNCERTAINTY .....</b>	<b>80</b>
<b>APPENDIX B – PROBE CALIBRATION CERTIFICATES .....</b>	<b>81</b>
<b>APPENDIX C – DIPOLE CALIBRATION CERTIFICATES .....</b>	<b>91</b>
<b>APPENDIX D EUT TEST POSITION PHOTOS .....</b>	<b>121</b>
LIQUID DEPTH $\geq 15\text{CM}$ .....	121
BODY-WORN-HEADSET FRONT SETUP PHOTO .....	121
BODY-WORN-HEADSET BACK SETUP PHOTO .....	122
BODY-LEFT SETUP PHOTO .....	122
BODY-RIGHT SETUP PHOTO .....	123
BODY-BOTTOM SETUP PHOTO .....	123
BODY-TOP SETUP PHOTO .....	124
LEFT HEAD TOUCH SETUP PHOTO .....	124
LEFT HEAD TILT SETUP PHOTO .....	125
RIGHT HEAD TOUCH SETUP PHOTO .....	125
RIGHT HEAD TILT SETUP PHOTO .....	126
<b>APPENDIX E EUT PHOTOS .....</b>	<b>127</b>
EUT – FRONT SIDE VIEW .....	127
EUT – BACK SIDE VIEW .....	127
EUT – TOP SIDE VIEW .....	128
EUT – BOTTOM SIDE VIEW .....	128
EUT – UNCOVERED VIEW .....	129
EUT – HEADSET VIEW .....	129
<b>APPENDIX F INFORMATIVE REFERENCES .....</b>	<b>130</b>

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSZ121116004-20	Original Report	2012-12-20

## EUT DESCRIPTION

This report has been prepared on behalf of Onglory Rich Limited. and their product, FCC ID: R6DTL700, Model: TL700 or the EUT (Equipment Under Test) as referred to in the rest of this report. The EUT is a 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>	Class10
<b>Operation Mode :</b>	GSM Voice , GPRS Data , Bluetooth and WiFi
<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 : 2402MHz-2480MHz WiFi(802.11b/g) : 2412MHz-2462MHz
<b>Conducted RF Power:</b>	Cellular Band : 31.41dBm PCS Band : 28.47dBm WiFi(802.11b/g) :12.40dBm Bluetooth: 3.77dBm
<b>Dimensions (L*W*H):</b>	126.5mm (L)× 66.3mm (W)× 15.4mm (H)
<b>Weight:</b>	212.9g
<b>Power Source:</b>	3.7 VDC /1450mAh Rechargeable Battery
<b>Normal Operation:</b>	Head and Body-worn

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## REFERENCE, STANDARDS, AND GUIDELINES

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### **FCC:**

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

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

### **CE:**

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

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

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

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

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

**CE Limit (10g Tissue)**

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

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

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

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

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## 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 in the X & Y axis, and 35mm in the Z axis.



## ALSAS-10U Interpolation and Extrapolation Uncertainty

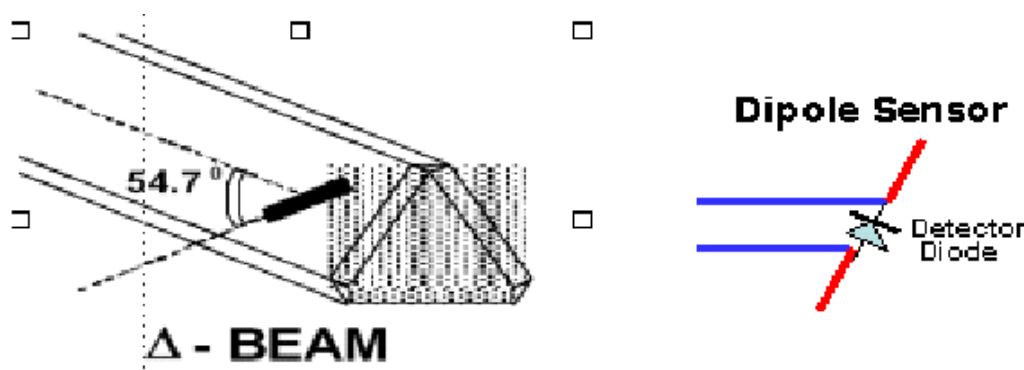
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

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

## 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.

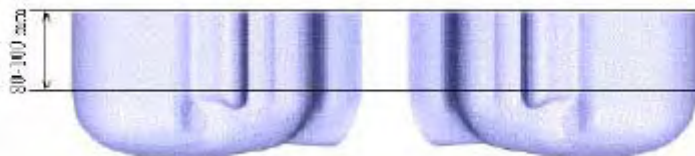


### Phantom Types

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

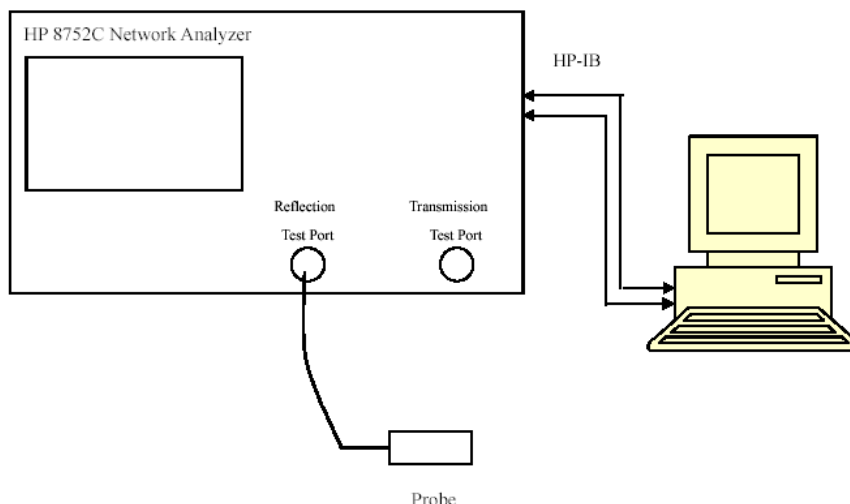
### Equipments List & Calibration Information

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, 2450MHz	ALS-D-2450-S-2	2011-08-25	220-00758
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
Simulated Tissue 2450 MHz Body	ALS-TS-2450-B	Each Time	290-01109
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	2012-08-08	101122



## SAR MEASUREMENT SYSTEM VERIFICATION

### Liquid Verification



Liquid Verification Setup Block Diagram

### Liquid Verification Results

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$ (S/m)	
824.2	Head	40.23	0.90	41.50	0.90	-3.060	0.000	$\pm 5$
	Body	55.12	0.95	55.20	0.97	-0.145	-2.062	$\pm 5$
836.6	Head	40.19	0.92	41.50	0.90	-3.157	2.222	$\pm 5$
	Body	55.19	0.97	55.20	0.97	-0.018	0.000	$\pm 5$
848.8	Head	39.96	0.93	41.50	0.90	-3.711	3.333	$\pm 5$
	Body	55.28	0.99	55.20	0.97	0.145	2.062	$\pm 5$
1850.2	Head	40.21	1.41	40.00	1.40	0.525	0.714	$\pm 5$
	Body	53.89	1.48	53.30	1.52	1.107	-2.632	$\pm 5$
1880.0	Head	40.22	1.43	40.00	1.40	0.550	2.143	$\pm 5$
	Body	53.64	1.52	53.30	1.52	0.638	0.000	$\pm 5$
1909.8	Head	40.22	1.45	40.00	1.40	0.550	3.571	$\pm 5$
	Body	53.72	1.53	53.30	1.52	0.788	0.658	$\pm 5$
2412.0	Body	52.84	1.92	52.70	1.95	0.266	-1.538	$\pm 5$
2437.0	Body	52.65	1.96	52.70	1.95	-0.095	0.513	$\pm 5$
2462.0	Body	52.48	2.00	52.70	1.95	-0.417	2.564	$\pm 5$
2412.0	Head	39.57	1.81	39.20	1.80	0.944	0.556	$\pm 5$
2437.0	Head	39.71	1.82	39.20	1.80	1.301	1.111	$\pm 5$
2462.0	Head	39.56	1.82	39.20	1.80	0.918	1.111	$\pm 5$

\*Liquid Verification was performed on 2012-11-25 and 2012-12-20.

Please refer to the following tables.

850 MHz Head				850 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	40.233979	19.713309		824.0	55.121687	20.697828
824.5	40.202951	19.713863		824.5	55.124825	20.597339
825.0	40.186292	19.714417		825.0	55.127958	20.609857
825.5	40.081151	19.714971		825.5	55.131101	20.622291
826.0	40.099508	19.715526		826.0	55.134239	20.757353
826.5	40.121401	19.716079		826.5	55.137377	20.821084
827.0	40.097888	19.716633		827.0	55.140515	20.735583
827.5	40.145209	19.717187		827.5	55.143653	20.613719
828.0	40.164815	19.717741		828.0	55.146791	20.648281
828.5	40.171241	19.718296		828.5	55.149929	20.605704
829.0	40.222172	19.718849		829.0	55.153067	20.709859
829.5	40.170665	19.719404		829.5	55.156205	20.652688
830.0	40.207033	19.719958		830.0	55.159343	20.530585
830.5	40.167062	19.720512		830.5	55.162481	20.594973
831.0	40.140061	19.721066		831.0	55.165619	20.580148
831.5	40.159615	19.721620		831.5	55.168757	20.787572
832.0	40.121433	19.722174		832.0	55.171895	20.765236
832.5	40.096257	19.722728		832.5	55.175033	20.541935
833.0	40.136793	19.723282		833.0	55.178171	20.475299
833.5	40.168212	19.723836		833.5	55.181309	20.586766
834.0	40.165637	19.724393		834.0	55.184446	20.738623
834.5	40.164217	19.724946		834.5	55.187584	20.631585
835.0	40.189046	19.725499		835.0	55.190722	20.575044
835.5	40.190046	19.726354		835.5	55.193865	20.822751
836.0	40.193646	19.727209		836.0	55.196998	20.829674
836.5	40.178678	19.728064		836.5	55.200136	20.687481
837.0	40.165475	19.728924		837.0	55.203274	20.514564
837.5	40.159682	19.729778		837.5	55.206412	20.550832
838.0	40.182855	19.730634		838.0	55.209552	20.835113
838.5	40.141385	19.731487		838.5	55.212688	20.850317
839.0	40.131316	19.732341		839.0	55.215826	20.772329
839.5	40.133786	19.733196		839.5	55.218964	20.707287
840.0	40.144853	19.734051		840.0	55.222102	20.774436
840.5	40.134215	19.734906		840.5	55.225240	20.819794
841.0	40.117487	19.735762		841.0	55.228378	20.774922
841.5	40.146929	19.736617		841.5	55.231516	20.711659
842.0	40.148631	19.737472		842.0	55.234654	20.887499
842.5	40.152327	19.738327		842.5	55.237792	20.856012
843.0	40.146422	19.729149		843.0	55.240931	20.816410
843.5	40.070125	19.730012		843.5	55.244068	20.771921
844.0	40.146377	19.730856		844.0	55.247206	20.789579
844.5	40.100668	19.731712		844.5	55.250344	20.815486
845.0	40.026686	19.732569		845.0	55.253482	20.724904
845.5	40.041988	19.733421		845.5	55.256627	20.671297
846.0	39.996571	19.754352		846.0	55.259758	20.844291
846.5	40.037513	19.755207		846.5	55.262896	20.905695
847.0	40.017779	19.756063		847.0	55.266034	20.854554
847.5	40.020963	19.756918		847.5	55.269172	20.774855
848.0	39.994565	19.757773		848.0	55.272310	20.865012
848.5	39.999164	19.758628		848.5	55.275448	20.943096
849.0	39.959428	19.759483		849.0	55.278586	20.943278

1900 MHz Head				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1850.0	40.212831	13.736225		1850.0	53.889828	14.408266
1851.2	40.215058	13.706249		1851.2	53.821747	14.365683
1852.4	40.215311	13.673533		1852.4	53.840591	14.366787
1853.6	40.215557	13.696901		1853.6	53.817174	14.343063
1854.8	40.215806	13.690857		1854.8	53.720012	14.362543
1856.0	40.216054	13.614970		1856.0	53.823033	14.398964
1857.2	40.216304	13.754828		1857.2	53.816204	14.424949
1858.4	40.216555	13.651031		1858.4	53.798218	14.346165
1859.6	40.216803	13.704967		1859.6	53.779889	14.340508
1860.8	40.217052	13.706287		1860.8	53.675680	14.393304
1862.0	40.217301	13.722829		1862.0	53.703356	14.220507
1863.2	40.217553	13.745259		1863.2	53.649337	14.233312
1864.4	40.217801	13.780247		1864.4	53.684089	14.250395
1865.6	40.218048	13.774816		1865.6	53.690562	14.221435
1866.8	40.218298	13.763633		1866.8	53.765572	14.212021
1868.0	40.218596	13.782143		1868.0	53.834016	14.228073
1869.2	40.218795	13.842903		1869.2	53.843078	14.250499
1870.4	40.219047	13.835641		1870.4	53.756576	14.301953
1871.6	40.219294	13.809571		1871.6	53.698956	14.302659
1872.8	40.219543	13.839626		1872.8	53.737392	14.331649
1874.0	40.219792	13.782279		1874.0	53.663855	14.339958
1875.2	40.220042	13.816342		1875.2	53.727018	14.403215
1876.4	40.220301	13.814309		1876.4	53.630133	14.325996
1877.6	40.220547	13.878809		1877.6	53.732416	14.406037
1878.8	40.220789	13.774412		1878.8	53.760203	14.537873
1880.0	40.221038	13.719635		1880.0	53.642524	14.556828
1881.2	40.221287	13.768375		1881.2	53.600764	14.553864
1882.4	40.221538	13.790973		1882.4	53.696306	14.525242
1883.6	40.221786	13.759746		1883.6	53.661807	14.481265
1884.8	40.222035	13.760324		1884.8	53.686704	14.504006
1886.0	40.222284	13.759650		1886.0	53.721915	14.436202
1887.2	40.222534	13.754797		1887.2	53.702695	14.412366
1888.4	40.222784	13.749879		1888.4	53.792467	14.446675
1889.6	40.223032	13.745103		1889.6	53.722958	14.451287
1890.8	40.223281	13.740253		1890.8	53.768633	14.508116
1892.0	40.223533	13.735409		1892.0	53.756597	14.304299
1893.2	40.223779	13.730559		1893.2	53.729049	14.265220
1894.4	40.224032	13.725712		1894.4	53.701687	14.314302
1895.6	40.224277	13.720865		1895.6	53.694535	14.648103
1896.8	40.224527	13.716018		1896.8	53.684436	14.646210
1898.0	40.224776	13.711171		1898.0	53.684766	14.626773
1899.2	40.225026	13.706324		1899.2	53.761767	14.627212
1900.4	40.225276	13.701477		1900.4	53.726683	14.525867
1901.6	40.225524	13.696630		1901.6	53.730166	14.615213
1902.8	40.225794	13.691783		1902.8	53.699257	14.575235
1904.0	40.226021	13.686945		1904.0	53.780968	14.544052
1905.2	40.226271	13.682089		1905.2	53.692725	14.512573
1906.4	40.226531	13.677242		1906.4	53.682637	14.437507
1907.6	40.226769	13.672395		1907.6	53.608317	14.554298
1908.8	40.227018	13.667548		1908.8	53.692597	14.489726
1910.0	40.227269	13.662701		1910.0	53.719120	14.453348

2450 MHz Head				2450 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
2410	39.562278	13.496685		2410	52.858467	14.310214
2411	39.563156	13.495621		2411	52.849437	14.317211
2412	39.568913	13.490219		2412	52.840425	14.322213
2413	39.574670	13.484817		2413	52.831416	14.327210
2414	39.580427	13.479415		2414	52.822405	14.332213
2415	39.586184	13.474013		2415	52.813402	14.337218
2416	39.591941	13.468611		2416	52.804393	14.342213
2417	39.597698	13.463209		2417	52.795378	14.347213
2418	39.603455	13.457807		2418	52.786372	14.352212
2419	39.609212	13.454403		2419	52.777361	14.357211
2420	39.614969	13.450999		2420	52.768366	14.362217
2421	39.620726	13.447595		2421	52.759335	14.387213
2422	39.626483	13.444191		2422	52.752326	14.394216
2423	39.632240	13.440787		2423	52.745318	14.401213
2424	39.637997	13.437383		2424	52.738314	14.408212
2425	39.643754	13.433979		2425	52.731303	14.415213
2426	39.649511	13.430575		2426	52.724295	14.422212
2427	39.655268	13.427171		2427	52.717287	14.429211
2428	39.661025	13.423767		2428	52.710279	14.436218
2429	39.666782	13.420363		2429	52.703272	14.443213
2430	39.672539	13.416959		2430	52.696268	14.450215
2431	39.678296	13.413555		2431	52.689256	14.457214
2432	39.684053	13.410151		2432	52.682248	14.464212
2433	39.689810	13.406747		2433	52.675240	14.471217
2434	39.695567	13.405621		2434	52.668233	14.478212
2435	39.701130	13.404530		2435	52.661225	14.485212
2436	39.701324	13.403343		2436	52.654217	14.492217
2437	39.707081	13.396936		2437	52.647209	14.499216
2438	39.712838	13.390529		2438	52.640201	14.506216
2440	39.718595	13.384122		2440	52.633199	14.513212
2441	39.724352	13.377715		2441	52.626186	14.520211
2442	39.730109	13.371308		2442	52.619178	14.527214
2443	39.735866	13.364901		2443	52.612171	14.531209
2444	39.741623	13.358494		2444	52.605163	14.535212
2445	39.747380	13.352087		2445	52.598155	14.539215
2446	39.753137	13.345680		2446	52.591147	14.543214
2447	39.758894	13.339273		2447	52.584139	14.547213
2448	39.764651	13.332866		2448	52.577131	14.551211
2449	39.770408	13.326459		2449	52.570128	14.555211
2450	39.776165	13.320052		2450	52.563116	14.559212
2451	39.781922	13.313645		2451	52.556108	14.563211
2452	39.787679	13.307238		2452	52.549121	14.567211
2453	39.793436	13.300831		2453	52.542092	14.571211
2454	39.799193	13.294424		2454	52.535085	14.575215
2455	39.804950	13.288017		2455	52.528077	14.579211
2456	39.800707	13.281610		2456	52.521069	14.583211
2457	39.816464	13.275203		2457	52.514061	14.587218
2458	39.811324	13.268796		2458	52.507055	14.591211
2459	39.817081	13.262389		2459	52.500046	14.595216
2460	39.812838	13.255982		2460	52.493038	14.599211
2461	39.812589	13.241853		2461	52.486032	14.603214
2462	39.562278	13.296685		2462	52.479022	14.607209

## 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	180-00558	2011-08-25	2014-08-24
APREL	Dipole antenna(1900MHz)	ALS-D-1900-S-2	210-00710	2011-08-25	2014-08-24
APREL	Dipole antenna(2450MHz)	ALS-D-2450-S-2	220-00758	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 (%)
2012-11-25	835	Head	1g	10.032	9.590	4.609	$\pm 10$
		Body	1g	9.880	9.684	2.024	$\pm 10$
	1900	Head	1g	40.029	39.648	0.961	$\pm 10$
		Body	1g	40.324	39.769	1.396	$\pm 10$
2012-12-20	2450	Body	1g	50.899	52.561	-3.162	$\pm 10$
		Head	1g	53.521	52.667	1.622	$\pm 10$

\*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 835MHz Head Liquid****Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558****Product Data**

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 9.995 W/kg  
Power Drift-Finish : 10.021W/kg  
Power Drift (%) : 2.681

**Phantom Data**

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

**Tissue Data**

Type : Head  
Serial No. : 270-01002  
Frequency : 835.0 MHz  
Last Calib. Date : 25-Nov-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 40.19 F/m  
Sigma : 0.92 S/m  
Density : 1000.00 kg/cu. m

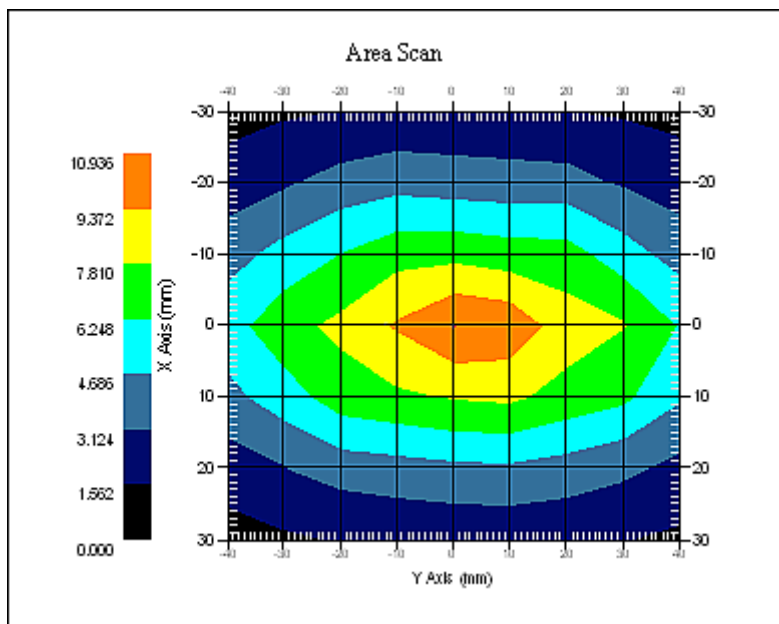
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 835  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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

1 gram SAR value : 10.032 W/kg  
10 gram SAR value : 6.325 W/kg  
Area Scan Peak SAR : 10.936 W/kg  
Zoom Scan Peak SAR : 17.329 W/kg



**835 MHz System Validation with Head Tissue**

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

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 10.325 W/kg  
Power Drift-Finish : 10.559W/kg  
Power Drift (%) : 1.845

**Phantom Data**

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

**Tissue Data**

Type : Body  
Serial No. : 270-02101  
Frequency : 835.0 MHz  
Last Calib. Date : 25-Nov-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 55.19 F/m  
Sigma : 0.96 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

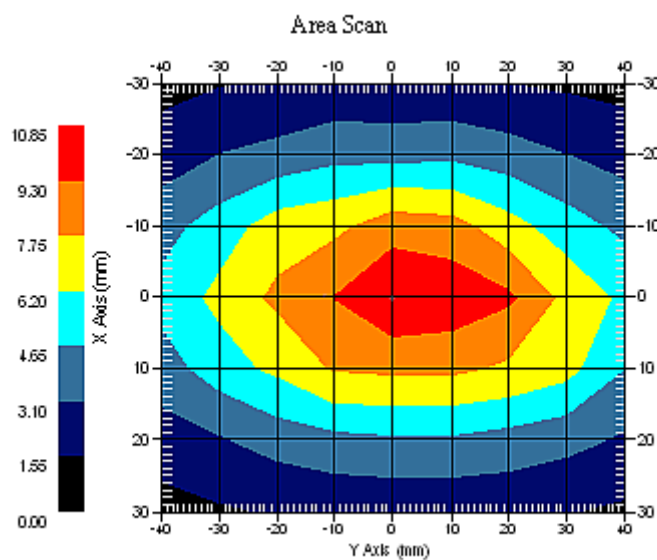
Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 835  
Duty Cycle Factor : 1  
Conversion Factor : 6.6  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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



1 gram SAR value : 9.880 W/kg  
10 gram SAR value : 5.964 W/kg  
Area Scan Peak SAR : 10.849 W/kg  
Zoom Scan Peak SAR : 16.994 W/kg



**835 MHz System Validation with Body Tissue**

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

Device Name : Dipole 1900MHz  
Serial No. : 210-00710  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency Band : 1900  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 39.951 W/kg  
Power Drift-Finish : 40.021 W/kg  
Power Drift (%) : 1.125

**Phantom Data**

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

**Tissue Data**

Type : Head  
Serial No. : 295-01103  
Frequency : 1900.00 MHz  
Last Calib. Date : 25-Nov-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 40.23 F/m  
Sigma : 1.45 S/m  
Density : 1000.00 kg/cu. M

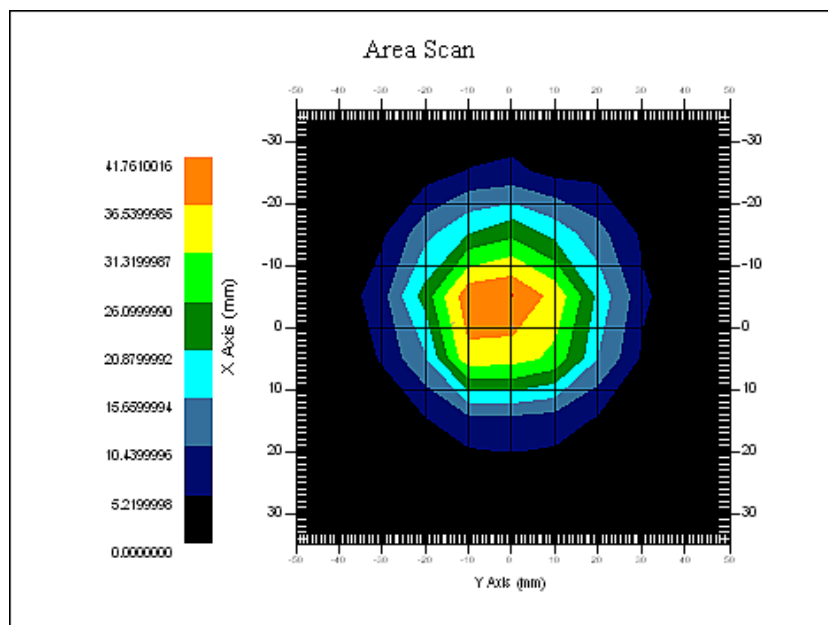
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 1900  
Duty Cycle Factor : 1  
Conversion Factor : 5.20  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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

1 gram SAR value : 40.029 W/kg  
10 gram SAR value : 21.931 W/kg  
Area Scan Peak SAR : 41.761 W/kg  
Zoom Scan Peak SAR : 89.656 W/kg



### 1900 MHz System Validation with Head Tissue

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

Device Name : Dipole 1900MHz  
Serial No. : 210-00710  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency Band : 1900  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 41.025 W/kg  
Power Drift-Finish : 40.321 W/kg  
Power Drift (%) : -1.296

**Phantom Data**

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

**Tissue Data**

Type : Body  
Serial No. : 295-02102  
Frequency : 1900.00 MHz  
Last Calib. Date : 25-Nov-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 53.73 F/m  
Sigma : 1.53 S/m  
Density : 1000.00 kg/cu. m

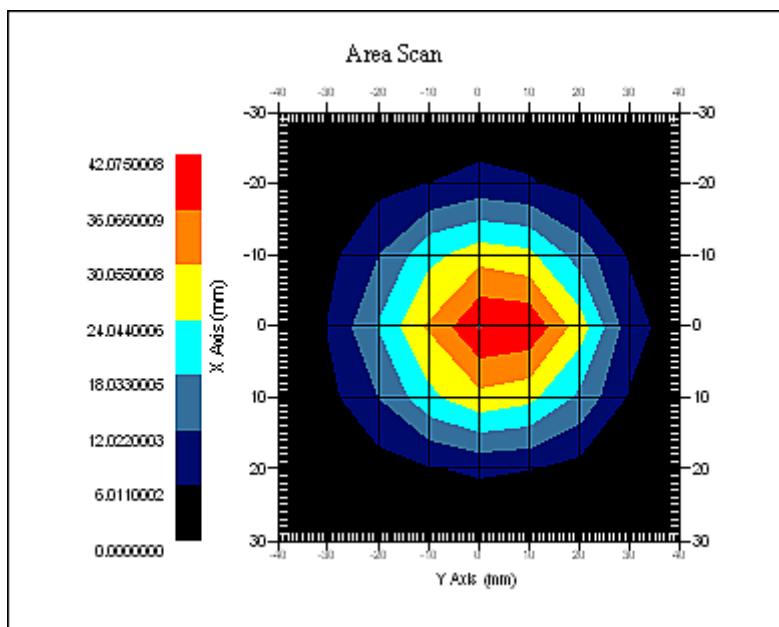
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 1900  
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 : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 40.324 W/kg  
10 gram SAR value : 22.022 W/kg  
Area Scan Peak SAR : 42.047 W/kg  
Zoom Scan Peak SAR : 93.025 W/kg



### 1900 MHz System Validation with Body Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 2450 MHz Body Liquid****Dipole 2450 MHz; Type: ALS-D-2450-S-2; S/N: 220-00758****Product Data**

Device Name : Dipole 2450MHz  
Serial No. : 220-00758  
Type : Dipole  
Model : ALS-D-2450-S-2  
Frequency Band : 2450  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 49.502 W/kg  
Power Drift-Finish : 50.682 W/kg  
Power Drift (%) : 2.037

**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. : 290-01109  
Frequency : 2450.00 MHz  
Last Calib. Date : 25-Nov-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 50.00 RH%  
Epsilon : 52.56 F/m  
Sigma : 1.98 S/m  
Density : 1000.00 kg/cu. M

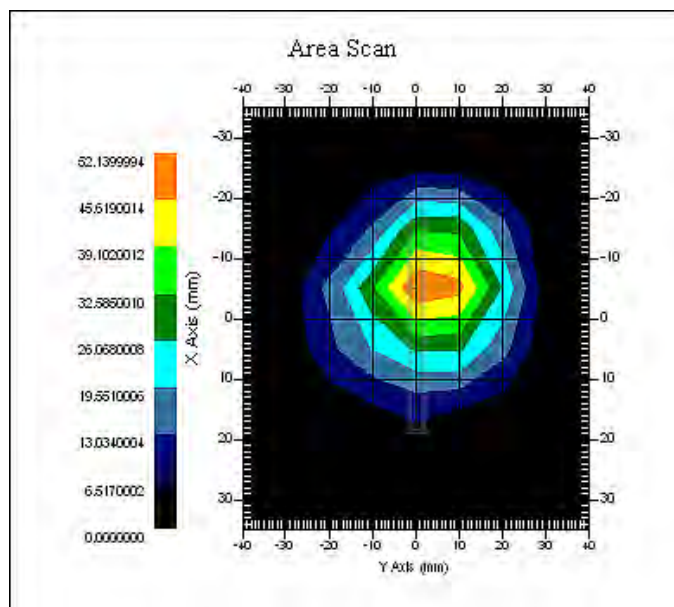
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 8x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 50.899 W/kg  
10 gram SAR value : 25.224 W/kg  
Area Scan Peak SAR : 56.140 W/kg  
Zoom Scan Peak SAR : 99.003 W/kg



### 2450 MHz System Validation

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 2450 MHz Head Liquid****Dipole 2450 MHz; Type: ALS-D-2450-S-2; S/N: 220-00758****Product Data**

Device Name : Dipole 2450MHz  
Serial No. : 220-00758  
Type : Dipole  
Model : ALS-D-2450-S-2  
Frequency Band : 2450  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 56.511 W/kg  
Power Drift-Finish : 56.021 W/kg  
Power Drift (%) : -0.875

**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 and Body  
Serial No. : 290-01109  
Frequency : 2450.00 MHz  
Last Calib. Date : 20-Dec-2012  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 50.00 RH%  
Epsilon : 39.78 F/m  
Sigma : 1.81 S/m  
Density : 1000.00 kg/cu. M

**Probe Data**

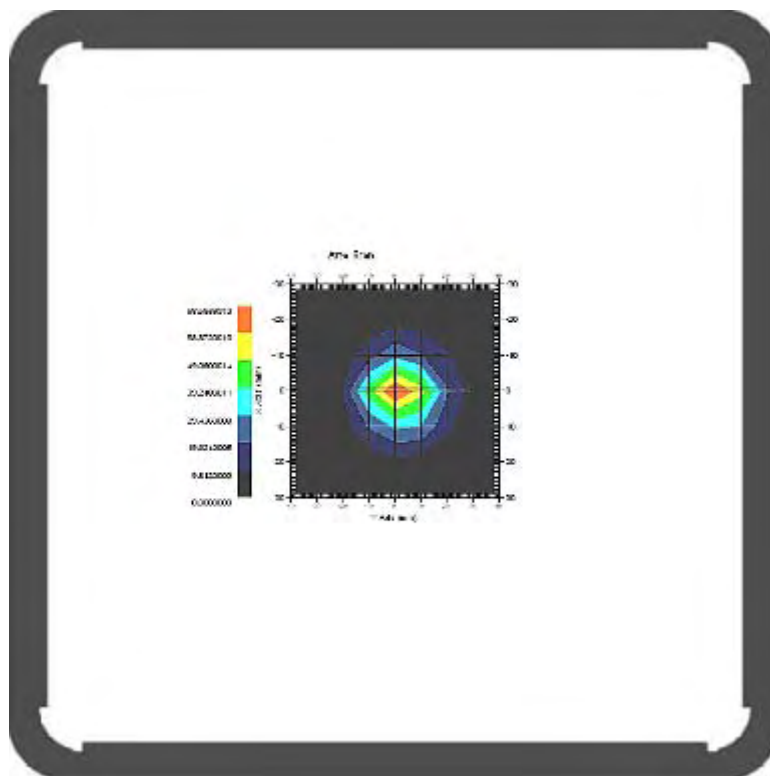
Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 09-Aug-2012  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
Probe Sensitivity : 1.20 1.20 1.20  $\mu\text{V}/(\text{V}/\text{m})^2$   
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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



1 gram SAR value : 53.521 W/kg  
10 gram SAR value : 24.954 W/kg  
Area Scan Peak SAR : 68.125 W/kg  
Zoom Scan Peak SAR : 120.656 W/kg



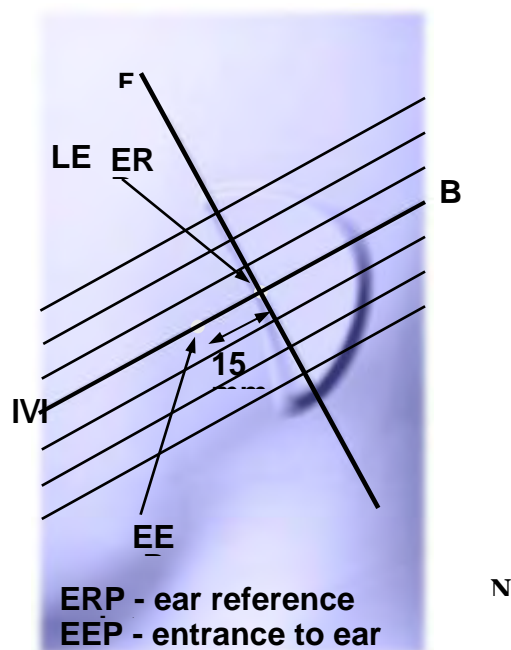
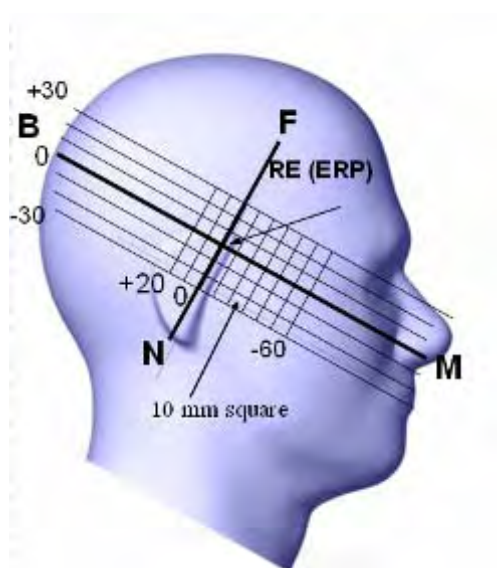
### 2450 MHz System Validation

## EUT TEST STRATEGY AND METHODOLOGY

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

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

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



## Cheek/Touch Position

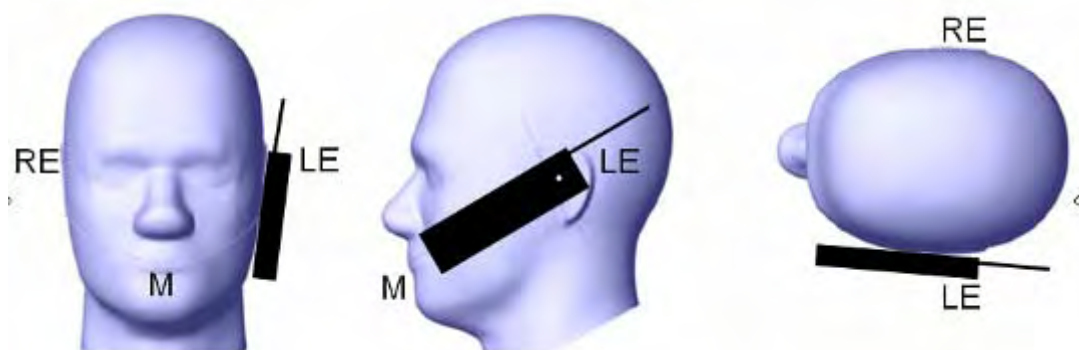
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

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

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

### Cheek /Touch Position



## Ear/Tilt Position

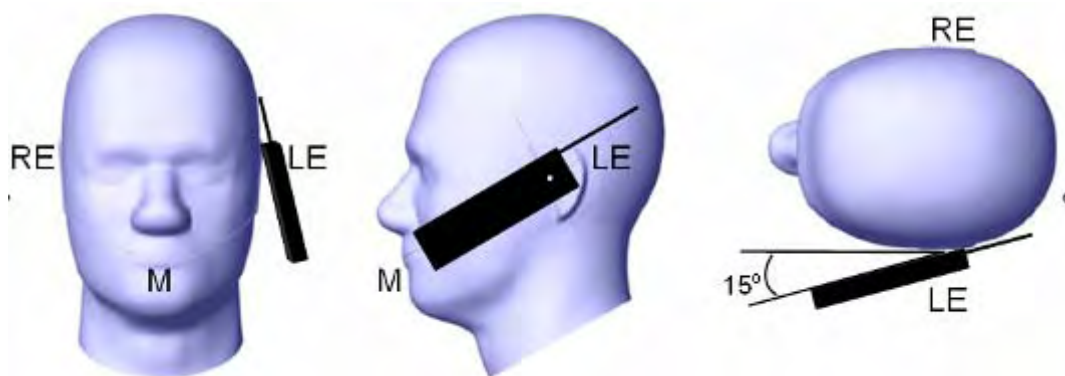
With the handset aligned in the “Cheek/Touch Position”:

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

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

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

#### **Ear /Tilt 15° Position**



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

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

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

## SAR Evaluation Procedure

The evaluation was performed with the following procedure:

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

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

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

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

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

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

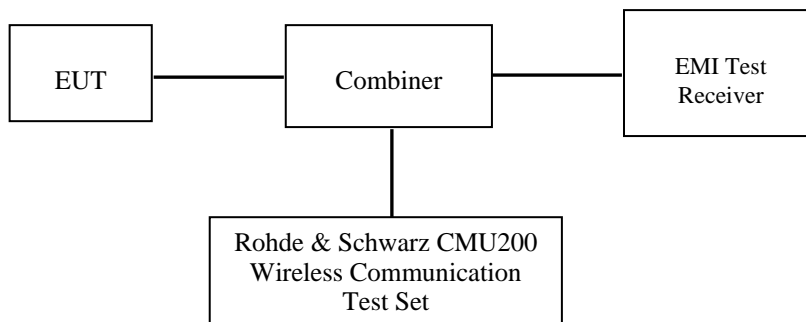
## CONDUCTED OUTPUT POWER MEASUREMENT

### Provision Applicable

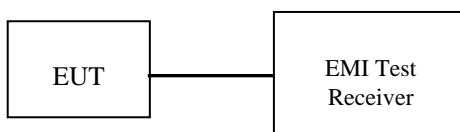
The measured peak output power should be greater and within 5% than EMI measurement.

### Test Procedure

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



### GSM



### WiFi

### Test Results:

#### GSM

Frequency Band	Frequency (MHz)	Conducted Output Power	
		GSM (dBm)	GSM (W)
Cellular	824.2	31.41	1.384
	836.6	31.39	1.377
	848.8	31.28	1.343
PCS	1850.2	28.41	0.693
	1880.0	28.28	0.673
	1909.8	28.35	0.684

**GPRS**

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
Cellular	128	824.2	31.35	31.17	/	/
	190	836.6	31.30	31.10	/	/
	251	848.8	31.24	31.04	/	/
PCS	512	1850.2	28.47	28.17	/	/
	661	1880.0	28.36	28.09	/	/
	810	1909.8	28.41	28.14	/	/

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	22.35	25.17	/	/
	190	836.6	22.30	25.10	/	/
	251	848.8	22.24	25.04	/	/
PCS	512	1850.2	19.47	22.17	/	/
	661	1880.0	19.36	22.09	/	/
	810	1909.8	19.41	22.14	/	/

**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 and 2 timeslots has been activated separately with power level 5(850 MHz band) and 0(1900 MHz band).

**WiFi**

Band	Frequency (MHz)	Conducted Output Power	
		(dBm)	(Watt)
802.11b	2412	12.40	0.017
	2437	12.19	0.017
	2462	12.25	0.017
802.11g	2412	10.78	0.012
	2437	10.51	0.011
	2462	10.66	0.012

**Note:**

1. The output power was tested under data rate of 1 Mbps for 802.11b, and 6 Mbps for 802.11g.
2. KDB248227-SAR is not required for 802.11g channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

**Bluetooth**

Mode	Channel frequency (MHz)	Reading power (dBm)	Power output (mw)
BDR(GFSK)	(Low)2402	3.64	2.312
	(Middle)2441	3.18	2.080
	(High)2480	3.64	2.312
EDR(4-DQPSK)	(Low)2402	3.24	2.109
	(Middle)2441	3.25	2.113
	(High)2480	3.77	2.382
EDR-8DPSK	(Low)2402	3.24	2.109
	(Middle)2441	3.03	2.009
	(High)2480	3.57	2.275

**Note:**

According to the appendix A of FCC KDB 447498 D01 General RF Exposure Guidance v05 generic portable criteria, the exclusion thresholds for 2450 MHz is 10 mW,

**Conclusion:**

Stand-alone SAR evaluation is not required for Bluetooth Antenna.



## SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

### SAR Test Data

#### Environmental Conditions

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

\* Testing was performed by Sandy Wang on 2012-11-25 to 2012-11-26 and 2012-12-20.

#### 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	-1.566	0.103	1.6
	190(Middle)	836.6	GSM	Integral	SAM	/	/	1.6
	251(High)	848.8	GSM	Integral	SAM	/	/	1.6
Left Head Tilt	128(Low)	824.2	GSM	Integral	SAM	-2.645	0.075	1.6
	190(Middle)	836.6	GSM	Integral	SAM	/	/	1.6
	251(High)	848.8	GSM	Integral	SAM	/	/	1.6
Right Head Cheek	128(Low)	824.2	GSM	Integral	SAM	-2.018	0.107	1.6
	190(Middle)	836.6	GSM	Integral	SAM	/	/	1.6
	251(High)	848.8	GSM	Integral	SAM	/	/	1.6
Right Head Tilt	128(Low)	824.2	GSM	Integral	SAM	2.912	0.073	1.6
	190(Middle)	836.6	GSM	Integral	SAM	/	/	1.6
	251(High)	848.8	GSM	Integral	SAM	/	/	1.6
Body-Front-Headset (10mm)	128(Low)	824.2	GSM	Integral	Universal	-0.545	0.048	1.6
	190(Middle)	836.6	GSM	Integral	Universal	/	/	1.6
	251(High)	848.8	GSM	Integral	Universal	/	/	1.6
Body-Back-Headset (10mm)	128(Low)	824.2	GSM	Integral	Universal	2.854	0.227	1.6
	190(Middle)	836.6	GSM	Integral	Universal	/	/	1.6
	251(High)	848.8	GSM	Integral	Universal	/	/	1.6

#### Note:

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.

**PCS 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	512(Low)	1850.2	GSM	Integral	SAM	-2.186	0.050	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	-1.898	0.018	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	-3.661	0.051	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	2.252	0.016	1.6
	661(Middle)	1880.0	GSM	Integral	SAM	/	/	1.6
	810(High)	1909.8	GSM	Integral	SAM	/	/	1.6
Body-Front-Headset (10mm)	512(Low)	1850.2	GSM	Integral	Universal	-2.616	0.020	1.6
	661(Middle)	1880.0	GSM	Integral	Universal	/	/	1.6
	810(High)	1909.8	GSM	Integral	Universal	/	/	1.6
Body-Back-Headset (10mm)	512(Low)	1850.2	GSM	Integral	Universal	1.127	0.131	1.6
	661(Middle)	1880.0	GSM	Integral	Universal	/	/	1.6
	810(High)	1909.8	GSM	Integral	Universal	/	/	1.6

**Note:**

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The EUT transmit and receive through the same GSM antenna while testing SAR.

**Wi-Fi (802.11b)**

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Phantom Type	Power Drift (%)	FCC 1g SAR (W/Kg)	
	Channel NO.	MHz					Measurement	Limit
Left Head Cheek	1	2412.0	802.11b	Integral	SAM	-2.855	0.009	1.6
	6	2437.0	802.11b	Integral	SAM	/	/	1.6
	11	2462.0	802.11b	Integral	SAM	/	/	1.6
Left Head Tilt	1	2412.0	802.11b	Integral	SAM	-3.608	0.005	1.6
	6	2437.0	802.11b	Integral	SAM	/	/	1.6
	11	2462.0	802.11b	Integral	SAM	/	/	1.6
Right Head Cheek	1	2412.0	802.11b	Integral	SAM	-2.940	0.015	1.6
	6	2437.0	802.11b	Integral	SAM	/	/	1.6
	11	2462.0	802.11b	Integral	SAM	/	/	1.6
Right Head Tilt	1	2412.0	802.11b	Integral	SAM	1.527	0.004	1.6
	6	2437.0	802.11b	Integral	SAM	/	/	1.6
	11	2462.0	802.11b	Integral	SAM	/	/	1.6

**Note:**

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The SAR testing is conducted with 100% duty cycle factor.
3. The output power was tested under data rate 1Mbps for 802.11b.

## Mobile Hot-Spot Test Result

The DUT is capable of functioning as a WiFi to Cellular Mobile hotspot. Additional SAR testing was performed according to KDB 941225 D06. Testing was performed with a separation of 1cm between the DUT and the flat phantom. The DUT was positioned for SAR tests with the front and back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is <2.5 cm from the edge. Each transmit band was utilized for SAR testing. The tested mode has been selected within each band that exhibits the highest time average output power.

### Hot spot-GPRS (Frequency Band: 835 MHz)

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Phantom Type	Power Drift (%)	FCC 1g SAR (W/Kg)	
	Channel	MHz					Measurement	Limit
Body-Front (10mm)	128	824.2	GPRS	Integral	Universal	-2.037	0.139	1.6
	190	836.6	GPRS	Integral	Universal	/	/	1.6
	251	848.8	GPRS	Integral	Universal	/	/	1.6
Body-Back (10mm)	128	824.2	GPRS	Integral	Universal	1.182	0.446	1.6
	190	836.6	GPRS	Integral	Universal	/	/	1.6
	251	848.8	GPRS	Integral	Universal	/	/	1.6
Body-Left (10mm)	128	824.2	GPRS	Integral	Universal	-2.347	0.089	1.6
	190	836.6	GPRS	Integral	Universal	/	/	1.6
	251	848.8	GPRS	Integral	Universal	/	/	1.6
Body-Right (10mm)	128	824.2	GPRS	Integral	Universal	2.266	0.052	1.6
	190	836.6	GPRS	Integral	Universal	/	/	1.6
	251	848.8	GPRS	Integral	Universal	/	/	1.6
Body-Bottom (10mm)	128	824.2	GPRS	Integral	Universal	-0.848	0.026	1.6
	190	836.6	GPRS	Integral	Universal	/	/	1.6
	251	848.8	GPRS	Integral	Universal	/	/	1.6

#### Note:

1 .When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.

**Hot spot-GPRS (Frequency Band: 1900 MHz)**

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Phantom Type	Power Drift (%)	FCC 1g SAR (W/Kg)	
	Channel	MHz					Measurement	Limit
Body-Front (10mm)	512	1850.2	GPRS	Integral	Universal	-0.574	0.051	1.6
	661	1880.0	GPRS	Integral	Universal	/	/	1.6
	810	1909.8	GPRS	Integral	Universal	/	/	1.6
Body-Back (10mm)	512	1850.2	GPRS	Integral	Universal	-1.850	0.239	1.6
	661	1880.0	GPRS	Integral	Universal	/	/	1.6
	810	1909.8	GPRS	Integral	Universal	/	/	1.6
Body-Left (10mm)	512	1850.2	GPRS	Integral	Universal	2.940	0.032	1.6
	661	1880.0	GPRS	Integral	Universal	/	/	1.6
	810	1909.8	GPRS	Integral	Universal	/	/	1.6
Body-Right (10mm)	512	1850.2	GPRS	Integral	Universal	-2.557	0.017	1.6
	661	1880.0	GPRS	Integral	Universal	/	/	1.6
	810	1909.8	GPRS	Integral	Universal	/	/	1.6
Body-Bottom (10mm)	512	1850.2	GPRS	Integral	Universal	-3.050	0.005	1.6
	661	1880.0	GPRS	Integral	Universal	/	/	1.6
	810	1909.8	GPRS	Integral	Universal	/	/	1.6

**Note:**

- 1 .When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
- 3.The Multi-slot Classes of EUT is Class 10 which has maximum 4 Downlink slots and 2 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3DL+2UL is the worse case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.

**Hot Spot-WiFi**

EUT Position	Frequency (MHz)		Test Mode	Antenna Type	Phantom Type	Power Drift (%)	FCC 1g SAR (W/Kg)	
	Channel	MHz					Measurement	Limit
Body-Front (10mm)	1	2412	802.11b	Integral	Universal	-2.221	0.003	1.6
	6	2437	802.11b	Integral	Universal	/	/	1.6
	11	2462	802.11b	Integral	Universal	/	/	1.6
Body-Back (10mm)	1	2412	802.11b	Integral	Universal	-1.099	0.004	1.6
	6	2437	802.11b	Integral	Universal	/	/	1.6
	11	2462	802.11b	Integral	Universal	/	/	1.6
Body-Left (10mm)	1	2412	802.11b	Integral	Universal	-4.019	0.002	1.6
	6	2437	802.11b	Integral	Universal	/	/	1.6
	11	2462	802.11b	Integral	Universal	/	/	1.6
Body-Top (10mm)	1	2412	802.11b	Integral	Universal	1.457	0.002	1.6
	6	2437	802.11b	Integral	Universal	/	/	1.6
	11	2462	802.11b	Integral	Universal	/	/	1.6

**Note:**

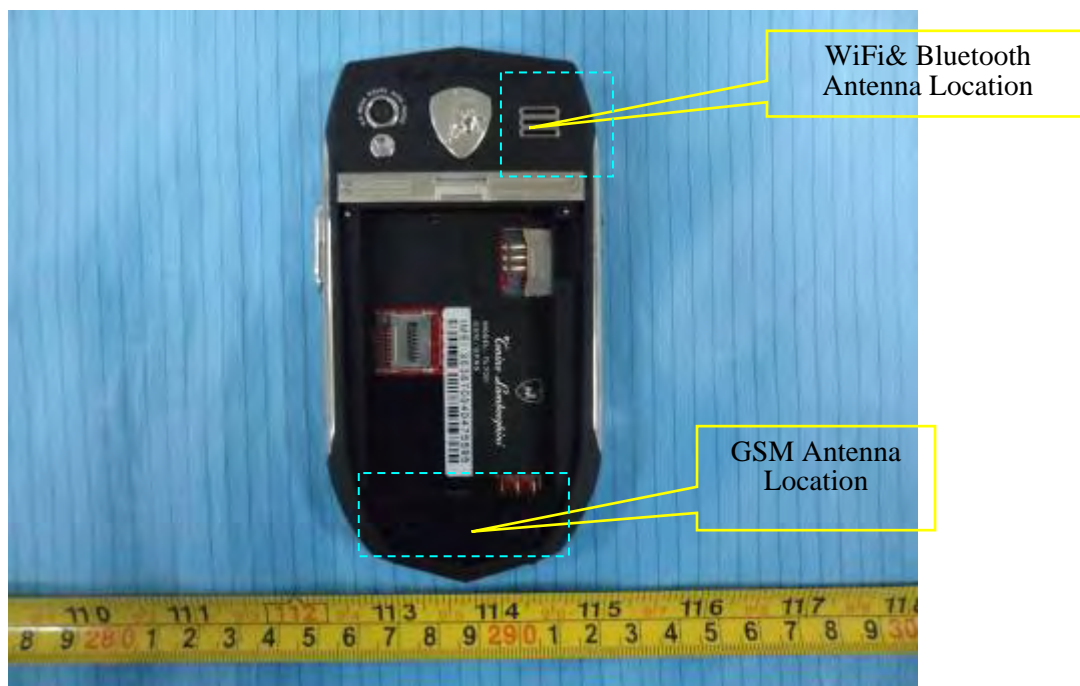
1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The SAR testing is conducted with 100% duty cycle factor.
3. The output power was tested under data rate 1Mbps for 802.11b.

## SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

### KDB 447498D01 General RF Exposure Guidance v05 KDB 648474 D04 SAR Handsets Multi Xmitter and Ant v01

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

#### WiFi & BT and GSM Antenna Location:



#### Antenna Information:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Scenario Supported?	Supported for Mobile Hot Spot	
GSM(CS Voice) + GSM(PS Data)	×	×	0.00
GSM(CS Voice) + WiFi	√	×	65.70
GSM(PS Data) + WiFi	√	√	65.70
Bluetooth + GSM	√	×	65.70
Bluetooth + WiFi	×	×	0.00

#### Standalone SAR test exclusion considerations:

##### Head Position:

Mode	Frequency (MHz)	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Threshold (1-g)	Distance (mm)	SAR Test Exclusion
GSM850	835	25.41	347.5	63.5	5	No
PCS1900	1900	19.41	87.3	33.2	5	No
Bluetooth	2450	3.77	2.4	0.8	5	Yes
WiFi	2450	12.40	17.4	5.4	5	No

Body Position:

Mode	Frequency (MHz)	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Threshold (1-g)	Distance (mm)	SAR Test Exclusion
GSM850	835	25.17	328.9	60.1	15	No
PCS1900	1900	22.17	164.8	45.4	15	No
Bluetooth	2450	3.77	2.4	0.3	15	Yes
WiFi	2450	12.40	17.4	1.8	15	Yes

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot$

$[\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

1.  $f(\text{GHz})$  is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.

#### Simultaneous SAR test exclusion considerations:

GSM with Bluetooth:

Mode	Position	Reported SAR (W/kg)		Σ SAR
		GSM	Bluetooth	
GSM850	Left Head Cheek	0.103	0.101	0.204
	Left Head Tile	0.075		0.176
	Right Head Cheek	0.107		0.208
	Right Head Tilt	0.073		0.174
	Body Front	0.139	0.034	0.173
	Body Back	0.446		0.480
PCS1900	Left Head Cheek	0.050	0.101	0.151
	Left Head Tile	0.018		0.119
	Right Head Cheek	0.051		0.152
	Right Head Tilt	0.016		0.117
	Body Front	0.051	0.034	0.085
	Body Back	0.239		0.273

Mode	Frequency (GHz)	Distance (mm)	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Estimated 1-g (W/kg)
Bluetooth Head	2.45	5	3.77	2.4	0.101
Bluetooth Body	2.45	15	3.77	2.4	0.034

## GSM with WiFi:

Mode	Position	Reported SAR (W/kg)		$\Sigma$ SAR
		GSM	Wi-Fi	
GSM850	Left Head Cheek	0.103	0.009	0.112
	Left Head Tile	0.075	0.005	0.080
	Right Head Cheek	0.107	0.015	0.122
	Right Head Tilt	0.073	0.004	0.077
	Body Front	0.139	0.003	0.142
	Body Back	0.446	0.004	0.450
PCS1900	Left Head Cheek	0.050	0.009	0.059
	Left Head Tile	0.018	0.005	0.023
	Right Head Cheek	0.051	0.015	0.066
	Right Head Tilt	0.016	0.004	0.020
	Body Front	0.051	0.003	0.054
	Body Back	0.239	0.004	0.243

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}/x]$

W/kg for test separation distances  $\leq 50$  mm;

where  $x = 7.5$  for 1-g SAR.

When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test Exclusion

**Conclusion:**

$\Sigma$ SAR  $< 1.6$  W/kg therefore simultaneous transmission SAR with Volume Scans is **not** required.



Evaluations for Simultaneous SAR, Mobile Hot Spot Positions					
Test Position	Stand Alone 1-g SAR (W/Kg)			$\sum$ 1-g SAR (W/Kg)	
	GSM 850	GSM 1900	WiFi	GSM 850+WiFi	GSM 1900+WiFi
Body-Front (1.0cm)	0.139	0.051	0.003	0.142	0.054
Body-Back (1.0cm)	0.446	0.239	0.004	0.450	0.243
Body-Left (1.0cm)	0.089	0.032	0.002	0.091	0.034
Body-Right (1.0cm)	0.052	0.017	N/A	N/A	N/A
Body-Bottom (1.0cm)	0.026	0.005	N/A	N/A	N/A

**Note:**

1. If the sum of the 1g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required.

## 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 : 0.009 W/kg  
Power Drift-Finish : 0.009W/kg  
Power Drift (%) : -1.566

#### Tissue Data

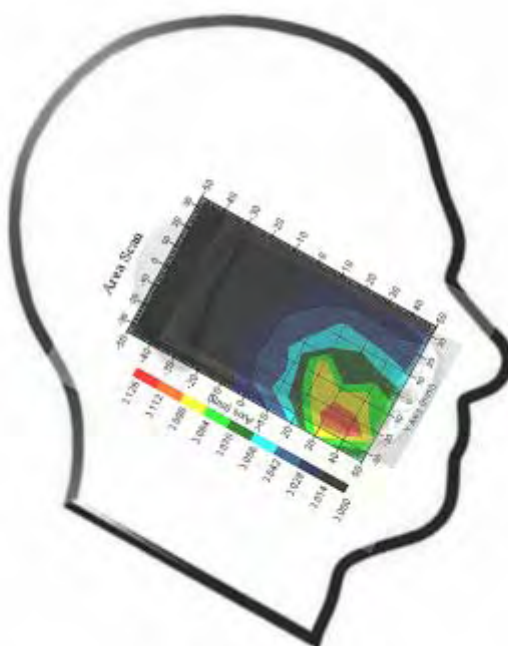
Type : Head  
Frequency : 824.20 MHz  
Epsilon : 42.23 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

#### Probe Data

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

1 gram SAR value : 0.103 W/kg  
10 gram SAR value : 0.055 W/kg  
Area Scan Peak SAR : 0.115 W/kg  
Zoom Scan Peak SAR : 0.250 W/kg

**Plot 1#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Tilt (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 : 0.003 W/kg  
Power Drift-Finish : 0.003 W/kg  
Power Drift (%) : -2.645

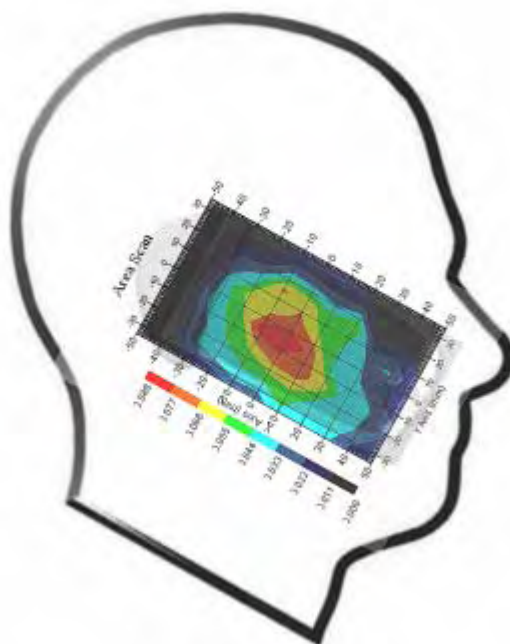
## Tissue Data

Type : Head  
Frequency : 824.20 MHz  
Epsilon : 42.23 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.075 W/kg  
10 gram SAR value : 0.047 W/kg  
Area Scan Peak SAR : 0.088 W/kg  
Zoom Scan Peak SAR : 0.163 W/kg

**Plot 2#**

**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 : 0.010 W/kg  
Power Drift-Finish : 0.010 W/kg  
Power Drift (%) : -2.018

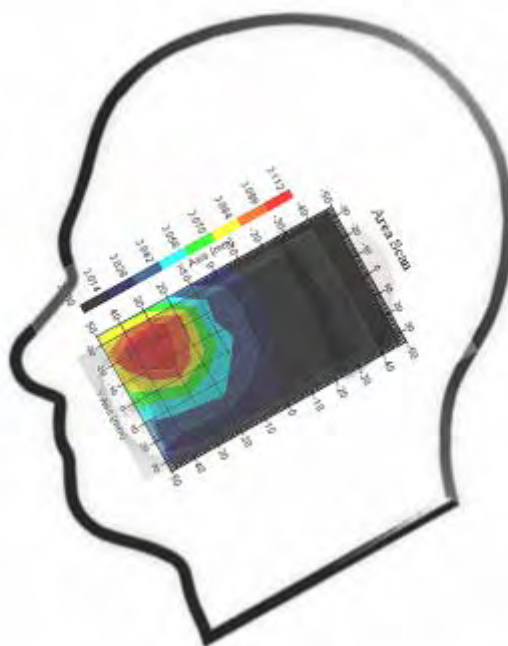
**Tissue Data**

Type : Head  
Frequency : 824.20 MHz  
Epsilon : 42.23 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

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

1 gram SAR value : 0.107 W/kg  
10 gram SAR value : 0.053 W/kg  
Area Scan Peak SAR : 0.111 W/kg  
Zoom Scan Peak SAR : 0.239 W/kg

**Plot 3#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Tilt (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 : 0.001 W/kg  
Power Drift-Finish : 0.001 W/kg  
Power Drift (%) : 2.912

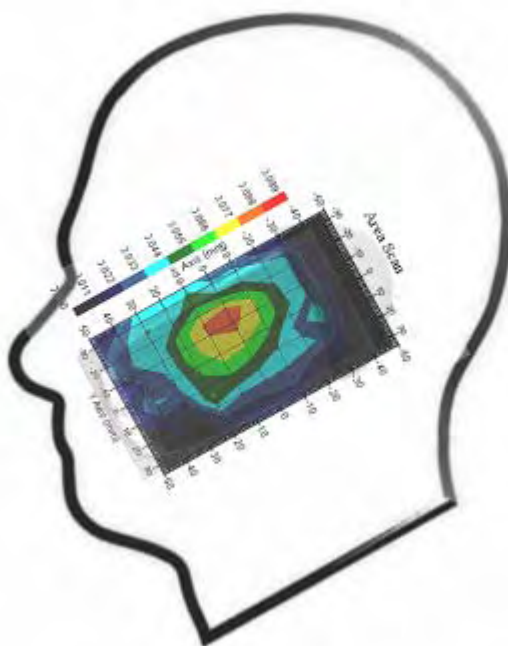
## Tissue Data

Type : Head  
Frequency : 824.20 MHz  
Epsilon : 42.23 F/m  
Sigma : 0.90 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.073 W/kg  
10 gram SAR value : 0.045 W/kg  
Area Scan Peak SAR : 0.091 W/kg  
Zoom Scan Peak SAR : 0.122 W/kg

**Plot 4#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn Front-Headset (824.2 MHz Low 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 : 0.036 W/kg  
Power Drift-Finish : 0.036 W/kg  
Power Drift (%) : -0.545

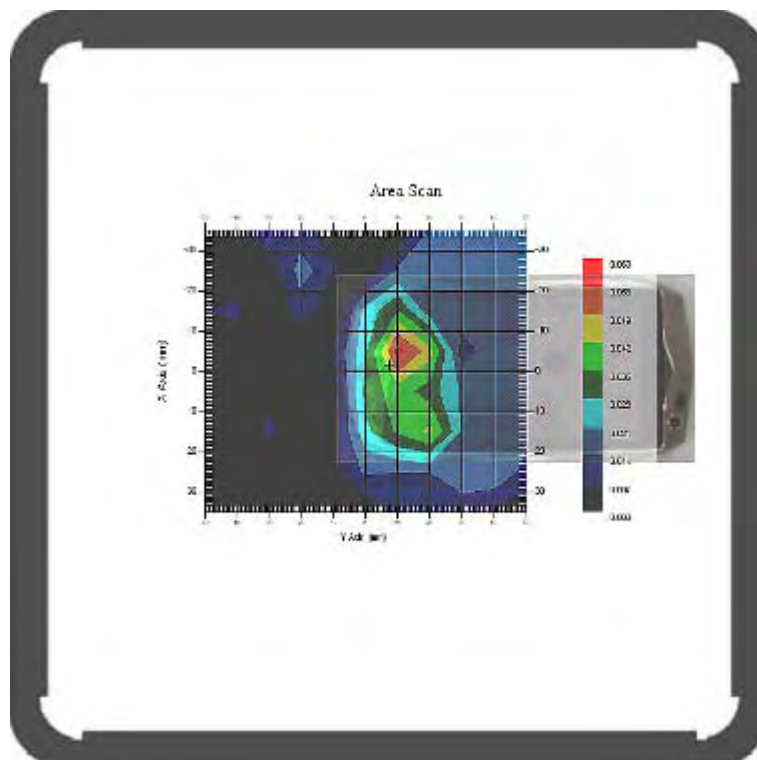
## Tissue Data

Type : Body  
Frequency : 824.20 MHz  
Epsilon : 55.12 F/m  
Sigma : 0.95 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.048 W/kg  
10 gram SAR value : 0.022 W/kg  
Area Scan Peak SAR : 0.059 W/kg  
Zoom Scan Peak SAR : 0.100 W/kg

**Plot 5#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn Back-Headset (824.2 MHz Low 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 : 0.209 W/kg  
Power Drift-Finish : 0.215 W/kg  
Power Drift (%) : 2.854

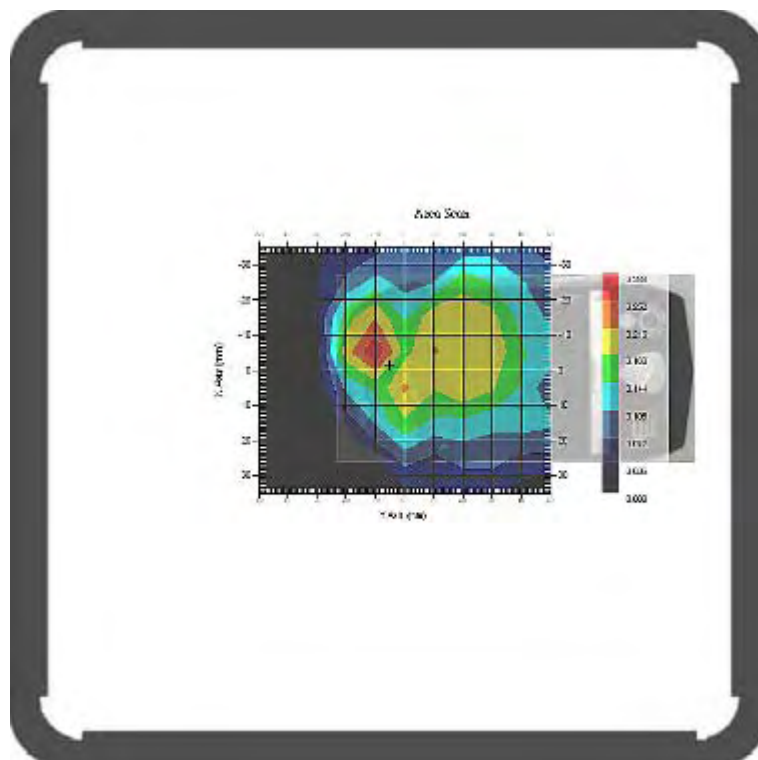
**Tissue Data**

Type : Body  
Frequency : 824.20 MHz  
Epsilon : 55.12 F/m  
Sigma : 0.95 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

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

1 gram SAR value : 0.227 W/kg  
10 gram SAR value : 0.136 W/kg  
Area Scan Peak SAR : 0.284 W/kg  
Zoom Scan Peak SAR : 0.510 W/kg

**Plot 6#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (1850.2 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 : 0.004 W/kg  
Power Drift-Finish : 0.004 W/kg  
Power Drift (%) : -2.186

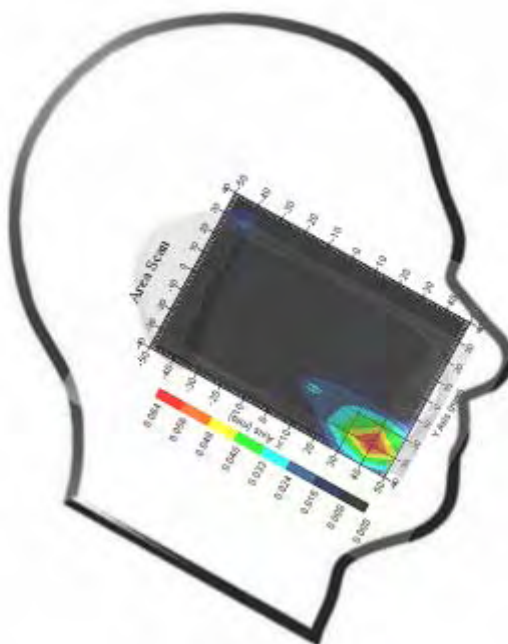
## Tissue Data

Type : Head  
Frequency : 1850.20 MHz  
Epsilon : 40.21 F/m  
Sigma : 1.41 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.050 W/kg  
10 gram SAR value : 0.022 W/kg  
Area Scan Peak SAR : 0.064 W/kg  
Zoom Scan Peak SAR : 0.104 W/kg

**Plot 7#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Tilt (1850.2 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 : 0.001 W/kg  
Power Drift-Finish : 0.001 W/kg  
Power Drift (%) : -1.898

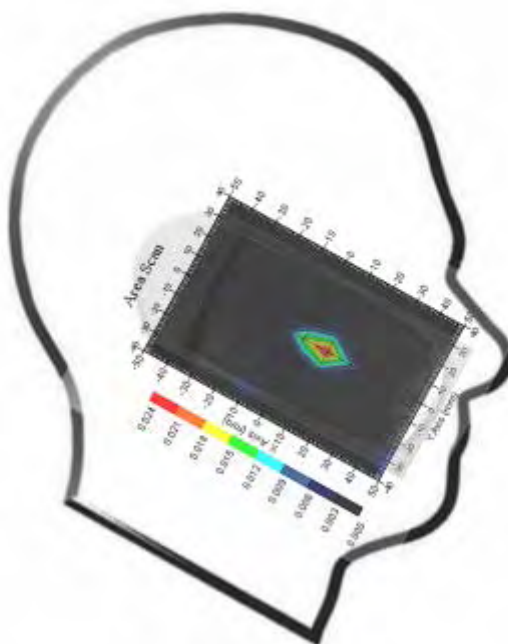
## Tissue Data

Type : Head  
Frequency : 1850.20 MHz  
Epsilon : 40.21 F/m  
Sigma : 1.41 S/m  
Density : 1000.00 kg/cu. M

## Probe Data

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

1 gram SAR value : 0.018 W/kg  
10 gram SAR value : 0.008 W/kg  
Area Scan Peak SAR : 0.021 W/kg  
Zoom Scan Peak SAR : 0.070 W/kg

**Plot 8#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Cheek (1850.2 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 : 0.002 W/kg  
Power Drift-Finish : 0.002W/kg  
Power Drift (%) : -3.661

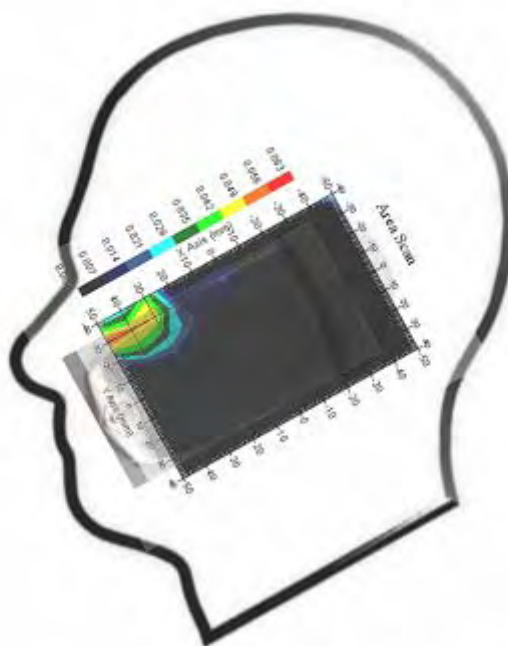
## Tissue Data

Type : Head  
Frequency : 1850.20 MHz  
Epsilon : 40.21 F/m  
Sigma : 1.41 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.051 W/kg  
10 gram SAR value : 0.023 W/kg  
Area Scan Peak SAR : 0.060 W/kg  
Zoom Scan Peak SAR : 0.099 W/kg

**Plot 9#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Tilt (1850.2 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 : 0.001 W/kg  
Power Drift-Finish : 0.001 W/kg  
Power Drift (%) : 2.252

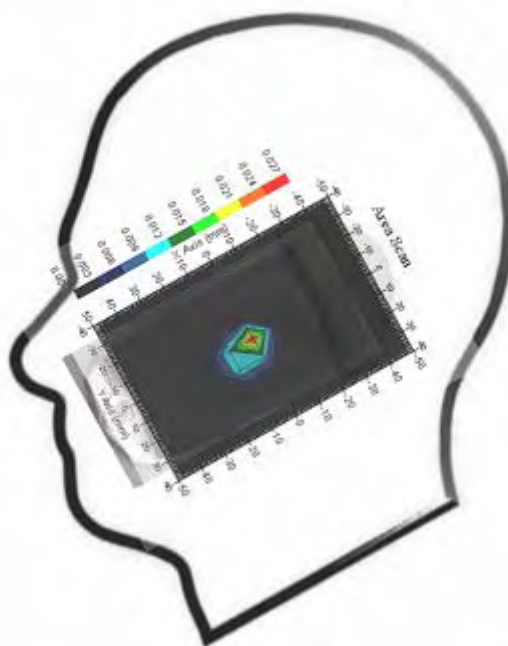
## Tissue Data

Type : Head  
Frequency : 1850.20 MHz  
Epsilon : 40.21 F/m  
Sigma : 1.41 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.016 W/kg  
10 gram SAR value : 0.007 W/kg  
Area Scan Peak SAR : 0.026 W/kg  
Zoom Scan Peak SAR : 0.061 W/kg

**Plot 10#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body- worn Front-Headset (1850.2 MHz Low 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 : 0.018 W/kg  
Power Drift-Finish : 0.018 W/kg  
Power Drift (%) : -2.616

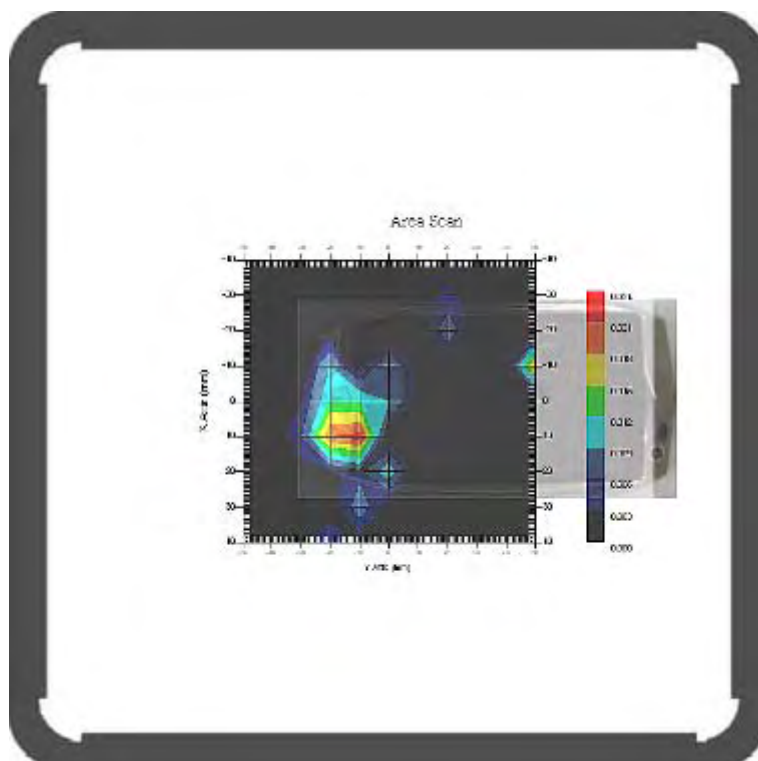
## Tissue Data

Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.89 F/m  
Sigma : 1.48 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.020 W/kg  
10 gram SAR value : 0.009 W/kg  
Area Scan Peak SAR : 0.023 W/kg  
Zoom Scan Peak SAR : 0.044 W/kg

**Plot 11#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body- worn Back- Headset (1850.2 MHz Low Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.088 W/kg  
Power Drift-Finish : 0.089 W/kg  
Power Drift (%) : 1.127

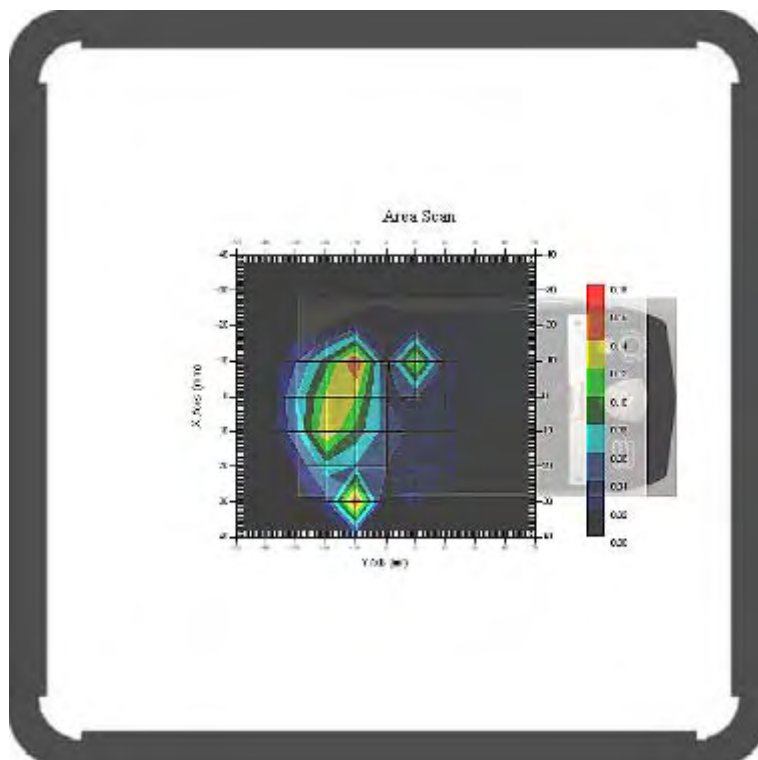
**Tissue Data**

Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.89 F/m  
Sigma : 1.48 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

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

1 gram SAR value : 0.131 W/kg  
10 gram SAR value : 0.059 W/kg  
Area Scan Peak SAR : 0.162 W/kg  
Zoom Scan Peak SAR : 0.260 W/kg

**Plot 12#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (2412 MHz Low Channel)**

## Measurement Data

Crest Factor : 1  
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 : 0.009 W/kg  
Power Drift-Finish : 0.008 W/kg  
Power Drift (%) : -2.855

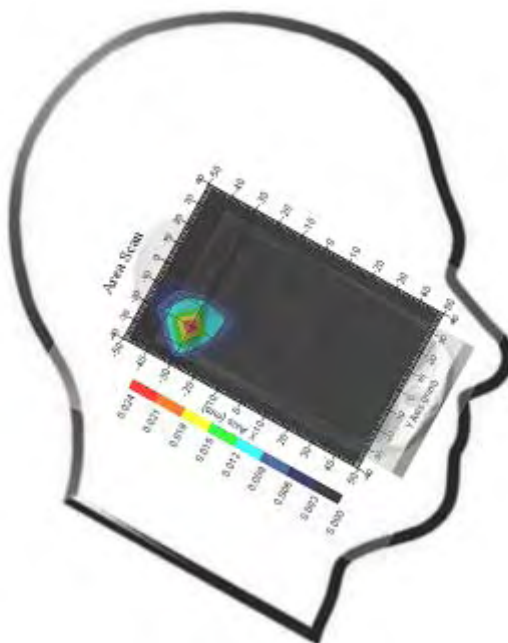
## Tissue Data

Type : Head  
Frequency : 2412.00 MHz  
Epsilon : 39.57 F/m  
Sigma : 1.81 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.017 W/kg  
10 gram SAR value : 0.009 W/kg  
Area Scan Peak SAR : 0.020 W/kg  
Zoom Scan Peak SAR : 0.041 W/kg

**Plot 13#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Tilt (2412 MHz Low Channel)**

## Measurement Data

Crest Factor : 1  
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 : 0.005 W/kg  
Power Drift-Finish : 0.005 W/kg  
Power Drift (%) : -3.608

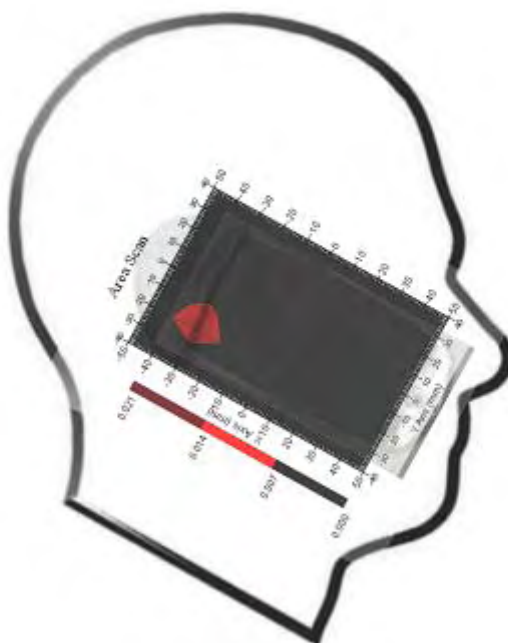
## Tissue Data

Type : Head  
Frequency : 2412.00 MHz  
Epsilon : 39.57 F/m  
Sigma : 1.81 S/m  
Density : 1000.00 kg/cu. M

## Probe Data

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.012 W/kg  
10 gram SAR value : 0.005 W/kg  
Area Scan Peak SAR : 0.017 W/kg  
Zoom Scan Peak SAR : 0.029 W/kg

**Plot 14#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Cheek (2412 MHz Low Channel)****Measurement Data**

Crest Factor : 1  
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 : 0.007 W/kg  
Power Drift-Finish : 0.007W/kg  
Power Drift (%) : -2.940

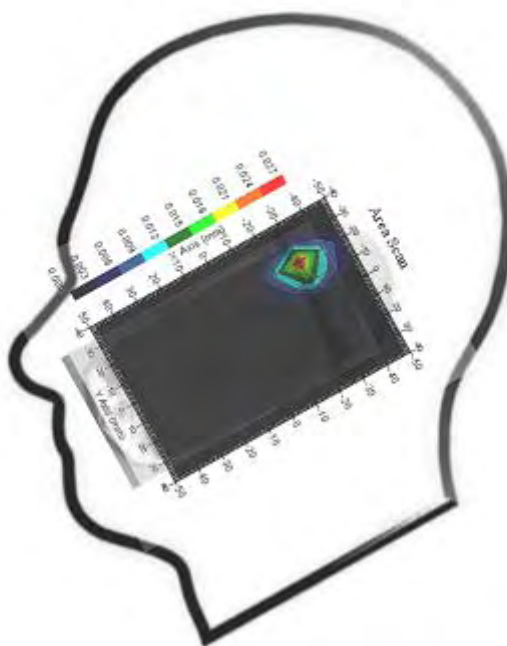
**Tissue Data**

Type : Head  
Frequency : 2412.00 MHz  
Epsilon : 39.57 F/m  
Sigma : 1.81 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.020 W/kg  
10 gram SAR value : 0.015 W/kg  
Area Scan Peak SAR : 0.022 W/kg  
Zoom Scan Peak SAR : 0.034 W/kg

**Plot 15#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Right Head Tilt (2412 MHz Low Channel)**

## Measurement Data

Crest Factor : 1  
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 : 0.003 W/kg  
Power Drift-Finish : 0.003 W/kg  
Power Drift (%) : 1.527

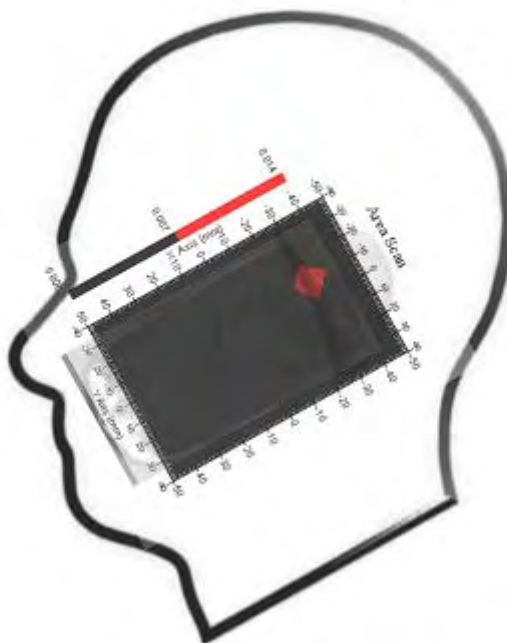
## Tissue Data

Type : Head  
Frequency : 2412 MHz  
Epsilon : 39.57 F/m  
Sigma : 1.81 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.009 W/kg  
10 gram SAR value : 0.004 W/kg  
Area Scan Peak SAR : 0.011 W/kg  
Zoom Scan Peak SAR : 0.020 W/kg

**Plot 16#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body-worn-Front (824.2 MHz Low Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.100W/kg  
Power Drift-Finish : 0.098 W/kg  
Power Drift (%) : -2.037

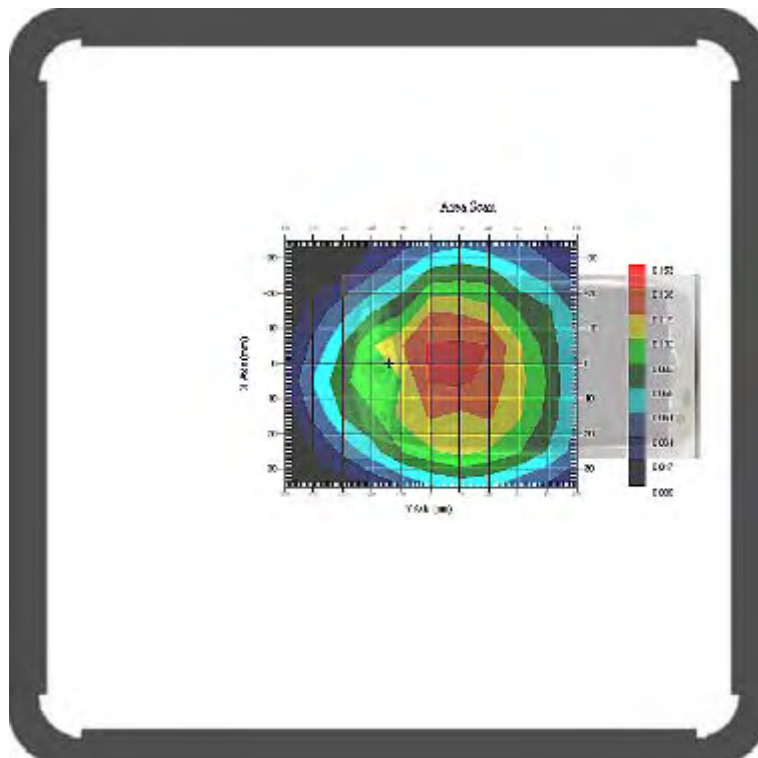
## Tissue Data

Type : Body  
Frequency : 824.20 MHz  
Epsilon : 55.12 F/m  
Sigma : 0.95 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.139 W/kg  
10 gram SAR value : 0.088 W/kg  
Area Scan Peak SAR : 0.152 W/kg  
Zoom Scan Peak SAR : 0.273 W/kg

**Plot 17#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body-worn-Back (824.2 MHz Low Channel)****Measurement Data**

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.429 W/kg  
Power Drift-Finish : 0.434 W/kg  
Power Drift (%) : 1.182

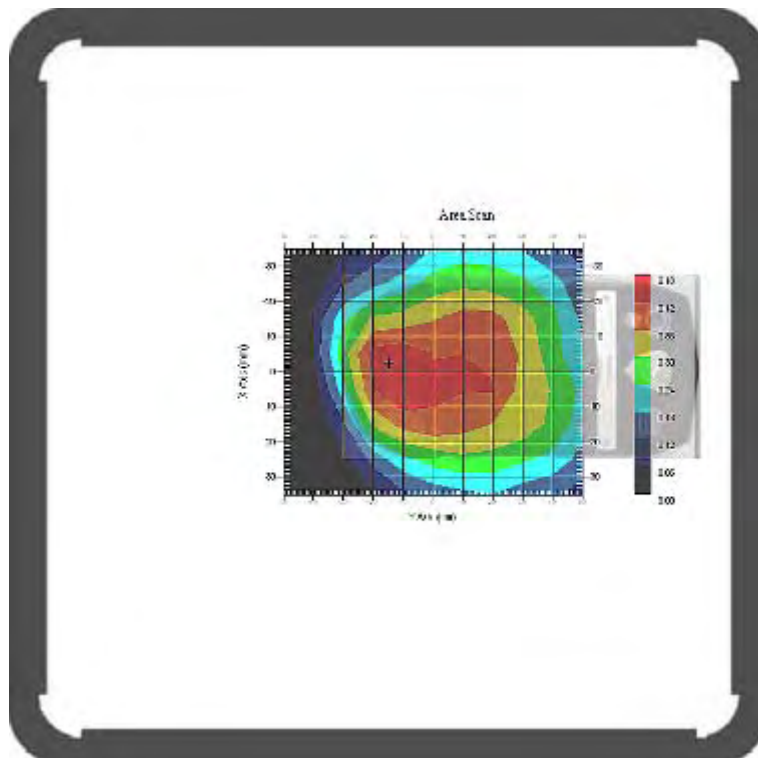
**Tissue Data**

Type : Body  
Frequency : 824.20 MHz  
Epsilon : 55.12 F/m  
Sigma : 0.95 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

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

1 gram SAR value : 0.446 W/kg  
10 gram SAR value : 0.257 W/kg  
Area Scan Peak SAR : 0.476 W/kg  
Zoom Scan Peak SAR : 0.600 W/kg

**Plot 18#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body-worn-Left (824.2 MHz Low Channel)****Measurement Data**

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.087 W/kg  
Power Drift-Finish : 0.085 W/kg  
Power Drift (%) : -2.347

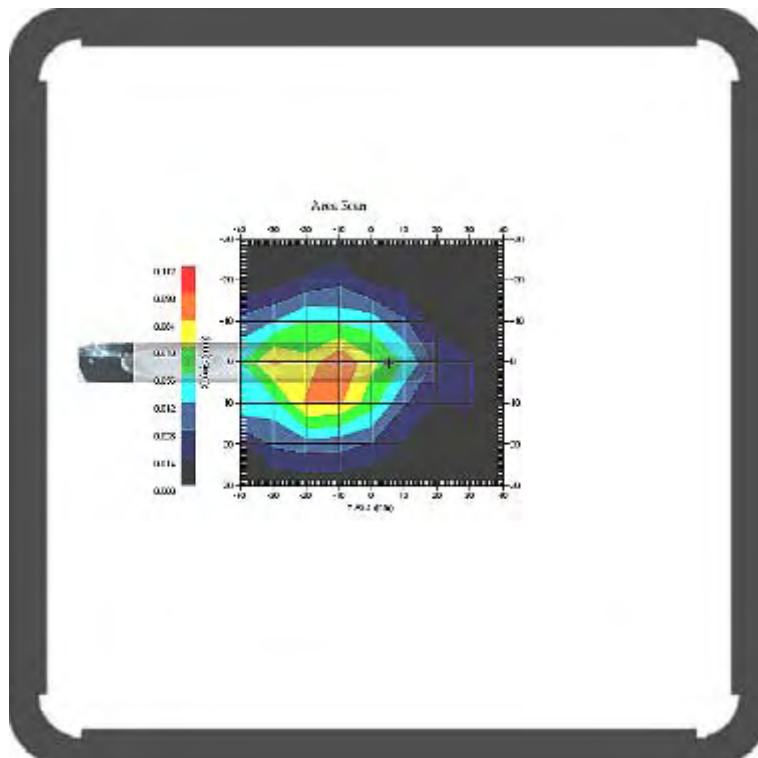
**Tissue Data**

Type : Body  
Frequency : 824.20 MHz  
Epsilon : 55.12 F/m  
Sigma : 0.95 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

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

1 gram SAR value : 0.089 W/kg  
10 gram SAR value : 0.045 W/kg  
Area Scan Peak SAR : 0.099 W/kg  
Zoom Scan Peak SAR : 0.200 W/kg

**Plot 19#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body-worn-Right (824.2 MHz Low Channel)****Measurement Data**

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.044 W/kg  
Power Drift-Finish : 0.045 W/kg  
Power Drift (%) : 2.266

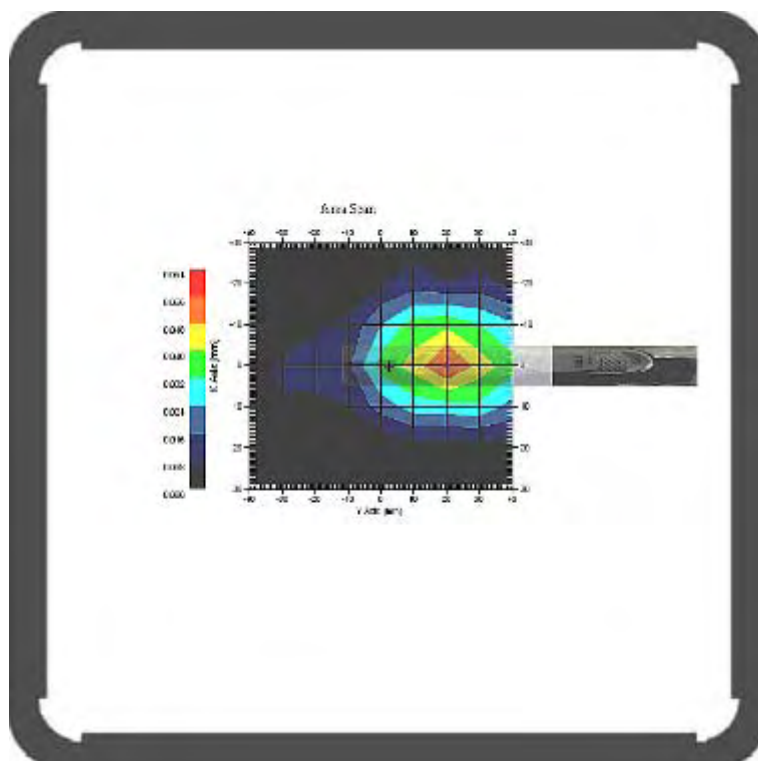
**Tissue Data**

Type : Body  
Frequency : 824.20 MHz  
Epsilon : 55.12 F/m  
Sigma : 0.95 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

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

1 gram SAR value : 0.052 W/kg  
10 gram SAR value : 0.023 W/kg  
Area Scan Peak SAR : 0.058 W/kg  
Zoom Scan Peak SAR : 0.102 W/kg

**Plot 20#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body-worn-Bottom (824.2 MHz Low Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.020 W/kg  
Power Drift-Finish : 0.020 W/kg  
Power Drift (%) : -0.848

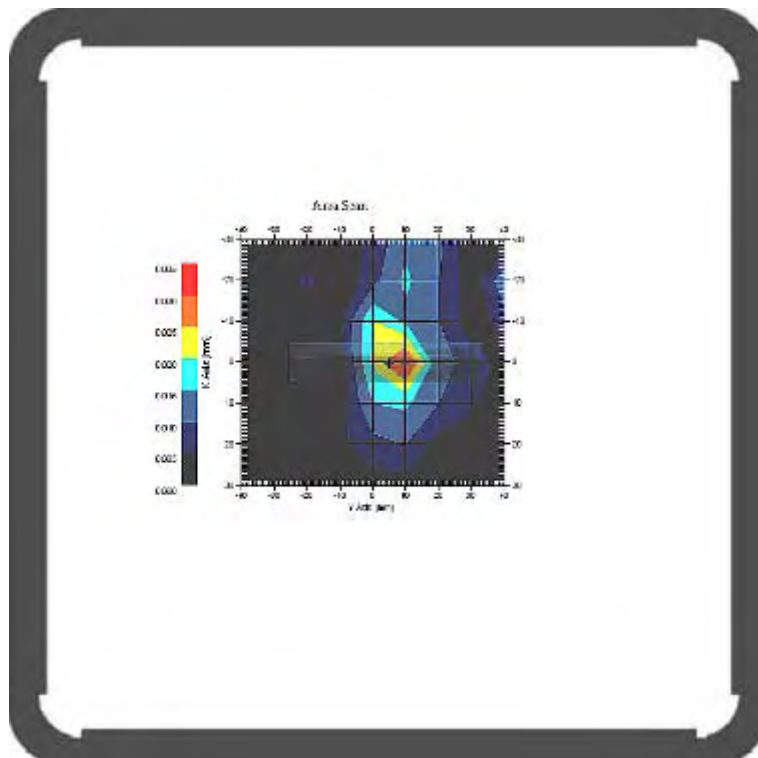
## Tissue Data

Type : Body  
Frequency : 824.20 MHz  
Epsilon : 55.12 F/m  
Sigma : 0.95 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

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

1 gram SAR value : 0.026 W/kg  
10 gram SAR value : 0.012 W/kg  
Area Scan Peak SAR : 0.032 W/kg  
Zoom Scan Peak SAR : 0.044 W/kg

**Plot 21#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body- worn Front (1850.2 MHz Low Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.045 W/kg  
Power Drift-Finish : 0.045 W/kg  
Power Drift (%) : -0.574

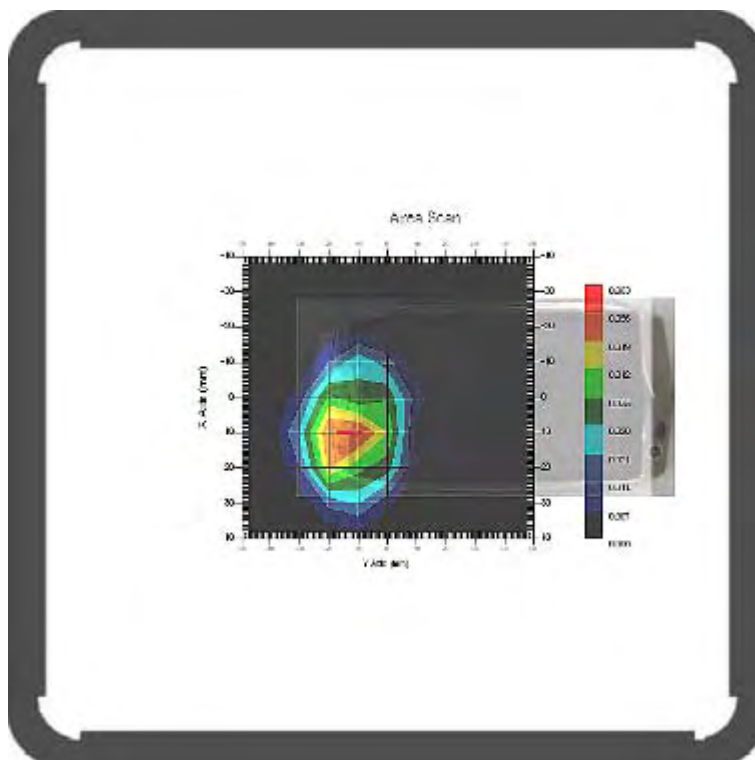
## Tissue Data

Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.89 F/m  
Sigma : 1.48 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 4  
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 : 0.051 W/kg  
10 gram SAR value : 0.024 W/kg  
Area Scan Peak SAR : 0.058 W/kg  
Zoom Scan Peak SAR : 0.110 W/kg

**Plot 22#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body- worn Back (1850.2 MHz Low Channel)****Measurement Data**

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.240 W/kg  
Power Drift-Finish : 0.236 W/kg  
Power Drift (%) : -1.850

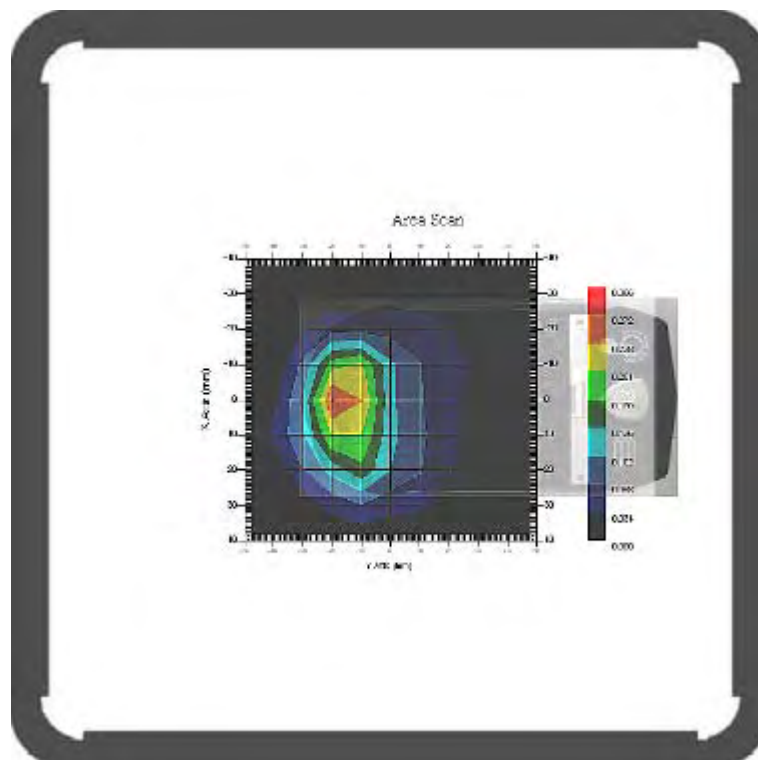
**Tissue Data**

Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.89 F/m  
Sigma : 1.48 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 4  
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 : 0.239 W/kg  
10 gram SAR value : 0.109 W/kg  
Area Scan Peak SAR : 0.276 W/kg  
Zoom Scan Peak SAR : 0.420 W/kg

**Plot 23#**



**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body- worn-Left (1850.2 MHz Low Channel)****Measurement Data**

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 7x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.012 W/kg  
Power Drift-Finish : 0.012 W/kg  
Power Drift (%) : 2.940

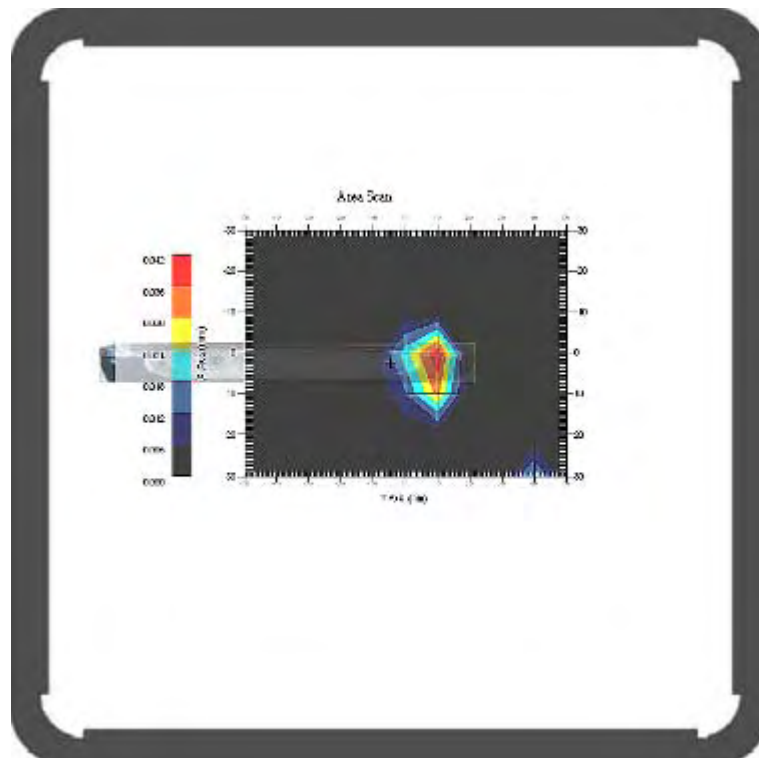
**Tissue Data**

Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.89 F/m  
Sigma : 1.48 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 4  
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 : 0.032 W/kg  
10 gram SAR value : 0.015 W/kg  
Area Scan Peak SAR : 0.042 W/kg  
Zoom Scan Peak SAR : 0.075 W/kg

**Plot 24#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body- worn-Right (1850.2 MHz Low Channel)****Measurement Data**

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 7x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.019 W/kg  
Power Drift-Finish : 0.019 W/kg  
Power Drift (%) : -2.557

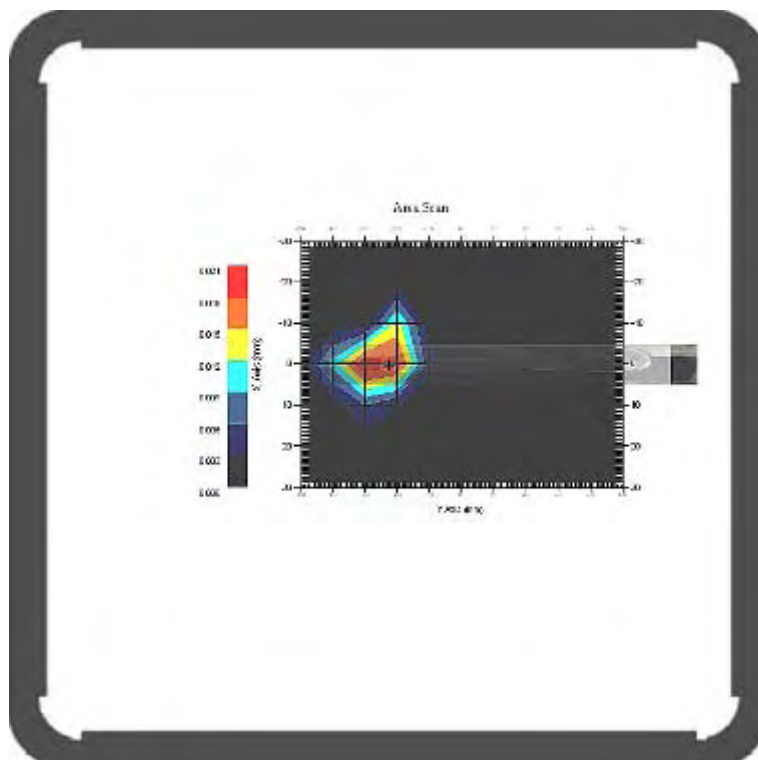
**Tissue Data**

Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.89 F/m  
Sigma : 1.48 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 4  
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 : 0.017 W/kg  
10 gram SAR value : 0.008 W/kg  
Area Scan Peak SAR : 0.021 W/kg  
Zoom Scan Peak SAR : 0.067 W/kg

**Plot 25#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: Body- worn-Bottom (1850.2 MHz Low Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 4  
Scan Type : Complete  
Area Scan : 7x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.002 W/kg  
Power Drift-Finish : 0.002 W/kg  
Power Drift (%) : -3.050

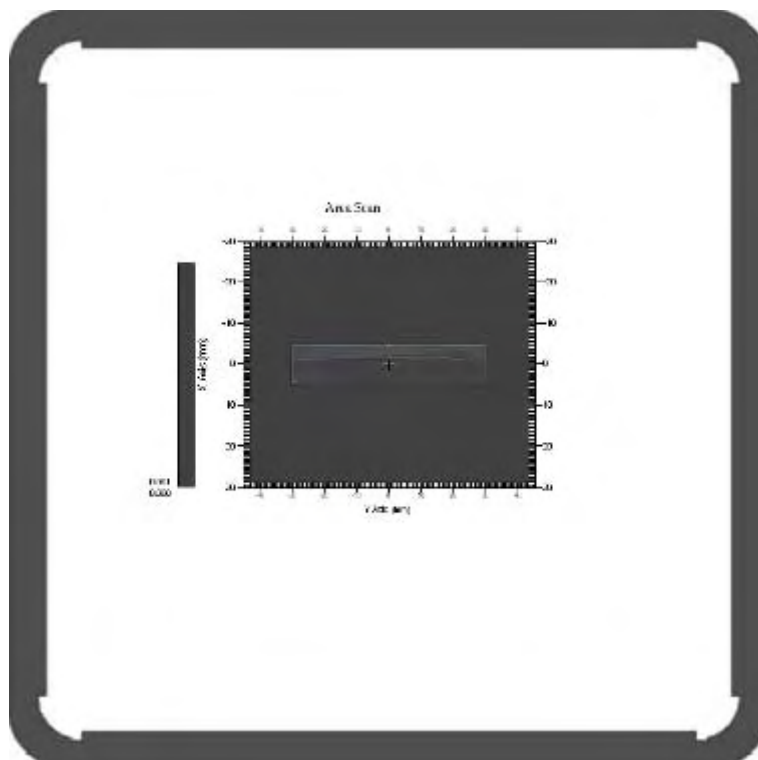
## Tissue Data

Type : Body  
Frequency : 1850.20 MHz  
Epsilon : 53.89 F/m  
Sigma : 1.48 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 4  
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 : 0.005 W/kg  
10 gram SAR value : 0.002 W/kg  
Area Scan Peak SAR : 0.009 W/kg  
Zoom Scan Peak SAR : 0.025 W/kg

**Plot 26#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: 802.11b; Body-Worn-Front (2412 MHz Channel 1)****Measurement Data**

Crest Factor : 1  
Scan Type : Complete  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.001 W/kg  
Power Drift-Finish : 0.001 W/kg  
Power Drift (%) : -2.221

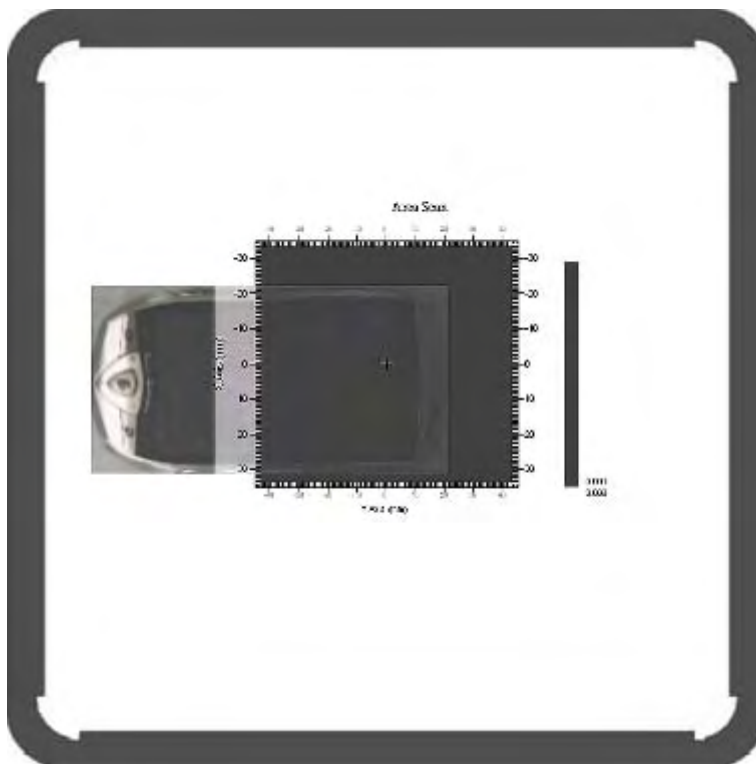
**Tissue Data**

Type : Body  
Frequency : 2412 MHz  
Epsilon : 52.84 F/m  
Sigma : 1.92 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.003 W/kg  
10 gram SAR value : 0.001 W/kg  
Area Scan Peak SAR : 0.005 W/kg  
Zoom Scan Peak SAR : 0.008 W/kg

**Plot 27#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: 802.11b; Body- Worn-Back (2412 MHz Channel 1)**

## Measurement Data

Crest Factor : 1  
Scan Type : Complete  
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.001 W/kg  
Power Drift-Finish : 0.001 W/kg  
Power Drift (%) : -1.099

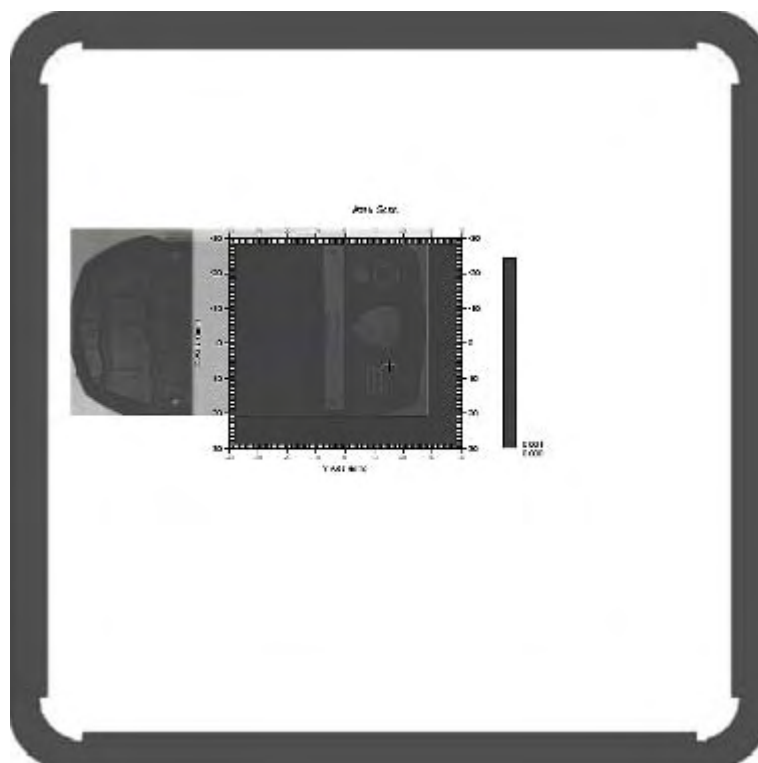
## Tissue Data

Type : Body  
Frequency : 2412 MHz  
Epsilon : 52.84 F/m  
Sigma : 1.92 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.004 W/kg  
10 gram SAR value : 0.002 W/kg  
Area Scan Peak SAR : 0.007 W/kg  
Zoom Scan Peak SAR : 0.009 W/kg

**Plot 28#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: 802.11b; Body- Worn-Left (2412 MHz Channel 1)****Measurement Data**

Crest Factor : 1  
Scan Type : Complete  
Area Scan : 6x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.001 W/kg  
Power Drift-Finish : 0.001 W/kg  
Power Drift (%) : -4.019

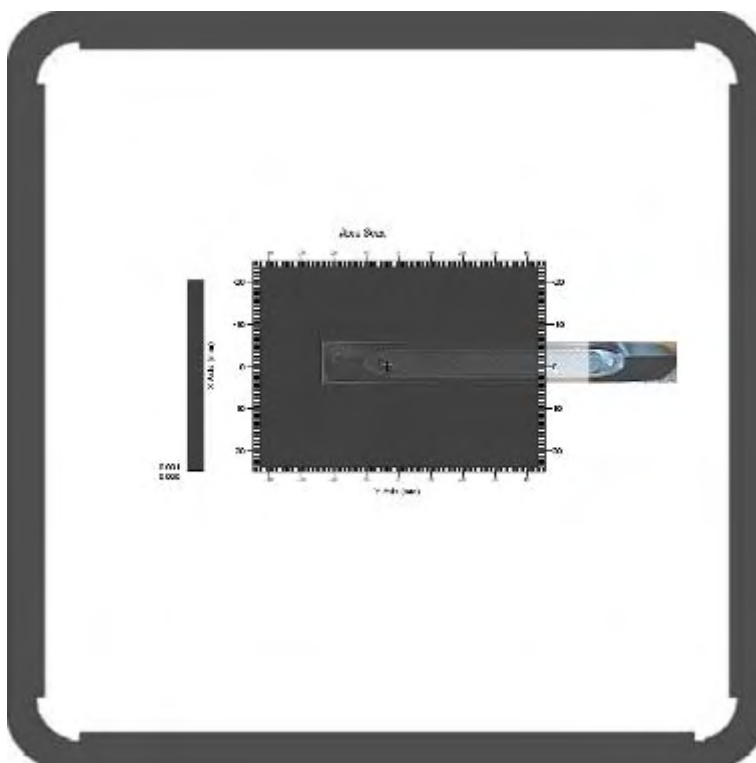
**Tissue Data**

Type : Body  
Frequency : 2412 MHz  
Epsilon : 52.84 F/m  
Sigma : 1.92 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.002 W/kg  
10 gram SAR value : 0.001 W/kg  
Area Scan Peak SAR : 0.004 W/kg  
Zoom Scan Peak SAR : 0.007 W/kg

**Plot 29#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Hot Spot: 802.11b; Body- Worn-Top (2412 MHz Channel 1)****Measurement Data**

Crest Factor : 1  
Scan Type : Complete  
Area Scan : 6x10x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.001 W/kg  
Power Drift-Finish : 0.001 W/kg  
Power Drift (%) : 1.457

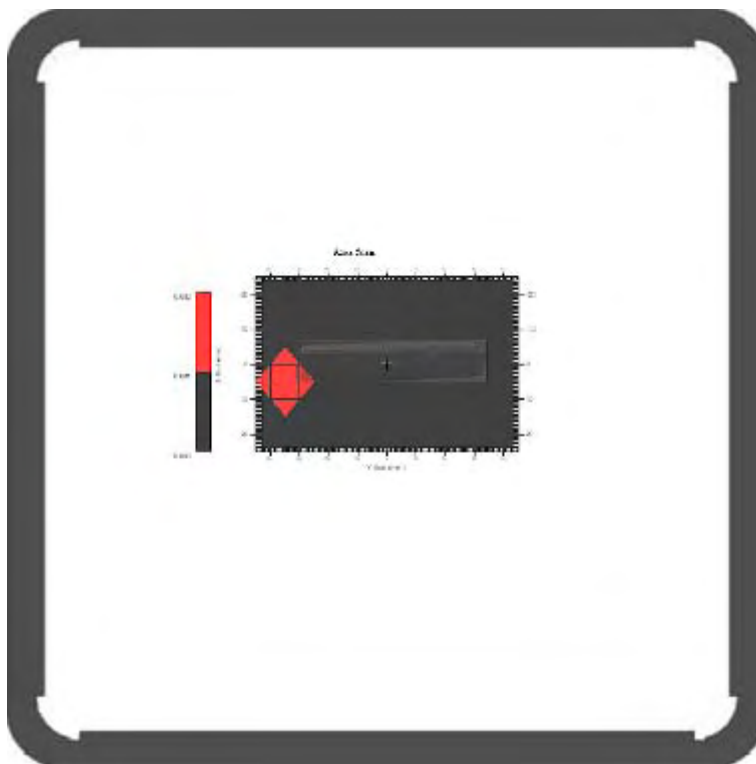
**Tissue Data**

Type : Body  
Frequency : 2412 MHz  
Epsilon : 52.84 F/m  
Sigma : 1.92 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
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 : 0.002 W/kg  
10 gram SAR value : 0.001 W/kg  
Area Scan Peak SAR : 0.002 W/kg  
Zoom Scan Peak SAR : 0.005 W/kg

**Plot 30#**

## APPENDIX A – MEASUREMENT UNCERTAINTY

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

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

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_1^1$ (1-g)	$c_1^1$ (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
<b>Measurement System</b>							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.006	rectangular	$\sqrt{3}$	1	1	0.003	0.003
RF Ambient Condition - Reflections	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech. Restrictions	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
<b>Restriction</b>							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test Sample Positioning	0.023	normal	1	1	1	0.023	0.023
Device Holder Uncertainty	6.215	normal	1	1	1	6.215	6.215
Drift of Output Power	4.627	rectangular	$\sqrt{3}$	1	1	2.67	2.67
<b>Phantom and Setup</b>							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	5.0	rectangular	$\sqrt{3}$	0.7	0.5	2.0	1.4
Liquid Conductivity(meas.)	1.938	normal	1	0.7	0.5	1.36	0.97
Liquid Permittivity(target)	5.0	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	3.093	normal	1	0.6	0.5	1.86	1.55
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10



## APPENDIX B – PROBE CALIBRATION CERTIFICATES

### NCL CALIBRATION LABORATORIES

Calibration File No.: 1427-1430

Client.: BACL Lab

## CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe

Record of Calibration

Head and Body

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 500-00283

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

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

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

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



Art Brennan, Quality Manager

### **NCL** CALIBRATION LABORATORIES

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

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

**NCL Calibration Laboratories**

Division of APREL Inc.

**Introduction**

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

**Calibration Method**

Probes are calibrated using the following methods.

<1000MHz

TEM Cell for sensitivity in air

Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz

Waveguide\* method to determine sensitivity in air and tissue

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

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

**References**

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

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Page 2 of 10

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

**NCL Calibration Laboratories**

Division of APREL Inc.

**Conditions**

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

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

**Primary Measurement Standards**

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

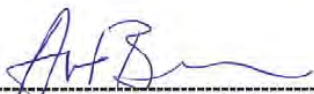
**Secondary Measurement Standards**


Signal Generator Agilent E4438C -506 MY55182336 June 7, 2013

**Attestation**

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

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

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

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

**NCL Calibration Laboratories**

Division of APREL Inc.

**Probe Summary**

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

\*Resistive to recommended tissue recipes per IEEE-1528

**Sensitivity in Air**

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



**NCL Calibration Laboratories**

Division of APREL Inc.

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

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

Page 5 of 10

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

**NCL Calibration Laboratories**

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Division of APREL Inc.

**Boundary Effect:**

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

**Spatial Resolution:**

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

**DAQ-PAQ Contribution**

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

**Boundary Effect:**

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

**NOTES:**

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

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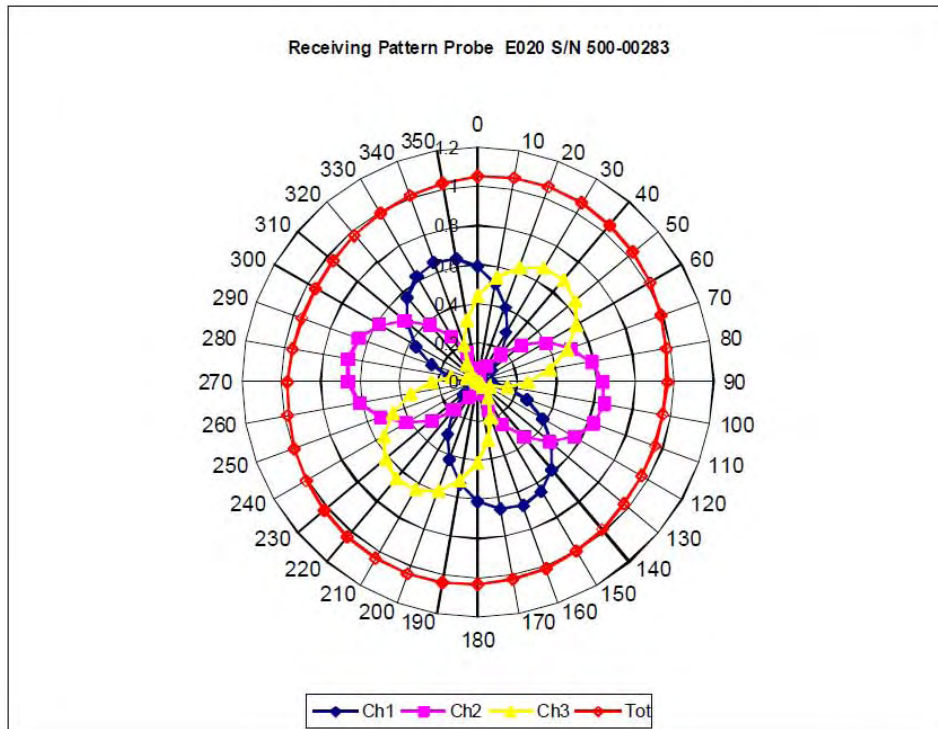
Page 6 of 10

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## NCL Calibration Laboratories

Division of APREL Inc.

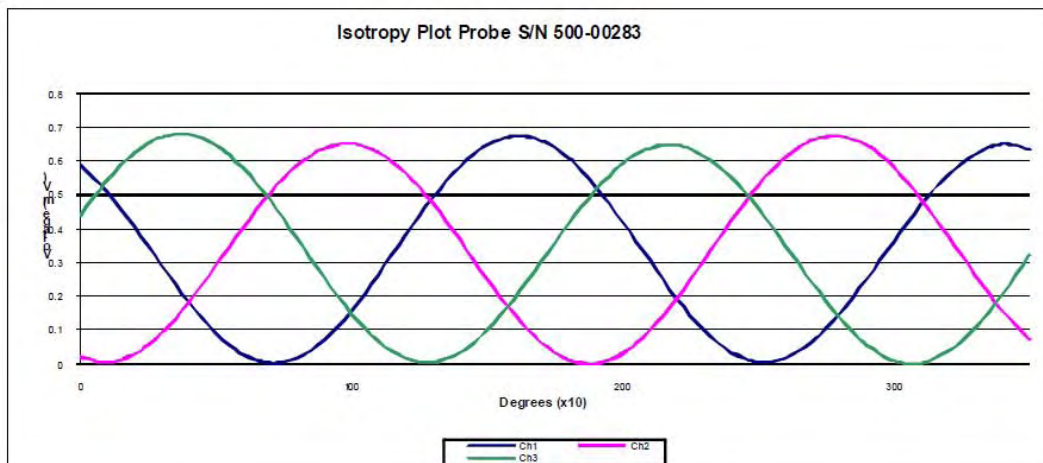
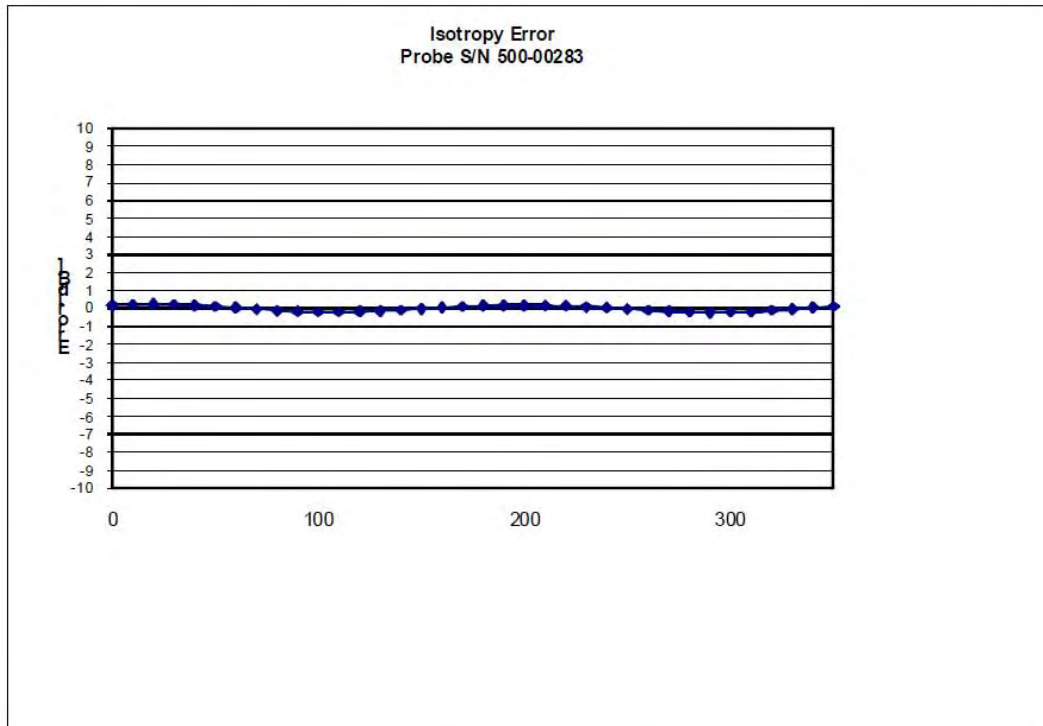
### Receiving Pattern Air



## NCL Calibration Laboratories

Division of APREL Inc.

### Isotropy Error Air



**Isotropy Tissue:**

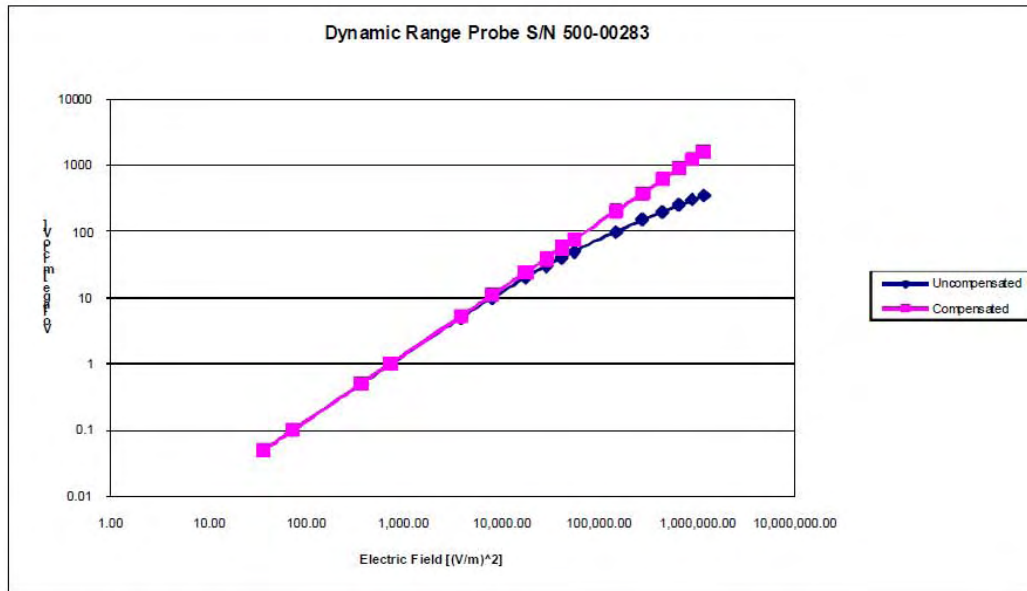
0.10 dB



## NCL Calibration Laboratories

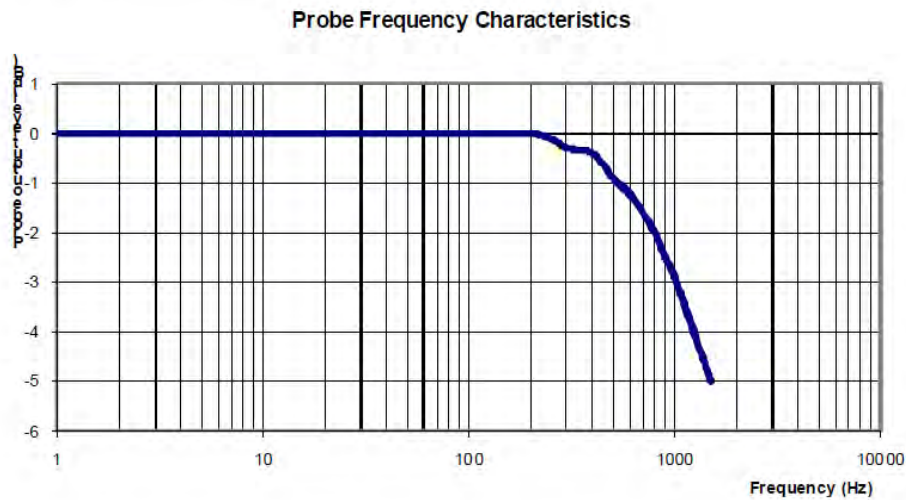
Division of APREL Inc.

## Dynamic Range



**NCL Calibration Laboratories**

Division of APREL Inc.

**Video Bandwidth**

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

**Test Equipment**

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

## APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

### NCL CALIBRATION LABORATORIES

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

## CERTIFICATE OF CALIBRATION

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

Validation Dipole(Head and Body)

Manufacturer: APREL Laboratories

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

Frequency: 835 MHz

Serial No: 180-00558

Customer: Bay Area Compliance Laboratory

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

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

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

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

**NCL** CALIBRATION LABORATORIES

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

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

**NCL Calibration Laboratories**

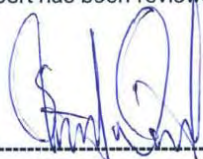
Division of APREL Laboratories.

**Conditions**

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

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

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



Stuart Nicol



C. Teodorian

**Primary Measurement Standards**

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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Calibration Results Summary**

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

**Mechanical Dimensions**

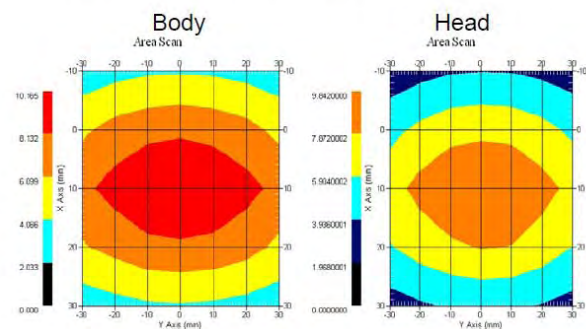
**Length:** 162.2 mm  
**Height:** 89.4 mm

**Electrical Specification**

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

**System Validation Results**

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



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3

**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.

4



**NCL Calibration Laboratories**

Division of APREL Laboratories.

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

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

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

**Tissue Validation**

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

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5

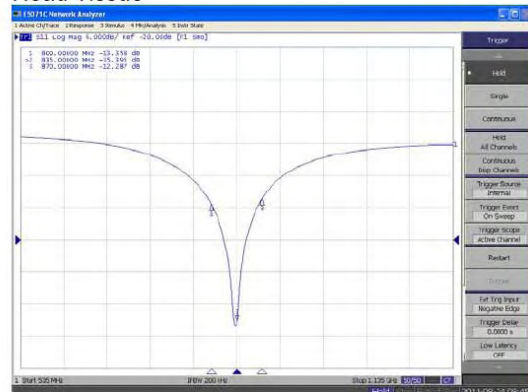
# **NCL Calibration Laboratories**

Division of APREL Laboratories.

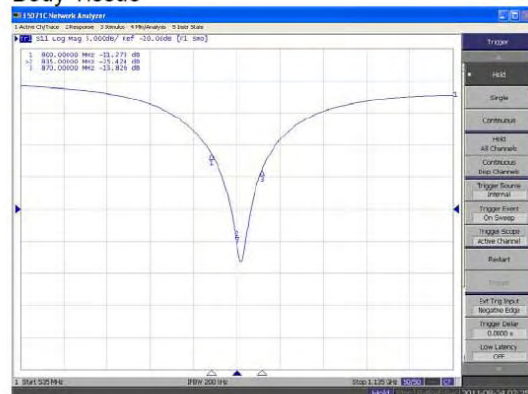
The Following Graphs are the results as displayed on the Vector Network Analyzer.

## **S11 Parameter Return Loss**

### **Head Tissue**



### **Body Tissue**



6

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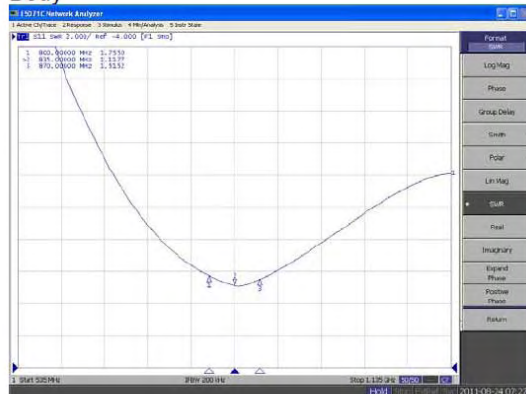
## NCL Calibration Laboratories

Division of APREL Laboratories.

### SWR Head



### Body

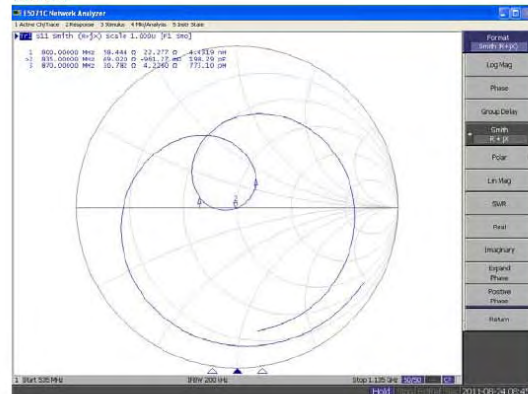
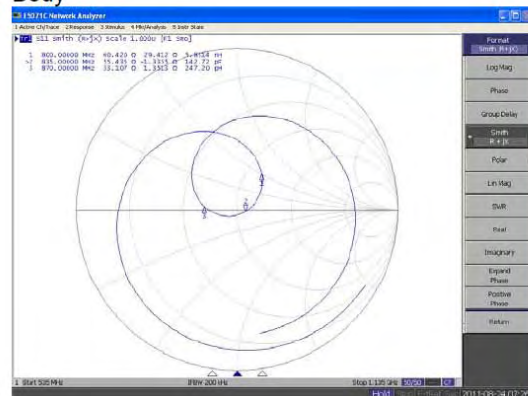


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7

**NCL Calibration Laboratories**

Division of APREL Laboratories.

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

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

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

### Mechanical Verification

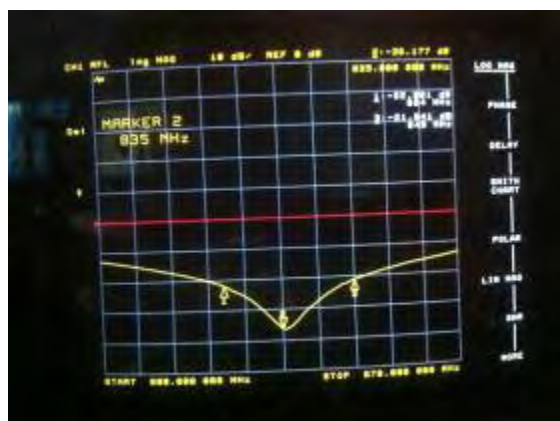
APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	161.2 mm	89.5 mm

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

### Test Graphs:

#### Head Tissue

Return Loss :

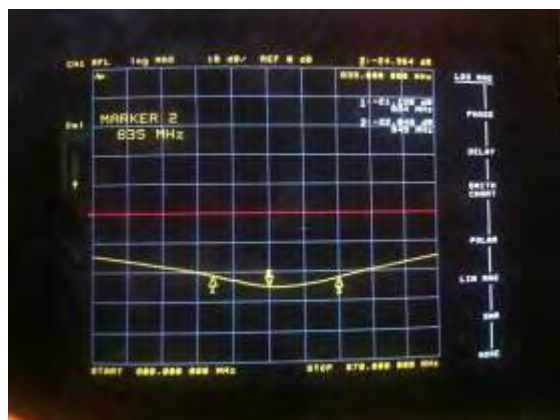


Impedance :



#### Body Tissue

Return Loss :



Impedance :



## NCL CALIBRATION LABORATORIES

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

# CERTIFICATE OF CALIBRATION

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

Validation Dipole (Head & Body)

Manufacturer: APREL Laboratories

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

Frequency: 1900 MHz

Serial No: 210-00710

Customer: Bay Area Compliance Laboratory

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

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

Released By: 

**NCL** CALIBRATION LABORATORIES

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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.


**Conditions**

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

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

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

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



Stuart Nicol



C. Teodorian

**Primary Measurement Standards**

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

**Secondary Measurement Standards**

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

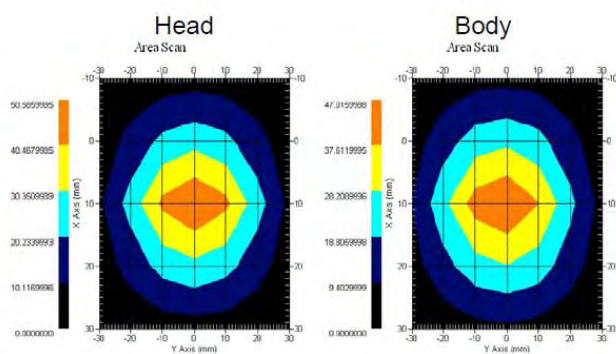
**Length:** 67.1 mm  
**Height:** 38.9 mm

**Electrical Specification**

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

**System Validation Results**

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



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>

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4



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

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

**Electrical Validation**

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

**Tissue Validation**

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

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5

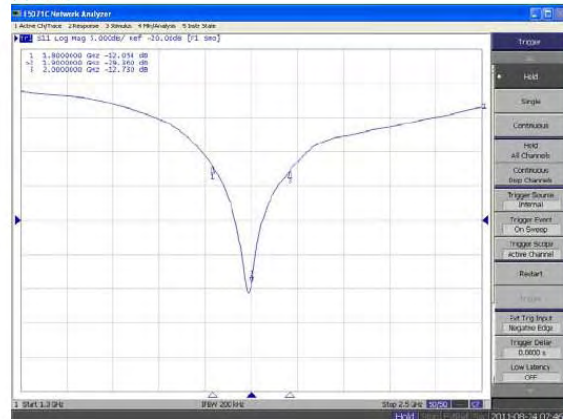
## NCL Calibration Laboratories

Division of APREL Laboratories.

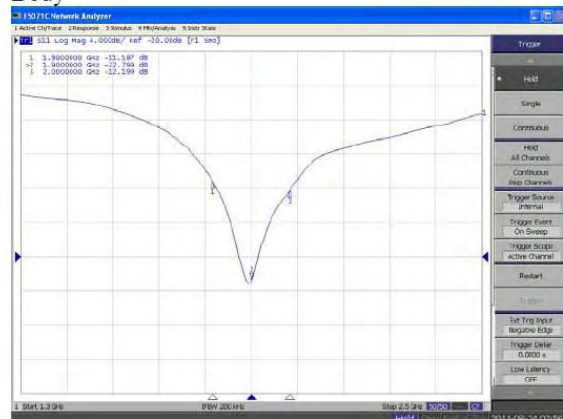
The Following Graphs are the results as displayed on the Vector Network Analyzer.

### S11 Parameter Return Loss

#### Head



#### Body



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## NCL Calibration Laboratories

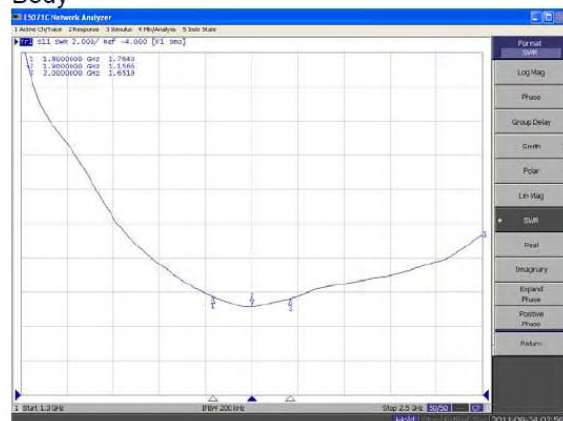
Division of APREL Laboratories.

### SWR

#### Head



#### Body



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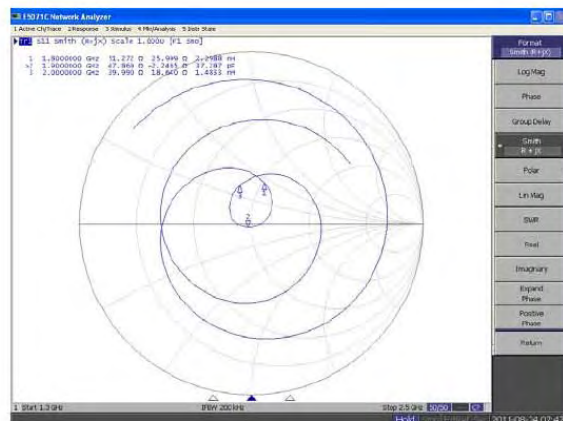
7

**NCL Calibration Laboratories**

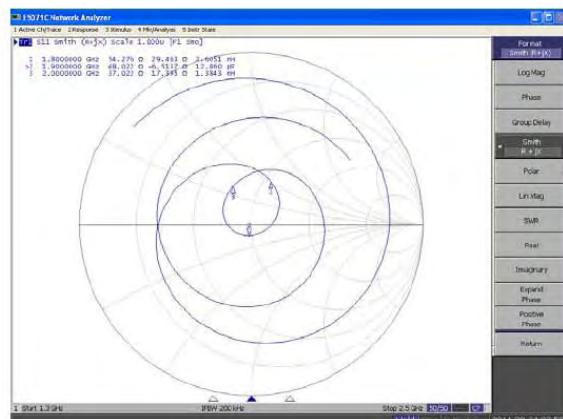
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**Smith Chart Dipole Impedance**

Head



Body



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8

**NCL Calibration Laboratories**

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**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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9

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

### Mechanical Verification

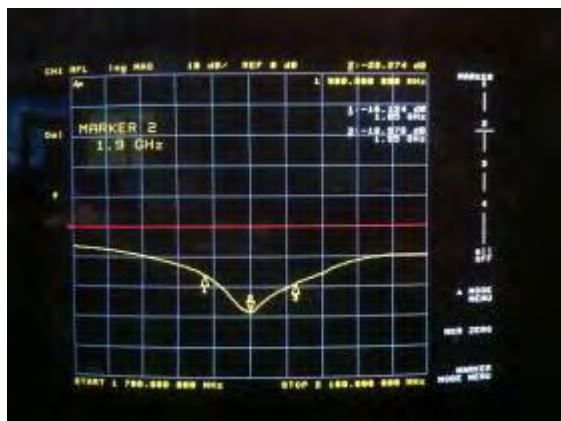
APREL Length	APREL Height	Measured Length	Measured Height
68.0 mm	39.5 mm	68.2 mm	39.2 mm

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

### Test Graphs:

#### Head Tissue

Return Loss :

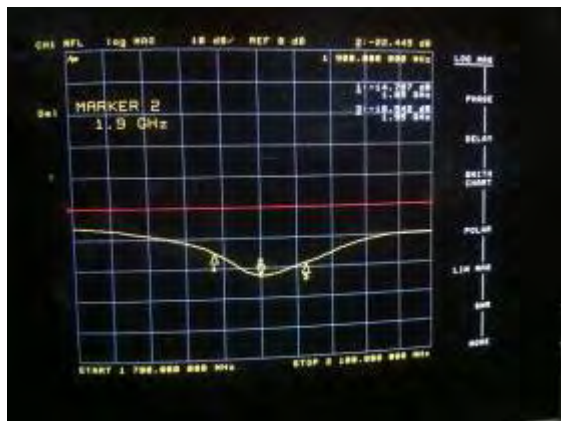


Impedance :



#### Body Tissue

Return Loss :



Impedance :





## NCL CALIBRATION LABORATORIES

Calibration File No: DC-1330  
Project Number: BAC-dipole-cal-5619

# 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-2450-S-2

Frequency: 2450 MHz

Serial No: 220-00758

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**

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**Conditions**

Dipole 220-00758 was received in good condition and was a re-calibration.

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

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

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



Stuart Nicol



C. Teodorian

**Primary Measurement Standards**

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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Calibration Results Summary**

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

**Mechanical Dimensions**

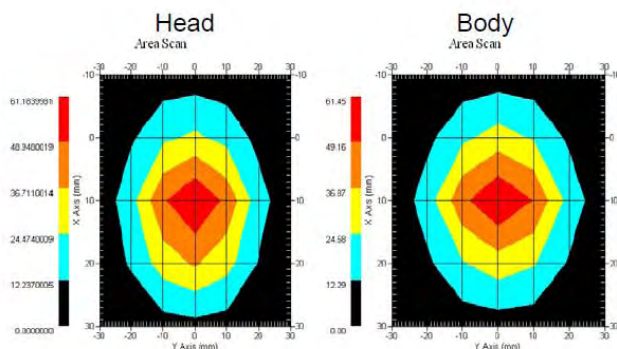
**Length:** 52.4 mm  
**Height:** 30.3 mm

**Electrical Specification**

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	2450 MHz	1.0459 U	-33.024 dB	48.533 $\Omega$
Body	2450 MHz	1.1159 U	-25.235 dB	46.676 $\Omega$

**System Validation Results**

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	2450 MHz	52.667	24.518	105.920
Body	2450 MHz	52.561	24.104	108.940



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3

**NCL Calibration Laboratories**

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**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 220-00758. 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"  
IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"  
Part 1: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)"  
IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"  
Part 2 *Draft*: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"

**Conditions**

Dipole 220-00758 was a re-calibration.

**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>

4

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

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

APREL Length	APREL Height	Measured Length	Measured Height
51.5 mm	30.4 mm	52.4 mm	30.3 mm

**Electrical Calibration**

Tissue Type	Return Loss:	SWR:	Impedance:
Head	-33.024 dB	1.0459 U	48.533 $\Omega$
Body	-25.235 dB	1.1159 U	46.676 $\Omega$

**Tissue Validation**

	Dielectric constant, $\epsilon_r$	Conductivity, $\sigma$ [S/m]
Head Tissue 2450MHz	38.2	1.82
Body Tissue 2450MHz	51.74	1.96

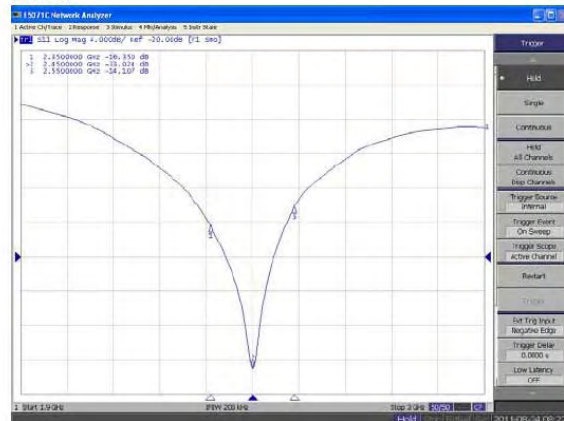
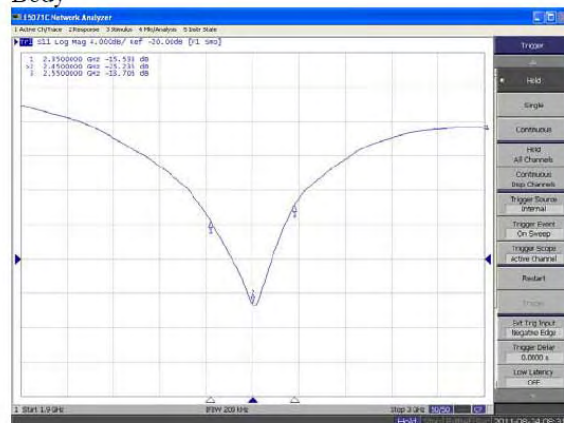
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**NCL Calibration Laboratories**

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

**S11 Parameter Return Loss****Head****Body**

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6



## NCL Calibration Laboratories

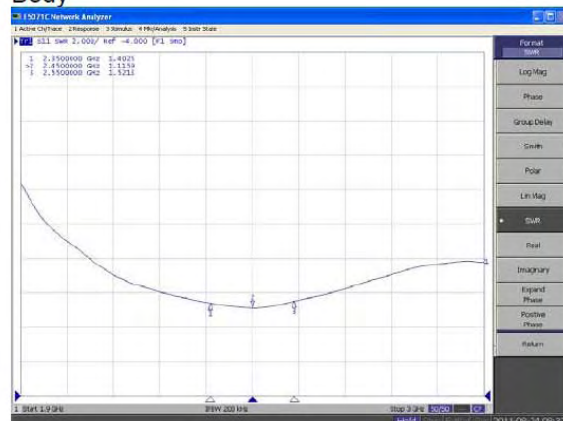
Division of APREL Laboratories.

### SWR

#### Head



#### Body

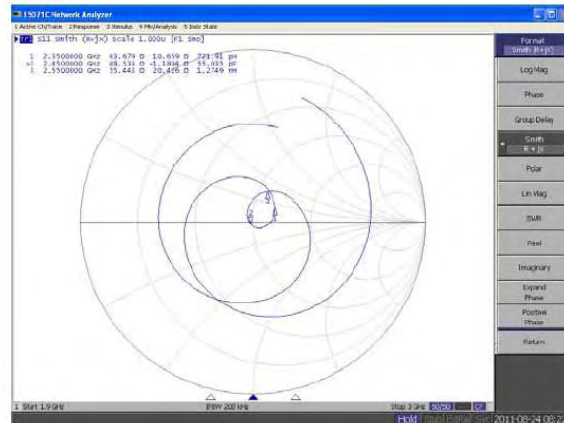
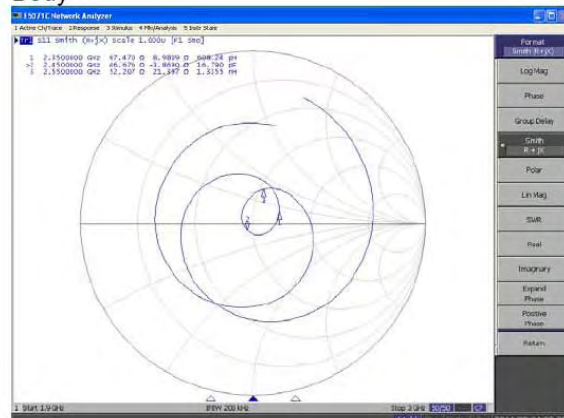


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**NCL Calibration Laboratories**

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**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 May 2011.

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9

## 2450MHz Dipole Calibration By BACL at 2012-12-12

### Mechanical Verification

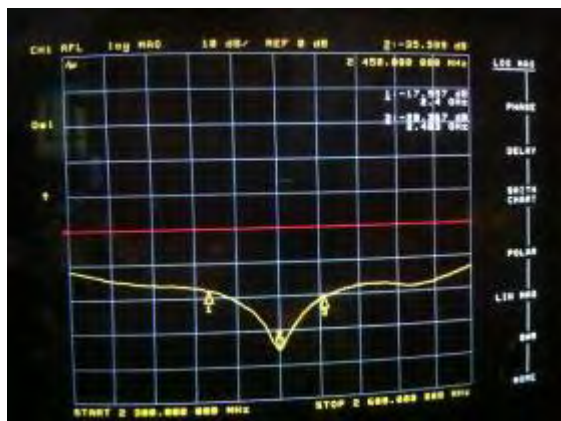
APREL Length	APREL Height	Measured Length	Measured Height
51.5mm	30.4 mm	51.6 mm	30.2 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-35.559 dB	49.627 $\Omega$
Body	-27.477 dB	48.238 $\Omega$

### Test Graphs:

#### Head Tissue

Return Loss :

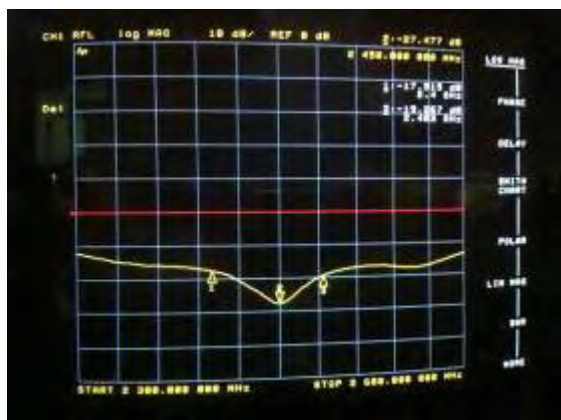


Impedance :



#### Body Tissue

Return Loss :



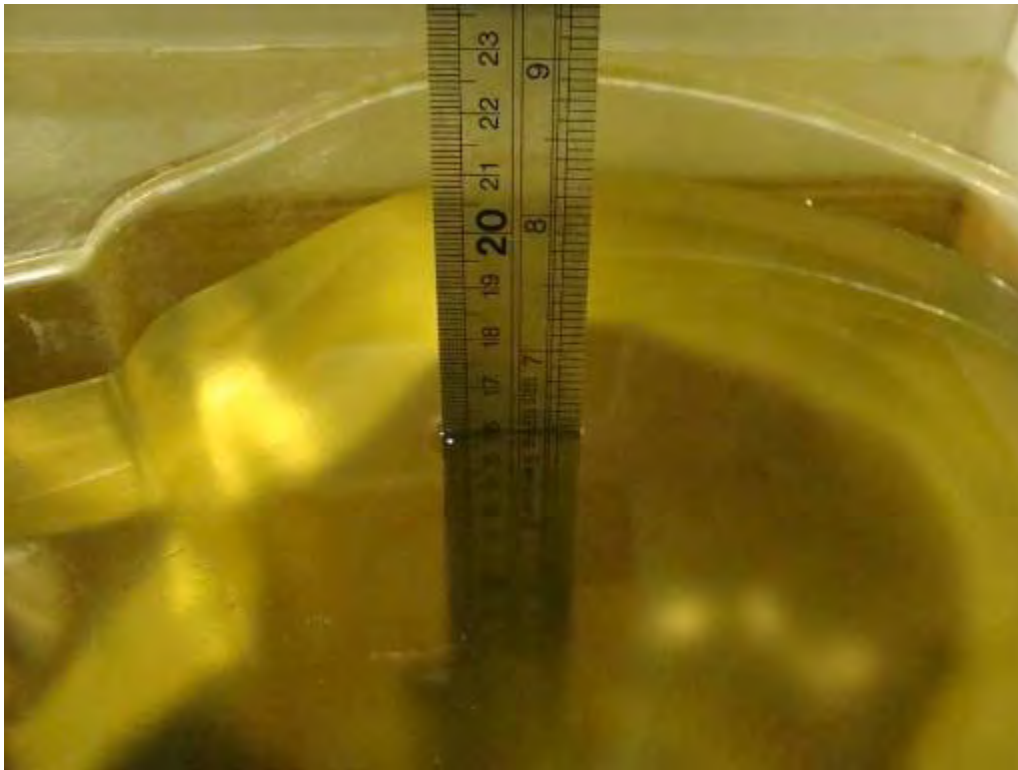
Impedance :



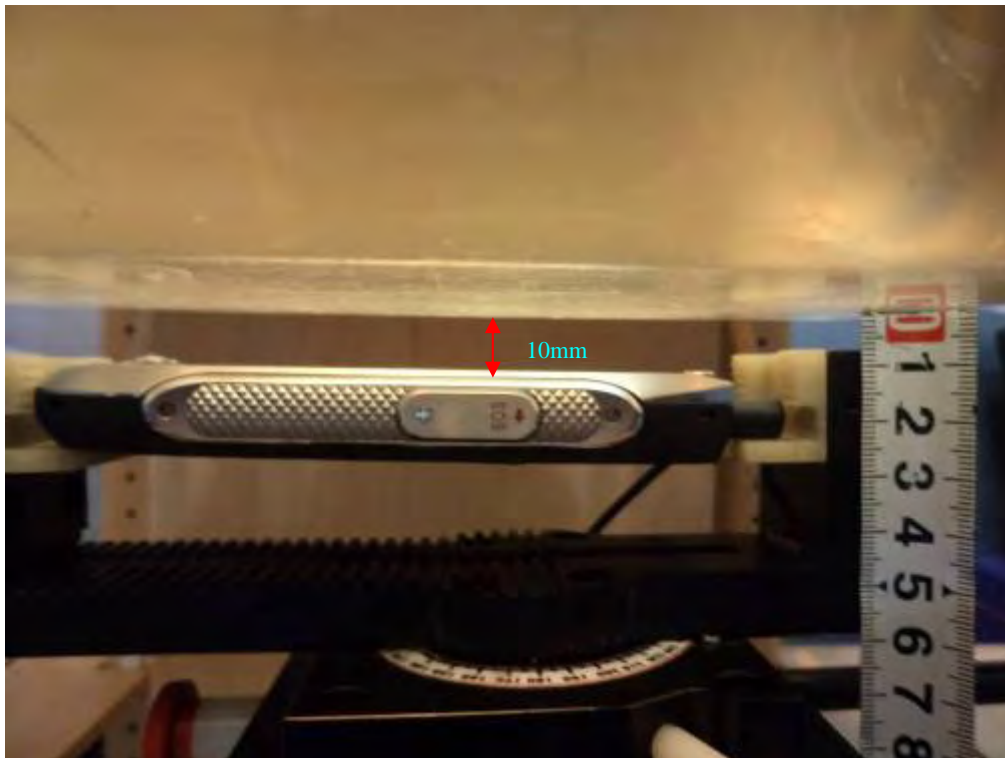


## APPENDIX D EUT TEST POSITION PHOTOS

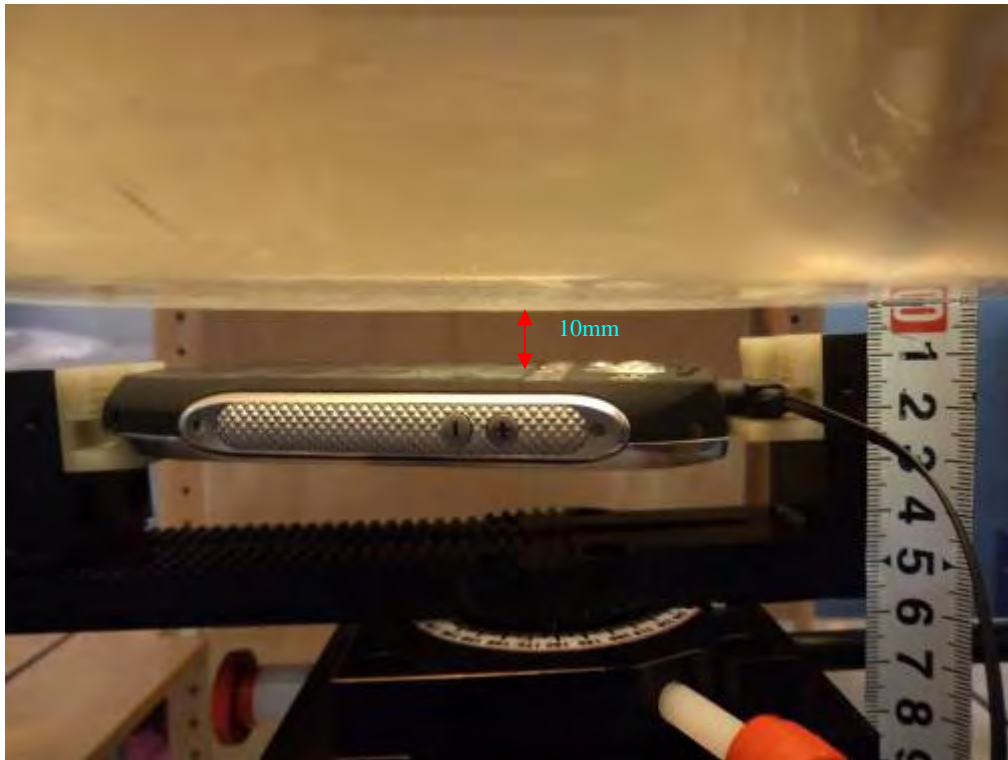
Liquid depth  $\geq 15\text{cm}$



Body-worn-Headset Front Setup Photo



**Body-worn-Headset Back Setup Photo**



**Body-Left Setup Photo**



**Body-Right Setup Photo**



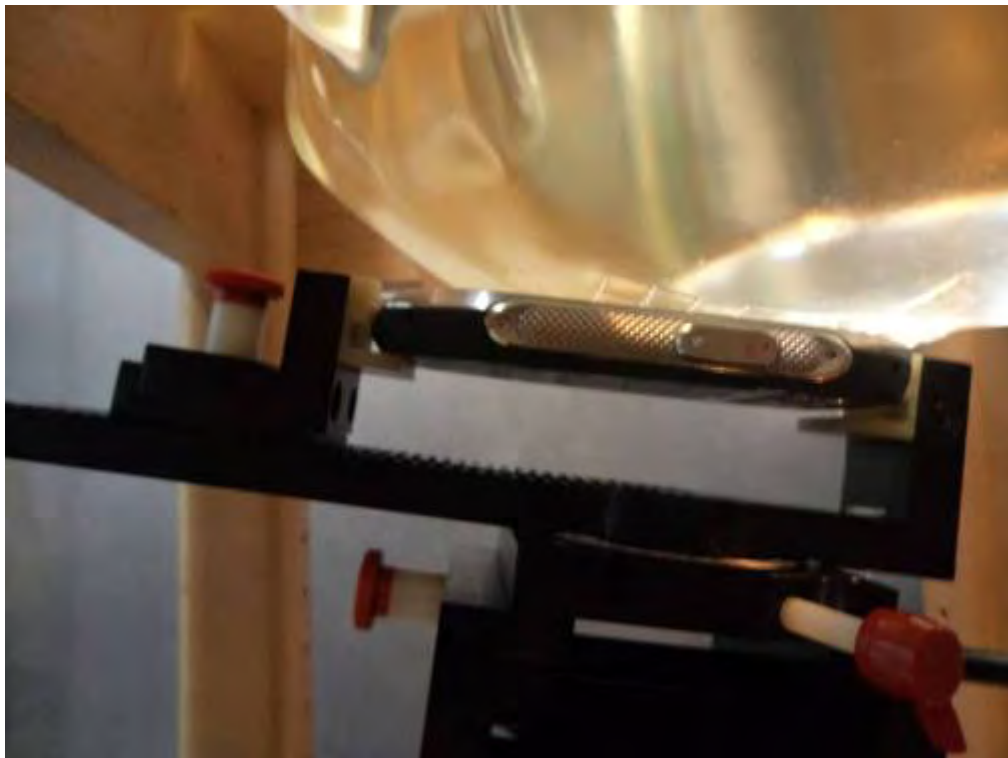
**Body-Bottom Setup Photo**



**Body-Top 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

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**EUT – Front Side View**



**EUT – Back Side View**



**EUT – Top Side View**



**EUT – Bottom Side View**





### EUT – Uncovered View



### EUT – Headset View



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## APPENDIX F INFORMATIVE REFERENCES

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- [1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.
- [2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, Office of Engineering & Technology, Washington, DC, 1997.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.
- [4] Niels Kuster, Ralph Kastle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.
- [5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM \_ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.
- [10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.
- [11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
- [12] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992. Dosimetric Evaluation of Sample device, month 1998 9
- [13] NIS81 NAMAS, \The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.
- [14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10.
- [15] FCC OET KDB648474 Do1 SAR Evaluation Considerations for Handsets with Multiple transmitters and Antennas.

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