



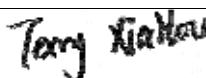
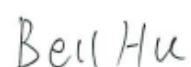
# SAR EVALUATION REPORT

For

## G53 Limited

ROOM 1701 , 17/F,FEE TAT COMMERCIAL CENTRE,613 NATHAN ROAD,MONGKOK  
HONG KONG

**FCC ID: 2ADLMFRV410**

<b>Report Type:</b> Original Report	<b>Product Type:</b> 3G Smart Phone
<b>Test Engineer:</b> <u>Terry XiaHou</u> 	
<b>Report Number:</b> <u>RSZ150429006-20</u>	
<b>Report Date:</b> <u>2015-05-18</u>	
<b>Reviewed By:</b> <u>SAR Engineer</u> 	
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

Attestation of Test Results		
EUT Information	Company Name	G53 Limited
	EUT Description	3G Smart Phone
	FCC ID	2ADLMFRV410
	Model Number	Admiral 410
	Test Date	2015-05-13
Frequency	Max. SAR Level(s) Reported	Limit(W/Kg)
GSM 850	0.330 W/kg 1g Head SAR 0.691 W/kg 1g Body SAR	1.6
PCS 1900	0.161 W/kg 1g Head SAR 0.365 W/kg 1g Body SAR	
WCDMA Band5	0.122 W/kg 1g Head SAR 0.279 W/kg 1g Body SAR	
WCDMA Band4	0.264 W/kg 1g Head SAR 0.714 W/kg 1g Body SAR	
WCDMA Band2	0.181 W/kg 1g Head SAR 0.341 W/kg 1g Body SAR	
Wi-Fi(802.11b)	0.190 W/kg 1g Head SAR 0.100 W/kg 1g Body SAR	
Simultaneous	0.520 W/kg 1g Head SAR 0.791 W/kg 1g Body SAR	
Applicable Standards	ANSI / IEEE C95.1 : 2005 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields,3 kHz to 300 GHz.	
	ANSI / IEEE C95.3 : 2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.	
	IEC 62209-2:2010 Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures -Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)	
	IEEE1528:2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	
	KDB procedures KDB 447498 D01 General RF Exposure Guidance v05r02. KDB 648474 D04 Handset SAR v01r02. KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03 KDB 865664 D02 RF Exposure Reporting v01r01 KDB 941225 D01 3G SAR Procedures v03 KDB 941225 D06 Hotspot Mode v02 KDB 248227 D01 802.11 Wi-Fi SAR v02	
<p><b>Note:</b> This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and RF exposure KDB procedures.</p> <p><b>The results and statements contained in this report pertain only to the device(s) evaluated.</b></p>		

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**DOCUMENT REVISION HISTORY**

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSZ150429006-20	Original Report	2015-05-18

## EUT DESCRIPTION

This report has been prepared on behalf of G53 Limited and their product, FCC ID: 2ADLMFRV410, Model: Admiral 410 or the EUT (Equipment under Test) as referred to in the rest of this report.

### Technical Specification

<b>Product Type</b>	Portable
<b>Exposure Category:</b>	Population / Uncontrolled
<b>Antenna Type(s):</b>	Internal Antenna
<b>Body-Worn Accessories:</b>	Headset
<b>Face-Head Accessories:</b>	None
<b>Multi-slot Class:</b>	Class12
<b>Operation Mode :</b>	GSM Voice, GPRS Data, WCDMA, Wi-Fi and Bluetooth
<b>Frequency Band:</b>	GSM 850 : 824-849 MHz(TX) ; 869-894 MHz(RX) PCS 1900: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) WCDMA Band5: 824-849 MHz(TX) ; 869-894 MHz(RX) WCDMA Band4: 1710-1755MHz(TX); 2110-2155MHz(RX) WCDMA Band2: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) Wi-Fi (802.11b/g/n20/n40): 2412MHz-2472MHz Wi-Fi (802.11n40): 2422MHz-2462MHz Bluetooth : 2402MHz-2480MHz
<b>Conducted RF Power:</b>	GSM 850 : 32.67dBm PCS 1900:29.21dBm WCDMA Band5: 21.99dBm WCDMA Band4: 22.60dBm WCDMA Band2: 22.29dBm Wi-Fi(802.11b/g/n20): 15.45dBm Wi-Fi(802.11n40): 8.89dBm BT 3.0: 1.88dBm BT 4.0: -6.68dBm
<b>Dimensions (L*W*H):</b>	131mm (L) × 65 mm (W) × 10 mm (H)
<b>Power Source:</b>	3.7 V <sub>DC</sub> Rechargeable Battery
<b>Normal Operation:</b>	Head and Body-worn

## REFERENCE, STANDARDS, AND GUIDELINES

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### FCC:

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

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

### CE:

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

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

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

## SAR Limits

### FCC Limit (1g Tissue)

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

### CE Limit (10g Tissue)

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

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

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

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

## FACILITIES

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

## DESCRIPTION OF TEST SYSTEM

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

### ALSAS-10U System Description

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

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

### Applications

Predefined measurement procedures compliant with the guidelines of CENELEC, IEEE, IEC, FCC, etc are utilized during the assessment for the device. Automatic detection for all SAR maxima are embedded within the core architecture for the system, ensuring that peak locations used for centering the zoom scan are within a 1mm resolution and a 0.05mm repeatable position. System operation range currently available up-to 6 GHz in simulated tissue.

### Area Scans

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

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

### Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the ALSAS-10U software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m<sup>3</sup> is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21.5mm.

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

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 5x5x8 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 35mm in the Z axis.



## ALSAS-10U Interpolation and Extrapolation Uncertainty

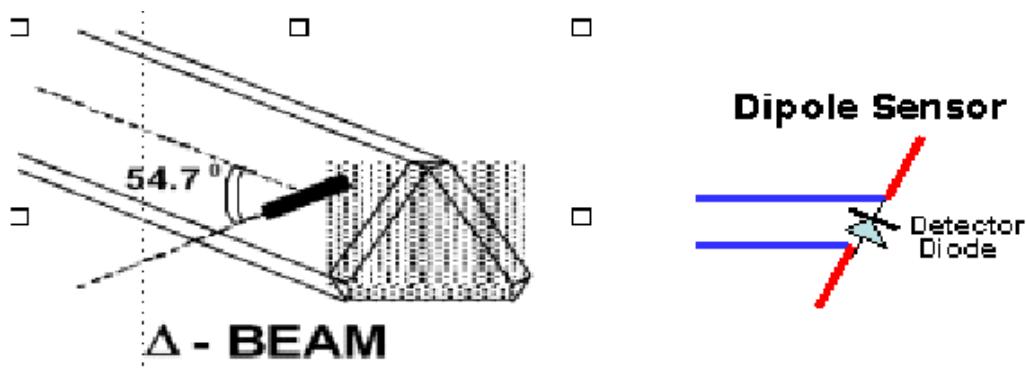
The overall uncertainty for the methodology and algorithms used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

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

## 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 $\mu$ V/(V/m) <sup>2</sup> to 0.85 $\mu$ V/(V/m) <sup>2</sup>
<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 $\mu$ V to 800mV. Integration of the fields measured is carried out at board level utilizing a Co-Processor which then sends the measured fields down into the main computational module in digitized form via an RS232 communications port. Probe linearity and duty cycle compensation is carried out within the main Daq-Paq module.

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

## Axis Articulated Robot

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



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

## ALSAS Universal Workstation

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

## Universal Device Positioner

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

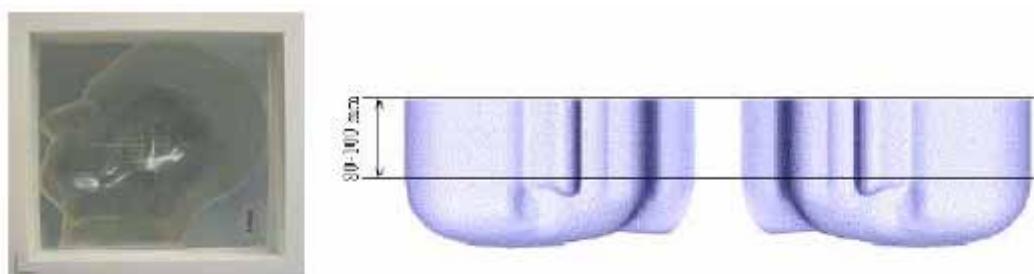


## Phantom Types

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

### APREL SAM Phantoms

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



## APREL Laboratories Universal Phantom

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

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

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



## Tissue Dielectric Parameters for Head and Body Phantoms

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

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

## Recommended Tissue Dielectric Parameters for Head and Body

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

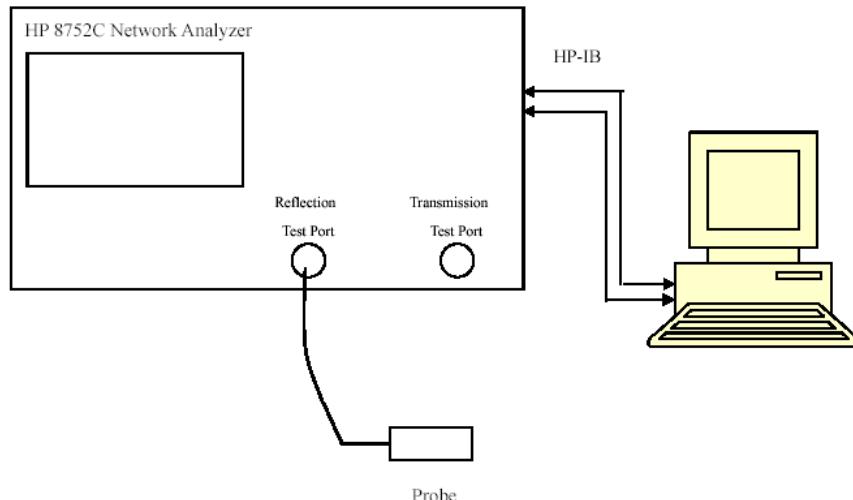
## EQUIPMENT LIST AND CALIBRATION

### Equipments List & Calibration 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	2014-10-14	110-00212
Miniature E-Field Probe	ALS-E-020	2014-10-14	500-00283
Dipole, 835MHz	ALS-D-835-S-2	2014-10-08	180-00558
Dipole, 1750MHz	ALS-D-1750-S-2	2013-10-08	198-00304
Dipole, 1900MHz	ALS-D-1900-S-2	2014-10-09	210-00710
Dipole, 2450MHz	ALS-D-2450-S-2	2014-10-09	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 1750 MHz Head	ALS-TS-1750-H	Each Time	285-01086
Simulated Tissue 1750 MHz Body	ALS-TS-1750-B	Each Time	285-01088
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 Head	ALS-TS-2450-H	Each Time	290-01108
Simulated Tissue 2450 MHz Body	ALS-TS-2450-B	Each Time	290-01109
Directional couple	DC6180A	N/A	0325849
Power Amplifier	5S1G4	N/A	71377
Dielectric probe kit	HP85070B	2014-06-13	N/A
Attenuator	3dB	2014-05-08	5402
Network analyzer	8752C	2014-06-03	3410A02356
Synthesized Sweeper	HP 8341B	2014-06-03	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	2014-11-23	106891
EMI Test Receiver	ESCI	2014-06-13	101746

## SAR MEASUREMENT SYSTEM VERIFICATION

### Liquid Verification



Liquid Verification Setup Block Diagram

**Liquid Verification Results**

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$ (S/m)	
824.2	Head	41.07	0.91	41.50	0.90	-1.036	1.111	$\pm 5$
	Body	53.82	0.95	55.20	0.97	-2.500	-2.062	$\pm 5$
826.4	Head	41.04	0.91	41.50	0.90	-1.108	1.111	$\pm 5$
	Body	53.81	0.95	55.20	0.97	-2.518	-2.062	$\pm 5$
836.6	Head	41.05	0.92	41.50	0.90	-1.084	2.222	$\pm 5$
	Body	53.85	0.96	55.20	0.97	-2.446	-1.031	$\pm 5$
846.6	Head	41.02	0.91	41.50	0.90	-1.157	1.111	$\pm 5$
	Body	53.85	0.97	55.20	0.97	-2.446	0.000	$\pm 5$
848.8	Head	41.01	0.91	41.50	0.90	-1.181	1.111	$\pm 5$
	Body	53.83	0.98	55.20	0.97	-2.482	1.031	$\pm 5$
1712.4	Head	39.53	1.37	40.10	1.37	-1.421	0.000	$\pm 5$
	Body	51.91	1.49	53.40	1.49	-2.790	0.000	$\pm 5$
1732.6	Head	39.40	1.36	40.10	1.37	-1.746	-0.730	$\pm 5$
	Body	51.85	1.51	53.40	1.49	-2.903	1.342	$\pm 5$
1752.6	Head	39.38	1.38	40.10	1.37	-1.796	0.730	$\pm 5$
	Body	51.97	1.53	53.40	1.49	-2.678	2.685	$\pm 5$
1850.2	Head	39.63	1.38	40.00	1.40	-0.925	-1.429	$\pm 5$
	Body	52.01	1.49	53.30	1.52	-2.420	-1.974	$\pm 5$
1852.4	Head	39.55	1.38	40.00	1.40	-1.125	-1.429	$\pm 5$
	Body	51.80	1.50	53.30	1.52	-2.814	-1.316	$\pm 5$
1880.0	Head	39.58	1.40	40.00	1.40	-1.050	0.000	$\pm 5$
	Body	51.89	1.52	53.30	1.52	-2.645	0.000	$\pm 5$
1907.6	Head	39.71	1.41	40.00	1.40	-0.725	0.714	$\pm 5$
	Body	52.04	1.53	53.30	1.52	-2.364	0.658	$\pm 5$
1909.8	Head	39.65	1.41	40.00	1.40	-0.875	0.714	$\pm 5$
	Body	52.05	1.55	53.30	1.52	-2.345	1.974	$\pm 5$
2412	Head	39.97	1.80	39.20	1.80	1.964	0.000	$\pm 5$
	Body	52.81	1.91	52.70	1.95	0.209	-2.051	$\pm 5$
2437	Head	39.55	1.82	39.20	1.80	0.893	1.111	$\pm 5$
	Body	52.85	2.04	52.70	1.95	0.285	4.615	$\pm 5$
2462	Head	39.63	1.85	39.20	1.80	1.097	2.778	$\pm 5$
	Body	52.85	1.99	52.70	1.95	0.285	2.051	$\pm 5$

\*Liquid Verification was performed on 2015-05-13.

Please refer to the following tables.

835 MHz Head				835 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	41.0691	19.7626		824.0	53.8166	20.6269
824.5	41.0585	19.7300		824.5	53.8701	20.6253
825.0	41.0659	19.7249		825.0	53.8135	20.6650
825.5	41.0057	19.6922		825.5	53.7634	20.6416
826.0	41.0585	19.7347		826.0	53.8703	20.6995
826.5	41.0424	19.7098		826.5	53.8105	20.6798
827.0	41.0539	19.7163		827.0	53.7772	20.6735
827.5	41.0848	19.7350		827.5	53.8613	20.6786
828.0	41.0853	19.7352		828.0	53.8030	20.6774
828.5	41.0872	19.7495		828.5	53.8003	20.6713
829.0	41.0602	19.7374		829.0	53.8166	20.6389
829.5	41.0463	19.7553		829.5	53.8451	20.6560
830.0	41.0419	19.7348		830.0	53.7940	20.6648
830.5	41.0250	19.7119		830.5	53.8722	20.7041
831.0	41.0728	19.7655		831.0	53.8272	20.6946
831.5	41.0956	19.6705		831.5	53.8085	20.6624
832.0	41.0971	19.7462		832.0	53.8679	20.6993
832.5	41.0993	19.6792		832.5	53.7861	20.7003
833.0	41.0001	19.7168		833.0	53.8484	20.6859
833.5	41.0582	19.7397		833.5	53.8171	20.6616
834.0	41.0766	19.6936		834.0	53.7893	20.6961
834.5	41.0401	19.7416		834.5	53.7726	20.6713
835.0	41.0944	19.6758		835.0	53.8007	20.7039
835.5	41.0535	19.7703		835.5	53.8508	20.6144
836.0	41.0587	19.6947		836.0	53.8586	20.7083
836.5	41.0949	19.7408		836.5	53.7724	20.6985
837.0	41.0366	19.7071		837.0	53.7938	20.6376
837.5	41.0448	19.7628		837.5	53.7763	20.6414
838.0	41.0442	19.7440		838.0	53.8007	20.6176
838.5	41.0844	19.7484		838.5	53.8637	20.6881
839.0	41.0917	19.7536		839.0	53.7784	20.6833
839.5	41.0557	19.7055		839.5	53.8181	20.6577
840.0	41.1015	19.4258		840.0	53.8048	20.6597
840.5	41.0228	19.4535		840.5	53.7699	20.6534
841.0	41.0384	19.3693		841.0	53.8451	20.6494
841.5	41.0538	19.4499		841.5	53.8624	20.7010
842.0	41.0838	19.4564		842.0	53.8431	20.6678
842.5	41.0136	19.4033		842.5	53.7963	20.7056
843.0	41.0942	19.4189		843.0	53.7784	20.6346
843.5	41.0226	19.4011		843.5	53.8039	20.6204
844.0	41.0604	19.4097		844.0	53.7757	20.6564
844.5	41.1027	19.4650		844.5	53.8005	20.6688
845.0	41.1024	19.3964		845.0	53.8596	20.7004
845.5	41.0249	19.4334		845.5	53.7716	20.6583
846.0	41.0494	19.4538		846.0	53.8223	20.6937
846.5	41.0177	19.4236		846.5	53.8519	20.6850
847.0	41.0990	19.4157		847.0	53.8475	20.6154
847.5	41.0154	19.4072		847.5	53.7969	20.6915
848.0	41.0307	19.3969		848.0	53.7890	20.7012
848.5	41.0753	19.4124		848.5	53.8026	20.6166
849.0	41.0065	19.3826		849.0	53.8303	20.7030

1750 MHz Head			1750 MHz Body		
Frequency (MHz)	e'	e''	Frequency (MHz)	e'	e''
1710.0	39.1845	14.3423	1710.0	51.9265	15.6367
1711.5	39.6297	14.4748	1711.5	51.8992	15.6472
1713.0	39.4225	14.2152	1713.0	51.9188	15.6506
1714.5	39.1640	14.4632	1714.5	51.9631	15.6410
1716.0	39.1348	14.4054	1716.0	51.8497	15.7131
1717.5	39.5377	14.4665	1717.5	51.9618	15.6343
1719.0	39.2131	14.3449	1719.0	51.9968	15.7071
1720.5	39.4435	14.2896	1720.5	51.9899	15.7065
1722.0	39.1423	14.1406	1722.0	51.8940	15.6360
1723.5	39.3939	14.5144	1723.5	51.9217	15.6001
1725.0	39.2879	14.4375	1725.0	51.9180	15.5350
1726.5	39.4486	14.4087	1726.5	51.9125	15.6693
1728.0	39.5903	14.5748	1728.0	51.9245	15.7104
1729.5	39.5010	14.1763	1729.5	51.8788	15.6790
1731.0	39.3442	14.2702	1731.0	51.8859	15.6161
1732.5	39.3953	14.1113	1732.5	51.8454	15.6703
1734.0	39.2101	14.4757	1734.0	51.9957	15.6490
1735.5	39.5498	14.1853	1735.5	51.8999	15.6644
1737.0	39.3841	14.5329	1737.0	51.8549	15.6608
1738.5	39.4663	14.2468	1738.5	51.8441	15.6890
1740.0	39.1057	14.3747	1740.0	51.8598	15.7100
1741.5	39.2779	14.3121	1741.5	51.8945	15.6744
1743.0	39.2353	14.5291	1743.0	51.8808	15.6225
1744.5	39.5768	14.1039	1744.5	51.9498	15.6851
1746.0	39.5839	14.1899	1746.0	51.9943	15.6389
1747.5	39.4073	14.5760	1747.5	51.9891	15.6441
1749.0	39.5596	14.1865	1749.0	51.9152	15.6711
1750.5	39.2708	14.2946	1750.5	51.9394	15.6355
1752.0	39.4000	14.0941	1752.0	51.9657	15.6624
1753.5	39.3150	14.3859	1753.5	51.9794	15.6279
1755.0	39.2941	14.2062	1755.0	51.8941	15.6036
1756.5	39.5386	14.4661	1756.5	51.9571	15.6949
1758.0	39.1228	14.3015	1758.0	51.9445	15.5292
1759.5	39.4066	14.2432	1759.5	51.9704	15.5573
1761.0	39.2942	14.2729	1761.0	51.8515	15.5799
1762.5	39.4808	14.3182	1762.5	51.9187	15.5233
1764.0	39.4184	14.1891	1764.0	51.9455	15.5053
1765.5	39.2294	14.3357	1765.5	51.8445	15.3550
1767.0	39.3496	14.1480	1767.0	51.9009	15.3444
1768.5	39.3609	14.2059	1768.5	51.9546	15.4688
1770.0	39.5366	14.1470	1770.0	51.9891	15.5286
1771.5	39.5526	14.0932	1771.5	51.8933	15.5303
1773.0	39.5016	14.4948	1773.0	51.9942	15.5536
1774.5	39.5147	14.0904	1774.5	51.9075	15.3314
1776.0	39.3786	14.1953	1776.0	51.9087	15.3431
1777.5	39.4744	14.4224	1777.5	51.9151	15.4928
1779.0	39.4202	14.4555	1779.0	51.8431	15.3827
1780.5	39.4242	14.4038	1780.5	51.8535	15.5932
1782.0	39.1692	14.4322	1782.0	51.9835	15.5551
1783.5	39.4726	14.5768	1783.5	51.9719	15.5859
1785.0	39.3346	14.3735	1785.0	51.9103	15.5125

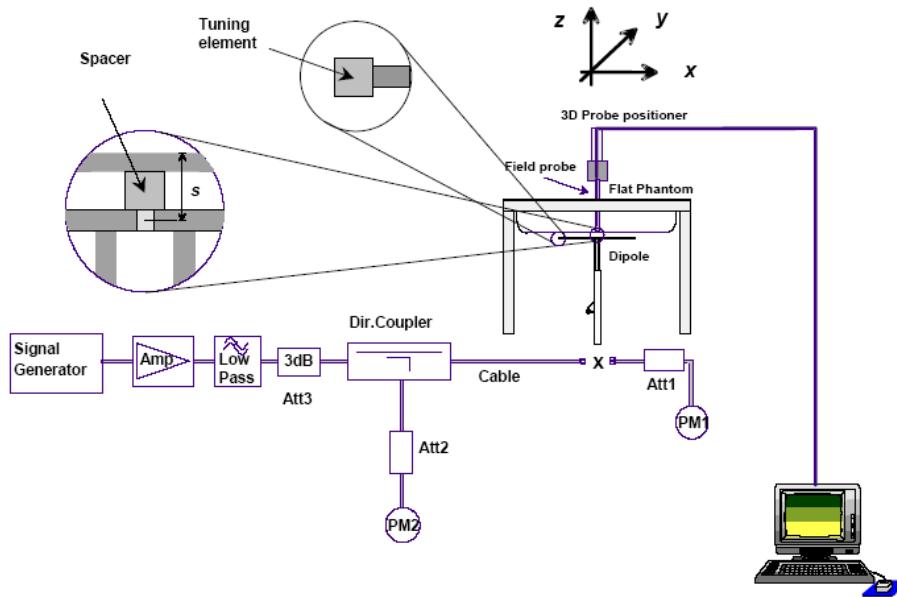
1900 MHz Head				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1850.0	39.6265	13.3976		1850.0	52.0071	14.5025
1851.2	39.5865	13.3123		1851.2	52.0998	14.5402
1852.4	39.5497	13.4288		1852.4	51.8039	14.5522
1853.6	39.7008	13.2602		1853.6	52.0654	14.4799
1854.8	39.7164	13.2407		1854.8	51.8259	14.5379
1856.0	39.7189	13.4065		1856.0	52.0381	14.4846
1857.2	39.5772	13.3167		1857.2	51.9486	14.4863
1858.4	39.5787	13.2595		1858.4	51.9603	14.5166
1859.6	39.5578	13.4144		1859.6	51.9240	14.5279
1860.8	39.6380	13.3840		1860.8	51.8278	14.5109
1862.0	39.5895	13.3673		1862.0	51.7690	14.4754
1863.2	39.6096	13.3914		1863.2	51.8564	14.5452
1864.4	39.6472	13.2788		1864.4	52.0165	14.5282
1865.6	39.5666	13.4253		1865.6	51.8880	14.5467
1866.8	39.5447	13.2511		1866.8	52.0458	14.4703
1868.0	39.7363	13.3827		1868.0	51.9582	14.4552
1869.2	39.6802	13.3612		1869.2	51.9892	14.5699
1870.4	39.7380	13.3490		1870.4	51.9814	14.4843
1871.6	39.6888	13.2990		1871.6	52.0448	14.4419
1872.8	39.6172	13.4233		1872.8	51.9785	14.5452
1874.0	39.5922	13.2971		1874.0	51.7390	14.5315
1875.2	39.6420	13.4145		1875.2	52.0266	14.5005
1876.4	39.5774	13.3894		1876.4	51.9412	14.5025
1877.6	39.7103	13.3294		1877.6	51.8045	14.5411
1878.8	39.7364	13.3633		1878.8	51.9977	14.4810
1880.0	39.5776	13.3730		1880.0	51.8888	14.5538
1881.2	39.5608	13.2728		1881.2	52.1000	14.4169
1882.4	39.7398	13.3975		1882.4	52.0289	14.4409
1883.6	39.6738	13.2954		1883.6	52.0528	14.5162
1884.8	39.7251	13.3009		1884.8	52.0082	14.5665
1886.0	39.7366	13.2701		1886.0	52.0322	14.4540
1887.2	39.6810	13.3674		1887.2	51.8447	14.4360
1888.4	39.5808	13.3650		1888.4	51.9258	14.5348
1889.6	39.6859	13.3709		1889.6	51.8430	14.4240
1890.8	39.6883	13.3158		1890.8	51.7470	14.5735
1892.0	39.5639	13.3028		1892.0	51.9340	14.5077
1893.2	39.7248	13.2831		1893.2	51.8524	14.4592
1894.4	39.7091	13.3440		1894.4	51.7959	14.5184
1895.6	39.7334	13.2420		1895.6	51.8089	14.4507
1896.8	39.6655	13.2918		1896.8	52.0371	14.5091
1898.0	39.5848	13.2721		1898.0	51.7781	14.5131
1899.2	39.6405	13.4297		1899.2	51.8534	14.4972
1900.4	39.6447	13.4168		1900.4	52.0086	14.4494
1901.6	39.5519	13.3713		1901.6	52.0009	14.4318
1902.8	39.5696	13.3345		1902.8	51.9265	14.5446
1904.0	39.6225	13.2453		1904.0	51.7651	14.4801
1905.2	39.7233	13.3359		1905.2	51.7724	14.4285
1906.4	39.6338	13.3661		1906.4	51.9341	14.4382
1907.6	39.7075	13.2538		1907.6	52.0357	14.4474
1908.8	39.5816	13.3469		1908.8	51.9980	14.5777
1910.0	39.6517	13.2884		1910.0	52.0523	14.5690

2450 MHz Head				2450 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
2410.0	39.7827	13.4788		2410.0	52.8486	14.3349
2411.0	39.8735	13.4230		2411.0	52.8824	14.3568
2412.0	39.9653	13.3857		2412.0	52.8094	14.2393
2413.0	39.7961	13.4269		2413.0	52.8326	14.7204
2414.0	39.4731	13.3639		2414.0	52.8024	14.7021
2415.0	39.8090	13.4615		2415.0	52.8633	14.0690
2416.0	39.9199	13.4874		2416.0	52.8465	14.6229
2417.0	39.6757	13.4422		2417.0	52.8072	14.6877
2418.0	39.4899	13.5035		2418.0	52.8607	14.7983
2419.0	39.6676	13.4129		2419.0	52.8680	14.7649
2420.0	39.9795	13.3047		2420.0	52.8393	14.0225
2421.0	39.9477	13.3719		2421.0	52.8048	14.5631
2422.0	39.9546	13.4577		2422.0	52.8633	14.7171
2423.0	39.6340	13.4706		2423.0	52.8143	14.5405
2424.0	39.9462	13.2816		2424.0	52.8789	14.1170
2425.0	39.4930	13.3309		2425.0	52.8472	14.9260
2426.0	39.8516	13.3110		2426.0	52.8670	14.3908
2427.0	39.9773	13.4885		2427.0	52.8867	14.7636
2428.0	39.6129	13.3272		2428.0	52.8357	14.5831
2429.0	39.7364	13.4461		2429.0	52.8386	14.7910
2430.0	39.7328	13.4912		2430.0	52.8597	14.9435
2431.0	39.6380	13.5286		2431.0	52.8848	14.0712
2432.0	39.6095	13.3310		2432.0	52.8809	14.5912
2433.0	39.8143	13.4210		2433.0	52.8202	15.0895
2434.0	39.8437	13.5483		2434.0	52.8021	14.8309
2435.0	39.5836	13.5877		2435.0	52.8291	14.3891
2436.0	39.6079	13.4885		2436.0	52.8342	14.2353
2437.0	39.5540	13.4684		2437.0	52.8454	15.0229
2438.0	39.9120	13.4871		2438.0	52.8908	14.6596
2440.0	39.5757	13.3942		2440.0	52.8503	14.4944
2441.0	39.6593	13.5769		2441.0	52.8418	15.0247
2442.0	39.9418	13.3400		2442.0	52.8496	14.9438
2443.0	39.9800	13.2923		2443.0	52.8901	14.9113
2444.0	39.6369	13.4479		2444.0	52.8808	14.4656
2445.0	39.6074	13.4378		2445.0	52.8556	14.3681
2446.0	39.8165	13.5021		2446.0	52.8526	14.6826
2447.0	39.8427	13.2794		2447.0	52.8111	14.3891
2448.0	39.6226	13.4898		2448.0	52.8325	14.5815
2449.0	39.9766	13.4215		2449.0	52.8112	14.5035
2450.0	39.8801	13.5317		2450.0	52.8590	14.7340
2451.0	39.4550	13.3906		2451.0	52.8557	14.5463
2452.0	39.5833	13.4792		2452.0	52.8567	14.3935
2453.0	39.8232	13.4045		2453.0	52.8797	14.5496
2454.0	39.5772	13.4709		2454.0	52.8488	14.6432
2455.0	39.9159	13.5268		2455.0	52.8055	14.5186
2456.0	39.9835	13.5335		2456.0	52.8427	14.3074
2457.0	39.5127	13.3908		2457.0	52.8820	14.7495
2458.0	39.8254	13.4674		2458.0	52.8755	14.3424
2459.0	39.7700	13.5656		2459.0	52.8317	14.6035
2460.0	39.4766	13.4165		2460.0	52.8083	15.0515
2461.0	39.5038	13.5929		2461.0	52.8686	14.0335
2462.0	39.6344	13.5264		2462.0	52.8534	14.5131

## 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	2014-10-14	2015-10-13
APREL	Dipole antenna(835MHz)	ALS-D-835-S-2	180-00558	2014-10-08	2017-10-07
APREL	Dipole antenna(1750MHz)	ALS-D-1750-S-2	198-00304	2013-10-08	2016-10-07
APREL	Dipole antenna(1900MHz)	ALS-D-1900-S-2	210-00710	2014-10-09	2017-10-08
APREL	Dipole antenna(2450MHz)	ALS-D-2450-S-2	220-00758	2014-10-09	2017-10-08

### System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2015-05-13	835	Head	1g	9.456	9.773	-3.244	$\pm 10$
		Body	1g	9.516	9.736	-2.260	$\pm 10$
	1750	Head	1g	35.812	37.020	-3.263	$\pm 10$
		Body	1g	33.730	36.650	-7.967	$\pm 10$
	1900	Head	1g	38.322	39.481	-2.936	$\pm 10$
		Body	1g	39.610	39.715	-0.264	$\pm 10$
	2450	Head	1g	50.296	54.916	-8.413	$\pm 10$
		Body	1g	52.366	52.418	-0.099	$\pm 10$

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

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

## Product Data

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 9.638 W/kg  
Power Drift-Finish : 9.613 W/kg  
Power Drift (%) : -0.283

## Phantom Data

Name : APREL-Uni  
Type : Uni-Phantom  
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 : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 41.09 F/m  
Sigma : 0.91 S/m  
Density : 1000.00 kg/cu. m

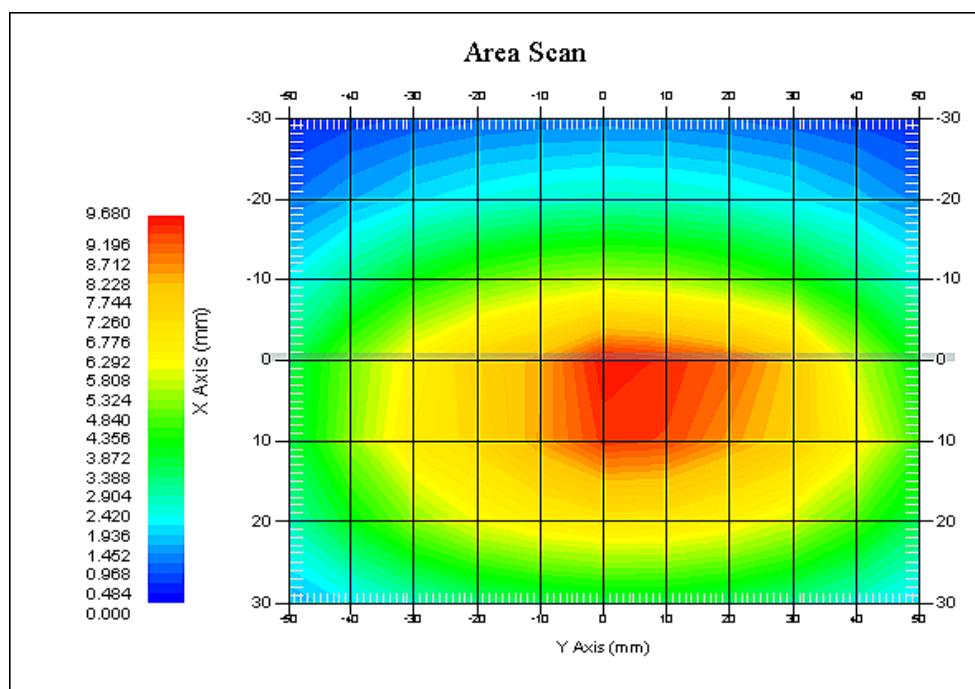
## Probe Data

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 835  
Duty Cycle Factor : 1  
Conversion Factor : 5.9  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

## Measurement Data

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

1 gram SAR value : 9.456 W/kg  
10 gram SAR value : 5.987 W/kg  
Area Scan Peak SAR : 9.680 W/kg  
Zoom Scan Peak SAR : 15.090 W/kg



### 835 MHz System Validation with Head Tissue

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

Device Name : Dipole 835 MHz  
Serial No. : 180-00558  
Type : Dipole  
Model : ALS-D-835-S-2  
Frequency Band : 835  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 9.555 W/kg  
Power Drift-Finish : 9.471 W/kg  
Power Drift (%) : -0.879

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
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 : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 53.80 F/m  
Sigma : 0.96 S/m  
Density : 1000.00 kg/cu. m

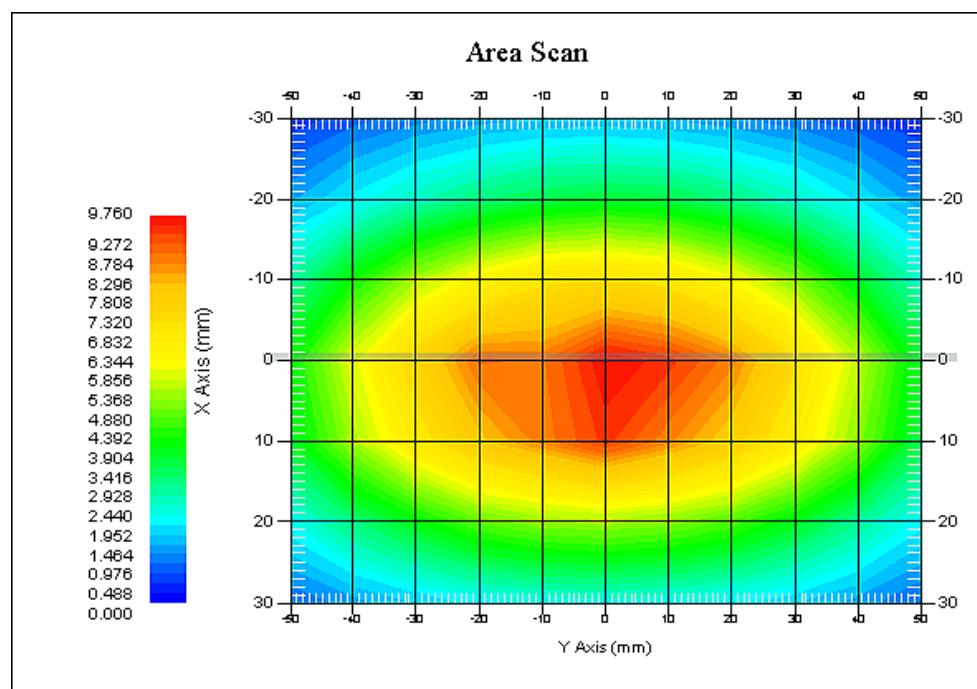
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 835  
Duty Cycle Factor : 1  
Conversion Factor : 5.9  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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

1 gram SAR value : 9.516 W/kg  
10 gram SAR value : 6.182 W/kg  
Area Scan Peak SAR : 9.739 W/kg  
Zoom Scan Peak SAR : 15.257 W/kg



### 835 MHz System Validation with Body Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1750 MHz Head Liquid****Dipole 1750 MHz; Type: ALS-D-1750-S-2; S/N: 198-00304****Product Data**

Device Name : Dipole 1750MHz  
Serial No. : 198-00304  
Type : Dipole  
Model : ALS-D-1750-S-2  
Frequency Band : 1750  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 35.276 W/kg  
Power Drift-Finish : 35.622 W/kg  
Power Drift (%) : 1.269

**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. : 285-01086  
Frequency : 1750 MHz  
Last Calib. Date : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 39.33 F/m  
Sigma : 1.38 S/m  
Density : 1000.00 kg/cu. M

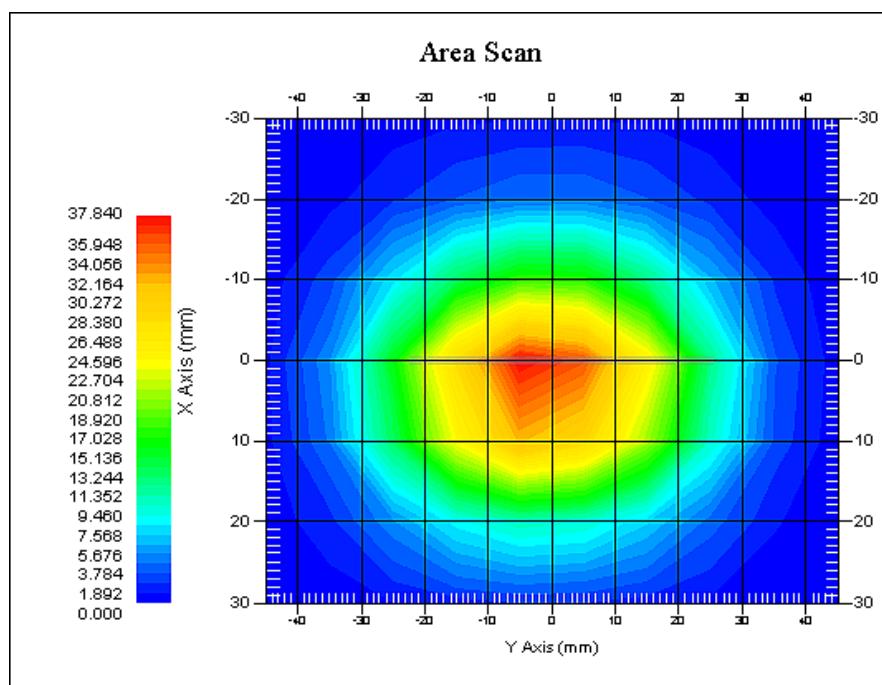
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 1750  
Duty Cycle Factor : 1  
Conversion Factor : 5.4  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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

1 gram SAR value : 35.812 W/kg  
10 gram SAR value : 19.232 W/kg  
Area Scan Peak SAR : 37.772 W/kg  
Zoom Scan Peak SAR : 62.520 W/kg



### 1750 MHz System Validation with Head Tissue

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 1750 MHz Body Liquid****Dipole 1750 MHz; Type: ALS-D-1750-S-2; S/N: 198-00304****Product Data**

Device Name : Dipole 1750MHz  
Serial No. : 198-00304  
Type : Dipole  
Model : ALS-D-1750-S-2  
Frequency Band : 1750  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 35.516 W/kg  
Power Drift-Finish : 34.785 W/kg  
Power Drift (%) : -2.081

**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. : 285-01088  
Frequency : 1750.00 MHz  
Last Calib. Date : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 51.93 F/m  
Sigma : 1.52 S/m  
Density : 1000.00 kg/cu. m

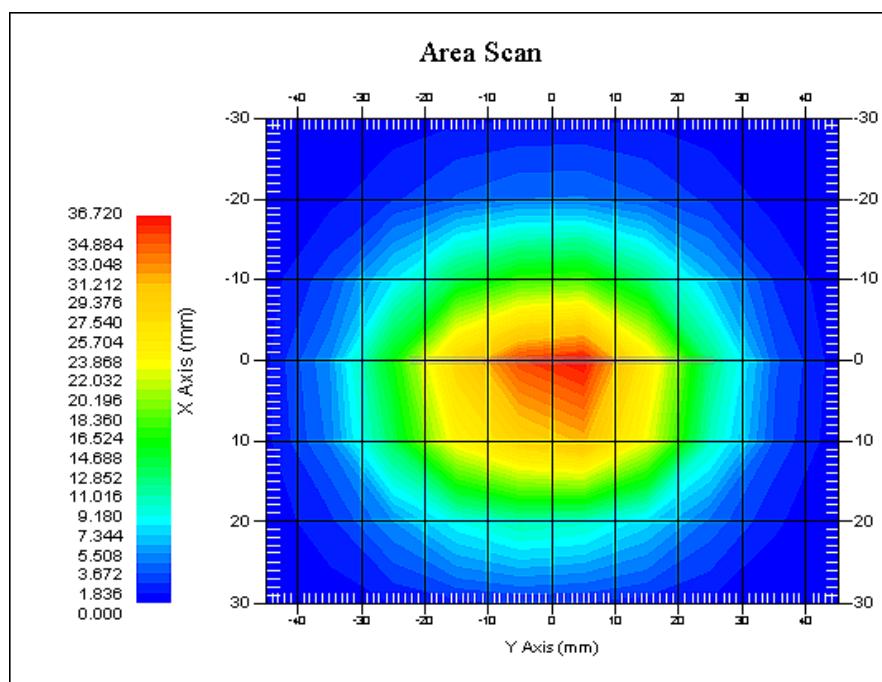
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 1750  
Duty Cycle Factor : 1  
Conversion Factor : 5.3  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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

1 gram SAR value : 33.730 W/kg  
10 gram SAR value : 19.377 W/kg  
Area Scan Peak SAR : 36.707 W/kg  
Zoom Scan Peak SAR : 65.257 W/kg



### 1750 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 : 41.323 W/kg  
Power Drift-Finish : 41.793 W/kg  
Power Drift (%) : 1.136

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Serial No. : System Default  
Location : Center  
Description : Default

**Tissue Data**

Type : Head  
Serial No. : 295-01103  
Frequency : 1900.00 MHz  
Last Calib. Date : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 39.64 F/m  
Sigma : 1.42 S/m  
Density : 1000.00 kg/cu. M

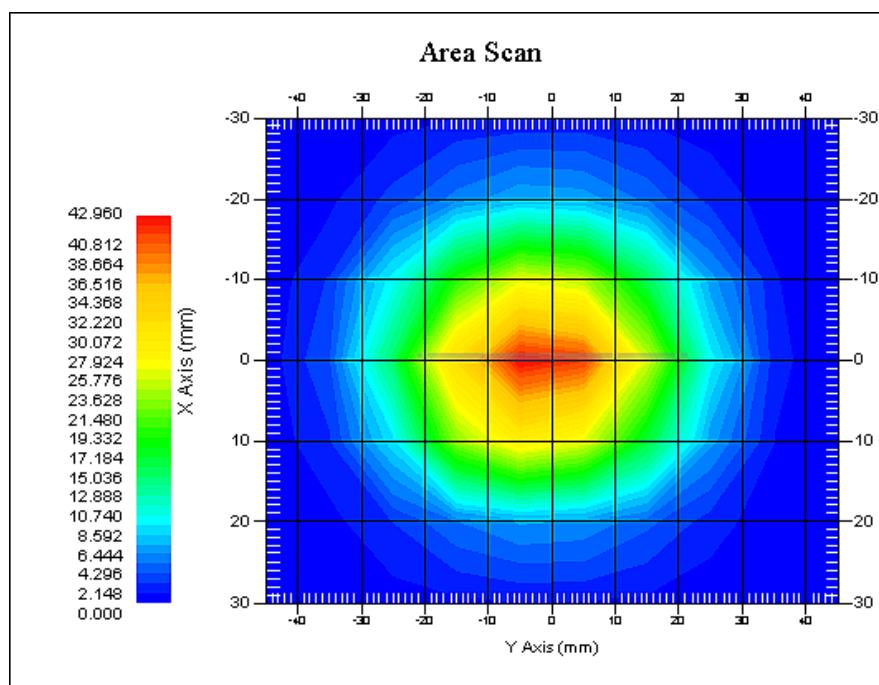
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 1900  
Duty Cycle Factor : 1  
Conversion Factor : 4.8  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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

1 gram SAR value : 38.322 W/kg  
10 gram SAR value : 20.310 W/kg  
Area Scan Peak SAR : 42.929 W/kg  
Zoom Scan Peak SAR : 71.630 W/kg



### 1900 MHz System Validation with Head Tissue

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

Device Name : Dipole 1900MHz  
Serial No. : 210-00710  
Type : Dipole  
Model : ALS-D-1900-S-2  
Frequency Band : 1900  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 43.411 W/kg  
Power Drift-Finish : 43.759 W/kg  
Power Drift (%) : 0.833

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Serial No. : System Default  
Location : Center  
Description : Default

**Tissue Data**

Type : Body  
Serial No. : 295-02102  
Frequency : 1900.00 MHz  
Last Calib. Date : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 56.00 RH%  
Epsilon : 52.96 F/m  
Sigma : 1.53 S/m  
Density : 1000.00 kg/cu. m

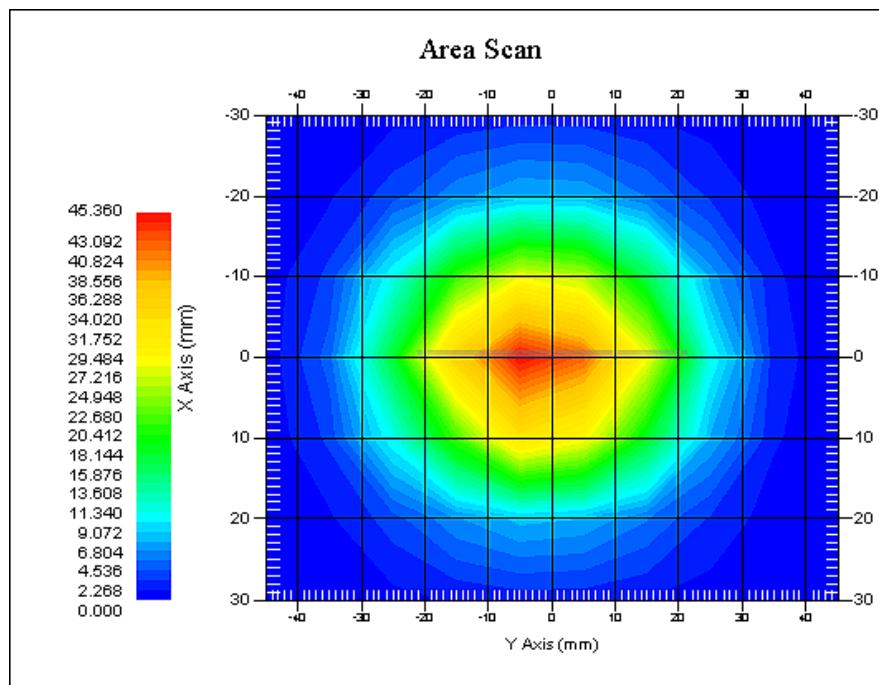
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 1900  
Duty Cycle Factor : 1  
Conversion Factor : 4.5  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

**Measurement Data**

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

1 gram SAR value : 39.610 W/kg  
10 gram SAR value : 20.732 W/kg  
Area Scan Peak SAR : 45.333 W/kg  
Zoom Scan Peak SAR : 72.200 W/kg



### 1900 MHz System Validation with Body Tissue

**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 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 51.176 W/kg  
Power Drift-Finish : 50.369 W/kg  
Power Drift (%) : -1.567

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Serial No. : System Default  
Location : Center  
Description : Default

**Tissue Data**

Type : Head  
Serial No. : 290-01109  
Frequency : 2450.0 MHz  
Last Calib. Date : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 50.00 RH%  
Epsilon : 39.88 F/m  
Sigma : 1.84 S/m  
Density : 1000.00 kg/cu. M

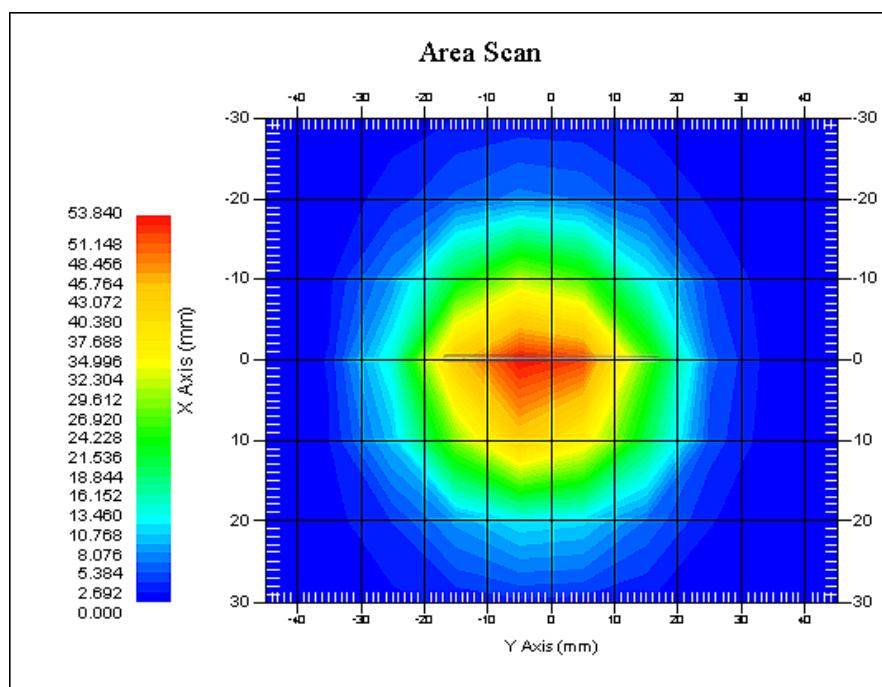
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 2450 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)<sup>2</sup>  
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 : 50.296 W/kg  
10 gram SAR value : 23.722 W/kg  
Area Scan Peak SAR : 53.775 W/kg  
Zoom Scan Peak SAR : 88.272 W/kg



### 2450 MHz System Validation with Head 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 MHz  
Max. Transmit Pwr : 1 W  
Drift Time : 3 min(s)  
Power Drift-Start : 55.255 W/kg  
Power Drift-Finish : 53.717 W/kg  
Power Drift (%) : -2.717

**Phantom Data**

Name : APREL-Uni  
Type : Uni-Phantom  
Serial No. : System Default  
Location : Center  
Description : Default

**Tissue Data**

Type : BODY  
Serial No. : 290-01109  
Frequency : 2450.0 MHz  
Last Calib. Date : 13-May-2015  
Temperature : 20.00 °C  
Ambient Temp. : 21.00 °C  
Humidity : 50.00 RH%  
Epsilon : 52.86 F/m  
Sigma : 2.01 S/m  
Density : 1000.00 kg/cu. M

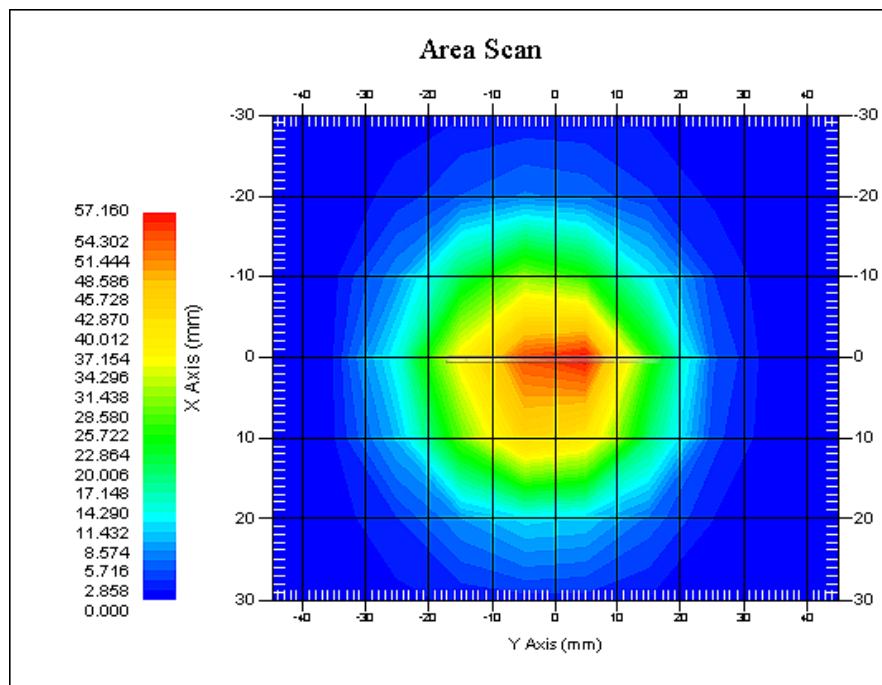
**Probe Data**

Name : E-Field  
Model : E-020  
Type : E-Field Triangle  
Serial No. : 500-00283  
Last Calib. Date : 14-Oct-2014  
Frequency Band : 2450 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)<sup>2</sup>  
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 : 52.366 W/kg  
10 gram SAR value : 24.290 W/kg  
Area Scan Peak SAR : 57.125 W/kg  
Zoom Scan Peak SAR : 91.566 W/kg



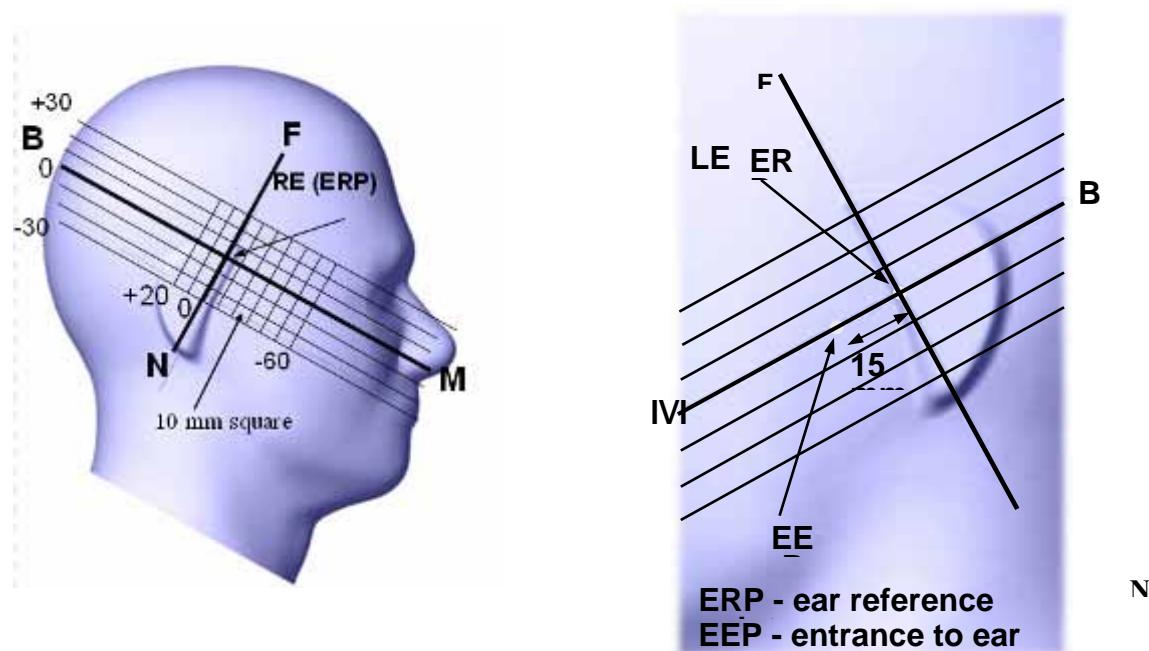
### 2450 MHz System Validation with Body Tissue

## EUT TEST STRATEGY AND METHODOLOGY

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

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper  $\frac{1}{4}$  of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point”. The “test device reference point” should be located at the same level as the center of the earpiece region. The “vertical centerline” should bisect the front surface of the handset at its top and bottom edges. A “ear reference point” is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the “phantom reference plane” defined by the three lines joining the center of each “ear reference point” (left and right) and the tip of the mouth.

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



## Cheek/Touch Position

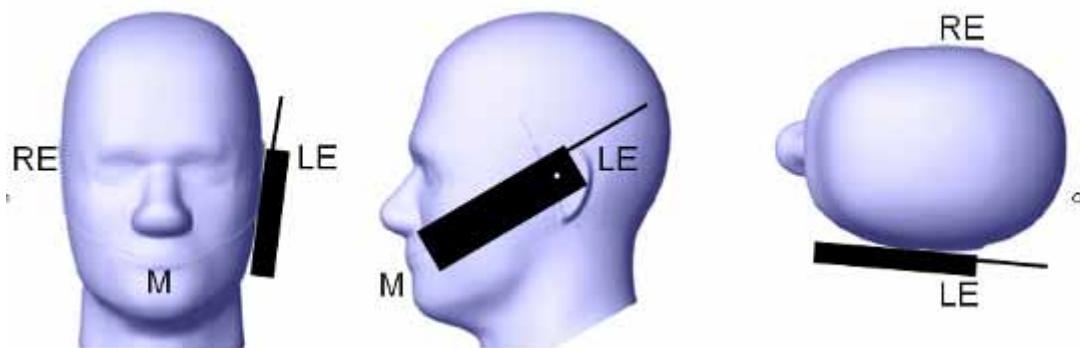
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

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

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

### Cheek /Touch Position



## Ear/Tilt Position

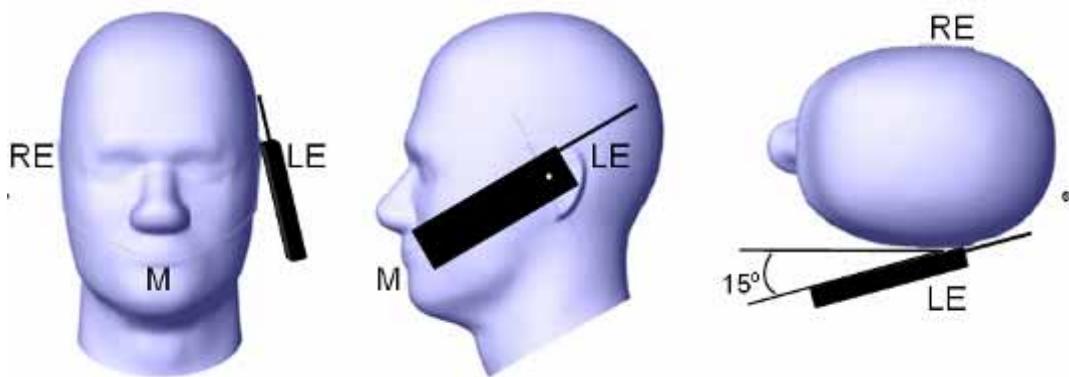
With the handset aligned in the “Cheek/Touch Position”:

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

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both “ear reference points” (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the “test device reference point” until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15°. 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, Tilt/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.

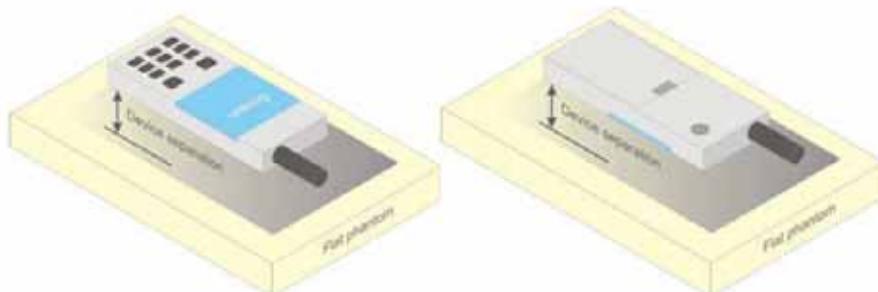


Figure 5 – Test positions for body-worn devices

## 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.

## Test methodology

KDB 447498 D01 General RF Exposure Guidance v05r02.  
KDB 648474 D04 Handset SAR v01r02.  
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03  
KDB 865664 D02 RF Exposure Reporting v01r01  
KDB 941225 D01 3G SAR Procedures v03  
KDB 941225 D06 Hotspot Mode v02  
KDB 248227 D01 802.11 Wi-Fi SAR v02

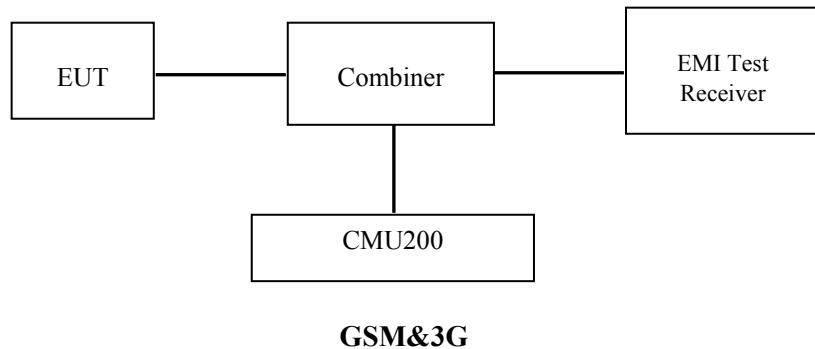
## CONDUCTED OUTPUT POWER MEASUREMENT

## **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.



### Maximum Output Power among production units

Max Target Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 850	32.70	32.70	32.70
GPRS 1 slot	32.70	32.70	32.70
GPRS 2 slot	31.60	31.60	31.60
GPRS 3 slot	29.70	29.70	29.70
GPRS 4 slot	28.70	28.70	28.70
PCS 1900	29.30	29.30	29.30
GPRS 1 slot	29.30	29.30	29.30
GPRS 2 slot	28.20	28.20	28.20
GPRS 3 slot	26.20	26.20	26.20
GPRS 4 slot	25.40	25.40	25.40
WCDMA Band 5	22.00	22.00	22.00
WCDMA Band 4	22.70	22.70	22.70
WCDMA Band 2	22.30	22.30	22.30
Wi-Fi(802.11b)	15.50	15.50	15.50
Wi-Fi(802.11g/n20/n40)	10.50	10.50	10.50
BT3.0	2.00	2.00	2.00
BT4.0	-6.00	-6.00	-6.00

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

Band	Frequency (MHz)	Conducted Output Power	
		Meas. Power (dBm)	Meas. Power (W)
GSM 850	824.2	32.56	1.803
	836.6	32.63	1.832
	848.8	<b>32.67</b>	1.849
PCS 1900	1850.2	29.15	0.822
	1880.0	<b>29.21</b>	0.834
	1909.8	29.19	0.830

**GPRS:**

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	32.57	31.53	29.54	28.52
	190	836.6	32.61	31.58	29.58	28.57
	251	848.8	32.66	31.59	29.61	28.62
PCS 1900	512	1850.2	29.11	28.07	26.18	25.27
	661	1880.0	29.20	28.12	26.19	25.31
	810	1909.8	29.21	28.12	26.15	25.24

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 for GPRS**

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	23.57	25.53	25.29	25.52
	190	836.6	23.61	25.58	25.33	25.57
	251	848.8	23.66	25.59	25.36	<b>25.62</b>
PCS 1900	512	1850.2	20.11	22.07	21.93	22.27
	661	1880.0	20.20	22.12	21.94	<b>22.31</b>
	810	1909.8	20.21	22.12	21.90	22.24

**Note:**

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

**WCDMA-Release 99:**

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

WCDMA General Settings	Loopback Mode	Test Mode 1		
	Rel99 RMC	12.2kbps RMC		
	Power Control Algorithm	Algorithm2		
	$\beta_c / \beta_d$	8/15		

**WCDMA HSDPA**

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

WCDMA General Settings	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subset	1	2	3	4
Loopback Mode		Test Mode 1			
Rel99 RMC		12.2kbps RMC			
HSDPA FRC		H-Set1			
Power Control Algorithm		Algorithm2			
WCDMA General Settings	c	2/15	12/15	15/15	15/15
	d	15/15	15/15	8/15	4/15
	d (SF)	64			
	c/ d	2/15	12/15	15/8	15/4
	hs	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
	$D_{ACK}$	8			
	$D_{NAK}$	8			
	$D_{CQI}$	8			
HSDPA Specific Settings	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	$A_{hs} = hs / c$	30/15			

## WCDMA HSUPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSUPA	HSUPA	HSUPA	HSUPA	HSUPA	
	Subset	1	2	3	4	5	
WCDMA General Settings	Loopback Mode	Test Mode 1					
	Rel99 RMC	12.2kbps RMC					
	HSDPA FRC	H-Set1					
	HSUPA Test	HSUPA Loopback					
	Power Control Algorithm	Algorithm2					
	c	11/15	6/15	15/15	2/15	15/15	
	d	15/15	15/15	9/15	15/15	0	
	ec	209/225	12/15	30/15	2/15	5/15	
	c/ d	11/15	6/15	15/9	2/15	-	
HSDPA Specific Settings	hs	22/15	12/15	30/15	4/15	5/15	
	CM(dB)	1.0	3.0	2.0	3.0	1.0	
	MPR(dB)	0	2	1	2	0	
	DACK	8					
	DNAK	8					
	DCQI	8					
HSUPA Specific Settings	Ack-Nack repetition factor	3					
	CQI Feedback	4ms					
	CQI Repetition Factor	2					
	Ahs= hs/ c	30/15					
	DE-DPCCH	6	8	8	5	7	
HSUPA Specific Settings	DHARQ	0	0	0	0	0	
	AG Index	20	12	15	17	21	
	ETFCI	75	67	92	71	81	
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9	
	Reference E_FCl	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27			E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27		

**HSPA+**

The following tests were conducted according to the test requirements in Table C.11.1.4 of 3GPP TS 34.121-1

Sub-test	$\beta_c$ (Note3)	$\beta_d$	$\beta_{HS}$ (Note1)	$\beta_{ec}$	$\beta_{ed}$ (2xSF2) (Note 4)	$\beta_{ed}$ (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed1}$ : 30/15 $\beta_{ed2}$ : 30/15	$\beta_{ed3}$ : 24/15 $\beta_{ed4}$ : 24/15	3.5	2.5	14	105	105

Note 1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI}$  = 30/15 with  $\beta_{hs} = 30/15 * \beta_c$ .

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the  $\beta_c$  is set to 1 and  $\beta_d$  = 0 by default.

Note 4:  $\beta_{ed}$  can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

**DC-HSDPA**

The following tests were conducted according to the test requirements in Table Table C.8.1.12 of 3GPP TS 34.121-1

**Table C.8.1.12: Fixed Reference Channel H-Set 12**

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Proces ses	6
Information Bit Payload ( $N_{INF}$ )	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.		
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

**WCDMA Band 5**

Mode	3GPP Sub Test	Average Output Power (dBm)		
		Low Channel (Ave. Power)	Middle Channel (Ave. Power)	High Channel (Ave. Power)
Rel 99	1	21.99	<b>21.99</b>	21.91
HSDPA	1	20.51	20.62	20.56
	2	20.42	20.55	20.45
	3	20.58	20.73	20.66
	4	20.39	20.51	20.52
	1	20.63	20.58	20.59
DC-HSDPA	2	20.45	20.63	20.62
	3	20.51	20.72	20.64
	4	20.63	20.54	20.57
	1	20.59	20.52	20.45
HSUPA	2	20.49	20.40	20.38
	3	20.67	20.58	20.53
	4	20.55	20.47	20.34
	5	20.68	20.62	20.58
HPA+	1	20.45	20.46	20.49

**WCDMA Band 4**

Mode	3GPP Sub Test	Average Output Power (dBm)		
		Low Channel (Ave. Power)	Middle Channel (Ave. Power)	High Channel (Ave. Power)
Rel 99	1	22.60	22.29	22.22
HSDPA	1	21.19	20.88	20.82
	2	21.09	20.78	20.69
	3	21.32	20.99	20.92
	4	21.11	20.84	20.70
	1	21.15	20.76	20.74
DC-HSDPA	2	21.02	20.69	20.69
	3	21.13	20.81	20.81
	4	21.04	20.65	20.82
	1	21.23	20.72	20.66
HSUPA	2	21.19	20.67	20.62
	3	21.33	20.84	20.77
	4	21.10	20.64	20.61
	5	21.30	20.80	20.78
HPA+	1	21.08	20.71	20.69

**WCDMA Band 2**

Mode	3GPP Sub Test	Average Output Power (dBm)		
		Low Channel (Ave. Power)	Middle Channel (Ave. Power)	High Channel (Ave. Power)
Rel 99	1	22.04	21.97	22.29
HSDPA	1	20.70	20.64	20.60
	2	20.62	20.52	20.55
	3	20.74	20.75	20.67
	4	20.63	20.53	20.54
	1	20.68	20.59	20.71
DC-HSDPA	2	20.61	20.61	20.73
	3	20.72	20.54	20.68
	4	20.65	20.63	20.58
	1	20.60	20.47	20.87
HSUPA	2	20.52	20.36	20.77
	3	20.67	20.56	20.94
	4	20.49	20.38	20.82
	5	20.67	20.56	20.95
HPA+	1	20.61	20.58	20.59

**Note:**

1. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model 1.
2. KDB 941225 D01-Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than  $\frac{1}{4}$  dB higher than measured without HSDPA using 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.
3. KDB 941225 D01-Body SAR is not required for HSUPA when the maximum average output of each RF channel with HSUPA active is less than  $\frac{1}{4}$  dB higher than measured without HSUPA using 12.2kbps RMC and the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.
4. When the maximum average output power of each RF channel with (uplink) HSPA+ or DC-HSDPA active is  $\leq \frac{1}{4}$  dB higher than that measured without HSPA+ or DC-HSDPA using 12.2 kbps RMC, or the maximum reported SAR for 12.2 kbps RMC without HSPA+ or DC-HSDPA is  $\leq 75\%$  of the SAR limit, SAR evaluation for HSPA+ or DC-HSDPA is not required.

**Bluetooth**

Mode	Channel frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
BDR(GFSK)	(Low)2402	1.19	1.315
	(Middle)2441	1.68	1.472
	(High)2480	1.78	1.507
EDR(4-DQPSK)	(Low)2402	1.04	1.271
	(Middle)2441	1.47	1.403
	(High)2480	1.55	1.429
EDR-8DPSK	(Low)2402	1.33	1.358
	(Middle)2441	1.81	1.517
	(High)2480	<b>1.88</b>	1.542
BLE	(Low)2402	-6.68	0.215
	(Middle)2440	-6.75	0.211
	(High)2480	-7.33	0.185

**Wi-Fi**

Band	Frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
802.11b	2412	<b>15.45</b>	35.075
	2437	15.39	34.594
	2472	15.26	33.574
802.11g	2412	10.39	10.940
	2437	10.17	10.399
	2472	10.26	10.617
802.11n HT20	2412	9.28	8.472
	2437	9.15	8.222
	2472	9.12	8.166
802.11n HT40	2422	8.89	7.745
	2437	8.74	7.482
	2462	8.67	7.362

**Note:**

1. KDB 248227 D01 802.11 Wi-Fi SAR v02,§5.2.2: When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is 1.2 W/kg.
2. The output power was tested under data rate 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n-HT20 and 13.5Mbps for 802.11n-HT40.

## SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

### SAR Test Data

#### Environmental Conditions

Temperature:	21-24
Relative Humidity:	50-53 %
ATM Pressure:	1001-1002 mbar

Testing was performed by Wilson Chen on 2015-05-13

#### GSM 850:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	824.2	GSM	-3.120	32.56	32.70	1.033	0.307	0.317	/
	836.6	GSM	2.436	32.63	32.70	1.016	0.325	<b>0.330</b>	<b>1#</b>
	848.8	GSM	1.528	32.67	32.70	1.007	0.318	0.320	/
Left Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	1.542	32.63	32.70	1.016	0.178	0.181	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-0.852	32.63	32.70	1.016	0.314	0.319	
	848.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	2.452	32.63	32.70	1.016	0.165	0.168	/
	848.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (10mm)	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-2.101	32.63	32.70	1.016	0.418	0.425	/
	848.8	GSM	/	/	/	/	/	/	/

#### 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.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

**PCS Band:**

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1850.2	GSM	1.245	29.15	29.30	1.035	0.148	0.153	/
	1880.0	GSM	-0.863	29.21	29.30	1.021	0.158	<b>0.161</b>	2#
	1909.8	GSM	4.023	29.19	29.30	1.026	0.139	0.143	/
Left Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	3.125	29.21	29.30	1.021	0.078	0.080	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	1.014	29.21	29.30	1.021	0.142	0.145	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	2.036	29.21	29.30	1.021	0.068	0.069	/
	1909.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (10mm)	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	-0.865	29.21	29.30	1.021	0.248	0.253	/
	1909.8	GSM	/	/	/	/	/	/	/

**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.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
4. When the maximum output power variation across the required test channels is  $> \frac{1}{2} \text{dB}$ , instead of the middle channel, the highest output power channel must be used.

## WCDMA Band5

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-1.137	21.99	22.00	1.002	0.122	<b>0.122</b>	3#
	846.6	RMC	/	/	/	/	/	/	/
Left Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	0.629	21.99	22.00	1.002	0.078	0.078	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Cheek	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-3.012	21.99	22.00	1.002	0.114	0.115	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	1.824	21.99	22.00	1.002	0.065	0.065	/
	846.6	RMC	/	/	/	/	/	/	/

## WCDMA Band4

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			Plot
						Scaled Factor	Meas. SAR	Scaled SAR	
Left Head Cheek	1712.4	RMC	/	/	/	/	/	/	/
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	0.974	22.60	22.70	1.023	0.258	<b>0.264</b>	4#
Left Head Tilt	1712.4	RMC	/	/	/	/	/	/	/
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	1.174	22.60	22.70	1.023	0.148	0.151	/
Right Head Cheek	1712.4	RMC	/	/	/	/	/	/	/
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	0.272	22.60	22.70	1.023	0.227	0.232	/
Right Head Tilt	1712.4	RMC	/	/	/	/	/	/	/
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	-1.574	22.60	22.70	1.023	0.137	0.140	/

## WCDMA Band2

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	2.453	22.29	22.30	1.002	0.181	<b>0.181</b>	<b>5#</b>
Left Head Tilt	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	4.698	22.29	22.30	1.002	0.092	0.092	/
Right Head Cheek	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	2.864	22.29	22.30	1.002	0.178	0.178	/
Right Head Tilt	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-2.456	22.29	22.30	1.002	0.095	0.095	/

## Note:

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model.
5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

## Wi-Fi 802.11b

EUT Position	Frequency (MHz)	Power Drift (%)	Meas. Avg. Power (dBm)	Max. Rated Avg. Power (dBm)	1 g SAR Value (W/Kg)			
					Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	2412	-1.983	15.45	15.50	1.012	0.188	<b>0.190</b>	<b>6#</b>
	2437	/	/	/	/	/	/	/
	2472	/	/	/	/	/	/	/
Left Head Tilt	2412	0.686	15.45	15.50	1.012	0.136	0.138	/
	2437	/	/	/	/	/	/	/
	2472	/	/	/	/	/	/	/
Right Head Cheek	2412	-1.685	15.45	15.50	1.012	0.157	0.159	/
	2437	/	/	/	/	/	/	/
	2472	/	/	/	/	/	/	/
Right Head Tilt	2412	0.636	15.45	15.50	1.012	0.110	0.111	/
	2437	/	/	/	/	/	/	/
	2472	/	/	/	/	/	/	/

**Note:**

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
3. KDB 248227 D01 802.11 Wi-Fi SAR v02,§5.2.2: When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power (in the report ratio is 0.316), the and the adjusted SAR is  $1.2\text{ W/kg}$ .

**Mobile Hot-Spot Test Result**

The DUT is capable of functioning as a Wi-Fi 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 back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is  $<2.5\text{ cm}$  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)**

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			Plot
						Scaled Factor	Meas. SAR	Scaled SAR	
Body-Back (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	0.381	28.62	28.70	1.019	0.678	<b>0.691</b>	7#
Body-Left (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	-1.105	28.62	28.70	1.019	0.326	0.332	
Body-Right (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	-2.065	28.62	28.70	1.019	0.158	0.161	
Body-Top (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	1.862	28.62	28.70	1.019	0.103	0.105	/

**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 Class12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worst case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.

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

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	0.825	25.31	25.40	1.007	0.362	<b>0.365</b>	<b>8#</b>
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Left (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	-2.536	25.31	25.40	1.007	0.102	0.103	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Right (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	-2.989	25.31	25.40	1.021	<b>0.061</b>	0.062	
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Top (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880.0	GPRS	1.253	25.31	25.40	1.021	0.348	0.355	/
	1909.8	GPRS	/	/	/	/	/	/	/

**Note:**

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
3. The Multi-slot Classes of EUT is Class12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worst case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.

**Hot Spot-WCDMA Band5**

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	0.413	21.99	22.00	1.002	0.278	<b>0.279</b>	<b>9#</b>
	846.6	RMC	/	/	/	/	/	/	/
Body-Left (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-2.212	21.99	22.00	1.002	0.208	0.208	/
	846.6	RMC	/	/	/	/	/	/	/
Body-Right (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	2.471	21.99	22.00	1.002	0.122	0.122	/
	846.6	RMC	/	/	/	/	/	/	/
Body-Bottom (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-3.332	21.99	22.00	1.002	0.055	0.055	/
	846.6	RMC	/	/	/	/	/	/	/

**Hot Spot-WCDMA Band4**

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			Plot
						Scaled Factor	Meas. SAR	Scaled SAR	
Body-Back (10mm)	1712.4	RMC	1.204	22.60	22.70	1.023	0.698	<b>0.714</b>	<b>10#</b>
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	/	/	/	/	/	/	/
Body-Left (10mm)	1712.4	RMC	-2.003	22.60	22.70	1.023	0.186	0.190	
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	/	/	/	/	/	/	/
Body-Right (10mm)	1712.4	RMC	0.214	22.60	22.70	1.023	0.090	0.092	
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	/	/	/	/	/	/	/
Body-Bottom (10mm)	1712.4	RMC	2.261	22.60	22.70	1.023	0.552	0.565	
	1732.6	RMC	/	/	/	/	/	/	/
	1752.6	RMC	/	/	/	/	/	/	/

**Hot Spot-WCDMA Band2**

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			Plot
						Scaled Factor	Meas. SAR	Scaled SAR	
Body-Back (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	0.513	22.29	22.30	1.002	0.340	<b>0.341</b>	<b>11#</b>
Body-Left (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-1.253	22.29	22.30	1.002	0.101	0.101	/
Body-Right (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-2.741	22.29	22.30	1.002	0.062	0.062	/
Body-Bottom (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880.0	RMC	/	/	/	/	/	/	/
	1907.6	RMC	3.015	22.29	22.30	1.002	0.310	0.311	/

**Note:**

- 1 .When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channels are optional.
2. For GPRS mode: the Multi-slot Classes of EUT is Class12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worst case.

3. For WCDMA mode: the default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model.

4. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

### Wi-Fi 802.11b (2412-2462MHz)

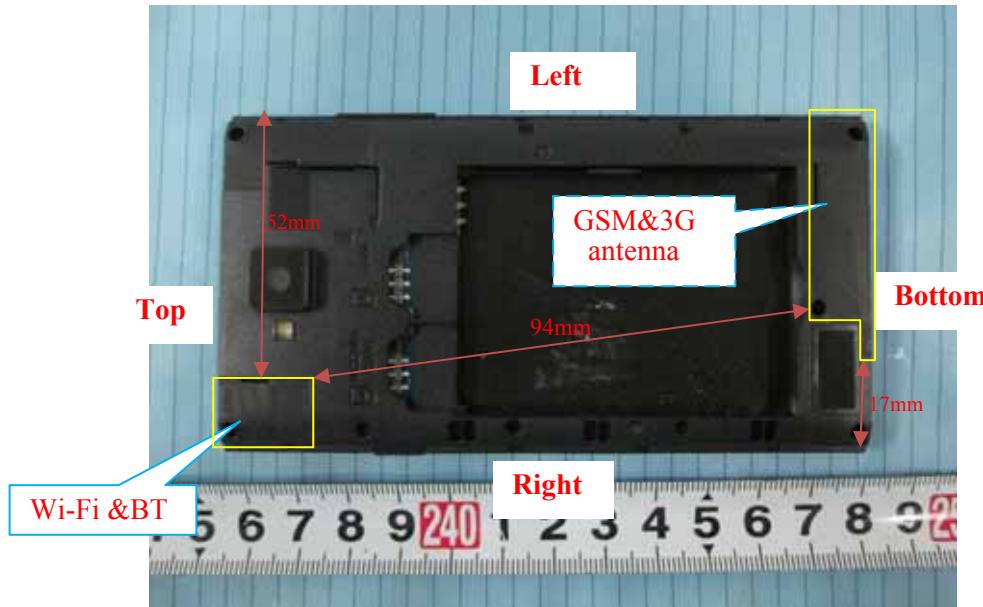
EUT Position	Frequency (MHz)		Power Drift (%)	Meas. Avg. Power (dBm)	Max. Rated Avg. Power (dBm)	1 g SAR Value (W/Kg)			
	Channel	MHz				Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-worn-Back (10mm)	1	2412	-0.654	15.45	15.50	1.012	0.099	<b>0.100</b>	<b>12#</b>
	6	2437	/	/	/	/	/	/	/
	11	2472	/	/	/	/	/	/	/
Body-worn-Right (10mm)	1	2412	-1.665	15.45	15.50	1.012	0.043	0.044	/
	6	2437	/	/	/	/	/	/	/
	11	2472	/	/	/	/	/	/	/
Body-worn-Top (10mm)	1	2412	-2.612	15.45	15.50	1.012	0.076	0.077	/
	6	2437	/	/	/	/	/	/	/
	11	2472	/	/	/	/	/	/	/

#### Note:

1. When the 1-g SAR is  $\leq 0.8\text{W/Kg}$ , testing for other channel is optional.
2. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
3. KDB 248227 D01 802.11 Wi-Fi SAR v02,§5.2.2: When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power (in the report ratio is 0.316), the and the adjusted SAR is 1.2 W/kg.

## SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

### BT &Wi-Fi and GSM&3G Antennas Location:



### Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Simultaneous?	Hotspot?	
GSM + WCDMA	✗	✗	0
GSM + Bluetooth	✓	✗	94
GSM + Wi-Fi	✓	✗	94
GPRS + WCDMA	✗	✗	0
GPRS + Bluetooth	✓	✗	94
GPRS + Wi-Fi	✓	✓	94
WCDMA + Bluetooth	✓	✗	94
WCDMA + Wi-Fi	✓	✓	94

### Standalone SAR test exclusion considerations

Head Position:

Mode	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GSM850	23.70	234.42	0	43.2	3.0	No
PCS1900	20.30	107.15	0	29.5	3.0	No
WCDMA Band5	22.00	158.49	0	29.2	3.0	No
WCDMA Band4	22.70	186.21	0	51.3	3.0	No
WCDMA Band2	22.30	169.82	0	44.9	3.0	No
Wi-Fi	15.50	35.48	0	11.1	3.0	No
Bluetooth	2.00	1.58	0	0.4	3.0	Yes

Body Position:

Mode	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GPRS850	25.70	371.54	10.00	34.3	3.0	No
GPRS1900	22.40	173.78	10.00	24.0	3.0	No
WCDMA Band5	22.00	158.49	10.00	14.6	3.0	No
WCDMA Band4	22.70	186.21	10.00	25.7	3.0	No
WCDMA Band2	22.30	169.82	10.00	22.5	3.0	No
Wi-Fi	15.50	35.48	10.00	5.6	3.0	No
Bluetooth	2.00	1.58	10.00	0.2	3.0	<b>Yes</b>

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances*  $\leq 50$  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.
4. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test Exclusion.

#### Standalone SAR estimation:

Mode	Frequency (GHz)	Distance (mm)	P <sub>avg</sub> (dBm)	P <sub>avg</sub> (mW)	Estimated 1-g (W/kg)
BT Head	2.48	0	2.00	1.58	0.053
BT Body	2.48	10	2.00	1.58	0.027

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:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})/x}] \text{ W/kg for test separation distances} \leq 50 \text{ mm};$$

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

**Simultaneous SAR test exclusion considerations:****GSM with BT:**

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	BT	< 1.6W/kg
GSM850	Left Head Cheek	0.330	0.053	0.383
	Left Head Tilt	0.181	0.053	0.234
	Right Head Cheek	0.319	0.053	0.372
	Right Head Tilt	0.168	0.053	0.221
	Body-Headset-Back	0.425	0.027	0.452
PCS1900	Left Head Cheek	0.161	0.053	0.214
	Left Head Tilt	0.080	0.053	0.133
	Right Head Cheek	0.145	0.053	0.198
	Right Head Tilt	0.069	0.053	0.122
	Body-Headset-Back	0.253	0.027	0.28

**WCDMA with BT:**

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	BT	< 1.6W/kg
WCDMA Band5	Left Head Cheek	0.122	0.053	0.175
	Left Head Tilt	0.078	0.053	0.131
	Right Head Cheek	0.114	0.053	0.167
	Right Head Tilt	0.065	0.053	0.118
WCDMA Band4	Left Head Cheek	0.264	0.053	0.317
	Left Head Tilt	0.151	0.053	0.204
	Right Head Cheek	0.232	0.053	0.285
	Right Head Tilt	0.140	0.053	0.193
WCDMA Band2	Left Head Cheek	0.181	0.053	0.234
	Left Head Tilt	0.178	0.053	0.231
	Right Head Cheek	0.095	0.053	0.148
	Right Head Tilt	0.122	0.053	0.175

**GSM with Wi-Fi:**

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	Wi-Fi	< 1.6W/kg
GSM850	Left Head Cheek	0.330	0.190	<b>0.520</b>
	Left Head Tilt	0.181	0.138	0.319
	Right Head Cheek	0.319	0.159	0.478
	Right Head Tilt	0.168	0.111	0.279
	Body-Headset-Back	0.425	0.100	0.525
PCS1900	Left Head Cheek	0.161	0.190	0.351
	Left Head Tilt	0.080	0.138	0.218
	Right Head Cheek	0.145	0.159	0.304
	Right Head Tilt	0.069	0.111	0.180
	Body-Headset-Back	0.253	0.100	0.353

**WCDMA with Wi-Fi:**

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	Wi-Fi	< 1.6W/kg
WCDMA Band5	Left Head Cheek	0.122	0.190	0.312
	Left Head Tilt	0.078	0.138	0.216
	Right Head Cheek	0.114	0.159	0.273
	Right Head Tilt	0.065	0.111	0.176
WCDMA Band4	Left Head Cheek	0.264	0.190	0.454
	Left Head Tilt	0.151	0.138	0.289
	Right Head Cheek	0.232	0.159	0.391
	Right Head Tilt	0.140	0.111	0.251
WCDMA Band2	Left Head Cheek	0.181	0.190	0.371
	Left Head Tilt	0.178	0.138	0.316
	Right Head Cheek	0.095	0.159	0.254
	Right Head Tilt	0.122	0.111	0.233

**Note:**

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.

Evaluations for Simultaneous SAR, BT+GSM/3G					
Test Position	Body-Back (1.0cm)	Body-Left (1.0cm)	Body-Right (1.0cm)	Body-Bottom (1.0cm)	Body-Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)				
GPRS 850	0.691	0.332	0.161	0.105	/
GPRS 1900	0.365	0.103	0.062	0.355	/
WCDMA Band5	0.279	0.208	0.122	0.055	/
WCDMA Band4	0.714	0.19	0.092	0.565	/
WCDMA Band2	0.341	0.101	0.062	0.311	/
BT	0.037	0.037	0.037	0.037	0.037
	$\Sigma$ 1-g SAR(W/Kg)				
GPRS850 + BT	0.728	0.369	0.198	0.142	/
GPRS1900 + BT	0.402	0.14	0.099	0.392	/
WCDMA Band5 + BT	0.316	0.245	0.159	0.092	/
WCDMA Band4 + BT	0.751	0.227	0.129	0.602	/
WCDMA Band2 + BT	0.378	0.138	0.099	0.348	/
Evaluations for Simultaneous SAR, Mobile Hot Spot Positions					
Test Position	Body-Back (1.0cm)	Body-Left (1.0cm)	Body-Right (1.0cm)	Body-Bottom (1.0cm)	Body-Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)				
GPRS 850	0.691	0.332	0.161	0.105	/
GPRS 1900	0.365	0.103	0.062	0.355	/
WCDMA Band5	0.279	0.208	0.122	0.055	/
WCDMA Band4	0.714	0.19	0.092	0.565	
WCDMA Band2	0.341	0.101	0.062	0.311	/
Wi-Fi	0.100	/	0.044	/	0.077
	$\Sigma$ 1-g SAR(W/Kg)				
GPRS850 + Wi-Fi	<b>0.791</b>	/	0.205	/	/
GPRS1900 + Wi-Fi	0.465	/	0.106	/	/
WCDMA Band5 + Wi-Fi	0.379	/	0.166	/	/
WCDMA Band4 + Wi-Fi	0.814	/	0.136	/	/
WCDMA Band2 + Wi-Fi	0.441	/	0.106	/	/

**Note:**

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.

**SAR Plots (Summary of the Highest SAR Values)****Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Left Head Cheek (836.6 MHz Middle Channel)****Measurement Data**

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 10x13x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.035 W/kg  
Power Drift-Finish : 0.036 W/kg  
Power Drift (%) : 2.436

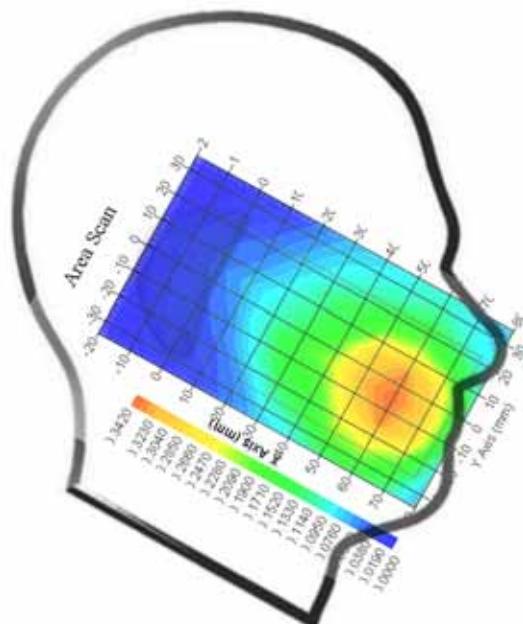
**Tissue Data**

Type : Head  
Frequency : 836.6 MHz  
Epsilon : 41.05 F/m  
Sigma : 0.92 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 8  
Conversion Factor : 5.9  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.325 W/kg  
10 gram SAR value : 0.198 W/kg  
Area Scan Peak SAR : 0.340 W/kg  
Zoom Scan Peak SAR : 0.576 W/kg

**Plot 1#**

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

## Measurement Data

Test mode : GSM  
Crest Factor : 8  
Scan Type : Complete  
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.010 W/kg  
Power Drift-Finish : 0.010 W/kg  
Power Drift (%) : -0.863

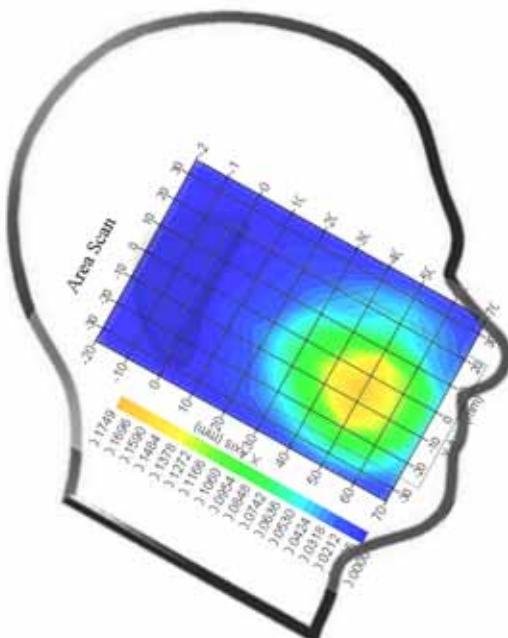
## Tissue Data

Type : Head  
Frequency : 1880.0 MHz  
Epsilon : 39.58 F/m  
Sigma : 1.40 S/m  
Density : 1000.00 kg/cu. M

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 8  
Conversion Factor : 4.8  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.158 W/kg  
10 gram SAR value : 0.082 W/kg  
Area Scan Peak SAR : 0.168 W/kg  
Zoom Scan Peak SAR : 0.325 W/kg

**Plot 2#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****WCDMA Band5; Left Head Cheek (836.6 MHz Middle Channel)****Measurement Data**

Test mode : RMC  
 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 : 0.015 W/kg  
 Power Drift-Finish : 0.015 W/kg  
 Power Drift (%) : -1.137

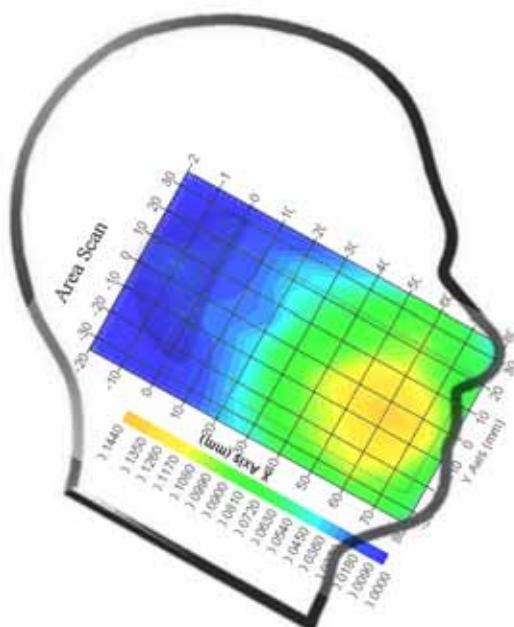
**Tissue Data**

Type : Head  
 Frequency : 836.6 MHz  
 Epsilon : 41.05 F/m  
 Sigma : 0.92 S/m  
 Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
 Frequency Band : 835  
 Duty Cycle Factor : 1  
 Conversion Factor : 5.9  
 Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
 Compression Point : 95.00 mV  
 Offset : 1.56 mm

1 gram SAR value : 0.122 W/kg  
 10 gram SAR value : 0.094 W/kg  
 Area Scan Peak SAR : 0.140 W/kg  
 Zoom Scan Peak SAR : 0.225 W/kg

**Plot 3#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****WCDMA Band4; Left Head Cheek (1712.4 MHz Low Channel)****Measurement Data**

Test mode : RMC  
Crest Factor : 1  
Scan Type : Complete  
Area Scan : 11x9x1: 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 (%) : 0.974

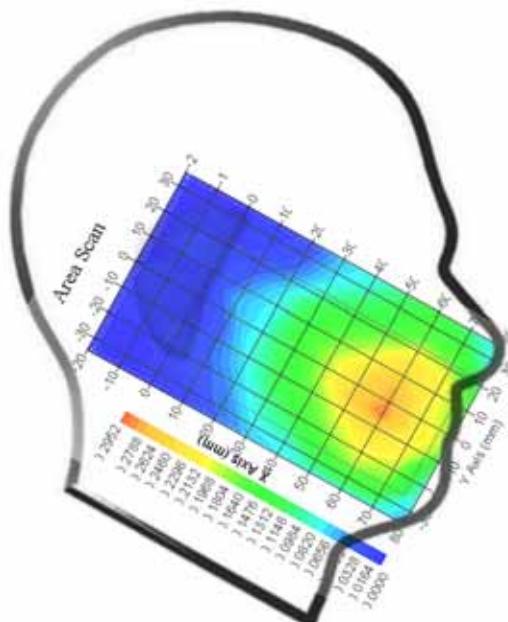
**Tissue Data**

Type : Head  
Frequency : 1712.4 MHz  
Epsilon : 40.53 F/m  
Sigma : 1.37 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1750  
Duty Cycle Factor : 1  
Conversion Factor : 5.4  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.258 W/kg  
10 gram SAR value : 0.155 W/kg  
Area Scan Peak SAR : 0.295 W/kg  
Zoom Scan Peak SAR : 0.404 W/kg

**Plot 4#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****WCDMA Band2; Left Head Cheek (1907.6 MHz High Channel)****Measurement Data**

Test mode : RMC  
Crest Factor : 1  
Scan Type : Complete  
Area Scan : 11x9x1: 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 (%) : 2.453

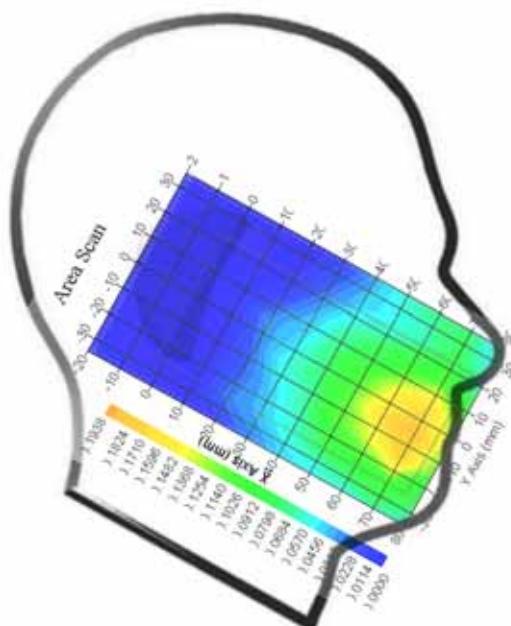
**Tissue Data**

Type : Head  
Frequency : 1907.6 MHz  
Epsilon : 39.71 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 : 1  
Conversion Factor : 4.8  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.181 W/kg  
10 gram SAR value : 0.098 W/kg  
Area Scan Peak SAR : 0.189 W/kg  
Zoom Scan Peak SAR : 0.241 W/kg

**Plot 5#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****802.11b; Left Head Cheek (2412 MHz Channel 1)****Measurement Data**

Test mode : 802.11b  
Crest Factor : 1  
Scan Type : Complete  
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.102 W/kg  
Power Drift-Finish : 0.100 W/kg  
Power Drift (%) : -1.983

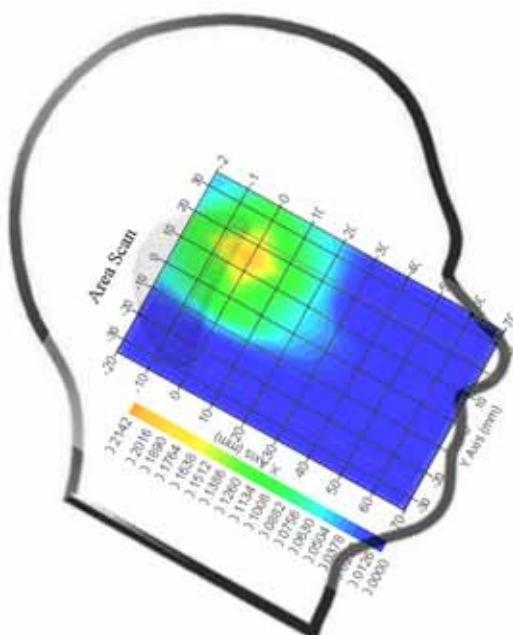
**Tissue Data**

Type : Head  
Frequency : 2412 MHz  
Epsilon : 39.97 F/m  
Sigma : 1.80 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 2450  
Duty Cycle Factor : 1  
Conversion Factor : 4.9  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.188 W/kg  
10 gram SAR value : 0.102 W/kg  
Area Scan Peak SAR : 0.210 W/kg  
Zoom Scan Peak SAR : 0.349 W/kg

**Plot 6#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn-Back (848.8 MHz High Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 2  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.575 W/kg  
Power Drift-Finish : 0.577 W/kg  
Power Drift (%) : 0.381

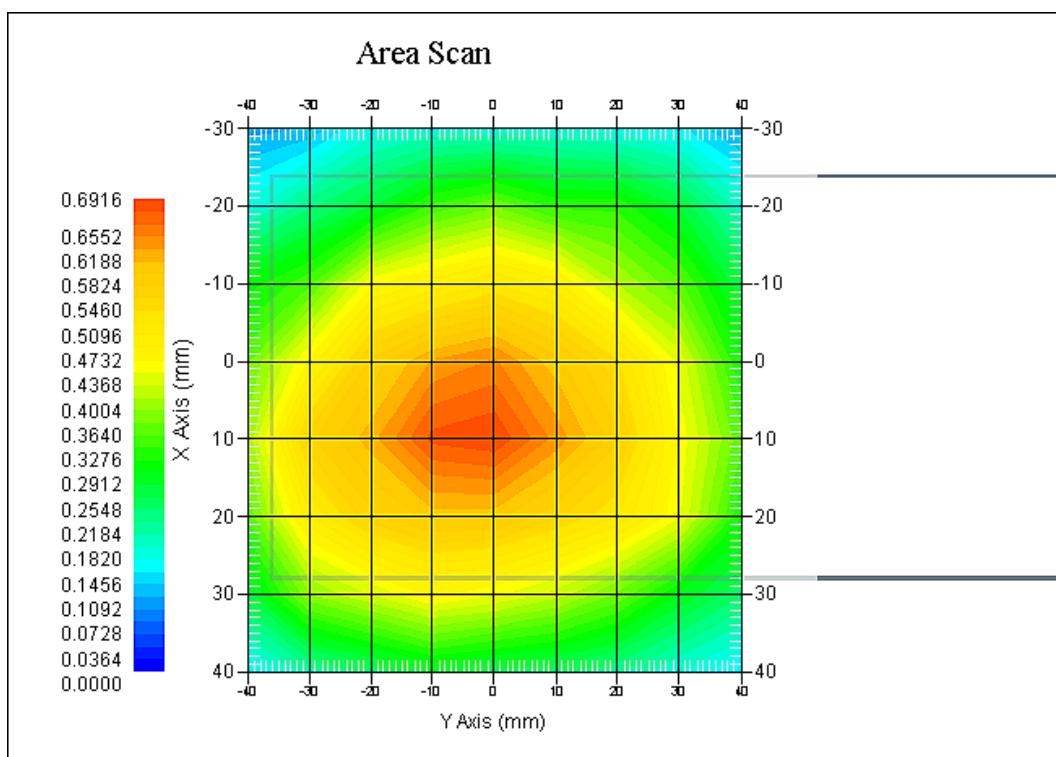
## Tissue Data

Type : Body  
Frequency : 848.8 MHz  
Epsilon : 53.83 F/m  
Sigma : 0.98 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 835  
Duty Cycle Factor : 2  
Conversion Factor : 5.9  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.678 W/kg  
10 gram SAR value : 0.523 W/kg  
Area Scan Peak SAR : 0.690 W/kg  
Zoom Scan Peak SAR : 1.102 W/kg

**Plot 7#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****Body-worn-Back (1880 MHz Middle Channel)**

## Measurement Data

Test mode : GPRS  
Crest Factor : 2  
Scan Type : Complete  
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.252 W/kg  
Power Drift-Finish : 0.254 W/kg  
Power Drift (%) : 0.825

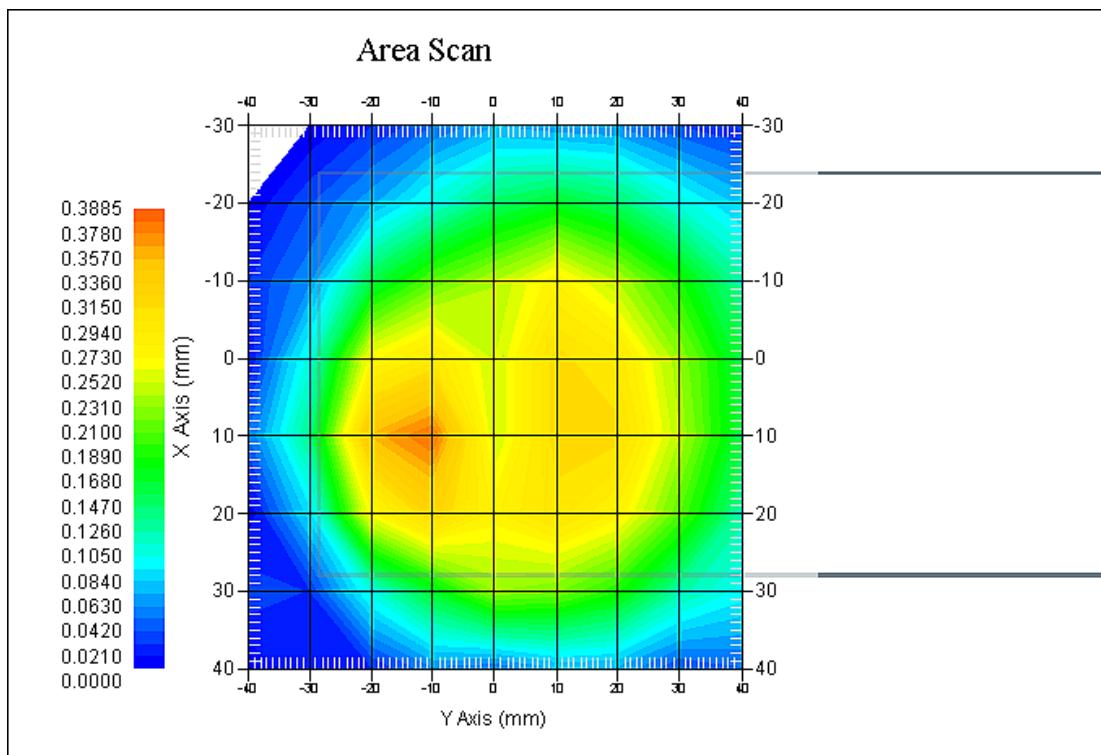
## Tissue Data

Type : Body  
Frequency : 1880 MHz  
Epsilon : 51.89 F/m  
Sigma : 1.52 S/m  
Density : 1000.00 kg/cu. m

## Probe Data

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 2  
Conversion Factor : 4.5  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.362 W/kg  
10 gram SAR value : 0.206 W/kg  
Area Scan Peak SAR : 0.378 W/kg  
Zoom Scan Peak SAR : 0.542 W/kg

**Plot 8#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****WCDMA Band5; Body-Worn-Back (836.6 MHz Middle Channel)****Measurement Data**

Test mode : RMC  
 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 : 0.268 W/kg  
 Power Drift-Finish : 0.269 W/kg  
 Power Drift (%) : 0.413

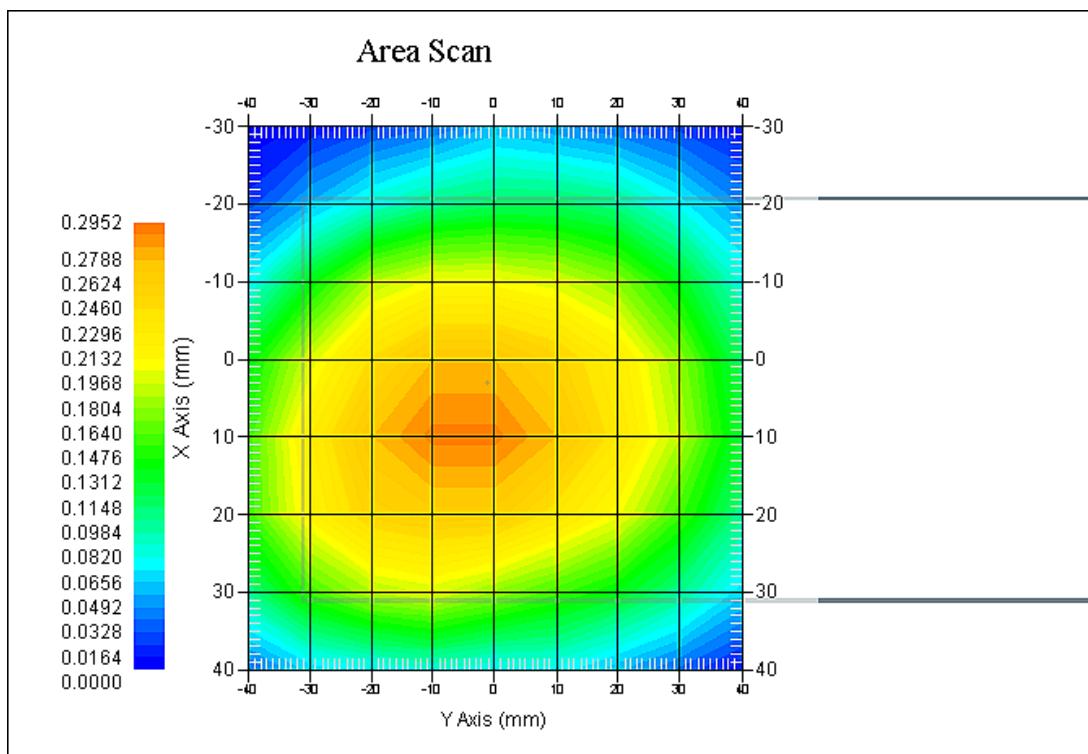
**Tissue Data**

Type : Body  
 Frequency : 836.6 MHz  
 Epsilon : 53.85 F/m  
 Sigma : 0.96 S/m  
 Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
 Frequency Band : 835  
 Duty Cycle Factor : 1  
 Conversion Factor : 5.9  
 Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
 Compression Point : 95.00 mV  
 Offset : 1.56 mm

1 gram SAR value : 0.278 W/kg  
 10 gram SAR value : 0.225 W/kg  
 Area Scan Peak SAR : 0.290 W/kg  
 Zoom Scan Peak SAR : 0.419 W/kg

**Plot 9#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****WCDMA Band4; Body-Worn-Back (1712.4 MHz Low Channel)****Measurement Data**

Test mode : RMC  
Crest Factor : 1  
Scan Type : Complete  
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.359 W/kg  
Power Drift-Finish : 0.363 W/kg  
Power Drift (%) : 1.204

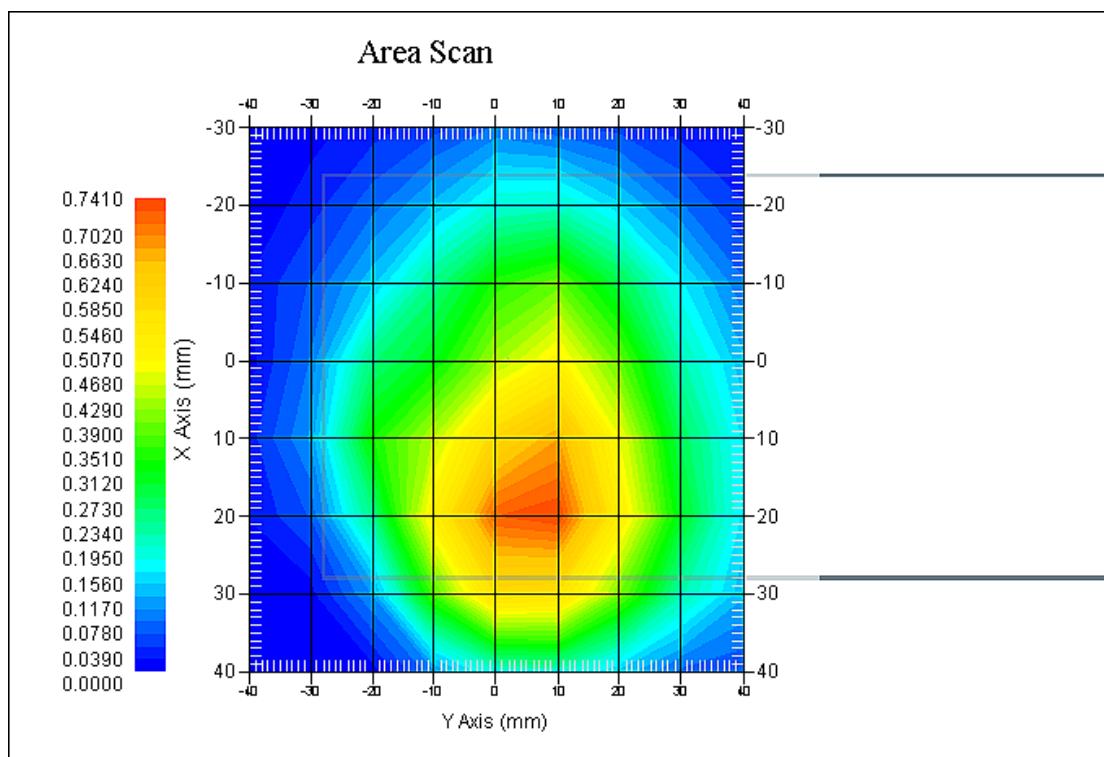
**Tissue Data**

Type : Body  
Frequency : 1712.4 MHz  
Epsilon : 51.91 F/m  
Sigma : 1.49 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1750  
Duty Cycle Factor : 1  
Conversion Factor : 5.3  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.698 W/kg  
10 gram SAR value : 0.462 W/kg  
Area Scan Peak SAR : 0.735 W/kg  
Zoom Scan Peak SAR : 1.341 W/kg

**Plot 10#**

**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****WCDMA Band2; Body-Worn-Back (1907.6 MHz High Channel)****Measurement Data**

Test mode : RMC  
Crest Factor : 1  
Scan Type : Complete  
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm  
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm  
Power Drift-Start : 0.201 W/kg  
Power Drift-Finish : 0.202 W/kg  
Power Drift (%) : 0.513

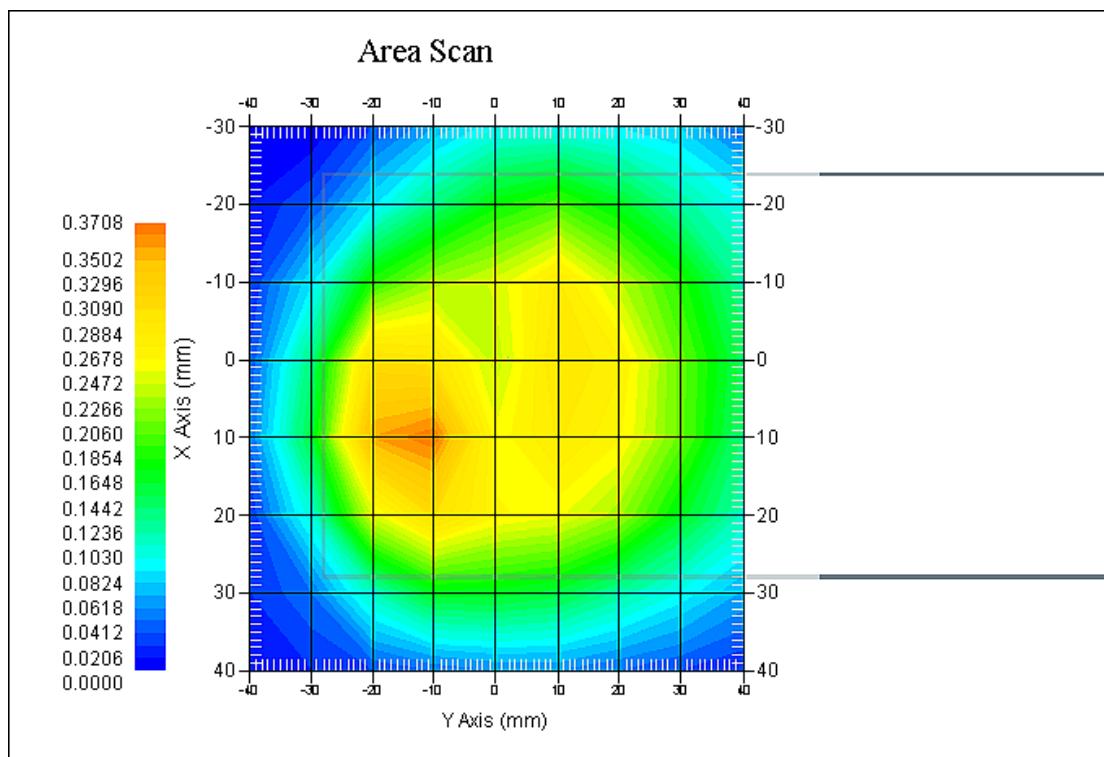
**Tissue Data**

Type : Body  
Frequency : 1907.6 MHz  
Epsilon : 52.04 F/m  
Sigma : 1.53 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 1900  
Duty Cycle Factor : 1  
Conversion Factor : 4.8  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.340 W/kg  
10 gram SAR value : 0.253 W/kg  
Area Scan Peak SAR : 0.367 W/kg  
Zoom Scan Peak SAR : 0.525 W/kg

**Plot 11#**

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

Crest Factor : 1  
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 : 0.023 W/kg  
Power Drift-Finish : 0.023 W/kg  
Power Drift (%) : -0.654

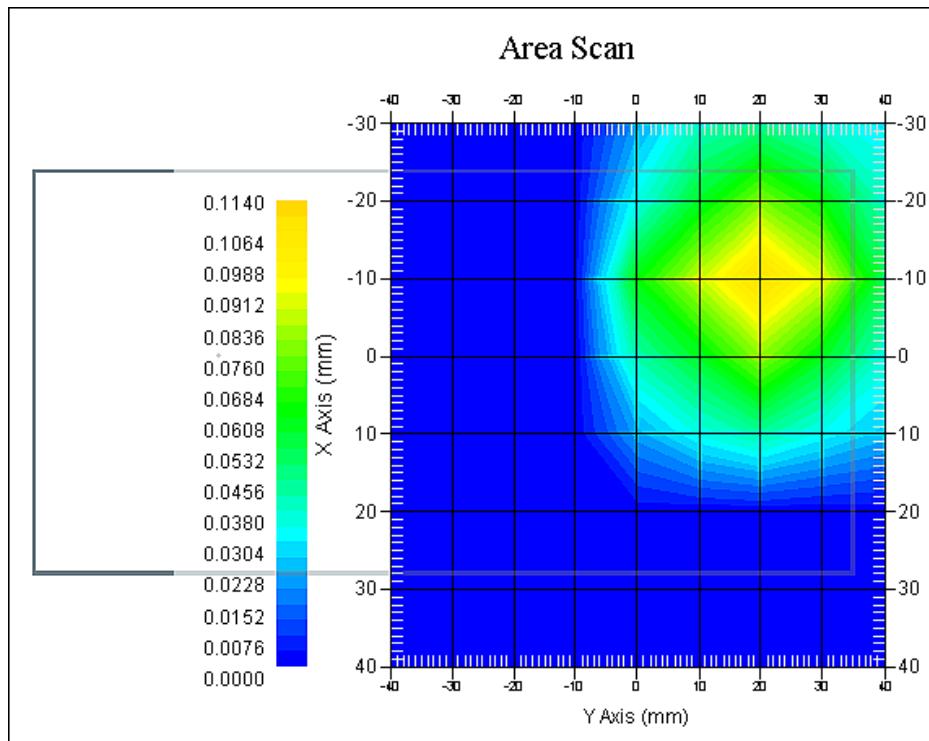
**Tissue Data**

Type : Body  
Frequency : 2412 MHz  
Epsilon : 52.81 F/m  
Sigma : 1.91 S/m  
Density : 1000.00 kg/cu. m

**Probe Data**

Serial No. : 500-00283  
Frequency Band : 2450 MHz  
Duty Cycle Factor : 1  
Conversion Factor : 4.3  
Probe Sensitivity : 1.20 1.20 1.20  $\mu$ V/(V/m)2  
Compression Point : 95.00 mV  
Offset : 1.56 mm

1 gram SAR value : 0.099 W/kg  
10 gram SAR value : 0.046 W/kg  
Area Scan Peak SAR : 0.109 W/kg  
Zoom Scan Peak SAR : 0.152 W/kg

**Plot 12#**

## APPENDIX A MEASUREMENT UNCERTAINTY

According to **IEEE1528:2013**, the uncertainty budget has been determined for the Head SAR measurement system and is given in the following Table.

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_i^1 (1-g)$	$c_i^1 (10-g)$	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
<b>Measurement System</b>							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	$\frac{(1-cp)^1}{\sqrt{2}}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.6	rectangular	$\sqrt{3}$	1	1	0.3	0.3
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
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
<b>Test sample related</b>							
Test sample positioning	2.0	normal	1	1	1	2.0	2.0
Test Sample Positioning	2.3	normal	1	1	1	2.3	2.3
Device Holder Uncertainty	4.0	normal	1	1	1	6.215	6.215
Drift of Output Power	5.0	rectangular	$\sqrt{3}$	1	1	2.67	2.67
<b>Phantom and Setup</b>							
Phantom Uncertainty	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
SAR correction in permittivity and conductivity	1.2	normal	1	1	0.85	1.2	1.0
Liquid conductivity measurement	5.0	normal	1	0.78	0.71	3.9	3.6
Liquid permittivity measurement	5.0	normal	1	0.25	0.29	1.3	1.5
conductivity—temperature	1.1	rectangular	$\sqrt{3}$	0.78	0.71	0.5	0.5
permittivity—temperature	1.3	rectangular	$\sqrt{3}$	0.23	0.23	0.2	0.2
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

According to **IEC62209-2:2010**, the uncertainty budget has been determined for the Body SAR measurement system and is given in the following Table.

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	$c_i^1 (1-g)$	$c_i^1 (10-g)$	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
<b>Measurement System</b>							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	$\frac{(1-cp)^1}{\sqrt{2}}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.6	rectangular	$\sqrt{3}$	1	1	0.3	0.3
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
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
<b>Test sample related</b>							
Test sample positioning	2.0	normal	1	1	1	2.0	2.0
Test Sample Positioning	2.3	normal	1	1	1	2.3	2.3
Device Holder Uncertainty	4.0	normal	1	1	1	6.215	6.215
Drift of Output Power	5.0	rectangular	$\sqrt{3}$	1	1	2.67	2.67
<b>Phantom and Setup</b>							
Phantom Uncertainty	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
SAR correction in permittivity and conductivity	1.2	normal	1	1	0.85	1.2	1.0
Liquid conductivity measurement	5.0	normal	1	0.78	0.71	3.9	3.6
Liquid permittivity measurement	5.0	normal	1	0.25	0.29	1.3	1.5
conductivity—temperature	1.1	rectangular	$\sqrt{3}$	0.78	0.71	0.5	0.5
permittivity—temperature	1.3	rectangular	$\sqrt{3}$	0.23	0.23	0.2	0.2
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.: PC-1598****Task No: BACL-5778****C E R T I F I C A T E   O F   C A L I B R A T I O N**

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

Equipment: Miniature Isotropic RF Probe  
Record of Calibration  
Head and Body  
Manufacturer: APREL Laboratories  
Model No.: E-020  
Serial No.: 500-00283

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole  
Project No: BACL-5745

Calibrated: 14<sup>th</sup> October 2014  
Released on: 14<sup>th</sup> October 2014

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

Released By:



Art Brennan, Quality Manager

**NCL CALIBRATION LABORATORIES**

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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 meteorgical practices.

**Calibration Method**

Probes are calibrated using the following methods.

<800 MHz

TEM Cell for sensitivity in air

Standard phantom using temperature transfer method for sensitivity in tissue

>800 MHz

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**

- o IEEE Standard 1528:2013  
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- o 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
- o IEC 62209-2:2010  
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)
- o TP-D01-032-E020-V2 E-Field probe calibration procedure
- o D22-012-Tissue dielectric tissue calibration procedure
- o D28-002-Dipole procedure for validation of SAR system using a dipole
- o IEEE 1309 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.

**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
Tektronix USB Power Meter	11C940	May 14, 2015
Signal Generator HP 83640B	3844A00689	Feb 12, 2015

**Secondary Measurement Standards**

Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015
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**Attestation**

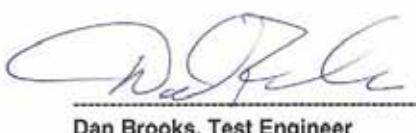
The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

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.



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Art Brennan, Quality Manager



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Dan Brooks, Test Engineer

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Page 3 of 10

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

**NCL Calibration Laboratories**

Division of APREL Inc.

**Probe Summary**

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

\*Resistive to recommended tissue recipes per IEEE-1528

**Sensitivity in Air**

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

**Diode Compression Point:** 95 mV

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Page 4 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.

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

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Standard Uncertainty (%)	Calibration Frequency Range (MHz)	Conversion Factor
450 H	Head	43.59	0.86	3.5	±50	5.7
450 B	Body	56.74	0.94	3.5	±50	5.8
750 H	Head	42.98	0.92	3.5	±50	6.0
750 B	Body	43.05	0.93	3.5	±50	5.5
835 H	Head	43.42	0.94	3.5	±50	5.9
835 B	Body	55.77	1.01	3.5	±50	5.9
900 H	Head	41.87	1.06	3.5	±50	6.0
900 B	Body	55.62	1.05	3.5	±50	5.9
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	38.23	1.38	3.5	±75	5.4
1750 B	Body	52.86	1.54	3.5	±75	5.3
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
1900 H	Head	40.20	1.38	3.5	±75	4.8
1900 B	Body	52.63	1.46	3.5	±75	4.5
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	37.26	1.84	3.5	±75	4.9
2450 B	Body	53.61	1.9	3.5	±75	4.3
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	37.49	3.16	3.5	±100	4.5
3600 B	Body	49.94	3.86	3.5	±100	4.0
5250 H	Head	35.51	4.78	3.5	±100	3.0
5250 B	Body	47.54	5.11	3.5	±100	2.8
5600 H	Head	36.05	5.15	3.5	±100	2.8
5600 B	Body	46.49	5.72	3.5	±100	2.2
5800 H	Head	45.99	6.01	3.5	±100	3.2
5800 B	Body	35.6	5.37	3.5	±100	2.5

Page 5 of 10

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**Boundary Effect:**

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

**Spatial Resolution:**

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

**DAQ-PAQ Contribution**

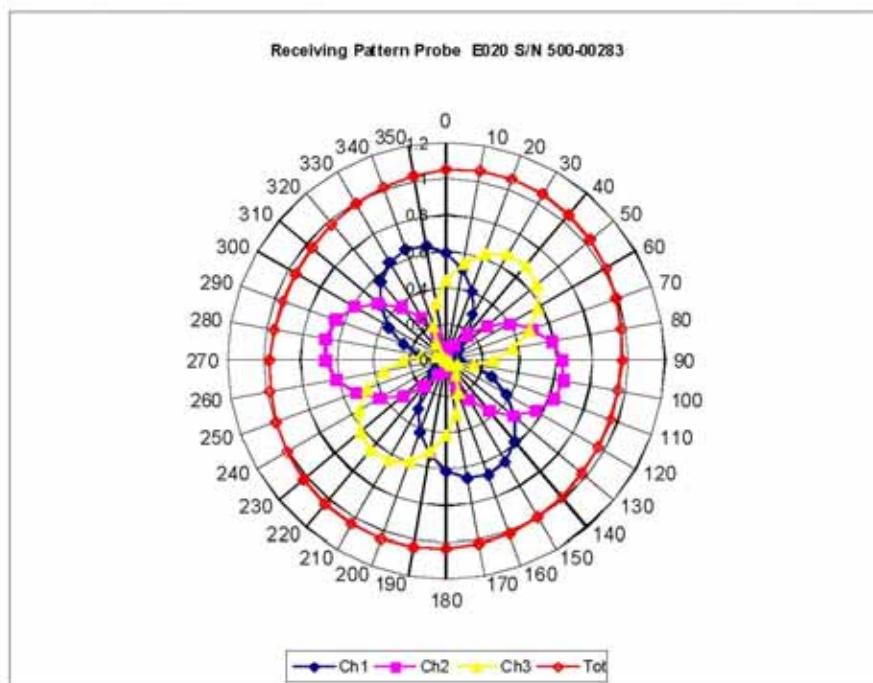
To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of  $5\text{ M}\Omega$ .

**Probe Calibration Uncertainty**

Uncertainty component	Tolerance ( $\pm$ %)	Probability distribution	Divisor	Standard uncertainty ( $\pm$ %)
Incident or forward power	2.5	R	$\sqrt{3}$	1.44
Reflected power	2	R	$\sqrt{3}$	1.15
Liquid conductivity measurement	1	R	$\sqrt{3}$	0.58
Liquid permittivity measurement	1	R	$\sqrt{3}$	0.58
Liquid conductivity deviation	1.5	R	$\sqrt{3}$	0.87
Liquid permittivity deviation	1.5	R	$\sqrt{3}$	0.87
Frequency deviation	2.25	R	$\sqrt{3}$	1.30
Field homogeneity	2.5	R	$\sqrt{3}$	1.44
Field-probe positioning	2.5	R	$\sqrt{3}$	1.44
Field-probe linearity	1.55	R	$\sqrt{3}$	0.89
<b>Combined standard uncertainty</b>		RSS		<b>3.50</b>

**NCL Calibration Laboratories**

Division of APREL Inc.

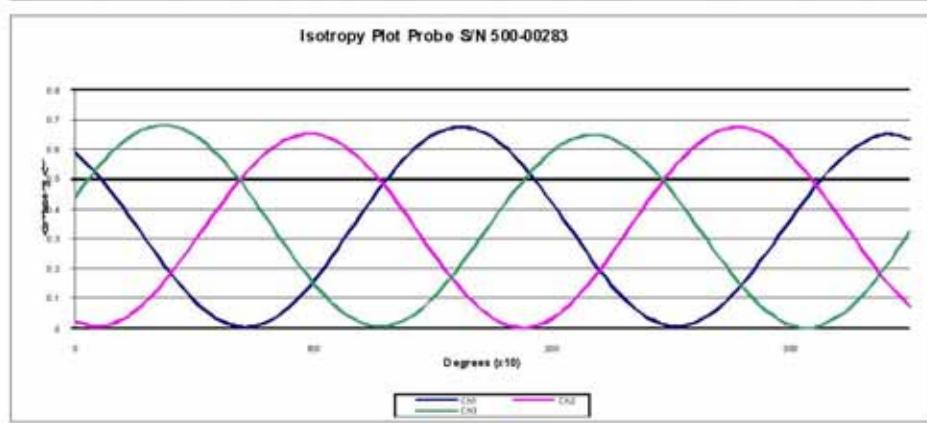
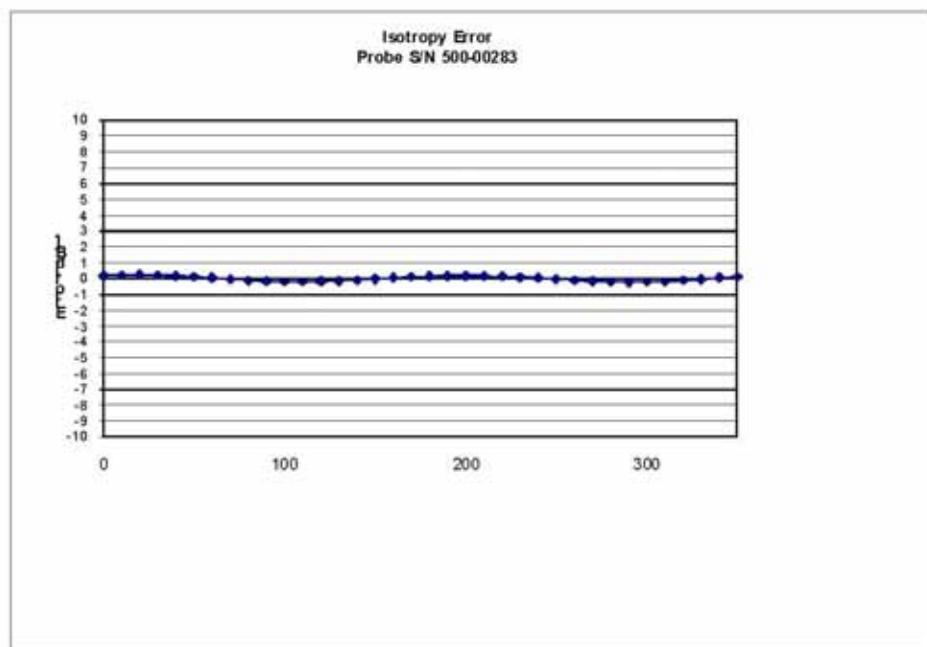
**Receiving Pattern Air**

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

**NCL Calibration Laboratories**

Division of APREL Inc.

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

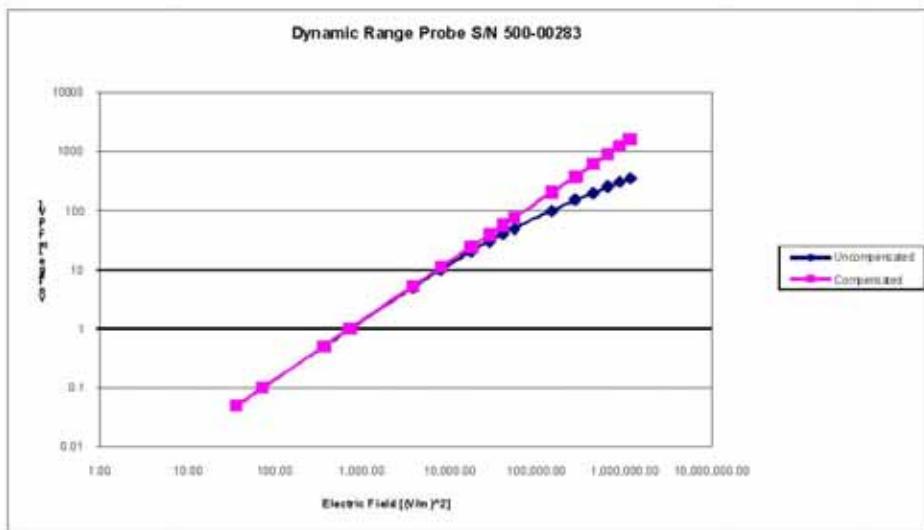
0.10 dB

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

**NCL Calibration Laboratories**

Division of APREL Inc.

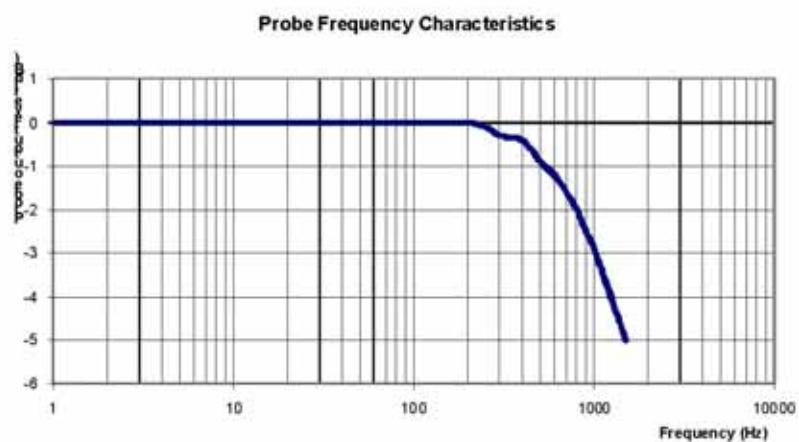
**Dynamic Range**

Page 9 of 10

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

**NCL Calibration Laboratories**

Division of APREL Inc.

**Video Bandwidth**

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

**Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2014.

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

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

Calibration File No: DC-1599  
Project Number: BAC-dipole-cal-5779

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

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

Validation Dipole(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 (China)

Calibrated: 8<sup>th</sup> October 2014  
Released on: 8<sup>th</sup> October 2014

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.  
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 with a damaged connection for a re-calibration.

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

**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



Maryna Nesterova Calibration Engineer

**Primary Measurement Standards**

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

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**

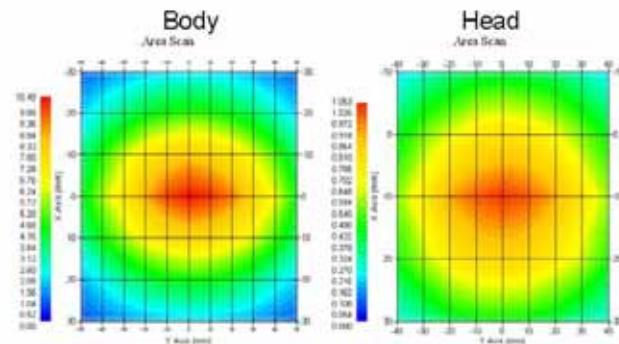
Length: 162.2 mm  
Height: 89.4 mm

**Electrical Specification**

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	835 MHz	1.066 U	-30.344 dB	49.001 $\Omega$
Body	835 MHz	1.089 U	-28.118 dB	53.117 $\Omega$

**System Validation Results**

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	835 MHz	9.773	6.174	14.713
Body	835 MHz	9.736	6.297	14.513



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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Introduction**

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 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 30 MHz to 6 GHz E-Field Probe Serial Number 225.

**References**

- IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
- Part 2: "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)"
- 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

**Conditions**

Dipole 180-00558 was repaired prior to this calibration. The repair reliability depends upon correct usage of the dipole.

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

**Dipole Calibration uncertainty**

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

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

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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

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

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

**Electrical Verification**

Tissue Type	Return Loss:	SWR:	Impedance:
Head	-30.344 dB	1.066 U	49.001Ω
Body	-28.118 dB	1.089 U	53.117 Ω □

**Tissue Validation**

	Dielectric constant, $\epsilon_r$	Conductivity, $\sigma$ [S/m]
Head Tissue 835MHz	43.42	0.94
Body Tissue 835MHz	55.77	1.01

## NCL Calibration Laboratories

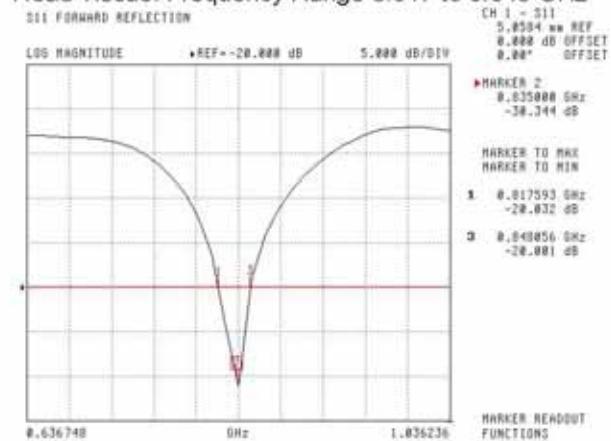
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Division of APREL Laboratories.

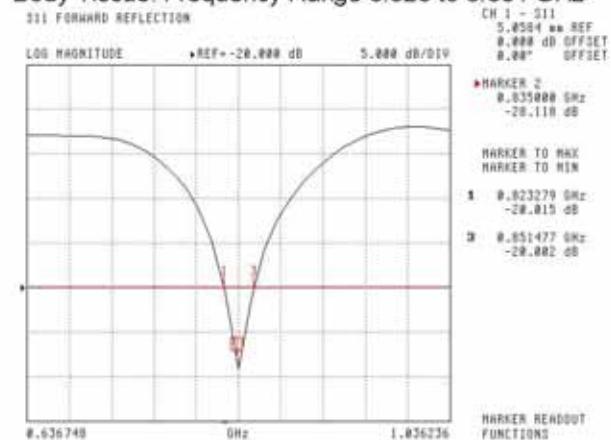
The Following Graphs are the results as displayed on the Vector Network Analyzer.

### S11 Parameter Return Loss

Head Tissue: Frequency Range 0.817 to 0.848 GHz

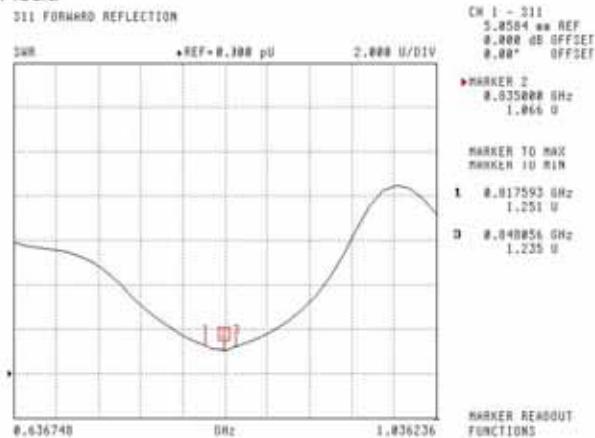
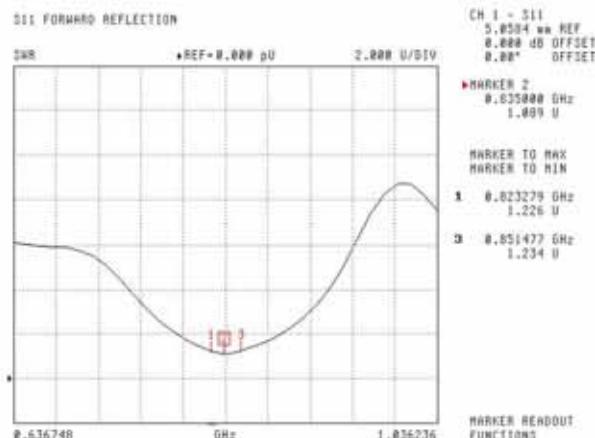


Body Tissue: Frequency Range 0.823 to 0.851 GHz



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**NCL Calibration Laboratories**  
Division of APREL Laboratories.**SWR**  
**Head****Body**

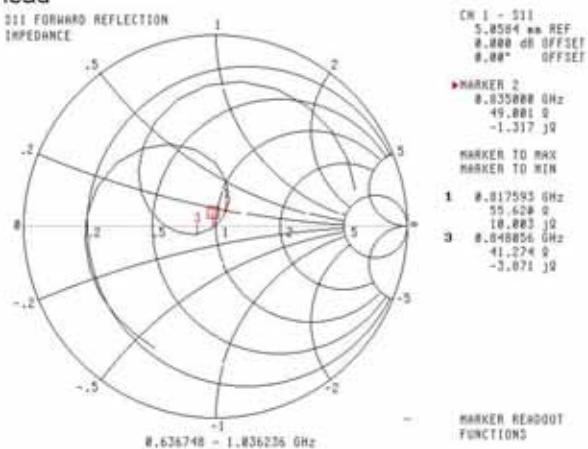
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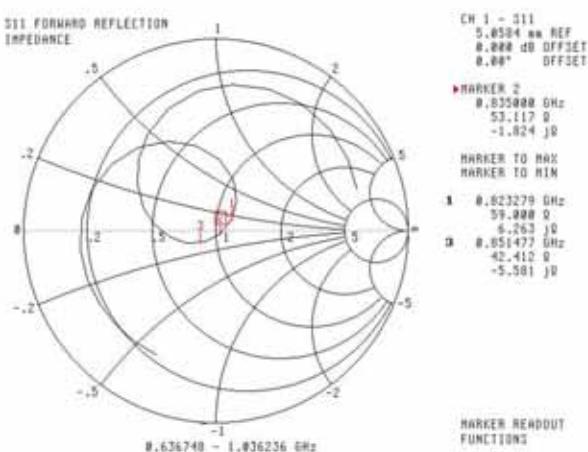
**NCL Calibration Laboratories**  
Division of APREL Laboratories.

### Smith Chart Dipole Impedance

#### Head



#### Body



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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2014.

**NCL CALIBRATION LABORATORIES**

Calibration File No: DC-1531  
Project Number: BACL-5745

**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.

BACL Head & Body Validation Dipole

Manufacturer: APREL Laboratories  
Part number: ALS-D-1750-S-2  
Frequency: 1750 MHz  
Serial No: 198-00304

Customer: ISL

Calibrated: 8<sup>th</sup> October, 2013  
Released on: 8<sup>th</sup> October, 2013

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 Laboratories.

**Conditions**

Dipole 198-00304 was an original 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 subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.



Art Brehnan, Quality Manager



Constantin Teodorian, Test Engineer

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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Calibration Results Summary**

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

**Mechanical Dimensions**

Length: 75 mm  
Height: 42 mm

**Electrical Calibration**

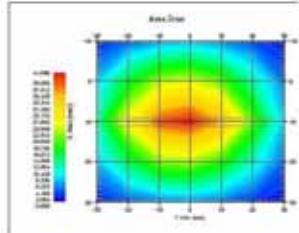
Test	Result Head	Result Body
S11 R/L	-25.567	-20.548 dB
SWR	1.111U	1.207 U
Impedance	53.637Ω	55.929 Ω

**System Validation Results, 1750 MHz**

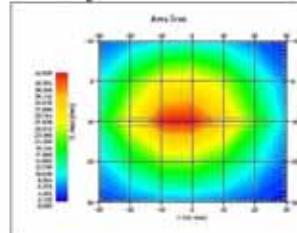
	1g	10g
Head	37.02	18.99
Body	36.65	18.85

Type	Epsilon	Sigma
Head	38.51	1.36
Body	51.79	1.53

Head



Body



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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Introduction**

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole. 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-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

**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**

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

This was an original calibration taken from stock.

**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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

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

Measured Length	Measured Height
75 mm	42 mm

**Tissue Validation**

Frequency	Permittivity $\epsilon$	Conductivity $\sigma$
1750 Head	38.23	1.38
1750 Body	52.86	1.54

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

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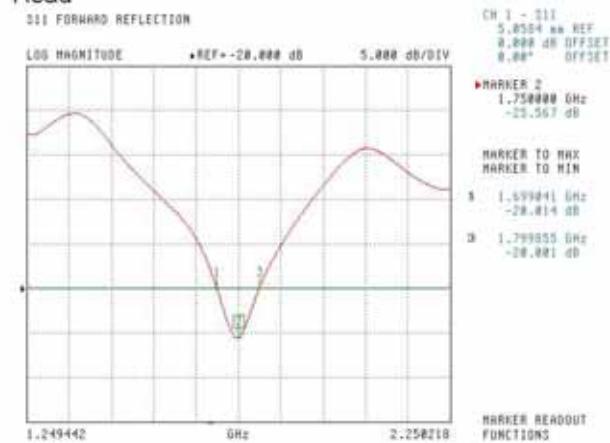
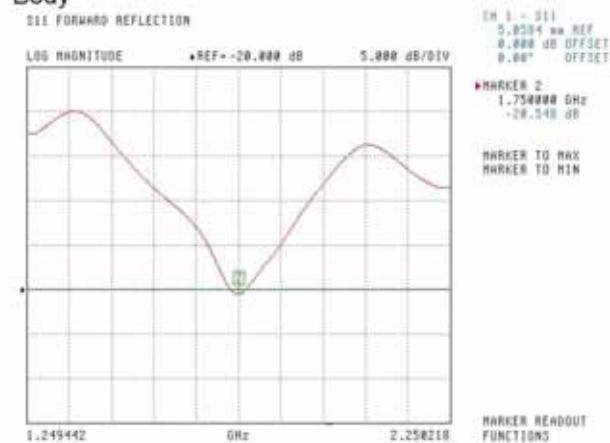
**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Electrical Calibration**

Test	Result Head	Result Body
S11 R/L	-25.567	-20.548 dB
SWR	1.111U	1.207 U
Impedance	53.637Ω	55.929 Ω

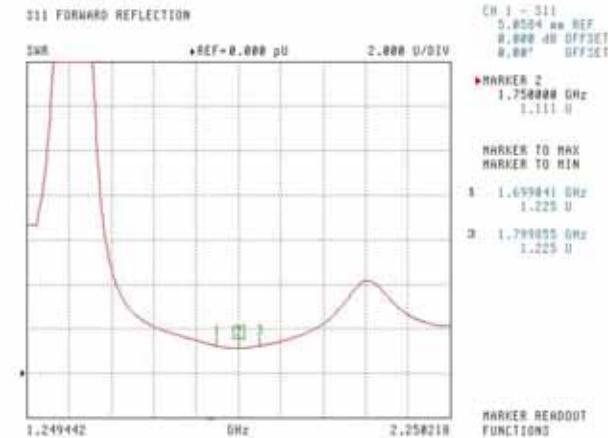
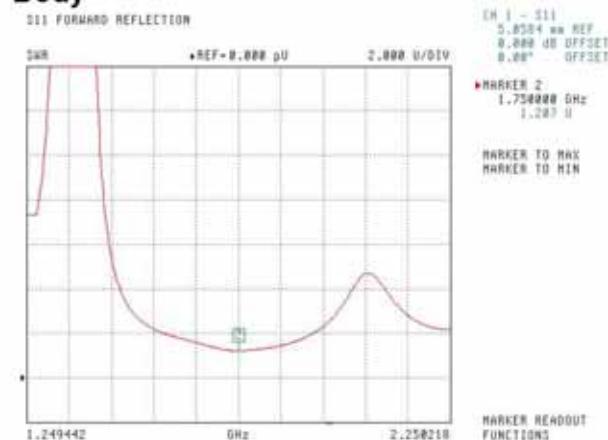
The Following Graphs are the results as displayed on the Vector Network Analyzer.

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

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

**NCL Calibration Laboratories**

Division of APREL Laboratories.

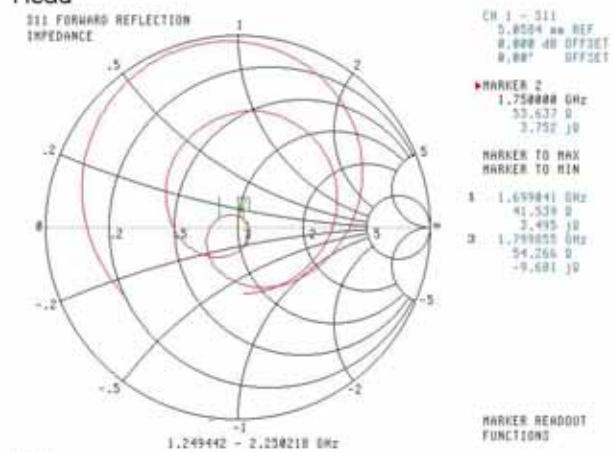
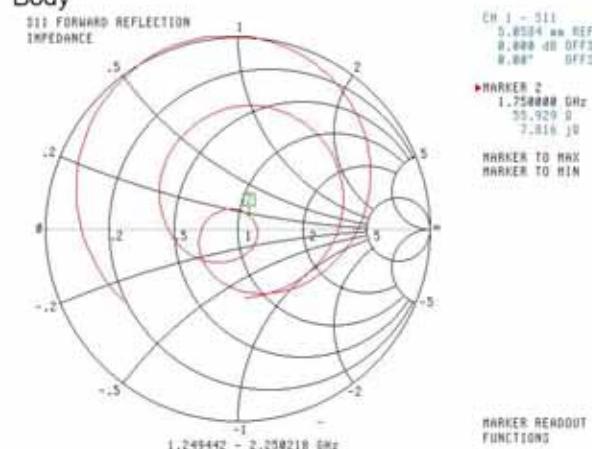
**SWR  
Head****Body**

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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**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 May 2013

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**NCL CALIBRATION LABORATORIES**

Calibration File No: DC-1601  
Project Number: BAC-dipole -cal-5779

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

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

Validation Dipole (Head & Body)

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

Customer: Bay Area Compliance Laboratory (China)

Calibrated: 9<sup>th</sup> October, 2014  
Released on: 9<sup>th</sup> October, 2014

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.  
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

**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



---

Maryna Nesterova Calibration Engineer

**Primary Measurement Standards**

<b>Instrument</b>	<b>Serial Number</b>	<b>Cal due date</b>
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

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**

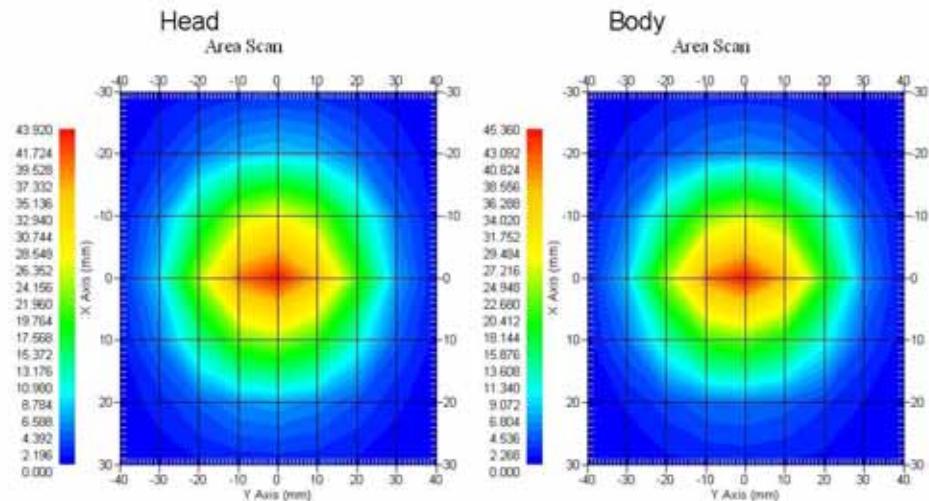
**Length:** 67.1 mm  
**Height:** 38.9 mm

**Electrical Specification**

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	1900MHz	1.084 U	-27.92 dB	52.247 $\Omega$
Body	1900MHz	1.128 U	-24.40 dB	52.618 $\Omega$

**System Validation Results**

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	1900 MHz	39.481	20.44	73.364
Body	1900 MHz	39.715	20.552	73.565



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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Introduction**

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 210-00710. 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 30 MHz to 6 GHz E-Field Probe Serial Number 225.

**References**

- IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
- Part 2: "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)"
- 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

**Conditions**

Dipole 210-00710 was a recalibration.

**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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**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	Frequency	SWR:	Return Loss	Impedance
Head	1900MHz	1.084 U	-27.92 dB	52.247 $\Omega$
Body	1900MHz	1.128 U	-24.40 dB	52.618 $\Omega$

**Tissue Validation**

	Dielectric constant, $\epsilon_r$	Conductivity, $\sigma$ [S/m]
Head Tissue 1900MHz	40.20	1.38
Body Tissue 1900MHz	52.63	1.46

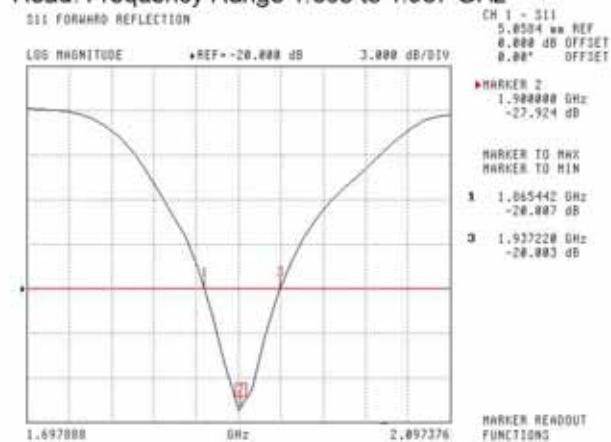
**NCL Calibration Laboratories**

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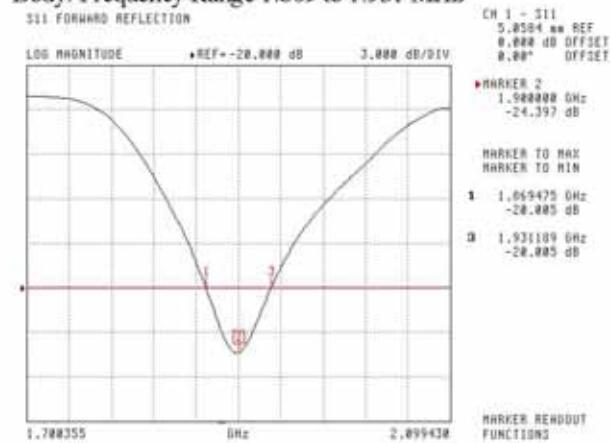
The Following Graphs are the results as displayed on the Vector Network Analyzer.

**S11 Parameter Return Loss**

Head: Frequency Range 1.865 to 1.937 GHz



Body: Frequency Range 1.869 to 1.931 MHz

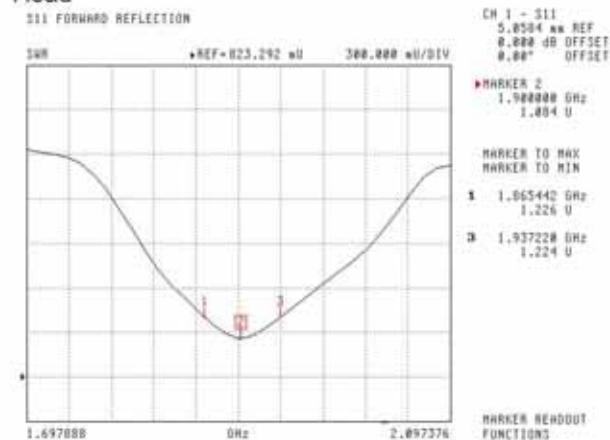
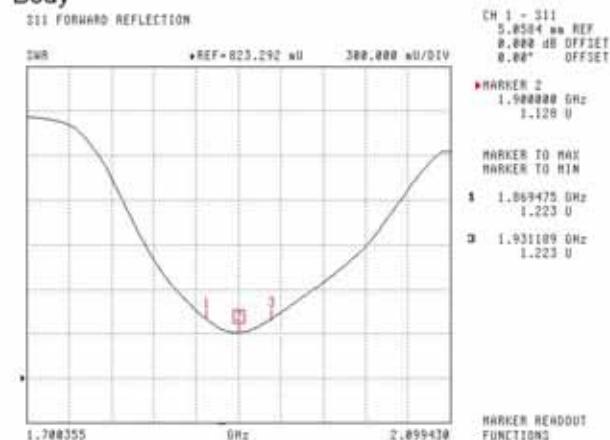


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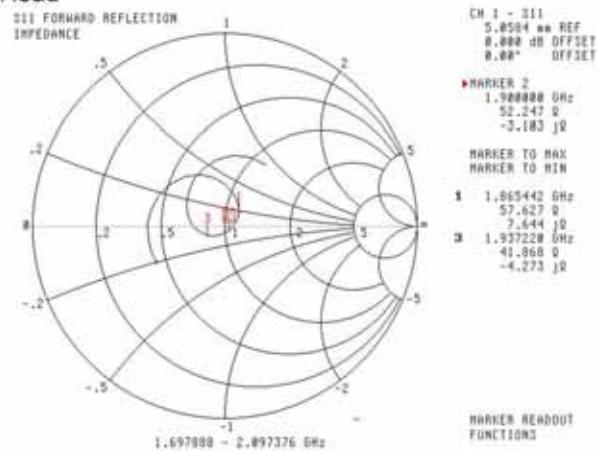
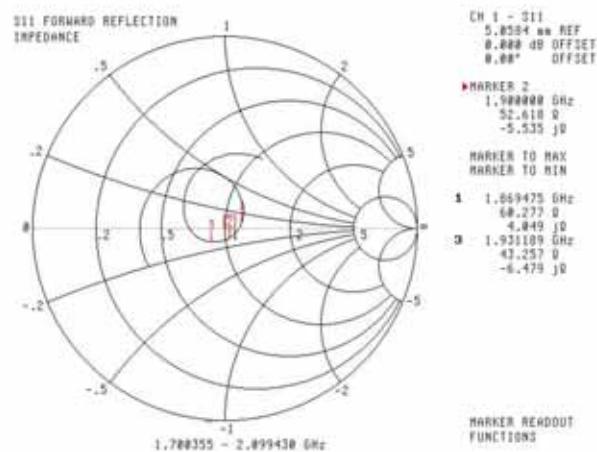
**SWR****Head****Body**

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**NCL Calibration Laboratories**

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

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**NCL Calibration Laboratories**

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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 2014

## NCL CALIBRATION LABORATORIES

Calibration File No: DC-1602  
Project Number: BAC-dipole-cal-5779

## 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: 9<sup>th</sup> October, 2014  
Released on: 9<sup>th</sup> October, 2014

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

Released By:

Art Brennan, Quality Manager

NCI CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr.  
Kanata, ONTARIO  
CANADA K2B 3H  
Division of APREL Lab.  
TEL: (613) 435-8300  
FAX: (613) 435-8300

**NCL Calibration Laboratories**

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**Conditions**

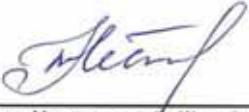
Dipole 220-00758 was received in good condition and was a re-calibration.

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

**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  
Maryna Nesterova Calibration Engineer**Primary Measurement Standards**

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

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**Calibration Results Summary**

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

**Mechanical Dimensions**

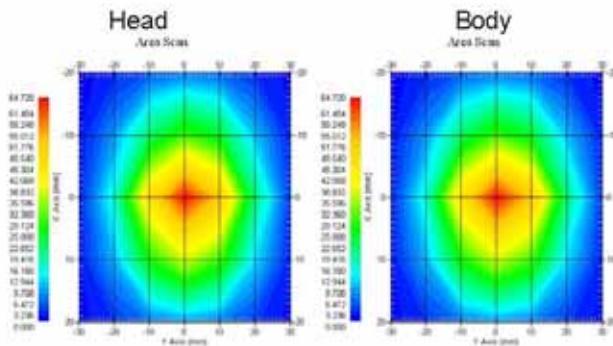
Length: 52.4 mm  
Height: 30.3 mm

**Electrical Specification**

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	2450 MHz	1.014 U	-45.184 dB	50.006Ω
Body	2450 MHz	1.070 U	-29.453 dB	50.672 Ω

**System Validation Results**

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	2450 MHz	54.916	25.327	111.97
Body	2450 MHz	52.418	24.691	103.91



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**NCL Calibration Laboratories**

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**Introduction**

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**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>

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**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 Specification**

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	2450 MHz	1.014 U	-45.184 dB	50.006Ω
Body	2450 MHz	1.070 U	-29.453 dB	50.672 Ω

**Tissue Validation**

	Dielectric constant, $\epsilon_r$	Conductivity, $\sigma$ [S/m]
Head Tissue 2450MHz	37.26	1.84
Body Tissue 2450MHz	53.61	1.90

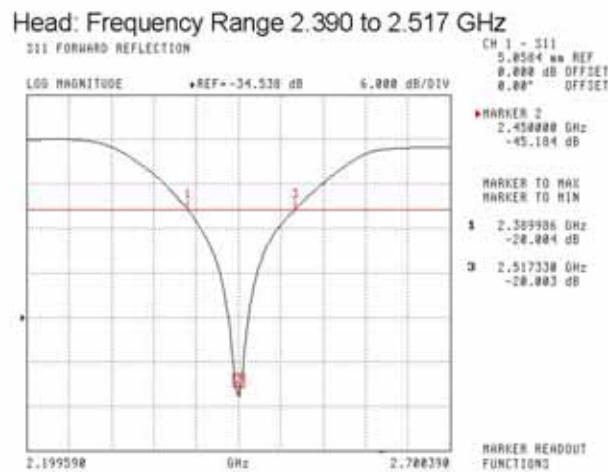
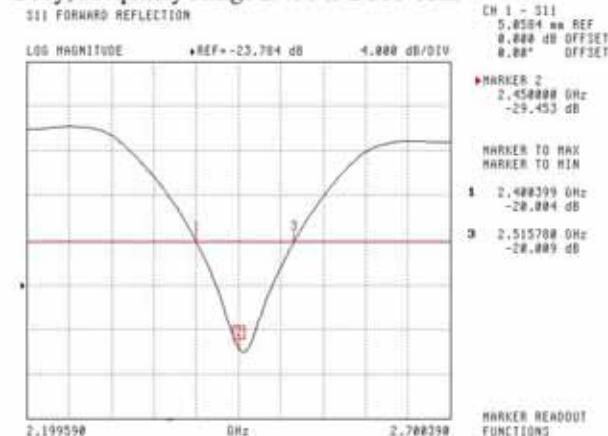
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**NCL Calibration Laboratories**

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

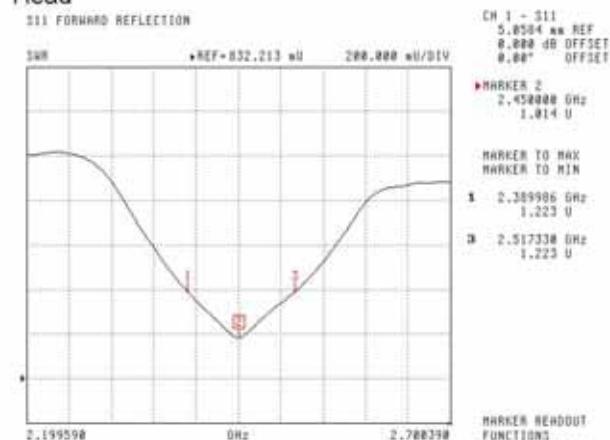
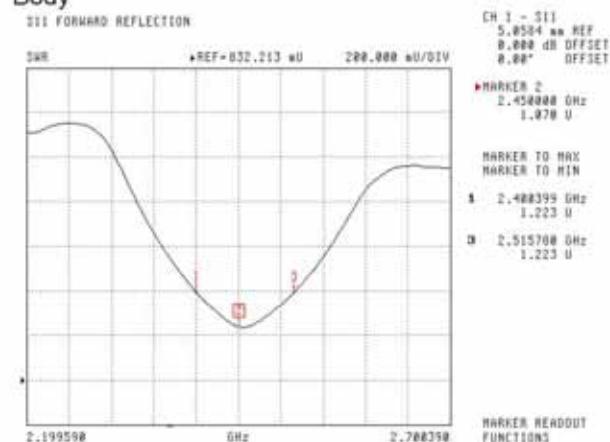
**S11 Parameter Return Loss****Body: Frequency Range 2.400 to 2.516 GHz**

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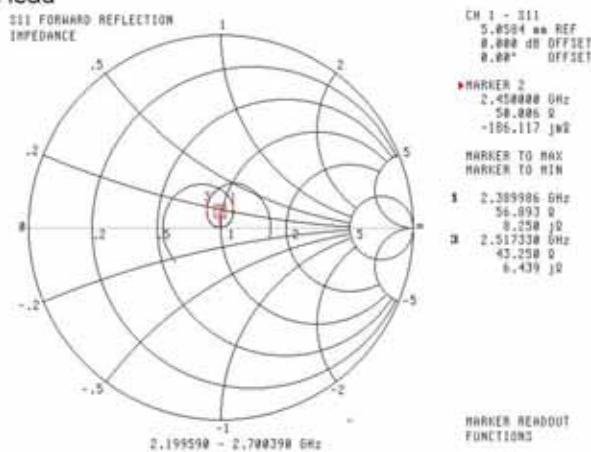
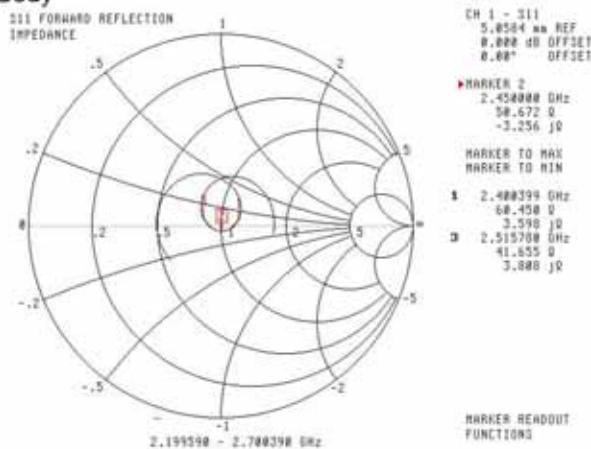
**SWR****Head****Body**

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

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

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**NCL Calibration Laboratories**

Division of APREL Laboratories.

**Test Equipment**

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2014.

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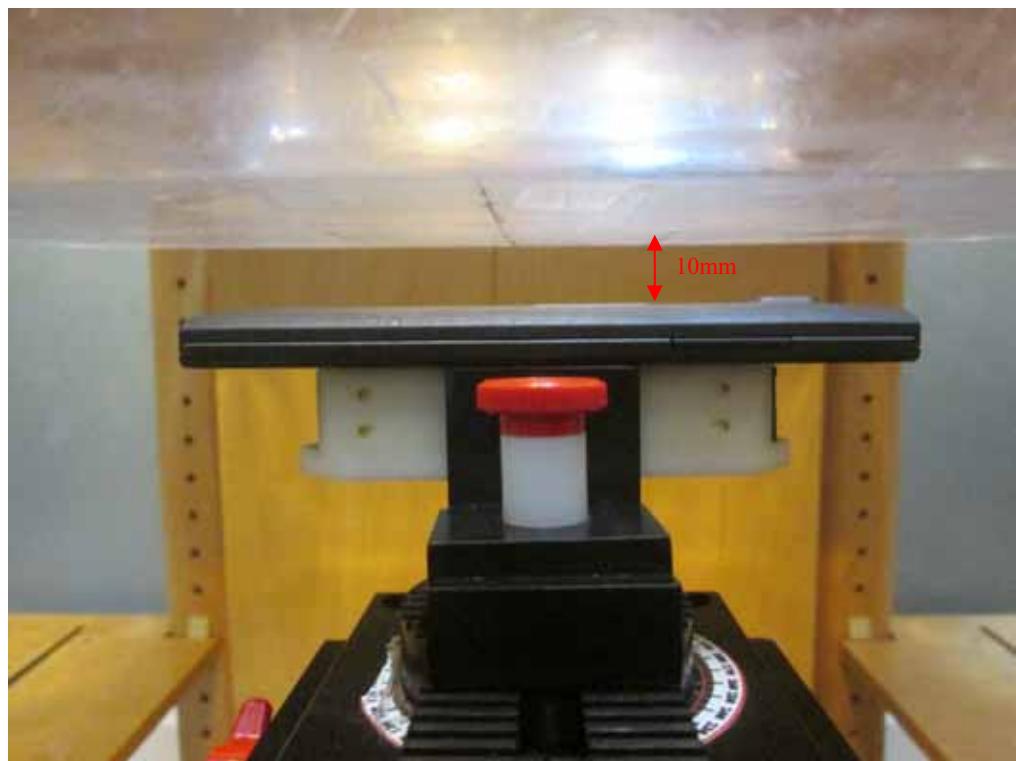
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## APPENDIX D EUT TEST POSITION PHOTOS

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



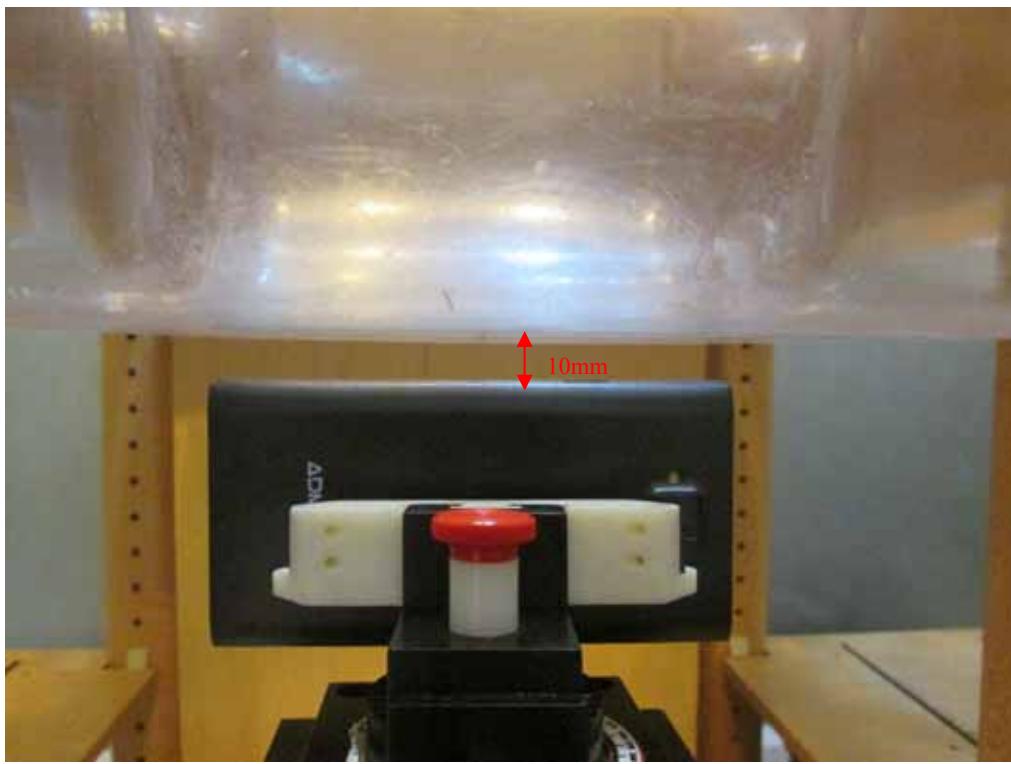
**Body-worn Back Setup Photo (10mm)**



**Body-worn Left Setup Photo (10mm)**



**Body-worn Right Setup Photo (10mm)**



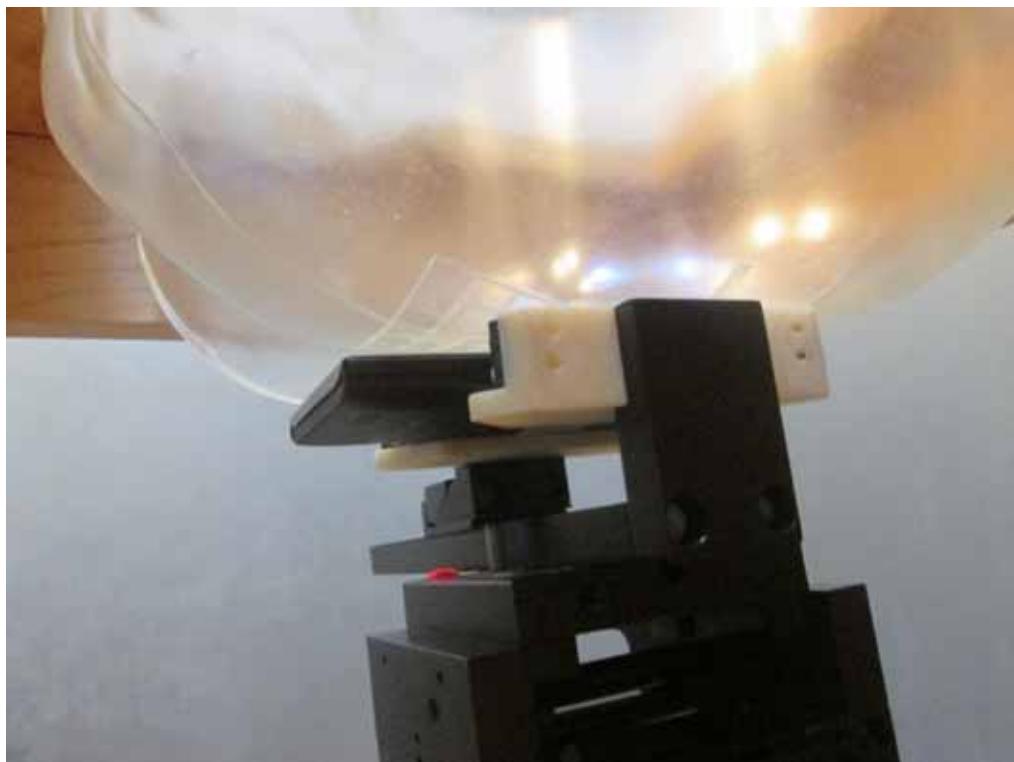
**Body-worn Top Setup Photo (10mm)**



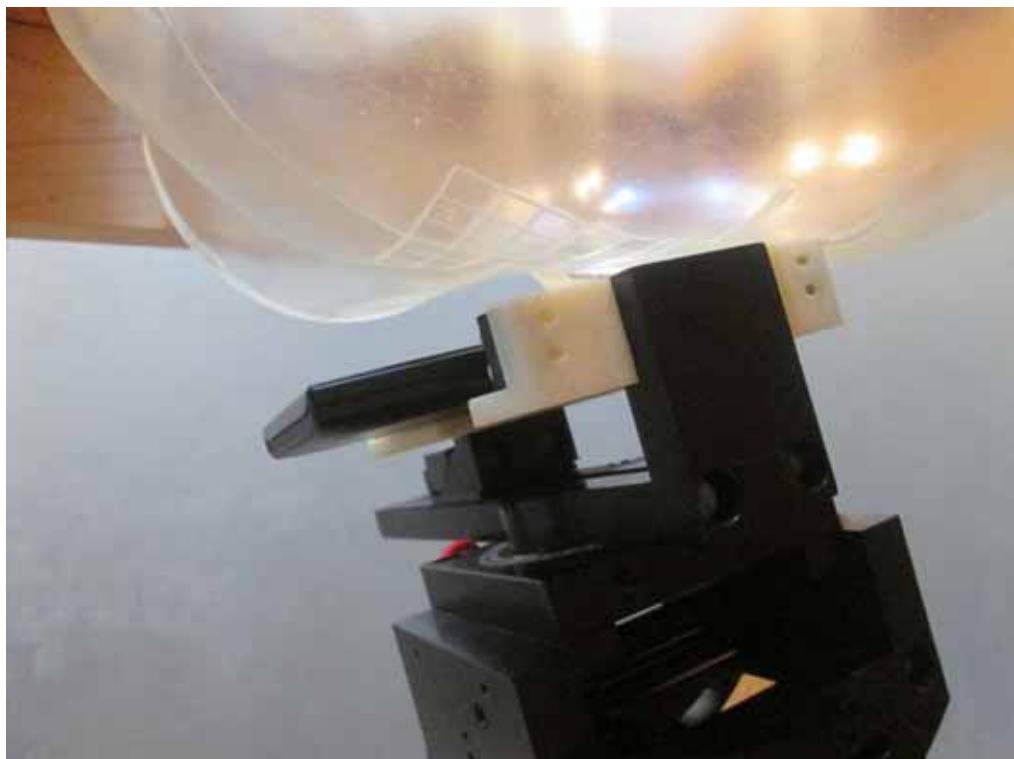
**Body-worn Bottom Setup Photo (10mm)**



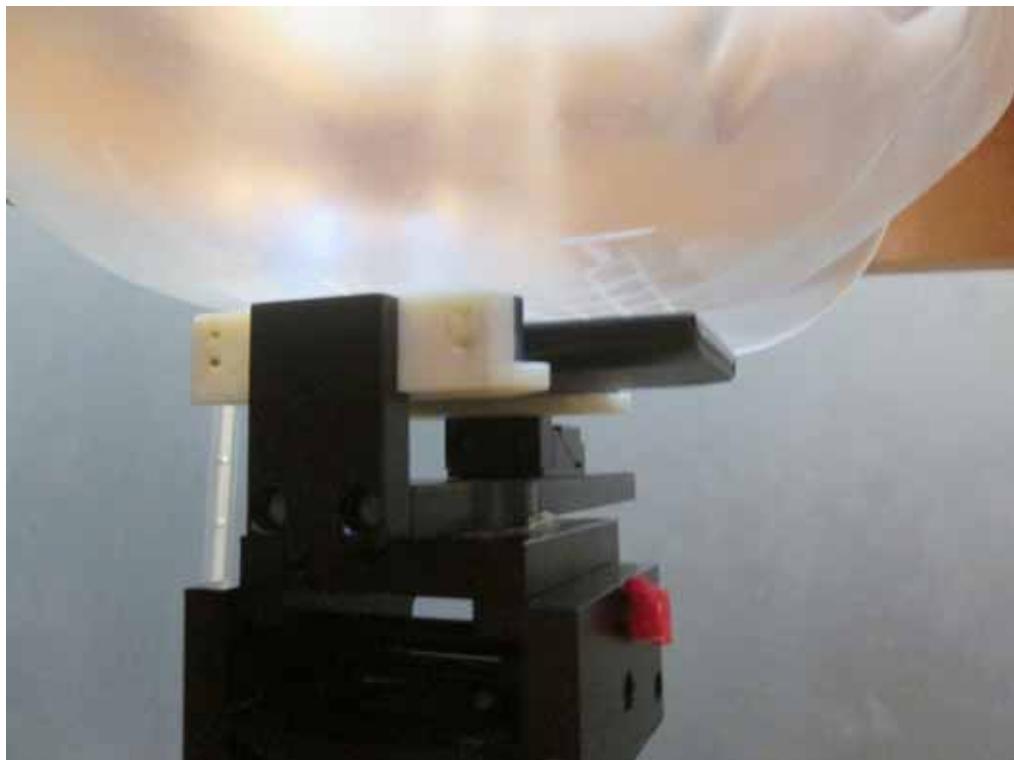
**Left Head Cheek Setup Photo**



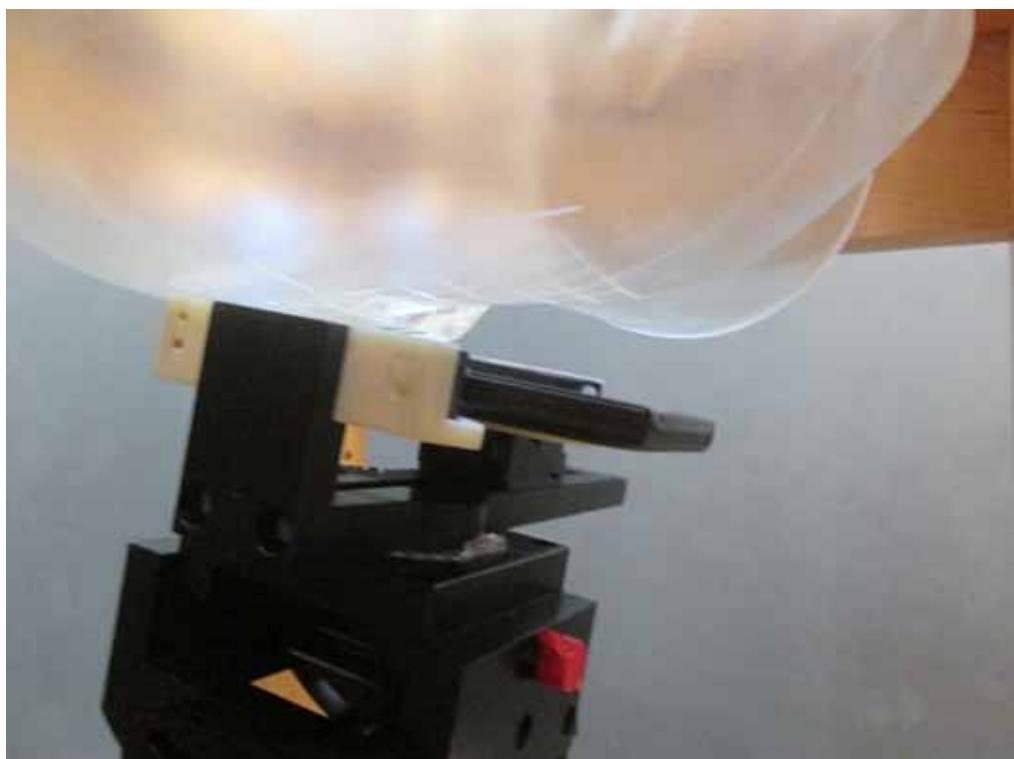
**Left Head Tilt Setup Photo**



**Right Head Check Setup Photo**



**Right Head Tilt Setup Photo**



## APPENDIX E EUT PHOTOS

**EUT – Front View**



**EUT – Back View**



**EUT – Left Side View**



**EUT – Right Side View**



**EUT – Top View**



**EUT – Bottom View**



**EUT – Uncover View**

## APPENDIX F INFORMATIVE REFERENCES

[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, O\_ce of Engineering & Technology, Washington, DC, 1997.

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-field scanning system for dosimetricPage 135 of 135 assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.

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[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.

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[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.

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