

SAR EVALUATION REPORT

For

DDM Brands LLC

1612 NW, 84TH Ave. Miami, Florida, U.S.A

FCC ID: A4JLIV10

Report Type: Original Report	Product Type: 2G mobile phone
Test Engineer: Sandy Wang	<i>Sandy Wang</i>
Report Number: RSZ130918004-20	
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Reviewed By: Alvin Huang RF Leader	<i>Alvin Huang</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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	DDM Brands LLC
	EUT Description	2G mobile phone
	FCC ID	A4JLIV10
	Model Number	LIV10
	Test Date	2013-07-28 to 2013-07-30
Frequency	Max. SAR Level(s) Reported	Limit(W/Kg)
Cellular Band	1.000 W/kg 1g Head SAR 0.797 W/kg 1g Body SAR	1.6
PCS Band	0.901 W/kg 1g Head SAR 0.128 W/kg 1g Body SAR	
Simultaneous	1.053 W/kg 1g Head SAR 0.815 W/kg 1g Body SAR	
Applicable Standards	ANSI / IEEE C95.1 : 2005 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fileds,3 kHz to 300 GHz.	
	ANSI / IEEE C95.3 : 2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.	
	IEEE1528:2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	
	KDB procedures 447498 D01-Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies 648474 D04-SAR Evaluation Considerations for Wireless Handsets	
<p>Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in IEEE 1528-2003 and RF exposure KDB procedures.</p> <p>The results and statements contained in this report pertain only to the device(s) evaluated.</p>		

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSZ130918004-20	Original Report	2013-09-30

EUT DESCRIPTION

This report has been prepared on behalf of DDM Brands LLC and their product, FCC ID: A4JLIV10, Model: LIV10 or the EUT (Equipment Under Test) as referred to in the rest of this report. The EUT is a 2G mobile phone.

Technical Specification

Product Type	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	Headset
Face-Head Accessories:	None
Multi-slot Class:	Class12
Hotspot:	Not support
Operation Mode :	GSM Voice, GPRS Data and Bluetooth
Frequency Band:	Cellular Band : 824-849 MHz(TX) ; 869-894 MHz(RX) PCS Band : 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) Bluetooth : 2402MHz-2480MHz
Conducted RF Power:	Cellular Band : 31.50dBm PCS Band : 29.69dBm Bluetooth : 1.00dBm
Dimensions (L*W*H):	102mm (L)×58mm (W)× 13mm (H)
Power Source:	3.7 VDC /800mAh Rechargeable Battery
Normal Operation:	Head and Body-worn

REFERENCE, STANDARDS, AND GUIDELINES

FCC:

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

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

CE:

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

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

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

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

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

CE Limit (10g Tissue)

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

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

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

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

FACILITIES AND ACCREDITATION

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 10mm² 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/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

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

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



ALSAS-10U Interpolation and Extrapolation Uncertainty

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

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

Isotropic E-Field Probe

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

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



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

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

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

Isotropic E-Field Probe Specification

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

Boundary Detection Unit and Probe Mounting Device

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

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

Daq-Paq (Analog to Digital Electronics)

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

ADC	12 Bit
Amplifier Range	20 mV to 200 mV and 150 mV to 800 mV
Field Integration	Local Co-Processor utilizing proprietary integration algorithms
Number of Input Channels	4 in total 3 dedicated and 1 spare
Communication	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.



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

ALSAS Universal Workstation

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

Universal Device Positioner

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

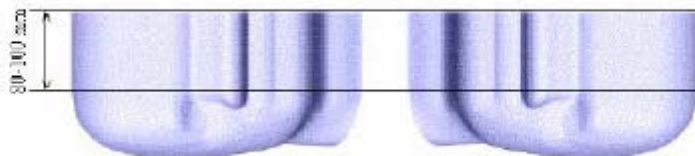


Phantom Types

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

APREL SAM Phantoms

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



APREL Laboratories Universal Phantom

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

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

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



Tissue Dielectric Parameters for Head and Body Phantoms

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

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

Recommended Tissue Dielectric Parameters for Head and Body

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

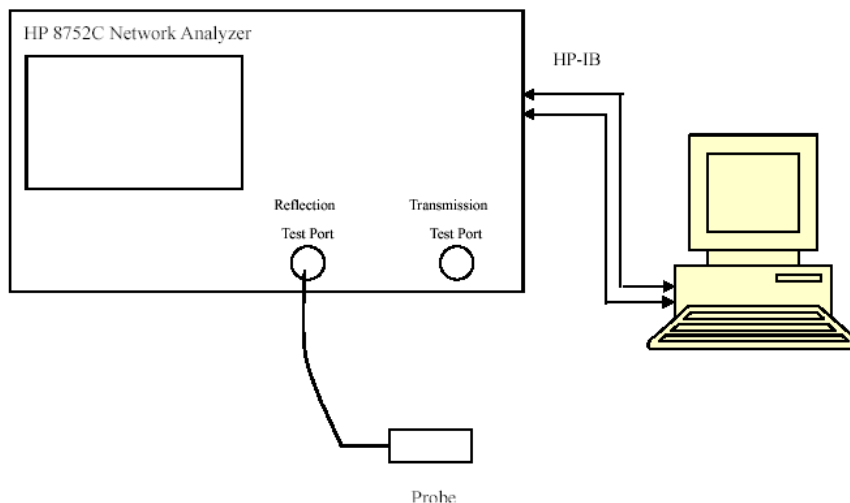
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	Calibration Date	S/N
CRS F3 robot	ALS-F3	N/A	RAF0805352
CRS F3 Software	ALS-F3-SW	N/A	N/A
CRS C500C controller	ALS-C500	N/A	RCF0805379
Probe mounting device & Boundary Detection Sensor System	ALS-PMDPS-3	N/A	120-00270
Universal Work Station	ALS-UWS	N/A	100-00157
Data Acquisition Package	ALS-DAQ-PAQ-3	2013-05-12	110-00212
Miniature E-Field Probe	ALS-E-020	2012-08-08	500-00283
Dipole, 835MHz	ALS-D-835-S-2	2011-08-25	180-00558
Dipole, 1900MHz	ALS-D-1900-S-2	2011-08-25	210-00710
Dipole Spacer	ALS-DS-U	N/A	250-00907
Device holder/Positioner	ALS-H-E-SET-2	N/A	170-00510
Left ear SAM phantom	ALS-P-SAM-L	N/A	130-00311
Right ear SAM phantom	ALS-P-SAM-R	N/A	140-00359
UniPhantom	ALS-P-UP-1	N/A	150-00413
Simulated Tissue 835 MHz Head	ALS-TS-835-H	Each Time	270-01002
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	270-02101
Simulated Tissue 1900 MHz Head	ALS-TS-1900-H	Each Time	295-01103
Simulated Tissue 1900 MHz Body	ALS-TS-1900-B	Each Time	295-02102
Power Amplifier	5S1G4	N/A	71377
Synthesized Sweeper	HP 8341B	2013-05-16	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU 200	2012-12-06	1100.0008.02
EMI Test Receiver	ESCI	2012-11-24	101120

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$ (S/m)	
824.2	Head	40.74	0.9	41.50	0.90	-1.831	0.000	± 5
	Body	54.86	0.95	55.20	0.97	-0.616	-2.062	± 5
836.6	Head	40.7	0.91	41.50	0.90	-1.928	1.111	± 5
	Body	54.93	0.97	55.20	0.97	-0.489	0.000	± 5
848.8	Head	40.47	0.93	41.50	0.90	-2.482	3.333	± 5
	Body	55.02	0.99	55.20	0.97	-0.326	2.062	± 5
1850.2	Head	40.23	1.39	40.00	1.40	0.575	-0.714	± 5
	Body	53.98	1.49	53.30	1.52	1.276	-1.974	± 5
1880.0	Head	40.24	1.41	40.00	1.40	0.600	0.714	± 5
	Body	53.73	1.53	53.30	1.52	0.807	0.658	± 5
1909.8	Head	40.25	1.43	40.00	1.40	0.625	2.143	± 5
	Body	53.81	1.54	53.30	1.52	0.957	1.316	± 5

*Liquid Verification was performed on 2013-07-28.

Please refer to the following tables.

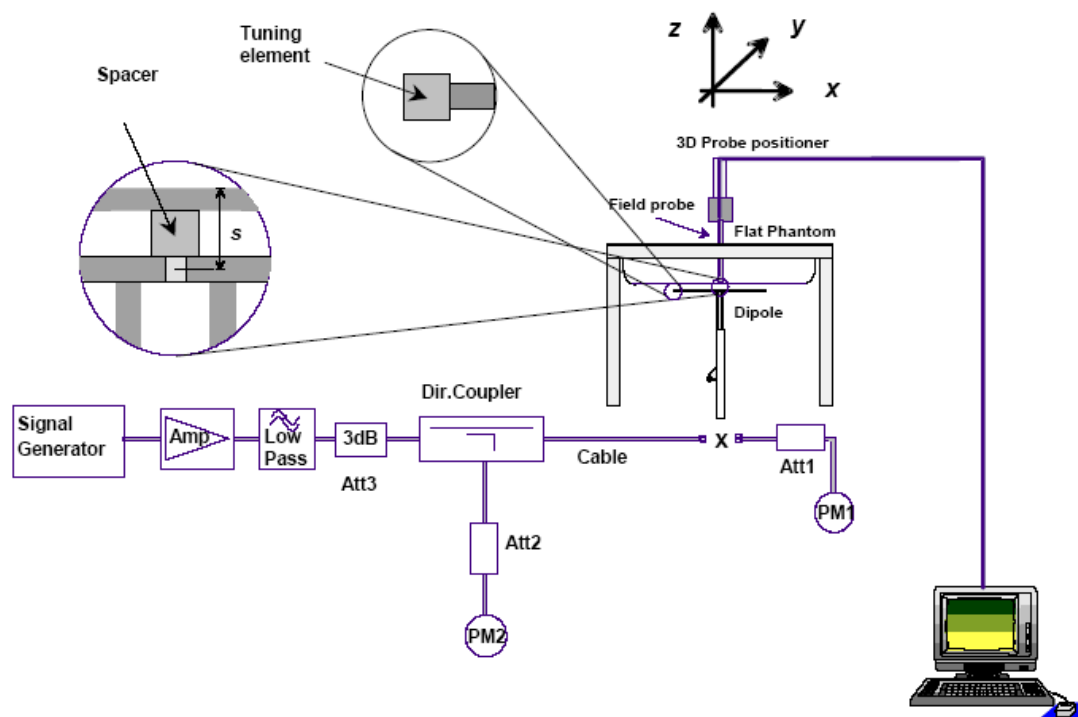
850 MHz Head				850 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
824.0	40.744048	19.577727		824.0	54.862795	20.676805
824.5	40.713019	19.578281		824.5	54.865933	20.576316
825.0	40.696359	19.578835		825.0	54.869066	20.588834
825.5	40.591219	19.579389		825.5	54.872209	20.601268
826.0	40.609577	19.579944		826.0	54.875347	20.736330
826.5	40.631470	19.580497		826.5	54.878485	20.800061
827.0	40.607957	19.581051		827.0	54.881623	20.714560
827.5	40.655278	19.581605		827.5	54.884761	20.592696
828.0	40.674884	19.582159		828.0	54.887899	20.627258
828.5	40.681310	19.582714		828.5	54.891037	20.584681
829.0	40.732241	19.583267		829.0	54.894175	20.688836
829.5	40.680734	19.583822		829.5	54.897313	20.631665
830.0	40.717102	19.584376		830.0	54.900451	20.509562
830.5	40.677131	19.584930		830.5	54.903589	20.573950
831.0	40.650129	19.585484		831.0	54.906727	20.559125
831.5	40.669684	19.586038		831.5	54.909865	20.766549
832.0	40.631502	19.586592		832.0	54.913003	20.744213
832.5	40.606326	19.587146		832.5	54.916141	20.520912
833.0	40.646862	19.587700		833.0	54.919279	20.454276
833.5	40.678281	19.588254		833.5	54.922417	20.565743
834.0	40.675706	19.588808		834.0	54.925555	20.717600
834.5	40.674286	19.589364		834.5	54.928693	20.610562
835.0	40.699115	19.589917		835.0	54.931831	20.554021
835.5	40.700115	19.590772		835.5	54.934969	20.801728
836.0	40.703715	19.591627		836.0	54.938106	20.808651
836.5	40.688747	19.592482		836.5	54.941244	20.666458
837.0	40.675544	19.593338		837.0	54.944382	20.493541
837.5	40.669751	19.594196		837.5	54.947520	20.529807
838.0	40.692924	19.595048		838.0	54.950658	20.814090
838.5	40.651454	19.595905		838.5	54.953796	20.829294
839.0	40.641385	19.596759		839.0	54.956934	20.751306
839.5	40.643855	19.597614		839.5	54.960072	20.686264
840.0	40.654922	19.598469		840.0	54.963210	20.753407
840.5	40.644284	19.599324		840.5	54.966348	20.798771
841.0	40.627556	19.600180		841.0	54.969486	20.753899
841.5	40.656998	19.601035		841.5	54.972624	20.690636
842.0	40.658700	19.601890		842.0	54.975762	20.866476
842.5	40.662396	19.602745		842.5	54.978900	20.834989
843.0	40.656491	19.593567		843.0	54.982038	20.795387
843.5	40.580194	19.594418		843.5	54.985176	20.750898
844.0	40.656446	19.595274		844.0	54.988314	20.768556
844.5	40.610737	19.596128		844.5	54.991452	20.794463
845.0	40.536755	19.596987		845.0	54.994590	20.703881
845.5	40.552057	19.597839		845.5	54.997728	20.650267
846.0	40.506640	19.618770		846.0	55.000866	20.823268
846.5	40.547579	19.619625		846.5	55.004004	20.884672
847.0	40.527848	19.620481		847.0	55.007142	20.833531
847.5	40.531032	19.621336		847.5	55.010280	20.753832
848.0	40.504634	19.622191		848.0	55.013418	20.843989
848.5	40.509229	19.623046		848.5	55.016556	20.922073
849.0	40.469497	19.623901		849.0	55.019694	20.922255

1900 MHz Head				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1850.0	40.230901	13.545737		1850.0	53.978789	14.494363
1851.2	40.233129	13.515761		1851.2	53.910708	14.451780
1852.4	40.233381	13.483042		1852.4	53.929552	14.452884
1853.6	40.233628	13.506413		1853.6	53.906135	14.429157
1854.8	40.233876	13.500369		1854.8	53.808971	14.448640
1856.0	40.234125	13.424482		1856.0	53.911994	14.485061
1857.2	40.234374	13.564340		1857.2	53.905165	14.511046
1858.4	40.234626	13.460542		1858.4	53.887179	14.432262
1859.6	40.234873	13.514479		1859.6	53.868850	14.426605
1860.8	40.235123	13.515799		1860.8	53.764641	14.479401
1862.0	40.235371	13.532341		1862.0	53.792317	14.306604
1863.2	40.235621	13.554771		1863.2	53.738298	14.319409
1864.4	40.235870	13.589759		1864.4	53.773050	14.336492
1865.6	40.236119	13.584328		1865.6	53.779523	14.307527
1866.8	40.236368	13.573145		1866.8	53.854533	14.298097
1868.0	40.236667	13.591652		1868.0	53.922977	14.314170
1869.2	40.236866	13.652412		1869.2	53.932039	14.336596
1870.4	40.237117	13.645153		1870.4	53.845537	14.388047
1871.6	40.237365	13.619083		1871.6	53.787917	14.388756
1872.8	40.237613	13.649138		1872.8	53.826351	14.417746
1874.0	40.237863	13.591791		1874.0	53.752816	14.426055
1875.2	40.238112	13.625854		1875.2	53.815979	14.489312
1876.4	40.238372	13.623821		1876.4	53.719094	14.412093
1877.6	40.238610	13.688321		1877.6	53.821377	14.492134
1878.8	40.238860	13.583924		1878.8	53.849164	14.623970
1880.0	40.239108	13.529147		1880.0	53.731485	14.642925
1881.2	40.239358	13.577887		1881.2	53.689725	14.639961
1882.4	40.239608	13.600485		1882.4	53.785267	14.611339
1883.6	40.239857	13.569258		1883.6	53.750768	14.567362
1884.8	40.240105	13.569836		1884.8	53.775665	14.590103
1886.0	40.240355	13.569162		1886.0	53.810876	14.522297
1887.2	40.240604	13.564309		1887.2	53.791651	14.498463
1888.4	40.240855	13.559391		1888.4	53.881428	14.532772
1889.6	40.241102	13.554612		1889.6	53.811919	14.537384
1890.8	40.241352	13.549765		1890.8	53.857594	14.594213
1892.0	40.241600	13.544921		1892.0	53.845558	14.390396
1893.2	40.241850	13.540071		1893.2	53.818010	14.351317
1894.4	40.242100	13.535224		1894.4	53.790648	14.400399
1895.6	40.242348	13.530377		1895.6	53.783496	14.734200
1896.8	40.242597	13.525530		1896.8	53.773397	14.732307
1898.0	40.242847	13.520683		1898.0	53.773727	14.712867
1899.2	40.243096	13.515836		1899.2	53.850728	14.713307
1900.4	40.243347	13.510989		1900.4	53.815644	14.611964
1901.6	40.243594	13.506142		1901.6	53.819127	14.701310
1902.8	40.243864	13.501295		1902.8	53.788218	14.661332
1904.0	40.244092	13.496457		1904.0	53.869929	14.630149
1905.2	40.244342	13.491601		1905.2	53.781686	14.598670
1906.4	40.244602	13.486754		1906.4	53.771598	14.523604
1907.6	40.244839	13.481907		1907.6	53.697278	14.640395
1908.8	40.245089	13.477060		1908.8	53.781558	14.575823
1910.0	40.245339	13.472213		1910.0	53.808081	14.539445

System Accuracy Verification

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

System Verification Setup Block Diagram



Probe and dipole antenna List and Detail

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

System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2013-07-28	835	Head	1g	9.749	9.590	1.658	± 10
		Body	1g	9.542	9.684	-1.466	± 10
	1900	Head	1g	40.211	39.648	1.420	± 10
		Body	1g	40.215	39.769	1.121	± 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 : 9.514 W/kg
Power Drift-Finish : 9.502 W/kg
Power Drift (%) : -0.126

Phantom Data

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

Tissue Data

Type : Head
Serial No. : 270-01002
Frequency : 835.0 MHz
Last Calib. Date : 28-Jul-2013
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 40.70 F/m
Sigma : 0.91 S/m
Density : 1000.00 kg/cu. m

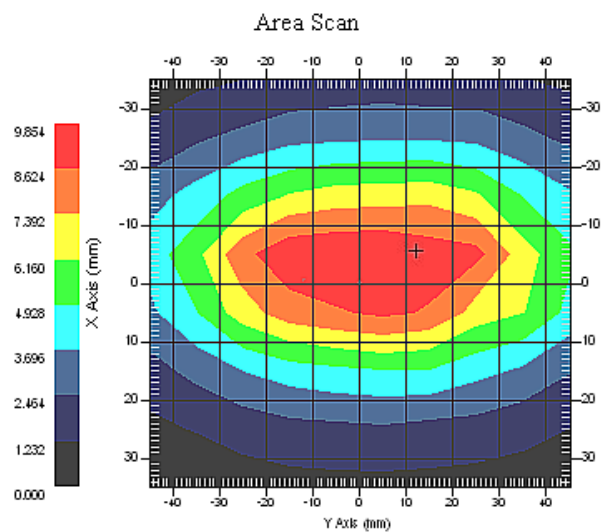
Probe Data

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

Measurement Data

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

1 gram SAR value : 9.749 W/kg
10 gram SAR value : 6.210 W/kg
Area Scan Peak SAR : 9.852 W/kg
Zoom Scan Peak SAR : 18.772W/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 : 9.468 W/kg
Power Drift-Finish : 9.452 W/kg
Power Drift (%) : -0.169

Phantom Data

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

Tissue Data

Type : Body
Serial No. : 270-02101
Frequency : 835.0 MHz
Last Calib. Date : 28-Jul-2013
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 54.93 F/m
Sigma : 0.95 S/m
Density : 1000.00 kg/cu. m

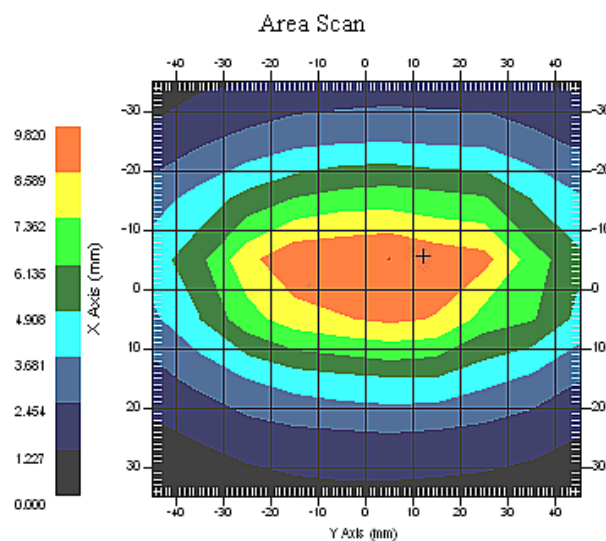
Probe Data

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

Measurement Data

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

1 gram SAR value : 9.542 W/kg
10 gram SAR value : 6.132 W/kg
Area Scan Peak SAR : 9.820 W/kg
Zoom Scan Peak SAR : 18.427 W/kg



835 MHz System Validation with Body Tissue

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

Device Name : Dipole 1900MHz
Serial No. : 210-00710
Type : Dipole
Model : ALS-D-1900-S-2
Frequency Band : 1900
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 40.151 W/kg
Power Drift-Finish : 40.102 W/kg
Power Drift (%) : -0.122

Phantom Data

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

Tissue Data

Type : Head
Serial No. : 295-01103
Frequency : 1900.00 MHz
Last Calib. Date : 28-Jul-2013
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 40.24 F/m
Sigma : 1.43 S/m
Density : 1000.00 kg/cu. M

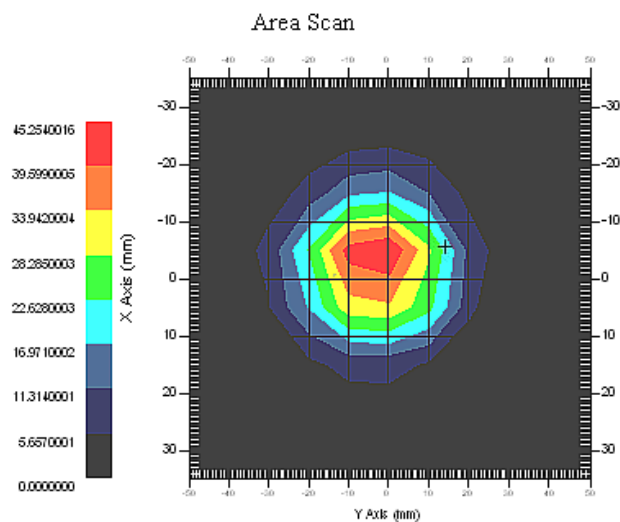
Probe Data

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

Measurement Data

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

1 gram SAR value : 40.211 W/kg
10 gram SAR value : 21.134 W/kg
Area Scan Peak SAR : 44.460 W/kg
Zoom Scan Peak SAR : 86.852 W/kg



1900 MHz System Validation with Head Tissue

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

Device Name : Dipole 1900MHz
Serial No. : 210-00710
Type : Dipole
Model : ALS-D-1900-S-2
Frequency Band : 1900
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 39.945 W/kg
Power Drift-Finish : 39.951 W/kg
Power Drift (%) : 0.015

Phantom Data

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

Tissue Data

Type : Body
Serial No. : 295-02102
Frequency : 1900.00 MHz
Last Calib. Date : 28-Jul-2013
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 53.82 F/m
Sigma : 1.54 S/m
Density : 1000.00 kg/cu. m

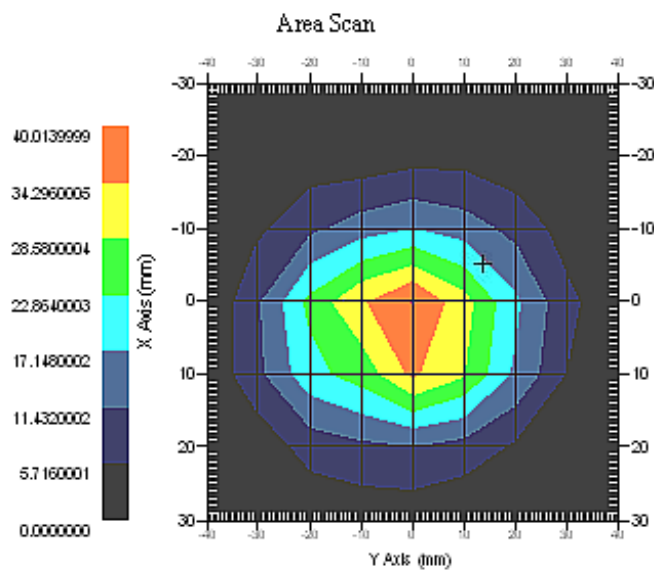
Probe Data

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

Measurement Data

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

1 gram SAR value : 40.215 W/kg
10 gram SAR value : 22.016 W/kg
Area Scan Peak SAR : 43.120 W/kg
Zoom Scan Peak SAR : 90.253 W/kg



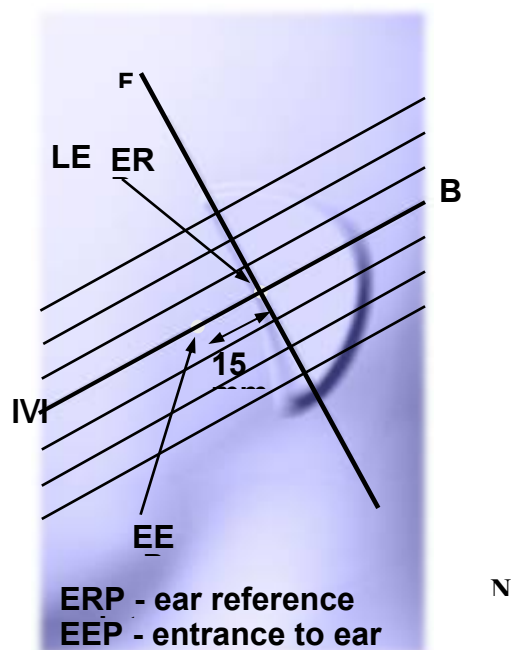
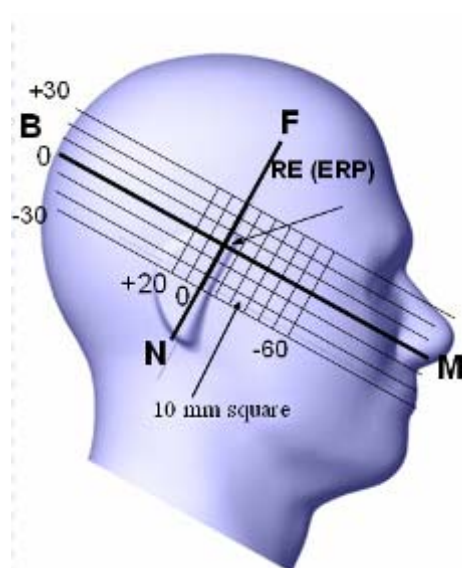
1900 MHz System Validation with Body Tissue

EUT TEST STRATEGY AND METHODOLOGY

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

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

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



Cheek/Touch Position

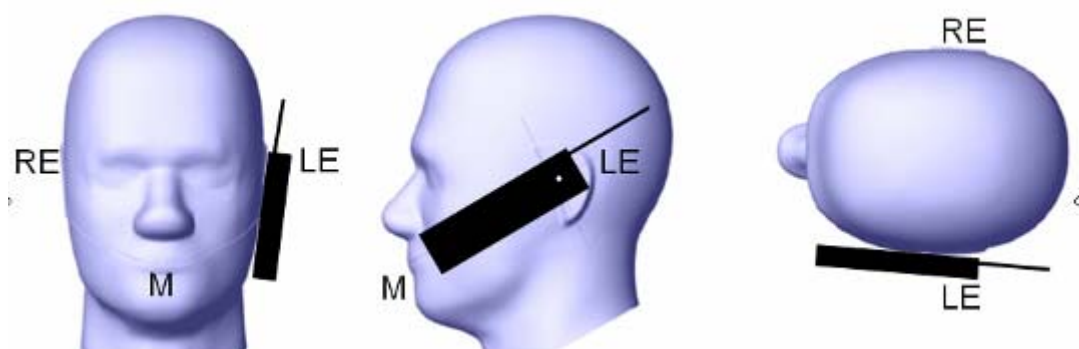
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

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

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

Cheek /Touch Position



Ear/Tilt Position

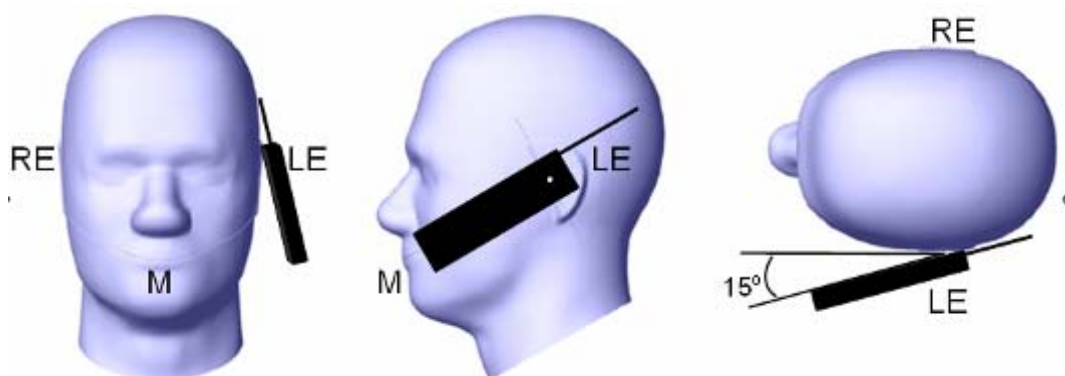
With the handset aligned in the “Cheek/Touch Position”:

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

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

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

Ear /Tilt 15° Position



Test positions for body-worn and other configurations

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

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

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

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

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

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

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

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

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

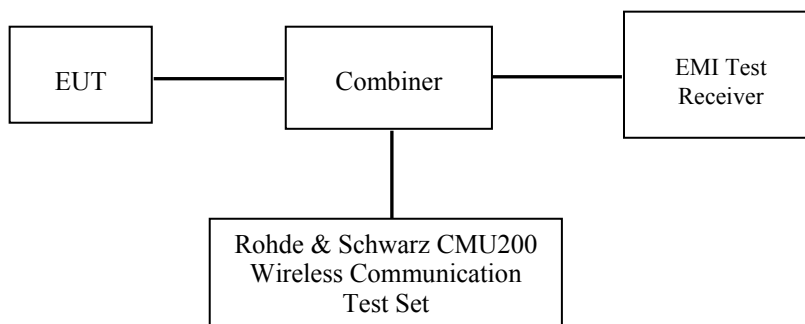
CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

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

Test Procedure

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



GSM

Maximum Output Power among production units

Max Target Peak Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 850	31.50	31.50	31.50
GPRS 1 slot	31.50	31.50	31.50
GPRS 2 slot	30.50	30.50	30.50
GPRS 3 slot	28.50	28.50	28.50
GPRS 4 slot	27.00	27.00	27.00
PCS 1900	30.00	30.00	30.00
GPRS 1 slot	30.00	30.00	30.00
GPRS 2 slot	28.00	28.00	28.00
GPRS 3 slot	26.50	26.50	26.50
GPRS 4 slot	24.50	24.50	24.50
BT	1.00	1.00	1.00

Test Results:**GSM**

Band	Frequency (MHz)	Conducted Peak Output Power	
		Meas. Power (dBm)	Meas. Power (W)
GSM 850	824.2	31.35	1.365
	836.6	31.44	1.393
	848.8	31.49	1.409
PCS 1900	1850.2	29.69	0.931
	1880.0	29.60	0.912
	1909.8	29.53	0.897

GPRS

Band	Channel No.	Frequency (MHz)	RF Peak Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	31.50	30.24	28.15	26.16
	190	836.6	31.41	30.34	28.32	26.37
	251	848.8	31.47	30.39	28.44	26.53
PCS 1900	512	1850.2	29.62	27.71	26.06	24.03
	661	1880.0	29.53	27.62	25.97	23.97
	810	1909.8	29.42	27.52	25.87	23.89

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

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

The time based average power

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	22.50	24.24	23.90	23.16
	190	836.6	22.41	24.34	24.07	23.37
	251	848.8	22.47	24.39	24.19	23.53
PCS 1900	512	1850.2	20.62	21.71	21.81	21.03
	661	1880.0	20.53	21.62	21.72	20.97
	810	1909.8	20.42	21.52	21.62	20.89

Note:

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

Bluetooth

Mode	Channel frequency (MHz)	Reading power (dBm)	Power output (mw)
BDR(GFSK)	(Low)2402	-0.89	0.815
	(Middle)2441	-0.72	0.847
	(High)2480	-1.79	0.662
EDR(4-DQPSK)	(Low)2402	0.33	1.079
	(Middle)2441	0.47	1.114
	(High)2480	-0.48	0.895
EDR-8DPSK	(Low)2402	0.81	1.205
	(Middle)2441	1.00	1.259
	(High)2480	0.04	1.009

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

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

** Testing was performed by Sandy Wang on 2013-07-28 to 2013-07-30.*

GSM 850:

EUT Position	Frequency (MHz)		Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	FCC 1g SAR (W/Kg)		
	Channel	MHz					Scaled Factor	Meas. SAR	Scaled SAR
Left Head Cheek	128(Low)	824.2	GSM	1.109	31.35	31.50	1.035	0.895	0.926
	190(Middle)	836.6	GSM	1.825	31.44	31.50	1.014	0.986	1.000
	251(High)	848.8	GSM	-1.458	31.49	31.50	1.002	0.914	0.916
Left Head Tilt	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	1.257	31.44	31.50	1.014	0.651	0.660
	251(High)	848.8	GSM	/	/	/	/	/	/
Right Head Cheek	128(Low)	824.2	GSM	1.172	31.35	31.50	1.035	0.911	0.943
	190(Middle)	836.6	GSM	-2.379	31.44	31.50	1.014	0.933	0.946
	251(High)	848.8	GSM	1.208	31.49	31.50	1.002	0.937	0.939
Right Head Tilt	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	0.751	31.44	31.50	1.014	0.624	0.633
	251(High)	848.8	GSM	/	/	/	/	/	/
Body-Front-Headset (15mm)	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	1.207	31.44	31.50	1.014	0.47	0.477
	251(High)	848.8	GSM	/	/	/	/	/	/
Body-Back-Headset (15mm)	128(Low)	824.2	GSM	/	/	/	/	/	/
	190(Middle)	836.6	GSM	-0.749	31.44	31.50	1.014	0.635	0.644
	251(High)	848.8	GSM	/	/	/	/	/	/
Body-Front (15mm)	128(Low)	824.2	GPRS	/	/	/	/	/	/
	190(Middle)	836.6	GPRS	-1.917	30.34	30.50	1.038	0.64	0.664
	251(High)	848.8	GPRS	/	/	/	/	/	/
Body-Back (15mm)	128(Low)	824.2	GPRS	/	/	/	/	/	/
	190(Middle)	836.6	GPRS	-1.318	30.34	30.50	1.038	0.768	0.797
	251(High)	848.8	GPRS	/	/	/	/	/	/

Note:

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

PCS Band:

EUT Position	Frequency (MHz)		Test Mode	Power Drift (%)	Meas. Peak Power (dBm)	Max. Rated Power (dBm)	FCC 1g SAR (W/Kg)		
	Channel	MHz					Scaled Factor	Meas. SAR	Scaled SAR
Left Head Cheek	512(Low)	1850.2	GSM	-1.821	29.69	30.00	1.074	0.779	0.837
	661(Middle)	1880.0	GSM	1.263	29.60	30.00	1.096	0.822	0.901
	810(High)	1909.8	GSM	-1.593	29.53	30.00	1.114	0.801	0.893
Left Head Tilt	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	-1.143	29.60	30.00	1.096	0.614	0.673
	810(High)	1909.8	GSM	/	/	/	/	/	/
Right Head Cheek	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	1.527	29.60	30.00	1.096	0.722	0.792
	810(High)	1909.8	GSM	/	/	/	/	/	/
Right Head Tilt	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	-2.124	29.60	30.00	1.096	0.589	0.646
	810(High)	1909.8	GSM	/	/	/	/	/	/
Body-Front-Headset (15mm)	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	0.824	29.60	30.00	1.096	0.071	0.078
	810(High)	1909.8	GSM	/	/	/	/	/	/
Body-Back-Headset (15mm)	512(Low)	1850.2	GSM	/	/	/	/	/	/
	661(Middle)	1880.0	GSM	0.527	29.60	30.00	1.096	0.082	0.090
	810(High)	1909.8	GSM	/	/	/	/	/	/
Body-Front (15mm)	512(Low)	1850.2	GPRS	/	/	/	/	/	/
	661(Middle)	1880.0	GPRS	-1.482	25.97	26.50	1.130	0.088	0.099
	810(High)	1909.8	GPRS	/	/	/	/	/	/
Body-Back (15mm)	512(Low)	1850.2	GPRS	/	/	/	/	/	/
	661(Middle)	1880.0	GPRS	1.275	25.97	26.50	1.130	0.113	0.128
	810(High)	1909.8	GPRS	/	/	/	/	/	/

Note:

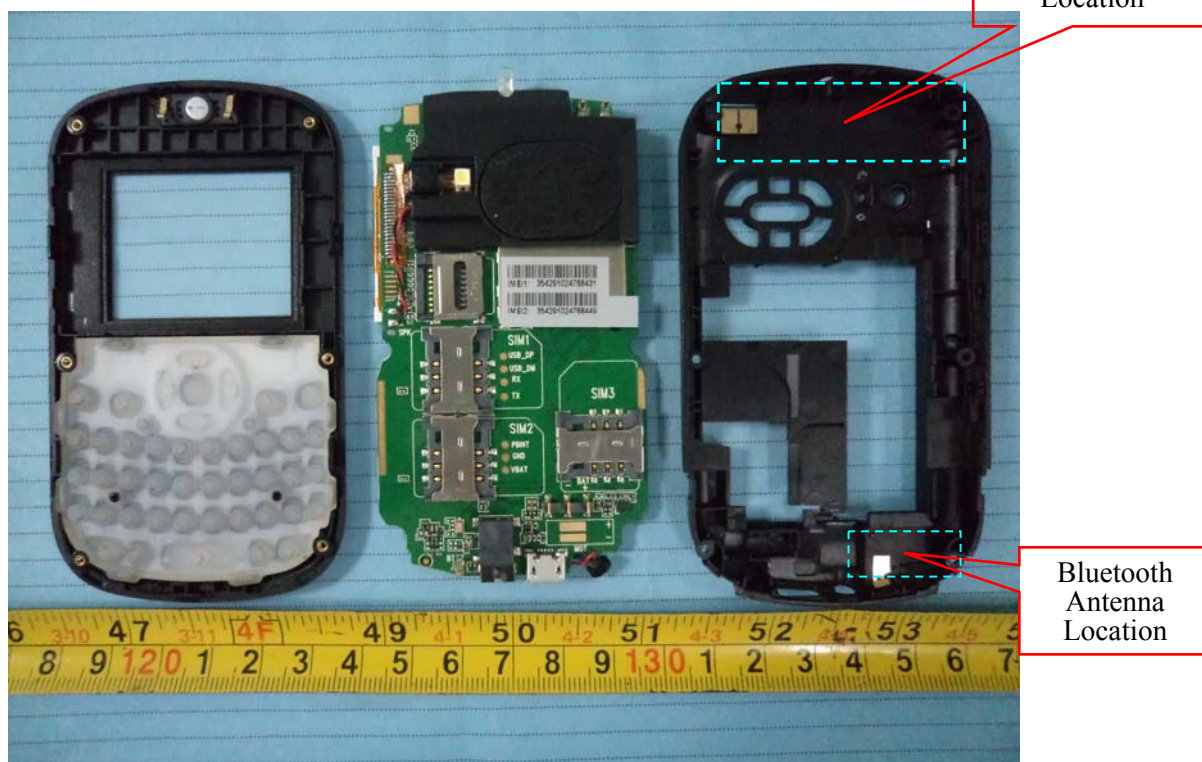
1. When the 1-g SAR is $\leq 0.8\text{W/Kg}$, testing for other channels are optional.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
3. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active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

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

KDB 447498D01 General RF Exposure Guidance v05

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

BT and GSM Antenna Location:



Antenna Information:

Description of Simultaneous Transmit Capabilities		Antennas Distance (mm)
Transmitter Combination	Scenario Supported?	
GSM + GPRS	×	0.00
GSM + Bluetooth	√	68.00
GPRS + Bluetooth	√	68.00

Standalone SAR test exclusion considerations:

Head Position:

Mode	Frequency (MHz)	P _{avg} (dBm)	P _{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GSM850	850	22.49	177.419	0	32.7	3.0	No
PCS1900	1900	20.69	117.220	0	32.3	3.0	No
Bluetooth	2450	1.00	1.259	0	0.4	3.0	Yes

Body Position:

Mode	Frequency (MHz)	P _{avg} (dBm)	P _{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GSM850	850	24.39	274.789	15	16.9	3.0	No
PCS1900	1900	21.81	151.705	15	13.9	3.0	No
Bluetooth	2450	1.00	1.259	15	0.1	3.0	Yes

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

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

$[\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 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.

Simultaneous SAR test exclusion considerations:

GSM with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	BT	< 1.6W/kg
GSM850	Left Head Cheek	1.000	0.053	1.053
	Left Head Tilt	0.660	0.053	0.713
	Right Head Cheek	0.946	0.053	0.999
	Right Head Tilt	0.633	0.053	0.686
	Body-Headset-Front	0.477	0.018	0.495
	Body-Headset-Back	0.644	0.018	0.662
	Body-Front	0.664	0.018	0.682
	Body-Back	0.797	0.018	0.815
PCS1900	Left Head Cheek	0.901	0.053	0.954
	Left Head Tile	0.673	0.053	0.726
	Right Head Cheek	0.792	0.053	0.845
	Right Head Tilt	0.646	0.053	0.699
	Body-Headset-Front	0.078	0.018	0.096
	Body-Headset-Back	0.090	0.018	0.108
	Body-Front	0.099	0.018	0.117
	Body-Back	0.128	0.018	0.146

Mode	Frequency (GHz)	Distance (mm)	P _{avg} (dBm)	P _{avg} (mW)	Estimated 1-g (W/kg)
Bluetooth Head	2.45	0	1.00	1.259	0.053
Bluetooth Body	2.45	15	1.00	1.259	0.018

Note:

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

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

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

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

Conclusion:

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

EUT SCAN RESULTS

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

Left Head Cheek (824.2 MHz Low Channel)

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.748 W/kg
Power Drift-Finish : 0.756W/kg
Power Drift (%) : 1.019

Tissue Data

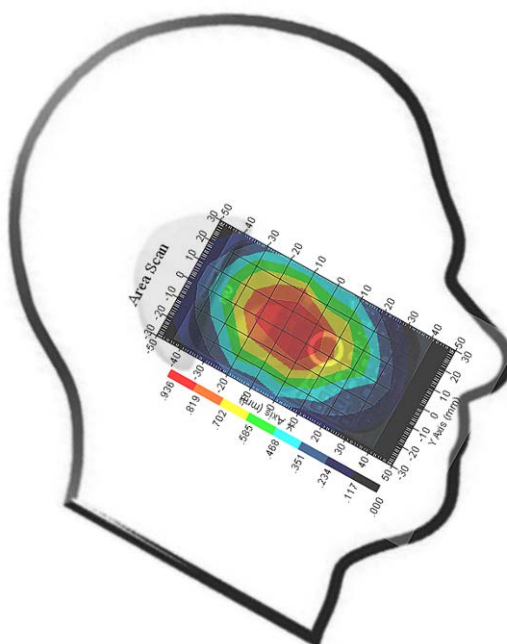
Type : Head
Frequency : 824.2 MHz
Epsilon : 40.74 F/m
Sigma : 0.90 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.895 W/kg
10 gram SAR value : 0.534 W/kg
Area Scan Peak SAR : 0.935 W/kg
Zoom Scan Peak SAR : 1.716 W/kg

Plot 1#



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

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.728 W/kg
Power Drift-Finish : 0.731 W/kg
Power Drift (%) : 1.825

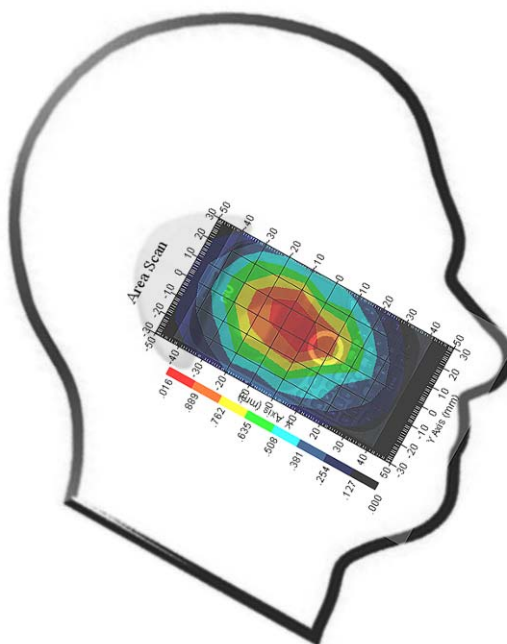
Tissue Data

Type : Head
Frequency : 836.6 MHz
Epsilon : 40.70 F/m
Sigma : 0.91 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.986 W/kg
10 gram SAR value : 0.785 W/kg
Area Scan Peak SAR : 1.015 W/kg
Zoom Scan Peak SAR : 1.851 W/kg

Plot 2#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.693 W/kg
Power Drift-Finish : 0.684W/kg
Power Drift (%) : -1.458

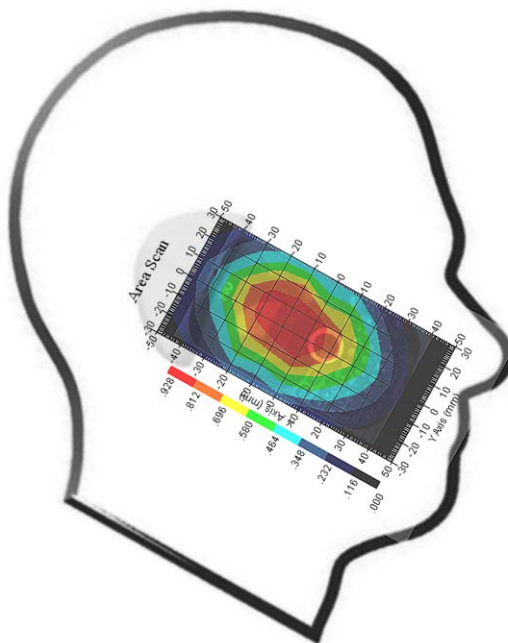
Tissue Data

Type : Head
Frequency : 848.8 MHz
Epsilon : 40.47 F/m
Sigma : 0.93 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.914 W/kg
10 gram SAR value : 0.617 W/kg
Area Scan Peak SAR : 0.928 W/kg
Zoom Scan Peak SAR : 1.715 W/kg

Plot 3#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.391 W/kg
Power Drift-Finish : 0.396 W/kg
Power Drift (%) : 1.257

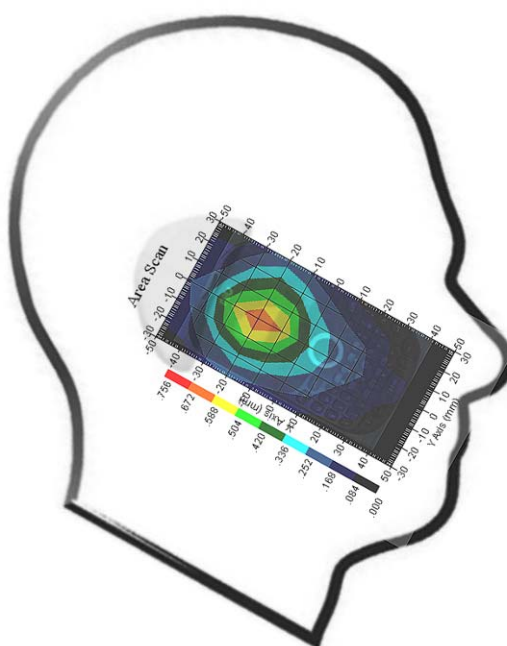
Tissue Data

Type : Head
Frequency : 836.6 MHz
Epsilon : 40.70 F/m
Sigma : 0.91 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.651 W/kg
10 gram SAR value : 0.400 W/kg
Area Scan Peak SAR : 0.734 W/kg
Zoom Scan Peak SAR : 1.342 W/kg

Plot 4#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Right Head Cheek (824.2MHz Low Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.718 W/kg
Power Drift-Finish : 0.726W/kg
Power Drift (%) : 1.172

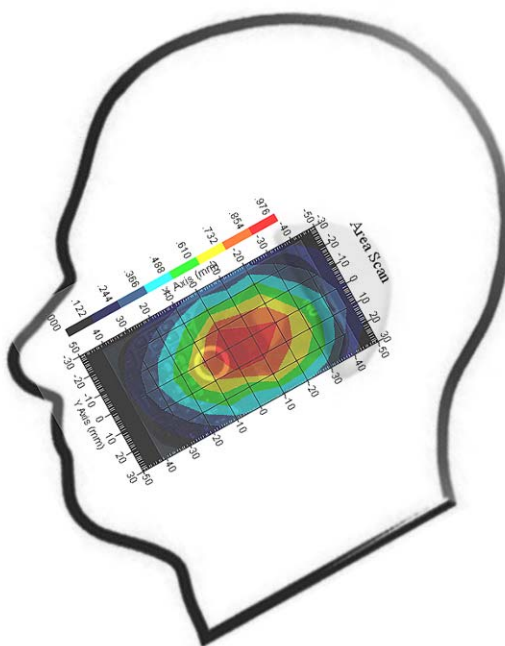
Tissue Data

Type : Head
Frequency : 824.2 MHz
Epsilon : 40.74 F/m
Sigma : 0.90 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.911 W/kg
10 gram SAR value : 0.632 W/kg
Area Scan Peak SAR : 0.975 W/kg
Zoom Scan Peak SAR : 1.785 W/kg

Plot 5#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.655 W/kg
Power Drift-Finish : 0.640 W/kg
Power Drift (%) : -2.379

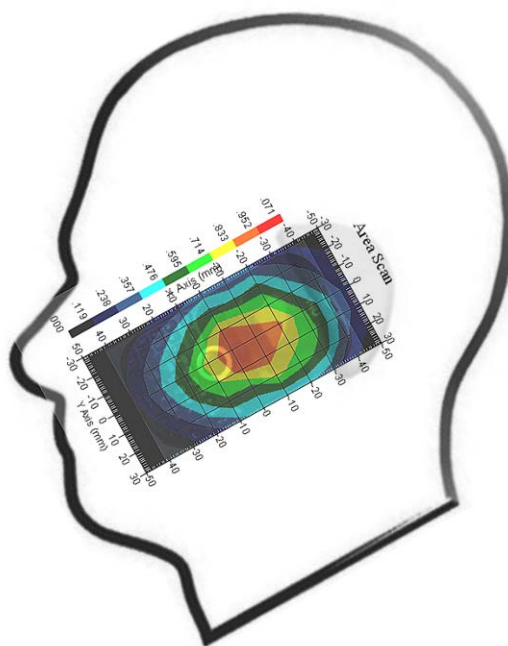
Tissue Data

Type : Head
Frequency : 836.6 MHz
Epsilon : 40.70 F/m
Sigma : 0.91 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.933 W/kg
10 gram SAR value : 0.621 W/kg
Area Scan Peak SAR : 0.964 W/kg
Zoom Scan Peak SAR : 1.787 W/kg

Plot 6#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.729 W/kg
Power Drift-Finish : 0.738W/kg
Power Drift (%) : 1.208

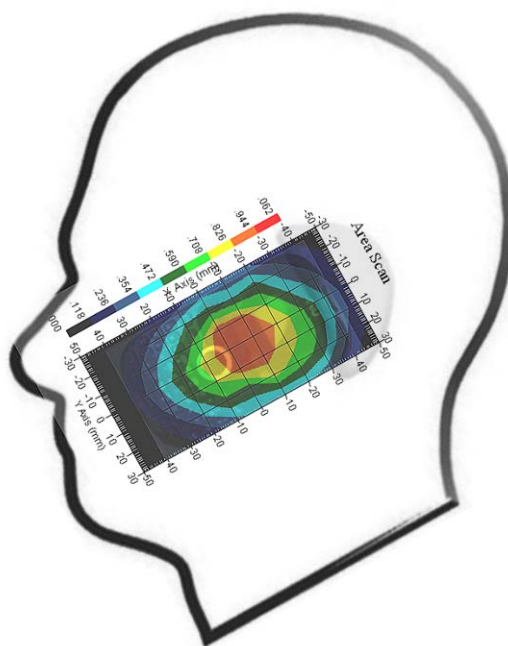
Tissue Data

Type : Head
Frequency : 848.8 MHz
Epsilon : 40.47 F/m
Sigma : 0.93 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.937 W/kg
10 gram SAR value : 0.594 W/kg
Area Scan Peak SAR : 1.001 W/kg
Zoom Scan Peak SAR : 1.912 W/kg

Plot 7#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.305 W/kg
Power Drift-Finish : 0.307 W/kg
Power Drift (%) : 0.751

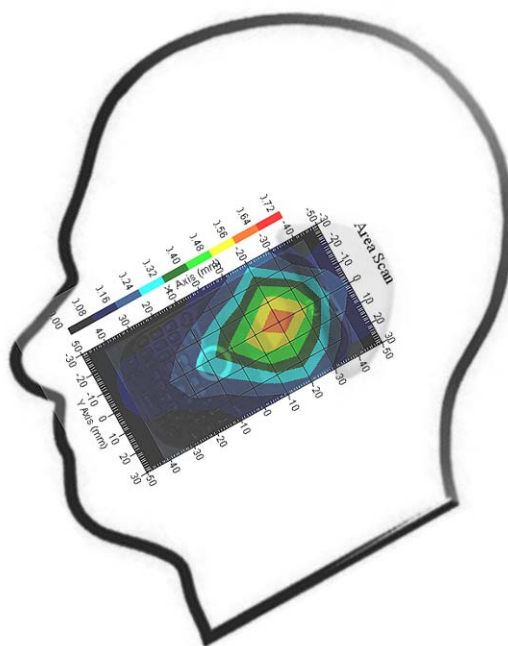
Tissue Data

Type : Head
Frequency : 836.6 MHz
Epsilon : 40.70 F/m
Sigma : 0.91 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.624 W/kg
10 gram SAR value : 0.410 W/kg
Area Scan Peak SAR : 0.718 W/kg
Zoom Scan Peak SAR : 1.258 W/kg

Plot 8#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.422 W/kg
Power Drift-Finish : 0.427 W/kg
Power Drift (%) : 1.207

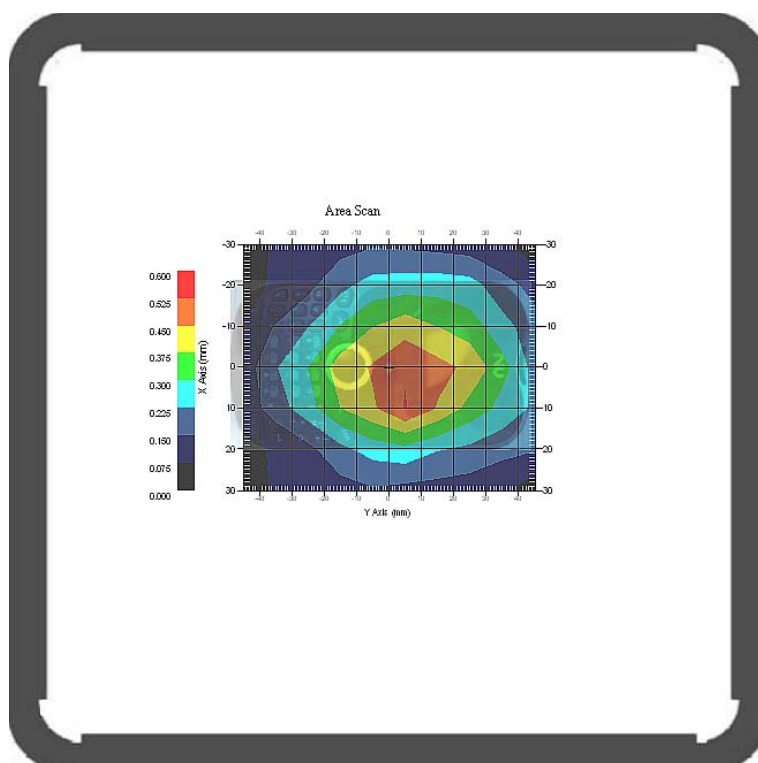
Tissue Data

Type : Body
Frequency : 836.6 MHz
Epsilon : 54.93 F/m
Sigma : 0.97 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.470 W/kg
10 gram SAR value : 0.285 W/kg
Area Scan Peak SAR : 0.520 W/kg
Zoom Scan Peak SAR : 0.820 W/kg

Plot 9#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.574 W/kg
Power Drift-Finish : 0.570 W/kg
Power Drift (%) : -0.749

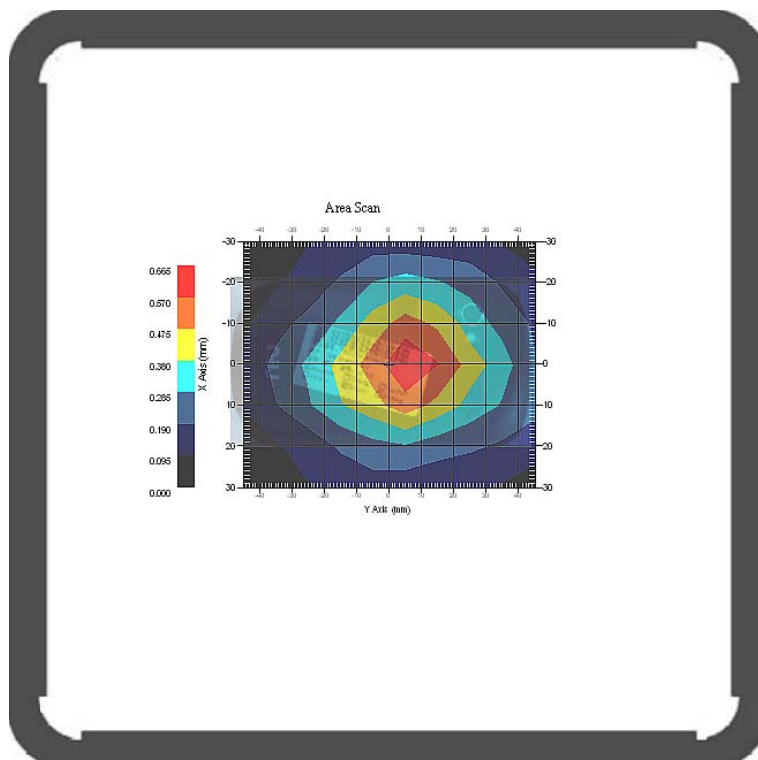
Tissue Data

Type : Body
Frequency : 836.6 MHz
Epsilon : 54.93 F/m
Sigma : 0.97 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.635 W/kg
10 gram SAR value : 0.394 W/kg
Area Scan Peak SAR : 0.665 W/kg
Zoom Scan Peak SAR : 0.920 W/kg

Plot 10#

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

Measurement Data

Test mode : GPRS
Crest Factor : 4
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.551 W/kg
Power Drift-Finish : 0.540 W/kg
Power Drift (%) : -1.917

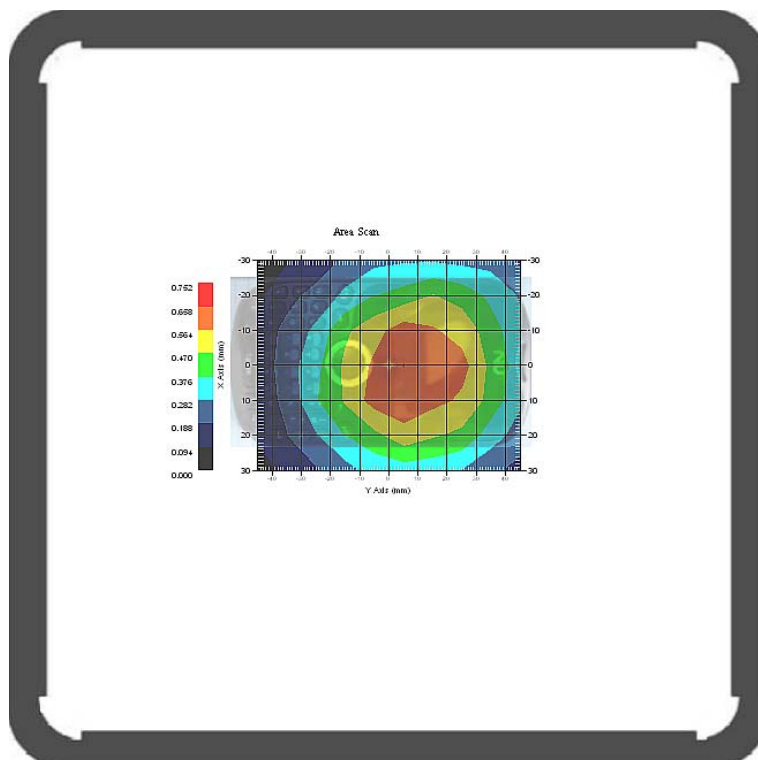
Tissue Data

Type : Body
Frequency : 836.6 MHz
Epsilon : 54.93 F/m
Sigma : 0.97 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.640 W/kg
10 gram SAR value : 0.445 W/kg
Area Scan Peak SAR : 0.660 W/kg
Zoom Scan Peak SAR : 0.900 W/kg

Plot 11#

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

Measurement Data

Test mode : GPRS
Crest Factor : 4
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.751 W/kg
Power Drift-Finish : 0.742W/kg
Power Drift (%) : -1.318

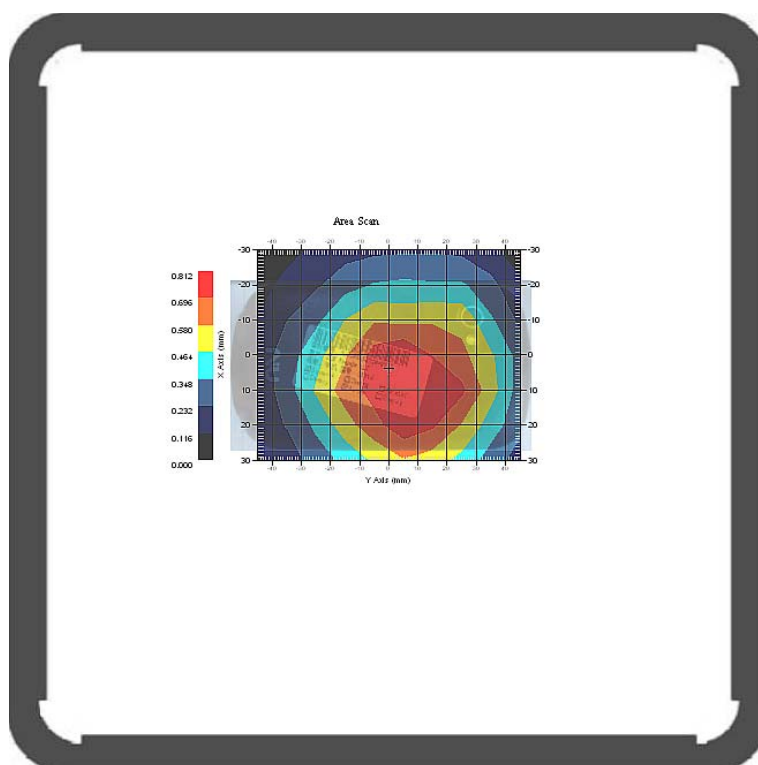
Tissue Data

Type : Body
Frequency : 836.6 MHz
Epsilon : 54.93 F/m
Sigma : 0.97 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.768 W/kg
10 gram SAR value : 0.533 W/kg
Area Scan Peak SAR : 0.809 W/kg
Zoom Scan Peak SAR : 1.081 W/kg

Plot 12#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.427 W/kg
Power Drift-Finish : 0.419 W/kg
Power Drift (%) : -1.821

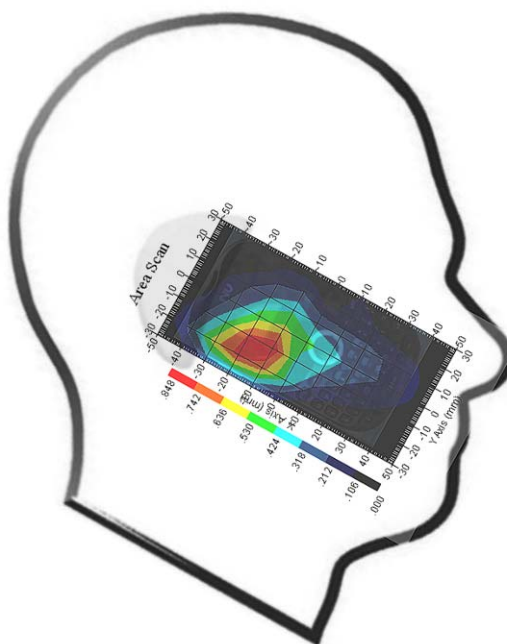
Tissue Data

Type : Head
Frequency : 1850.2 MHz
Epsilon : 40.23 F/m
Sigma : 1.39 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.779 W/kg
10 gram SAR value : 0.457 W/kg
Area Scan Peak SAR : 0.844 W/kg
Zoom Scan Peak SAR : 1.452 W/kg

Plot 13#

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 : 0.487 W/kg
Power Drift-Finish : 0.493 W/kg
Power Drift (%) : 1.263

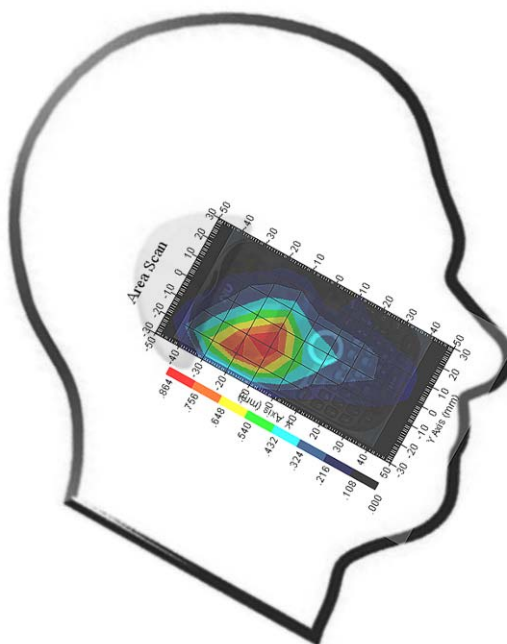
Tissue Data

Type : Head
Frequency : 1880.0 MHz
Epsilon : 40.24F/m
Sigma : 1.41 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.822 W/kg
10 gram SAR value : 0.460 W/kg
Area Scan Peak SAR : 0.863 W/kg
Zoom Scan Peak SAR : 1.522 W/kg

Plot 14#

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

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.500 W/kg
Power Drift-Finish : 0.492 W/kg
Power Drift (%) : -1.593

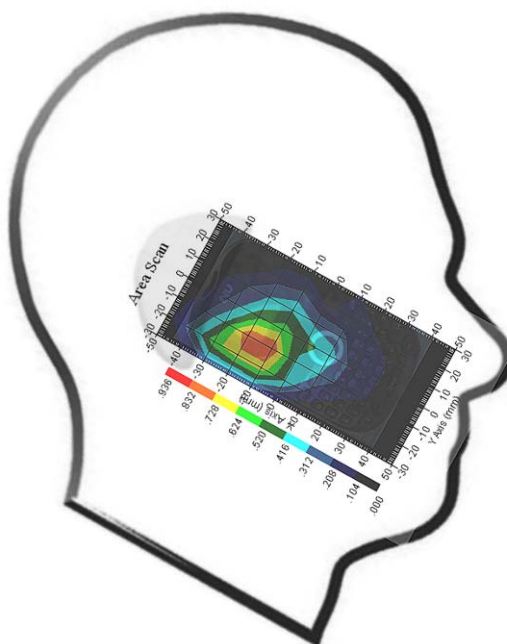
Tissue Data

Type : Head
Frequency : 1909.8 MHz
Epsilon : 40.25 F/m
Sigma : 1.43 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.801 W/kg
10 gram SAR value : 0.419 W/kg
Area Scan Peak SAR : 0.836 W/kg
Zoom Scan Peak SAR : 1.487 W/kg

Plot 15#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.452 W/kg
Power Drift-Finish : 0.447 W/kg
Power Drift (%) : -1.143

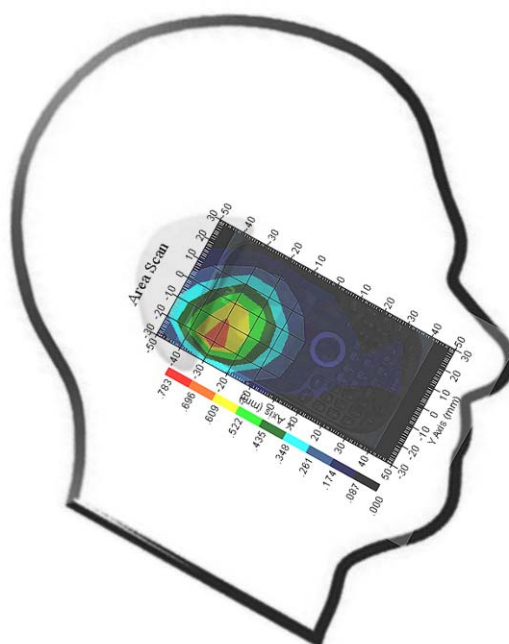
Tissue Data

Type : Head
Frequency : 1880.0 MHz
Epsilon : 40.24F/m
Sigma : 1.41 S/m
Density : 1000.00 kg/cu. M

Probe Data

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

1 gram SAR value : 0.614 W/kg
10 gram SAR value : 0.327 W/kg
Area Scan Peak SAR : 0.697 W/kg
Zoom Scan Peak SAR : 1.017 W/kg

Plot 16#

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

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.529 W/kg
Power Drift-Finish : 0.537W/kg
Power Drift (%) : 1.527

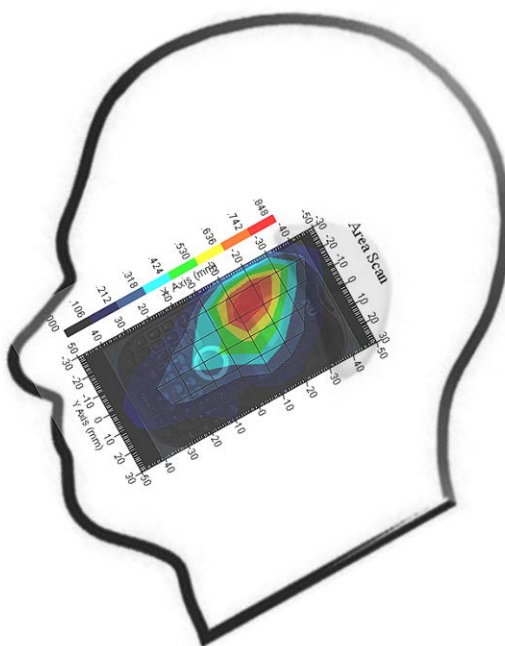
Tissue Data

Type : Head
Frequency : 1880.0 MHz
Epsilon : 40.24F/m
Sigma : 1.41 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.722 W/kg
10 gram SAR value : 0.468 W/kg
Area Scan Peak SAR : 0.816 W/kg
Zoom Scan Peak SAR : 1.501 W/kg

Plot 17#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.401 W/kg
Power Drift-Finish : 0.392 W/kg
Power Drift (%) : -2.124

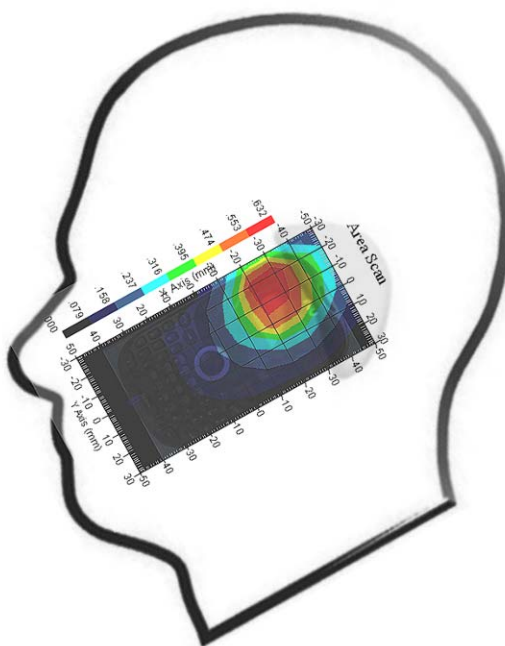
Tissue Data

Type : Head
Frequency : 1880.0 MHz
Epsilon : 40.24F/m
Sigma : 1.41 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.589 W/kg
10 gram SAR value : 0.321 W/kg
Area Scan Peak SAR : 0.631 W/kg
Zoom Scan Peak SAR : 0.988 W/kg

Plot 18#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.042 W/kg
Power Drift-Finish : 0.042 W/kg
Power Drift (%) : 0.824

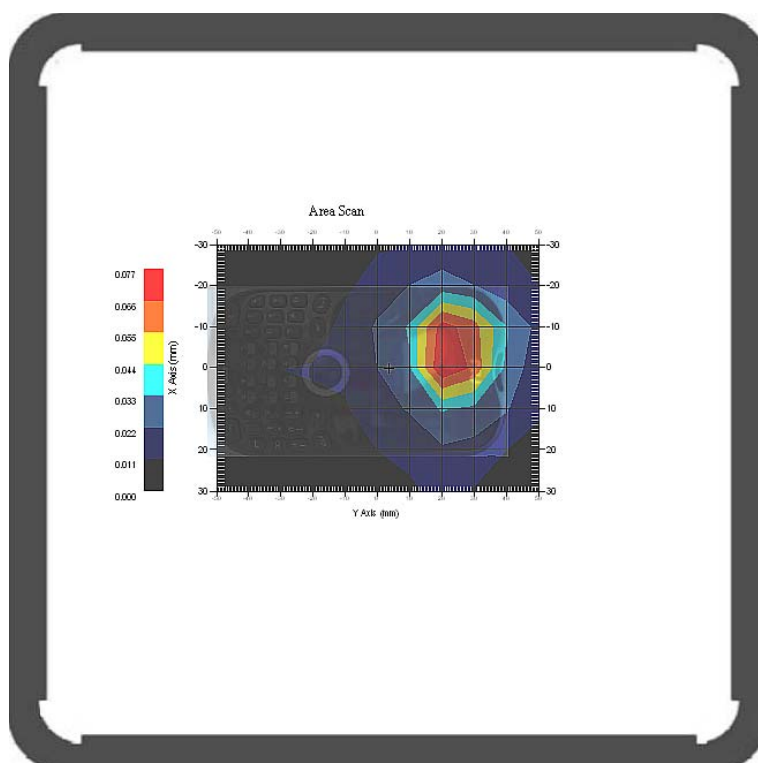
Tissue Data

Type : Body
Frequency : 1880.0 MHz
Epsilon : 53.73 F/m
Sigma : 1.53 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.071 W/kg
10 gram SAR value : 0.034 W/kg
Area Scan Peak SAR : 0.077 W/kg
Zoom Scan Peak SAR : 0.170 W/kg

Plot 19#

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

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.050 W/kg
Power Drift-Finish : 0.050W/kg
Power Drift (%) : 0.527

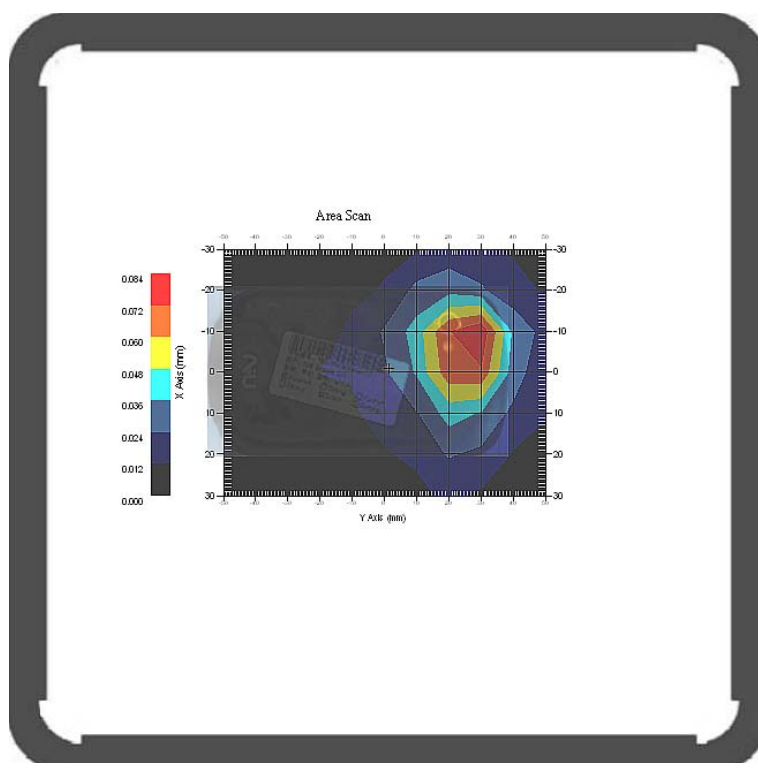
Tissue Data

Type : Body
Frequency : 1880.0 MHz
Epsilon : 53.73 F/m
Sigma : 1.53 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.082 W/kg
10 gram SAR value : 0.039 W/kg
Area Scan Peak SAR : 0.084 W/kg
Zoom Scan Peak SAR : 0.204 W/kg

Plot 20#

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

Measurement Data

Test mode : GPRS
Crest Factor : 2.67
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.063 W/kg
Power Drift-Finish : 0.062 W/kg
Power Drift (%) : -1.482

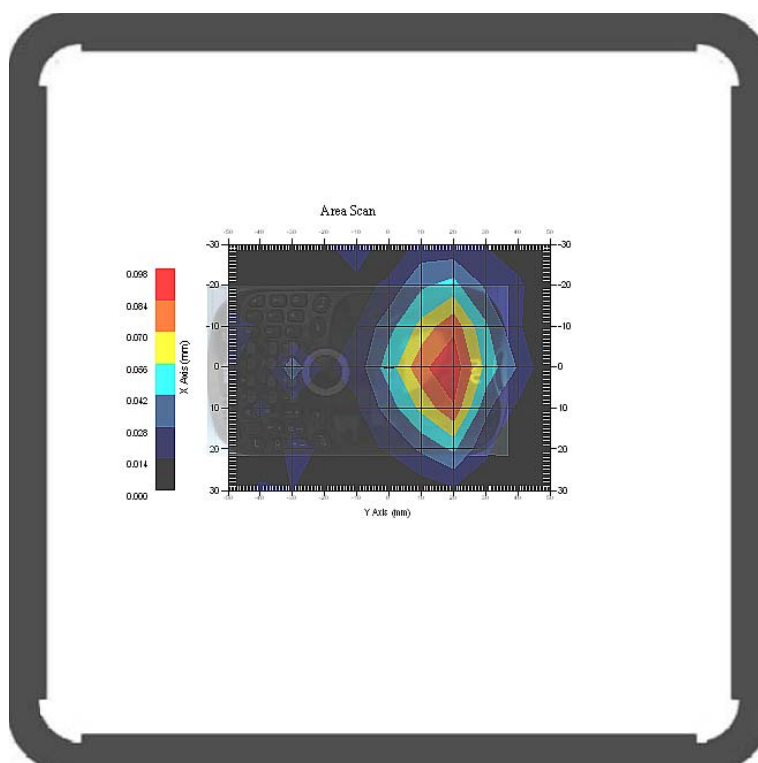
Tissue Data

Type : Body
Frequency : 1880.0 MHz
Epsilon : 53.73 F/m
Sigma : 1.53 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.088 W/kg
10 gram SAR value : 0.044 W/kg
Area Scan Peak SAR : 0.095 W/kg
Zoom Scan Peak SAR : 0.180 W/kg

Plot 21#

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

Measurement Data

Test mode : GPRS
Crest Factor : 2.67
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.082 W/kg
Power Drift-Finish : 0.083 W/kg
Power Drift (%) : 1.275

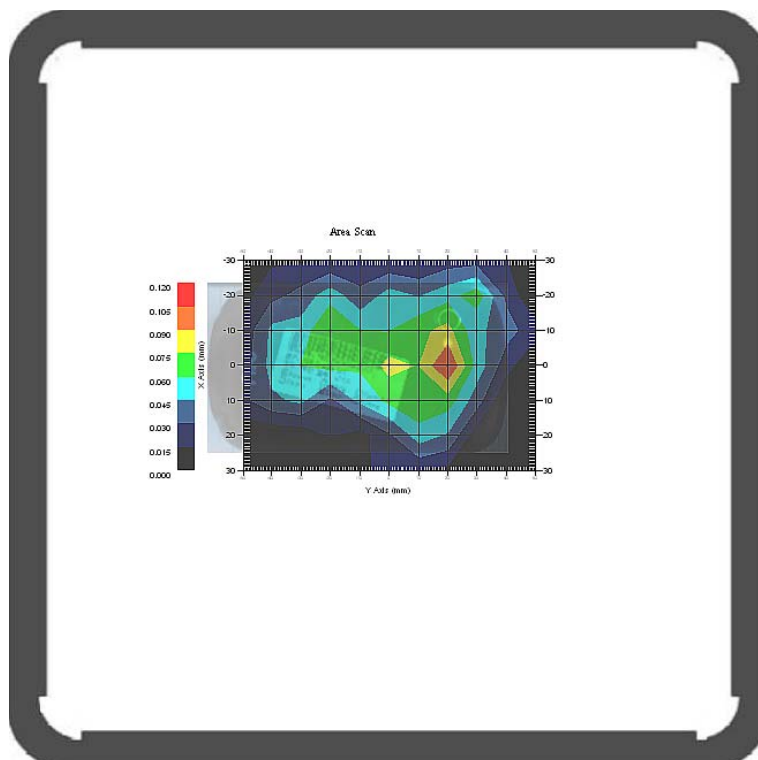
Tissue Data

Type : Body
Frequency : 1880.0 MHz
Epsilon : 53.73 F/m
Sigma : 1.53 S/m
Density : 1000.00 kg/cu. m

Probe Data

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

1 gram SAR value : 0.113 W/kg
10 gram SAR value : 0.055 W/kg
Area Scan Peak SAR : 0.116 W/kg
Zoom Scan Peak SAR : 0.250 W/kg

Plot 22#

APPENDIX A MEASUREMENT UNCERTAINTY

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

Measurement Uncertainty for 300MHz to 3GHz

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

APPENDIX B PROBE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No.: 1427-1430

Client.: BACL Lab

CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe

Record of Calibration

Head and Body

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 500-00283

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

Calibrated: 8th August 2012
Released on: 9th August 2012

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

Released By:



Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

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

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

NCL Calibration Laboratories

Division of APREL Inc.

Introduction

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

Calibration Method

Probes are calibrated using the following methods.

<1000MHz

TEM Cell for sensitivity in air

Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz

Waveguide* method to determine sensitivity in air and tissue

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

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

References

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

Page 2 of 10

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

NCL Calibration Laboratories

Division of APREL Inc.

Conditions

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

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

Primary Measurement Standards

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

Secondary Measurement Standards

Signal Generator Agilent E4438C -506 MY55182336 June 7, 2013


Attestation

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

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



Art Brennan, Quality Manager



Dan Brooks, Test Engineer

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

NCL Calibration Laboratories

Division of APREL Inc.

Calibration for Tissue (Head H, Body B)

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

NCL Calibration Laboratories

Division of APREL Inc.

Boundary Effect:

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

Spatial Resolution:

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

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

DAQ-PAQ Contribution

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

Boundary Effect:

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

NOTES:

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

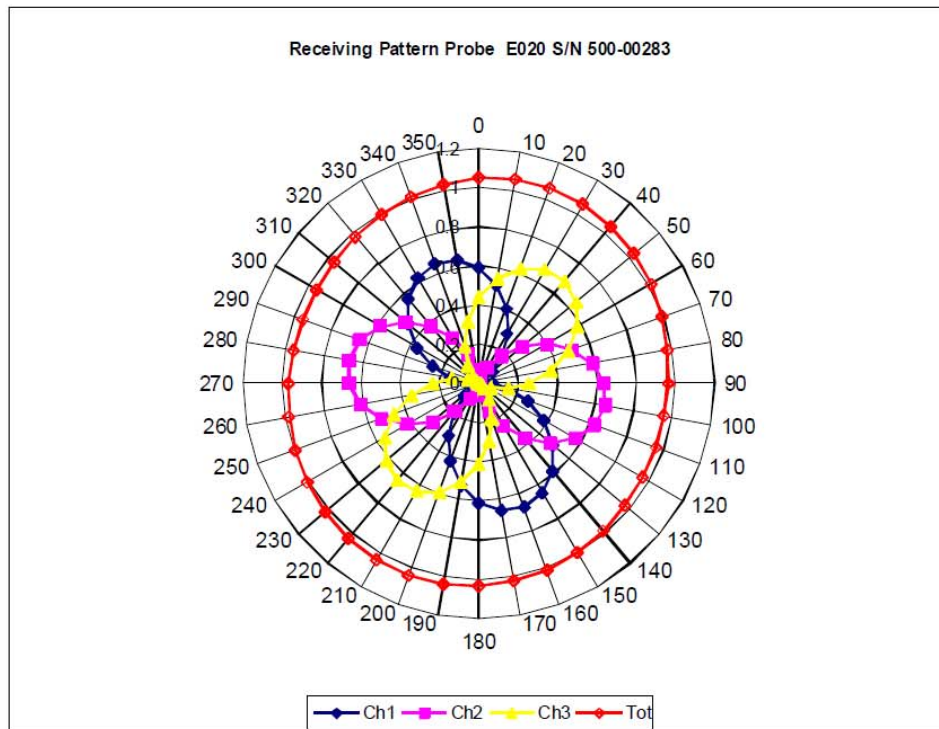
Page 6 of 10

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NCL Calibration Laboratories

Division of APREL Inc.

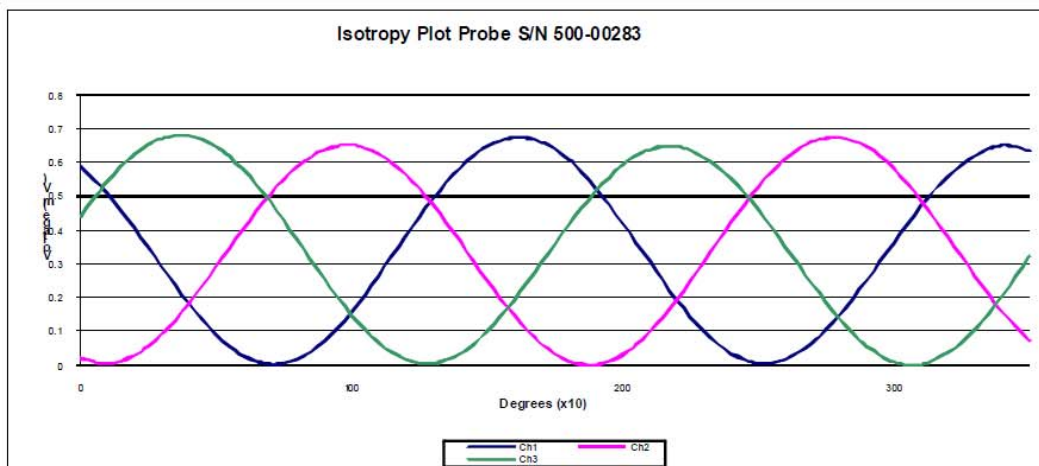
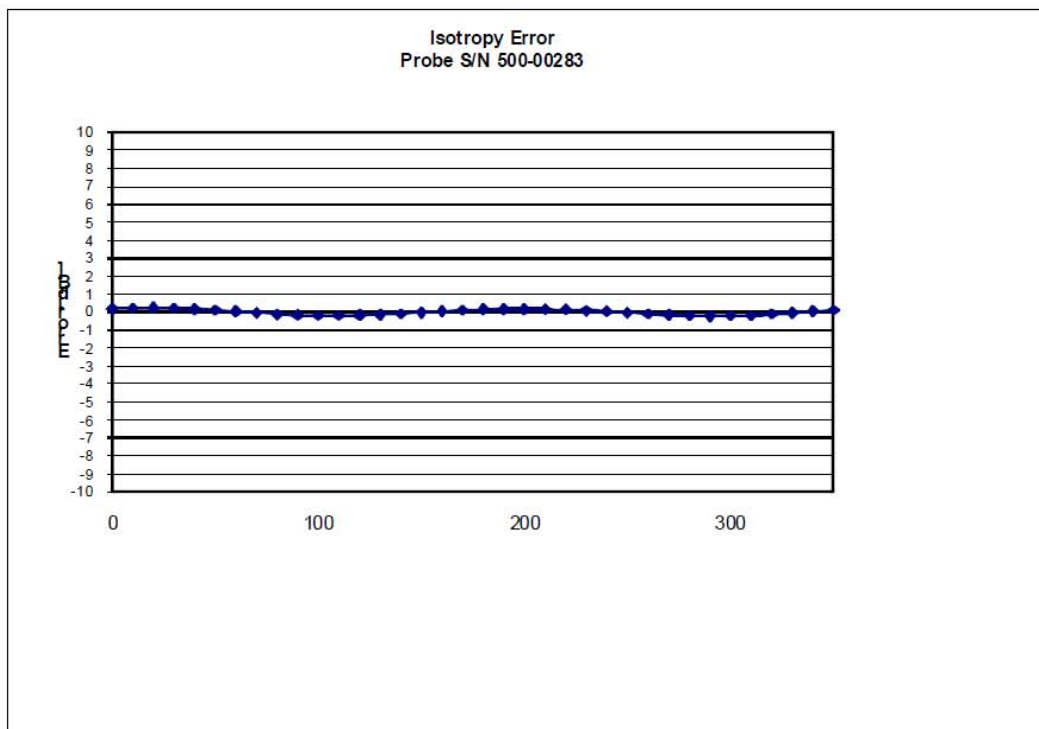
Receiving Pattern Air



NCL Calibration Laboratories

Division of APREL Inc.

Isotropy Error Air



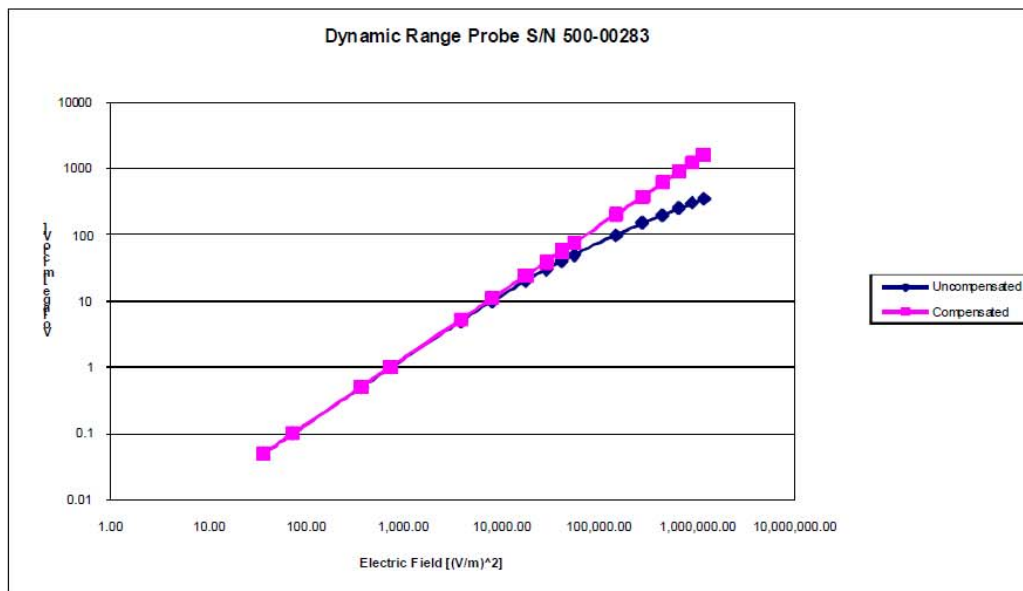
Isotropy Tissue:

0.10 dB

NCL Calibration Laboratories

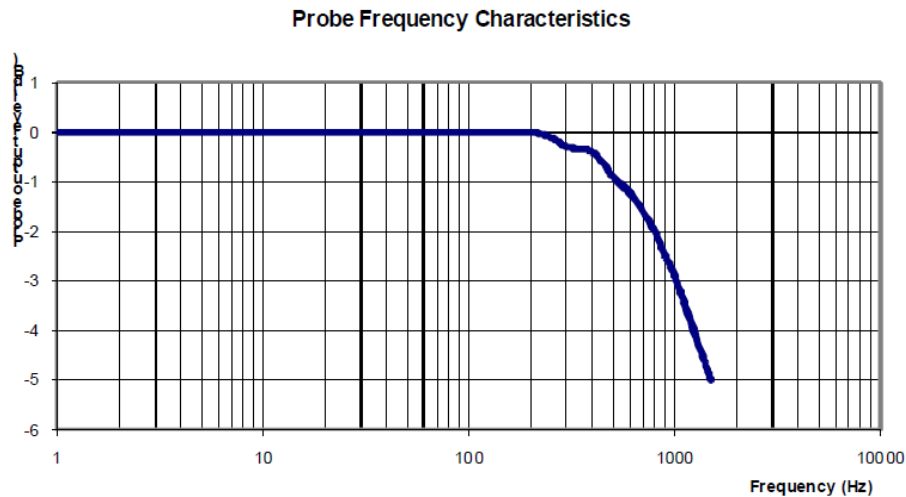
Division of APREL Inc.

Dynamic Range



NCL Calibration Laboratories

Division of APREL Inc.

Video Bandwidth

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

Test Equipment

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

APPENDIX C DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

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

CERTIFICATE OF CALIBRATION

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

Validation Dipole(Head and Body)

Manufacturer: APREL Laboratories

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

Frequency: 835 MHz

Serial No: 180-00558

Customer: Bay Area Compliance Laboratory

Calibrated: 25th August 2011

Released on: 25th August 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES

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

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

NCL Calibration Laboratories

Division of APREL Laboratories.

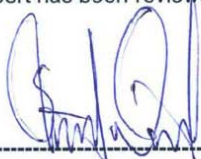
Conditions

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

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

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

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



Stuart Nicol



C. Teodorian

Primary Measurement Standards

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

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Calibration Results Summary

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

Mechanical Dimensions

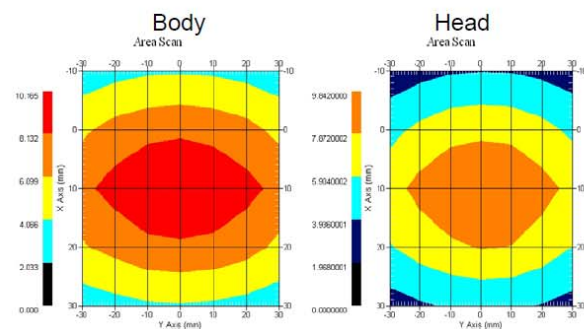
Length: 162.2 mm
Height: 89.4 mm

Electrical Specification

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

System Validation Results

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



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NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

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

References

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

Conditions

Dipole 180-00558 was new taken from stock.

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

Dipole Calibration uncertainty

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

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

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NCL Calibration Laboratories

Division of APREL Laboratories.

Dipole Calibration Results**Mechanical Verification**

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

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

Tissue Validation

	Dielectric constant, ϵ_r	Conductivity, σ [S/m]
Head Tissue 835MHz	41.78	0.92
Body Tissue 835MHz	56.37	0.95

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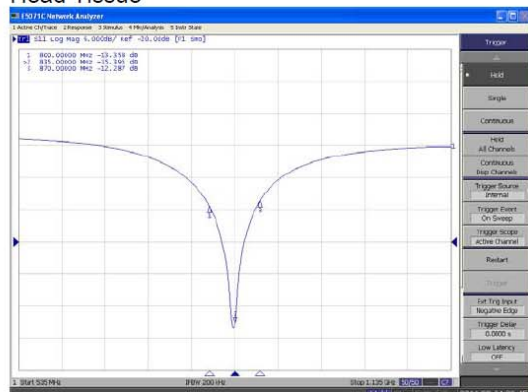
NCL Calibration Laboratories

Division of APREL Laboratories.

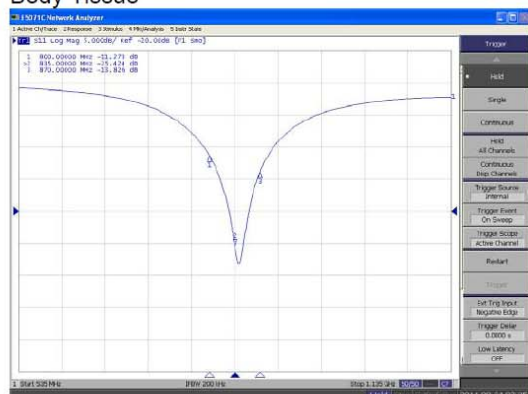
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head Tissue



Body Tissue

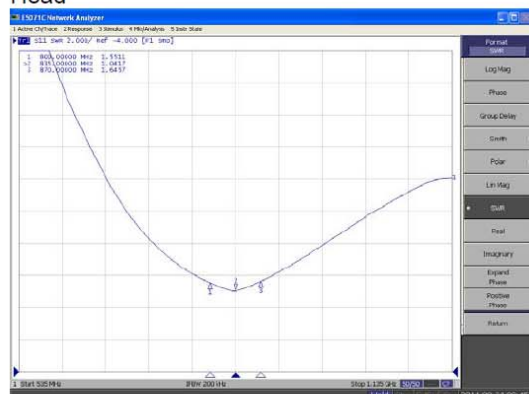


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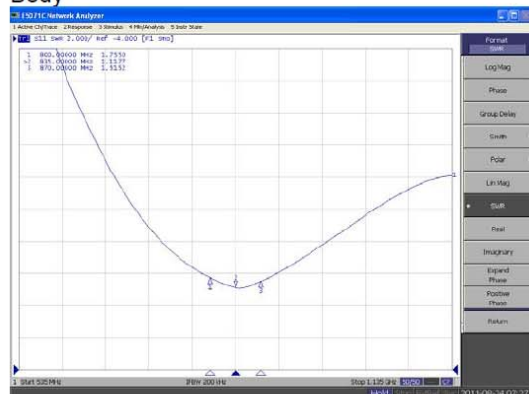
NCL Calibration Laboratories

Division of APREL Laboratories.

SWR Head



Body



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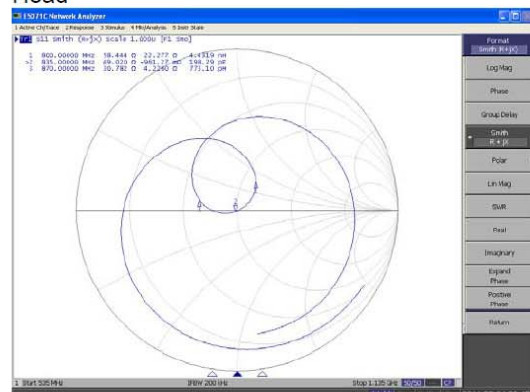
7

NCL Calibration Laboratories

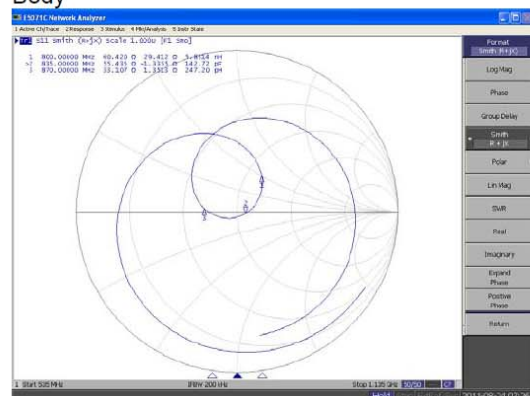
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



Body



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NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

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

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

Mechanical Verification

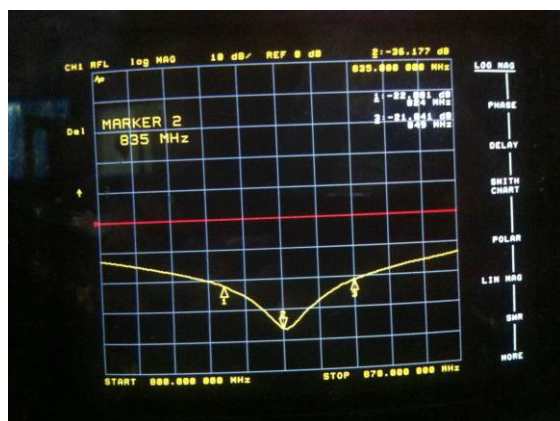
APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	161.2 mm	89.5 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-36.177 dB	50.207 Ω
Body	-24.964 dB	49.594 Ω

Test Graphs:

Head Tissue

Return Loss :

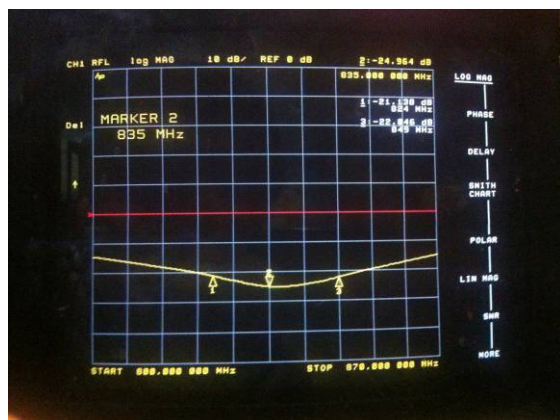


Impedance :



Body Tissue

Return Loss :



Impedance :



NCL CALIBRATION LABORATORIES

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

CERTIFICATE OF CALIBRATION

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

Validation Dipole (Head & Body)

Manufacturer: APREL Laboratories

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

Frequency: 1900 MHz

Serial No: 210-00710

Customer: Bay Area Compliance Laboratory

Calibrated: 25th August, 2011
Released on: 25th August, 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES

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

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

NCL Calibration Laboratories

Division of APREL Laboratories.


Conditions

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

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

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

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



Stuart Nicol



C. Teodorian

Primary Measurement Standards

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

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Calibration Results Summary

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

Mechanical Dimensions

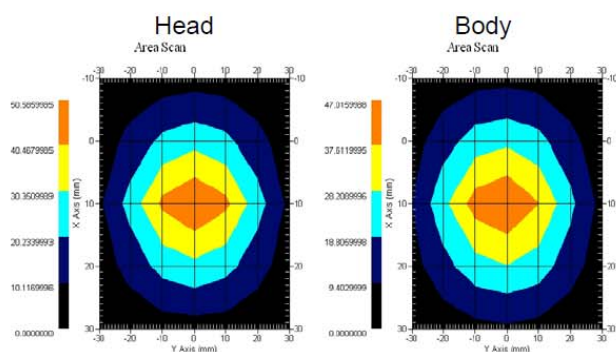
Length: 67.1 mm
Height: 38.9 mm

Electrical Specification

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

System Validation Results

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



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

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

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

References

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

Conditions

Dipole 210-00710 was new taken from stock.

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

Dipole Calibration uncertainty

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

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

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

4

NCL Calibration Laboratories

Division of APREL Laboratories.

Dipole Calibration Results**Mechanical Verification**

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

Electrical Validation

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

Tissue Validation

	Dielectric constant, ϵ_r	Conductivity, σ [S/m]
Head Tissue 1900MHz	38.4	1.43
Body Tissue 1900MHz	51.87	1.59

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Division of APREL Laboratories.

S11 Parameter Return Loss

170/17C Network Analyzer

1 Active Ch1 track 2 Response 3 Stimulus 4 TR1 (Analysis) 5 Plot State

1 S11 Log Mag 1.00000 ref -20.00dB F1 (MHz)

1 3.00000 GHz -20.014 dB
2 3.00000 GHz -35.363 dB
3 3.00000 GHz -32.733 dB

1.000 1.000

Pov: 20.00%

S11 Log Mag 3.000 1.000

170/17C

1.000 1.000

Trigger

- Single
- Continuous
- Hold All Channels
- Continuous Stop Channels
- Trigger Source Internal
- Trigger Event On Sweep
- Trigger Stop Active Channel
- Restart
- Trigger
- Set Trig Input Negative Edge
- Trigger Delay 0.000 s
- Low Latency Off
- Help

52017C Network Analyzer

1 Active Channels - 2 Resolvers - 3 Standard - 4 RF/Analysis - 5 Data Status

F1 Log Mag 1.000E+000 -20.00dB [F1 seq]

Frequency (GHz)	Magnitude (dB)
1.3800000	-21.287
1.8000000	-21.790
2.0000000	-22.199

1 Step 1.394 F0W 20.916 Step 2.594 30000

Trigger

- Hold
- Single
- Continuous
- Find
- All Channels
- Continuous
- Keep Channels
- Trigger Source Internal
- Trigger Event On Sweep
- Trigger Scope Active Channel
- Reset
- Trigger
- Set Trig Input Negative Edge
- Trigger Delay 0.000 s
- Low Latency OFF

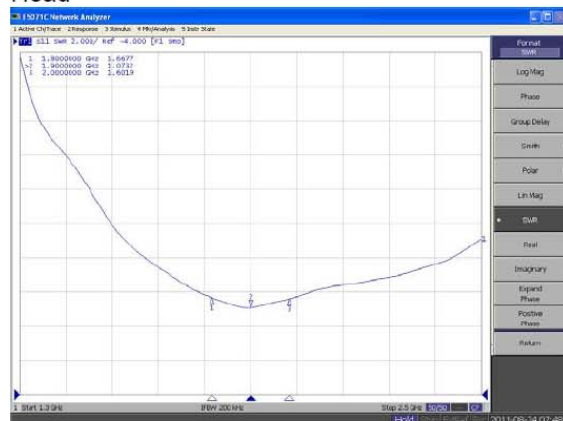
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NCL Calibration Laboratories

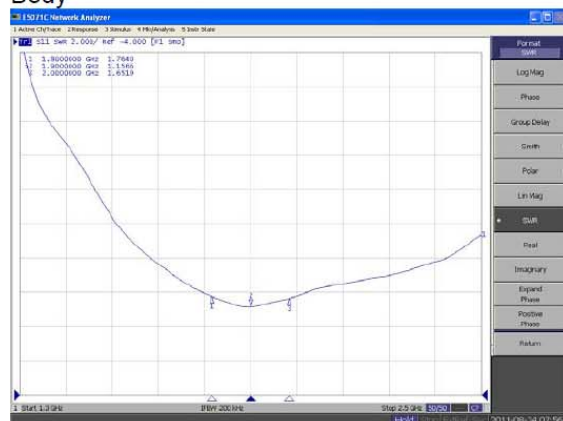
Division of APREL Laboratories.

SWR

Head



Body



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Division of APREL Laboratories.

Head

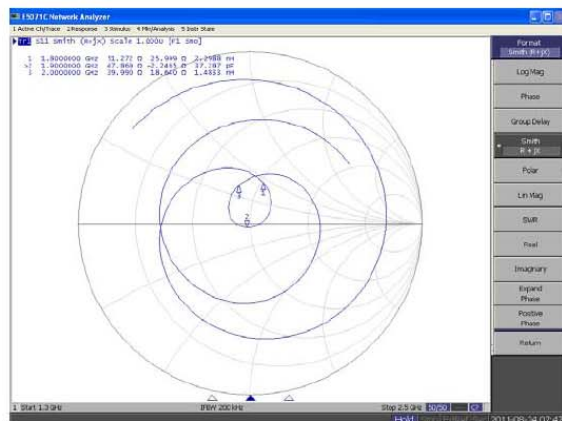


Figure 1: Smith Chart showing the design of a Wilkinson power divider. The chart displays the normalized impedances of the two output ports, which are plotted as points on the outer scale. The chart is labeled with "S11 Smith (m3)" and "Scale 1.0000 (1.0000)". The output impedances are approximately 1.845 j and 1.845 -j. The chart also shows the input impedance, which is 1.0000 (1.0000).

8

NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

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

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9

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

Mechanical Verification

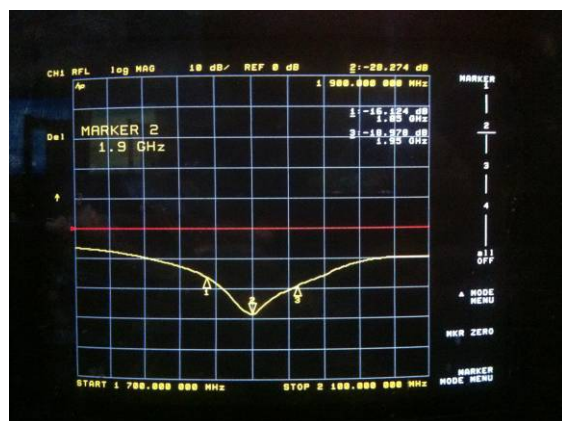
APREL Length	APREL Height	Measured Length	Measured Height
68.0 mm	39.5 mm	68.2 mm	39.2 mm

Tissue Type	Measured Return Loss	Measured Impedance
Head	-28.284 dB	49.471 Ω
Body	-22.445 dB	51.588 Ω

Test Graphs:

Head Tissue

Return Loss :

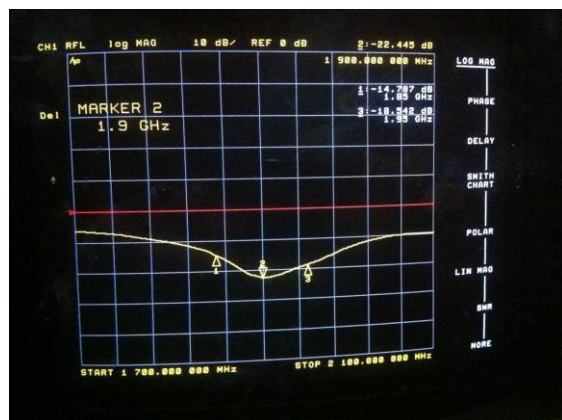


Impedance :



Body Tissue

Return Loss :

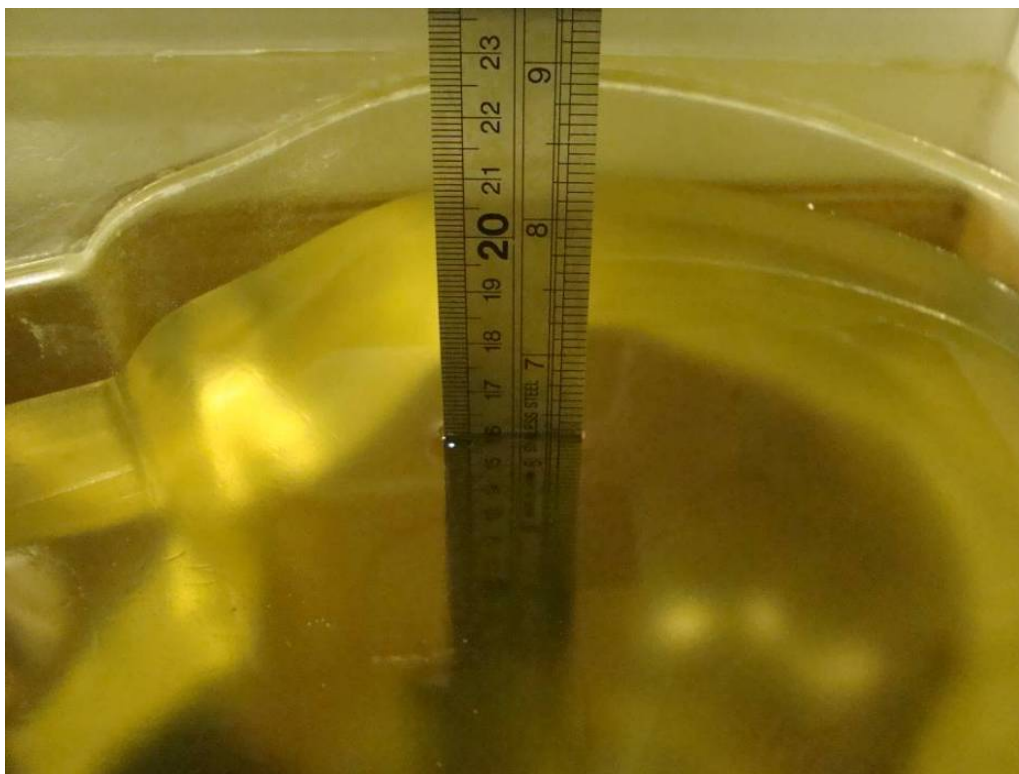


Impedance :

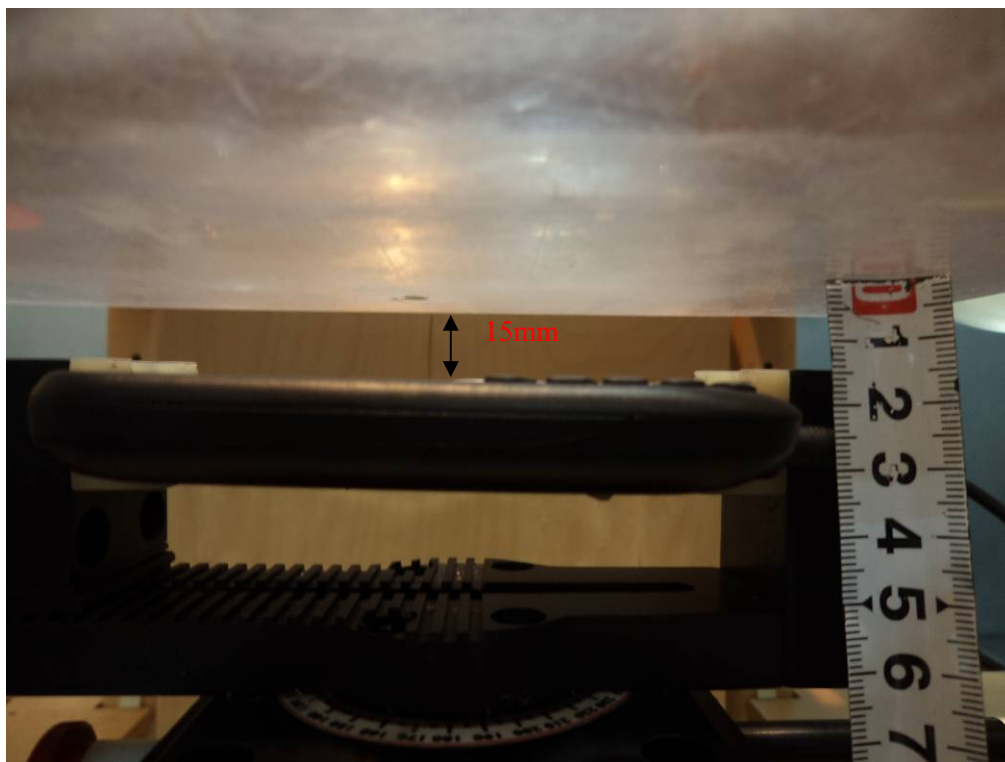


APPENDIX D EUT TEST POSITION PHOTOS

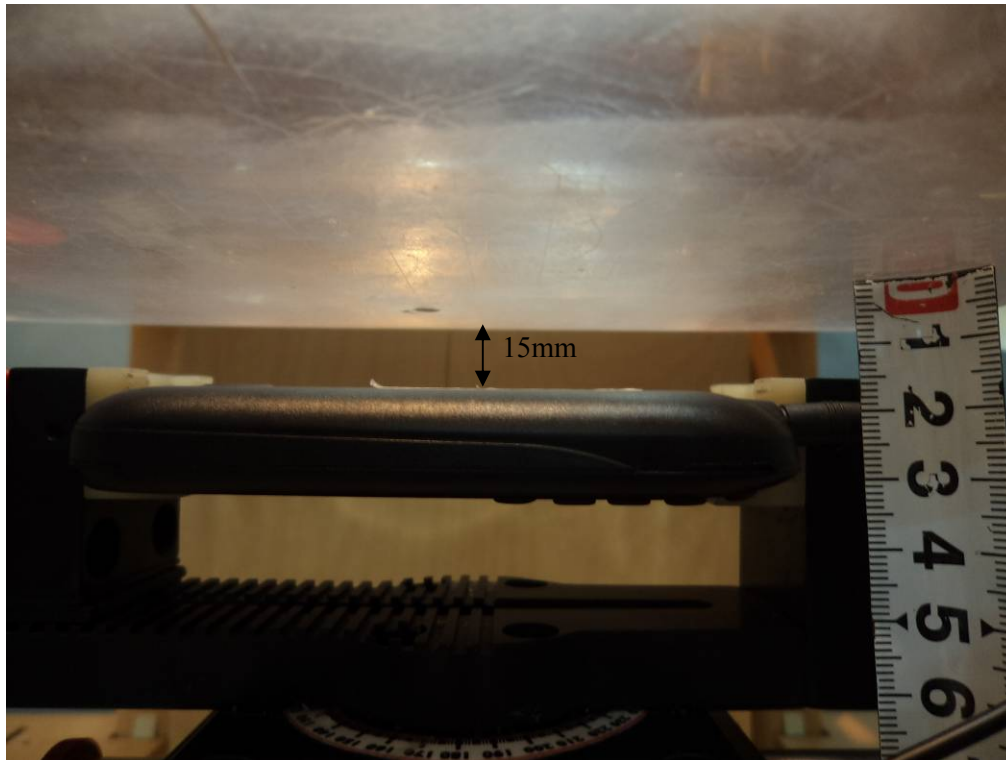
Liquid depth $\geq 15\text{cm}$



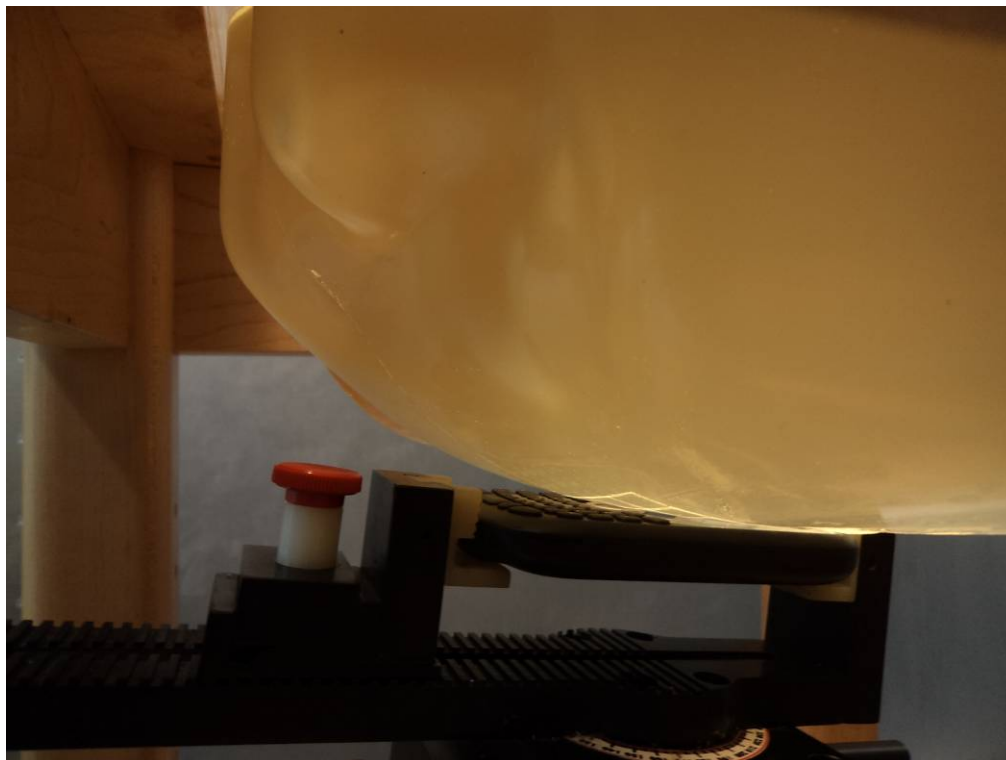
Body-worn-Headset Front Setup Photo



Body-worn-Headset Back Setup Photo



Left Head Touch Setup Photo



Left Head Tilt Setup Photo



Right Head Touch Setup Photo



Right Head Tilt Setup Photo



APPENDIX E EUT PHOTOS

EUT– Front View



EUT–Back View



EUT-Right Side View



EUT-Left Side View



EUT-Top View



EUT-Bottom View



EUT-Uncovered 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, Office of Engineering & Technology, Washington, DC, 1997.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105-113, Jan. 1996.
- [4] Niels Kuster, Ralph K. Astle, and Thomas Schmid, "Dosimetric evaluation of mobile communications equipment with known precision", IEEE Transactions on Communications, vol. E80-B, no. 5, pp. 645-652, May 1997.
- [5] CENELEC, "Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15-17, 1997, pp. 120-24.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp. 172-175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. Uhn, and Niels Kuster, "The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.
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