SAR Test Report

Product Name	:	GSM MOBILE PHONE
Model No.	:	L700
FCC ID	:	FOCGC661838

Prepared By:	:	Inventec Appliances(Pudong) Corporation
Address:	:	No.789 Pu Xing Road,Shanghai,PRC
Date of Receipt	:	2012.03.28
Date of Test	:	2012.03.28-2012.03.30
Report No.	:	20120328SAR

Test Report Certification

Date of Issue : Mar.28.2012

Report No. : 20120328SAR

Product Name	:	GSM MOBILE PHONE
Model No.	:	L700
Trade Name	:	JZH-Mobile
Applicant	:	JZH-Mobile Communication technology Co., LTD
Address	:	1302,A block, Haisong Building, Chegongmiao, Futian District,Shenzhen City, China.
Standard	:	FCC 47 CFR Part2 (2.1093) IEEE C95.1-1999 IEEE 1528-2003 FCC OET Bulletin 65 supplement C KDB 648474
TX/RX Frequency Range		GSM/GPRS 850 824.2 ~ 848.8 MHz 869.2 ~ 893.8 MHz GSM/GPRS 1900 1850.2 ~ 1909.8 MHz 1930.2 ~ 1989.8 MHz
Test Result	:	Complied

The Test Results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of IAC regulatory Laboratory

Documented By : Kelly Lin APR. 05.2012

Kelly Lin/Engineer

Tested By : Byran Hung APR. 05.2012

Byran Hung/Senior Engineer

Approved By : Jeff Huang APR. 05.2012

Jeff Huang/Director of Operations

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1. GENERAL INFORMATION

1.1. Applicant

Company Name: JZH-Mobile Communication technology Co., LTD

Address: 1302,A block, Haisong Building, Chegongmiao, Futian District,Shenzhen City, China.

1.2. Manufacturer

Company Name: JZH-Mobile Communication technology Co., LTD

Address: 1302,A block, Haisong Building, Chegongmiao, Futian District,Shenzhen City, China

1.3. Test Environment

Ambient conditions in the laboratory:

Items	Required	Actural
Temperature(℃)	15~30	21.4
Humidity(%RH)	30~70	46

2. SAR Measurement System

2.1. 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 order to provide a platform which is repeatable with minimum uncertainty.

2.1.1 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 is available up to 6 GHz in simulated tissue.

2.1.2 Area Scans

Area Scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a $10mm^2$ 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.

2.1.3 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 1g or 10g mass is dependent on the density of the liquid representing the simulated tissue. A density of $1000Kg/m^3$ 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 1g cube is 10mm, with the side length of the 10g 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 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 5 ×5×8 (8mm×8mm×5mm) providing a volume of 32mm in the X & Y axis, and 35mm in the Z axis.

2.1.4 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:

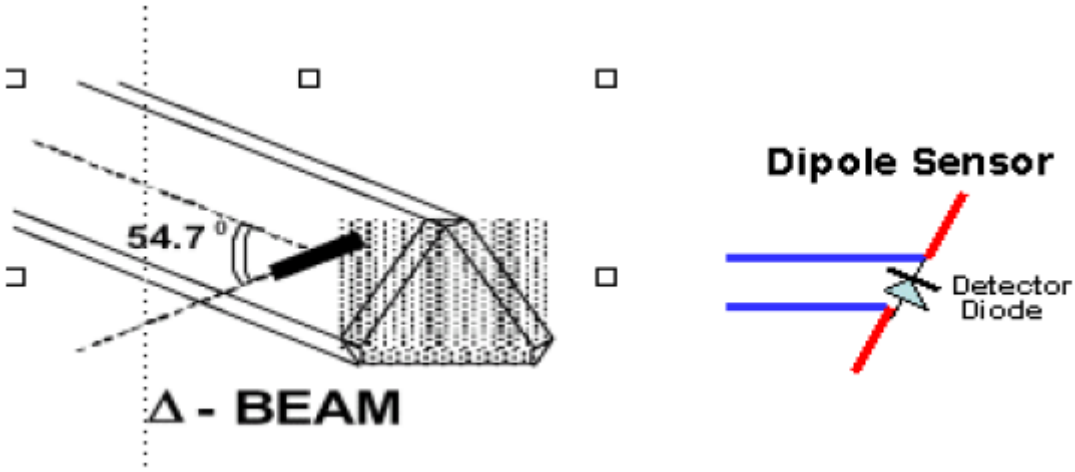
$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2}\cdot\left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a+2z)^2}\right)$$

2.2 Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropic, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change. A number of methods is used for calibrating probes, and these are outlined in the table below:

Calibration Frequency	Air Calibration	Tissue Calibration
900MHz	TEM Cell	Temperature
1800MHz	TEM Cell	Temperature

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.

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

2.2.1 Isotropic E-Field Probe Specification

Calibration in Air	Frequency Dependent Below 2GHz Calibration in air performed in a TEM Cell Above 2GHz Calibration in air performed in waveguide
Sensitivity	0.70 μV/(V/m)^2 to 0.85 μV/(V/m)^2
Dynamic Range	0.0005 W/kg to 100W/kg
Isotropic Response	Better than 0.2dB
Diode Compression point (DCP)	Calibration for Specific Frequency
Probe Tip Radius	< 5mm
Sensor Offset	1.56 (+/- 0.02mm)
Probe Length	290mm
Video Bandwidth	@ 500 Hz: 1dB @1.02 KHz: 3dB
Boundary Effect	Less than 2% for distance greater than 2.4mm
Spatial Resolution	Diameter less than 5mm Compliant with Standards

Probe model no: ALS-E-020, S/N: 500-00282

2.3 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 detecting during probe tilt (probe normalize) exercises, and utilizes a second stage emergency stop. The signal electronics are 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 connected to an isolated probe interconnect where the output stage of the probe is fed directly into the amplifier stage of the Daq-Paq.

2.4 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 μ 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 a RS232 communications port. Probe linearity and duty cycle compensation is carried out within the main Daq-Paq module.

ADC	12 Bit
Amplifier Range	20mV to 200mV and 150mV to 800mV
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

2.5 Axis Articulated Robot

ALSAS-10U utilizes a six 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 envelop. 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	0.05mm
Controller Type	Single phase Pentium based C500C
Robot Reach	710mm
Communication	RS232 and LAN compatible

2.6 ALSAS Universal Workstation

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

2.7 Universal Device Positioner

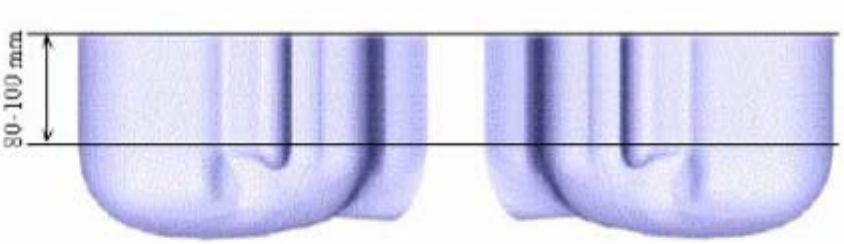
The universal device positioner allows complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales which form the design used to indicate positioning for any given test scenario in all major axes. A 15° tilt movements for head SAR analysis. Overall uncertainty for measurements has 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.

2.8 Phontom Types

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

2.8.1 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.



2.8.2 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.

3. Tissue Simulating Liquid

3.1. The composition of the tissue simulating liquid

INGREDIENT （% Weight）	850MHz Head	1900MHZ Head	850MHZ Body	1900MHz Body	2450MHz Body
Water	40.45%	54.9%	45.0%	70.17%	73.2%
Salt	1.45%	0.18%	52.4%	0.39%	0%
Sugar	57.6%	0%	1.4%	0%	0%
HEC	0.4%	0%	1.0%	0%	0%
Preventol	0.1%	0%	0.1%	0%	0%
DGBE	0%	44.92%	0%	29.44%	26.76%

3.2. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to SAR evaluation using APREL Dielectric Probe Kit and Agilent E5071B Vector Network Analyzer.

Head Tissue Simulate Measurement				
Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp.(℃)
		ε_r	σ (s/m)	
850MHz	Reference result	41.5	0.90	NA
	+/-5% window	39.425to43.575	0.855to0.945	
	29-Mra-12	40.38	0.92	20.7
1900MHz	Reference result	40.0	1.40	NA
	+/-5% window	38to42	1.33 to 1.47	
	29-Mra-12	40.09	1.42	20.7

Body Tissue Simulate Measurement				
Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp.(℃)
		ε_r	σ (s/m)	
850MHz	Reference result	55.2	0.97	NA
	+/-5% window	52.44to57.96	0.922to1.019	
	29-Mar-12	54.08	0.95	20.7
1900MHz	Reference result	53.3	1.52	NA
	+/-5% window	50.635to55.965	1.444to1.596	
	29-Mar-12	52.13	1.54	20.7
2450MHz	Reference result	52.7	1.95	NA
	+/-5% window	50.065to55.335	1.852to2.0475	
	29-Mra-12	52.09	1.92	20.7

3.3. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in PP1528 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 P1428 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.

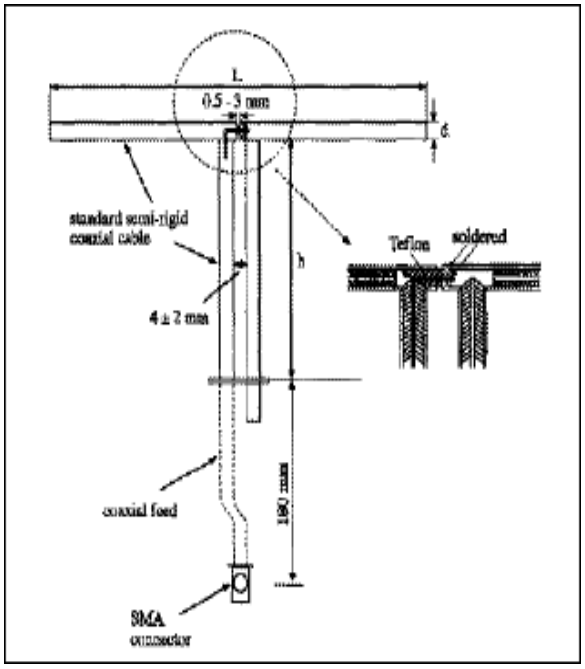
Target Frequency	Head		Body	
(MHz)	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7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

(ε_r =relative permittivity, σ =conductivity and ρ =1000 Kg/m^3)

4. SAR Measurement Procedure

4.1. SAR System Validation

4.1.1. Validation Dipoles



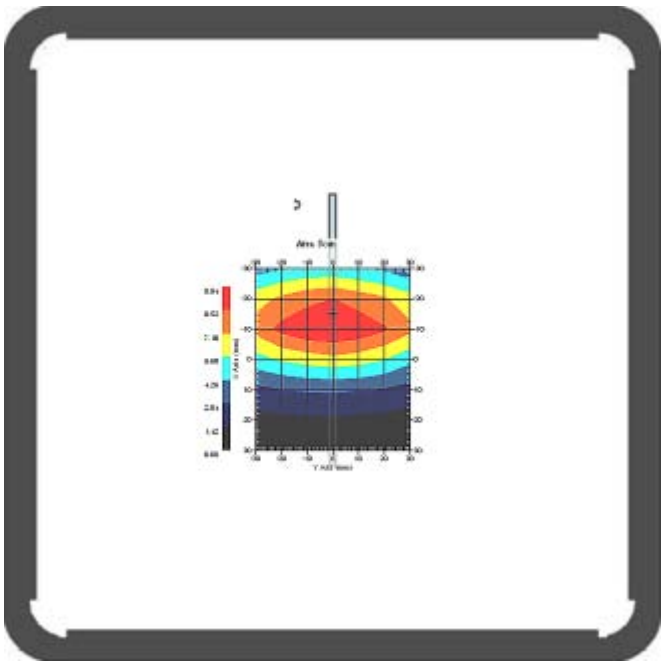
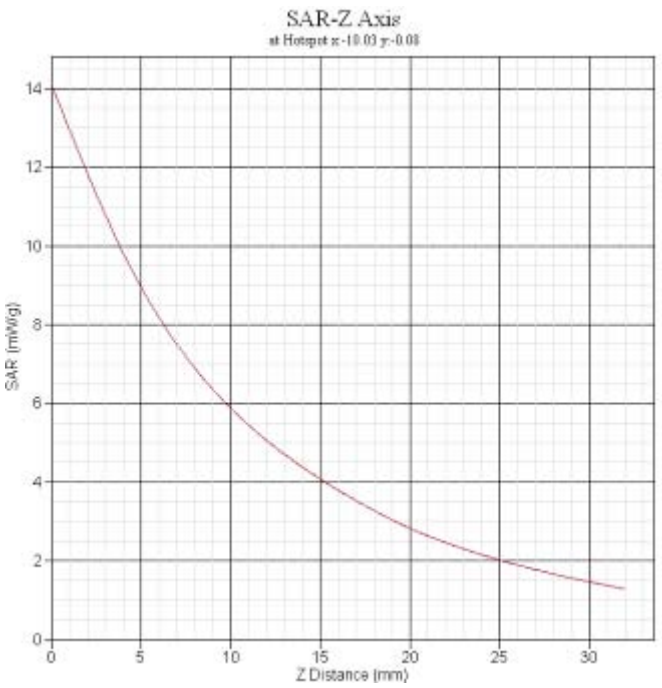
The dipoles used are based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. The table below provides details for the mechanical and electrical specifications for the dipoles.

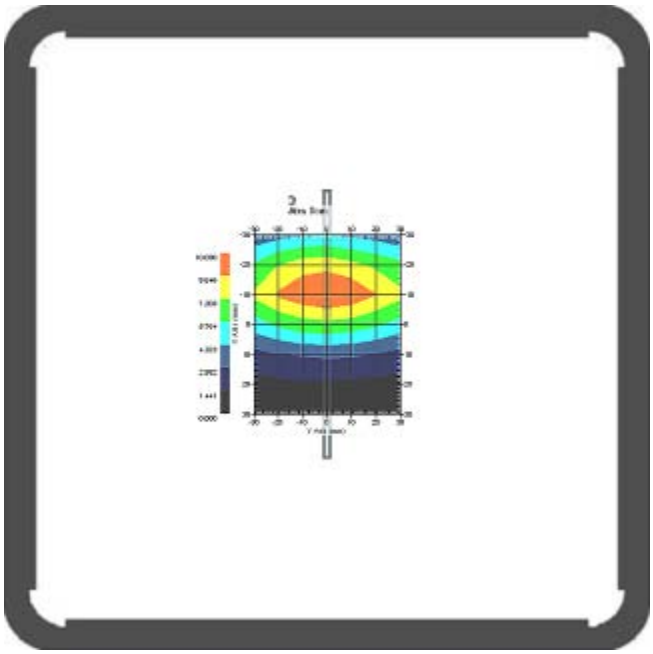
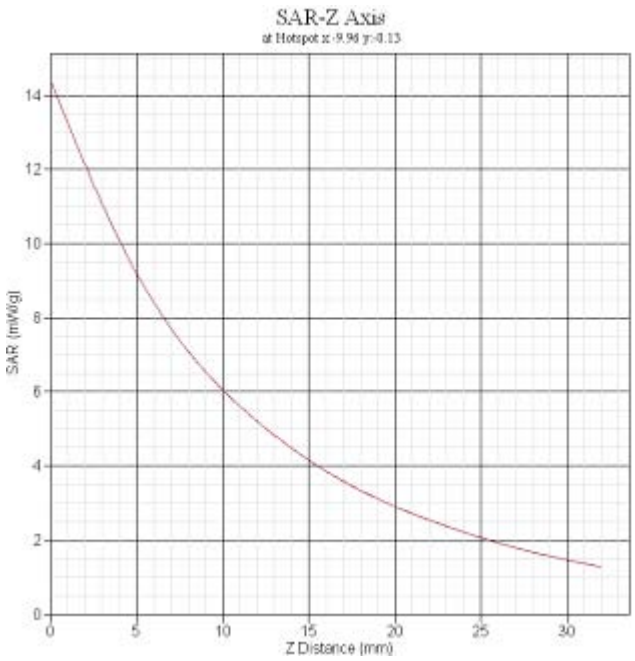
Frequency	L(mm)	h(mm)	d(mm)
850MHz	161	89.8	3.6
1900MHz	67.1	38.9	3.6
2450MHz	51.5	30.4	3.6

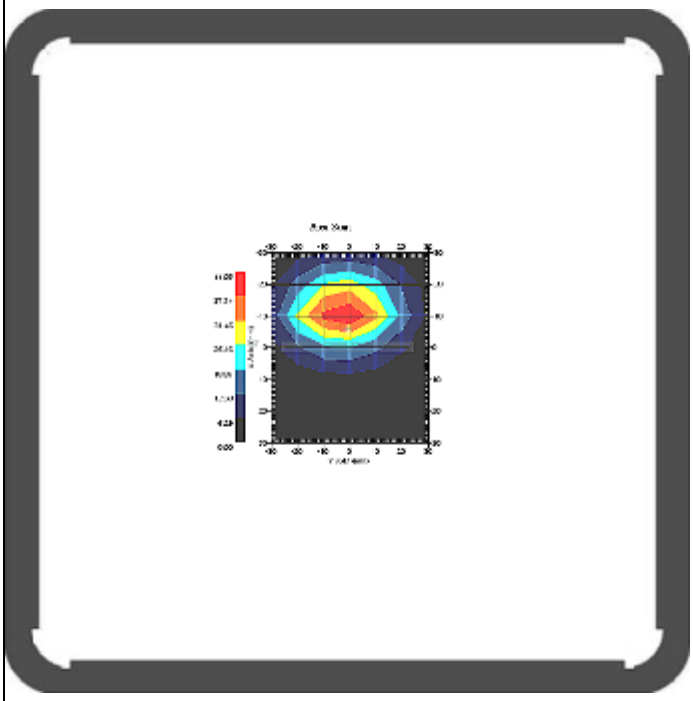
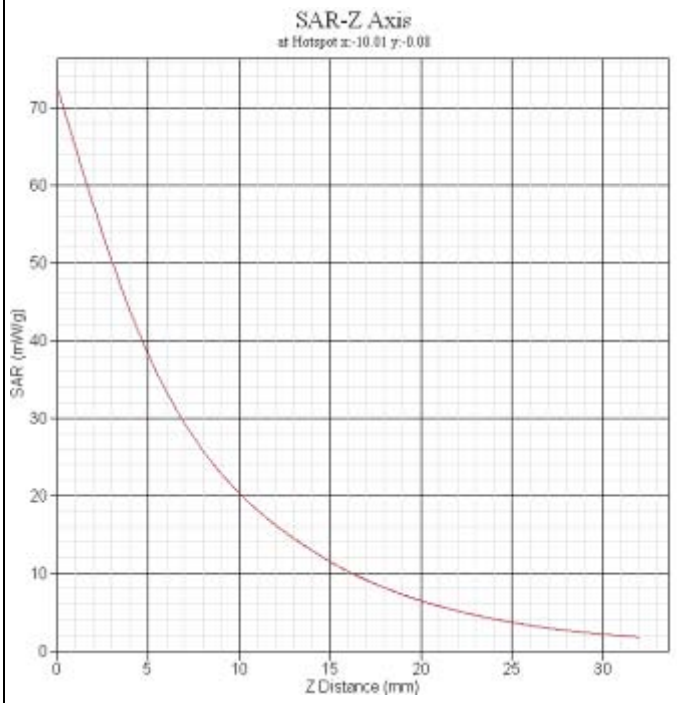
4.1.2. Validation Result

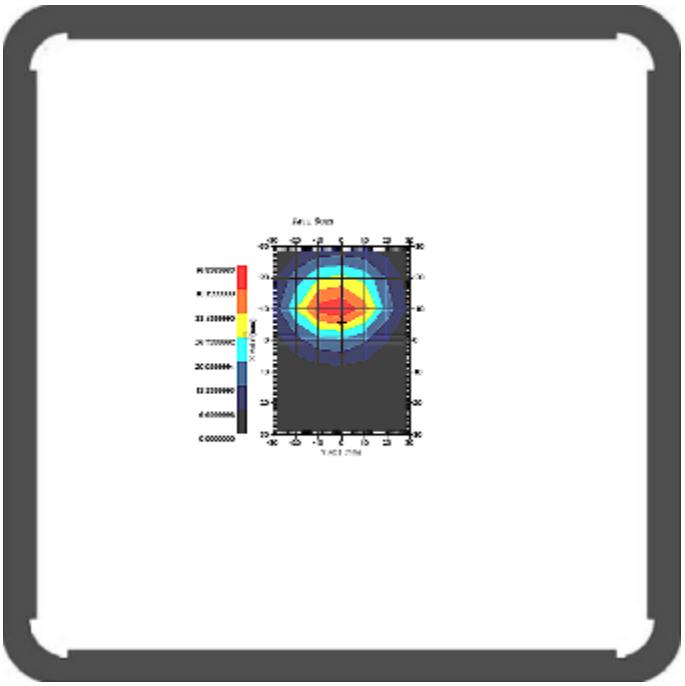
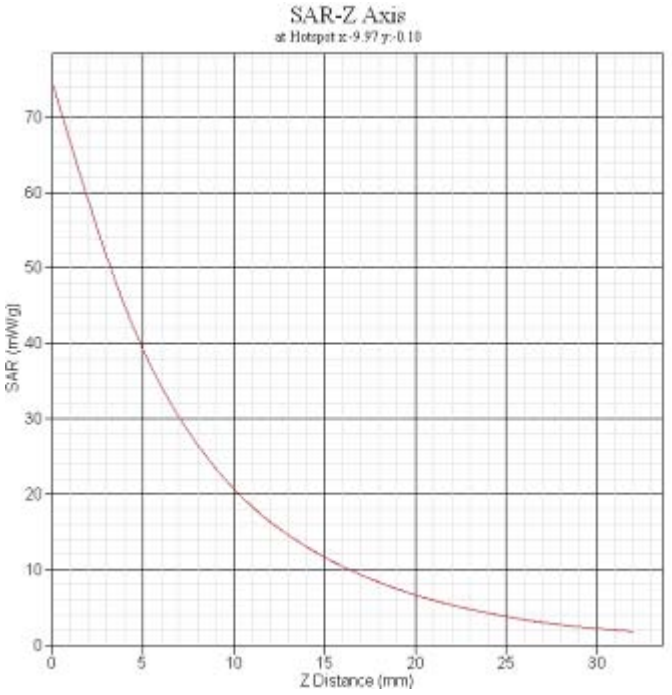
Head System Performance Check at 850MHZ&1900MHz				
Validation Kit: ASL-D-850-S-2				
Frequency(MHz)	Description	SAR(W/Kg) 1g	SAR(W/Kg) 10g	Tissue Temp.(℃)
850MHz	Reference result	9.590	6.003	N/A
	+/-5%window	9.110to10.07	5.702to6.303	
	29-Mar-12(1W)	9.156	5.790	20.7
Validation Kit: ASL-D-1900-S-2				
Frequency(MHz)	Description	SAR(W/Kg) 1g	SAR(W/Kg) 10g	Tissue Temp.(℃)
1900MHz	Reference result	39.387	19.668	N/A
	+/-5%window	37.418to41.356	18.685to20.651	
	29-Mar-12(1W)	38.096	18.906	20.7
Note: All SAR values are normalized to 1W forward power.				

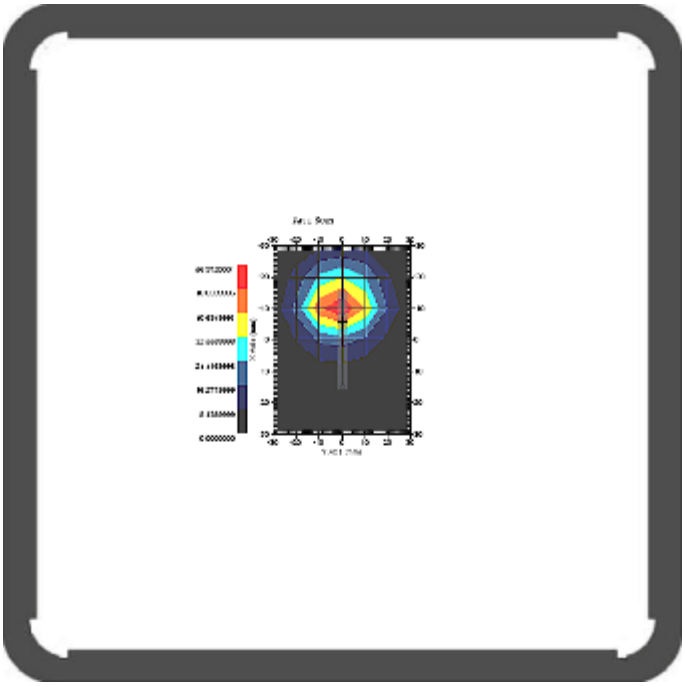
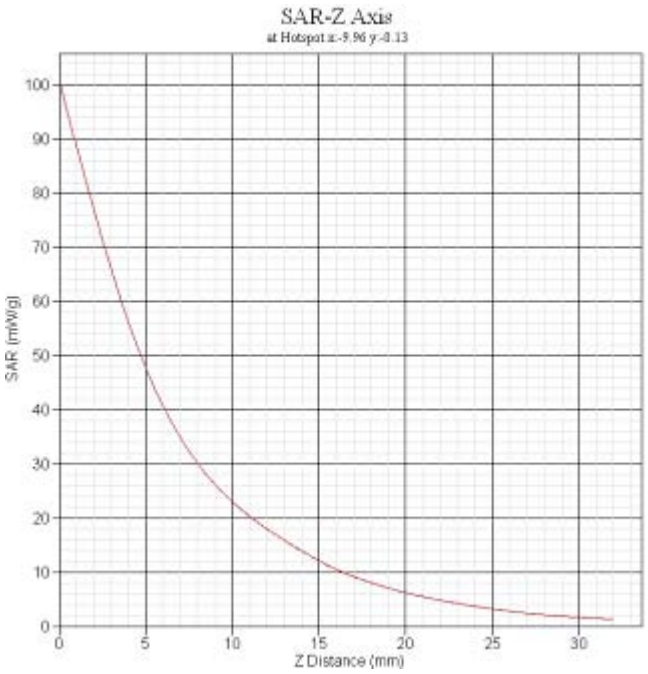
Body System Performance Check at 850MHZ&1900MHz&2450MHz				
Validation Kit: ASL-D-850-S-2				
Frequency(MHz)	Description	SAR(W/Kg) 1g	SAR(W/Kg) 10g	Tissue Temp.(℃)
850MHz	Reference result	9.981	6.006	N/A
	+/-5%window	9.482to10.48	5.706to6.306	
	29-Mar-12(1W)	9.540	5.741	20.7
Validation Kit: ASL-D-1900-S-2				
Frequency(MHz)	Description	SAR(W/Kg) 1g	SAR(W/Kg) 10g	Tissue Temp.(℃)
1900MHz	Reference result	39.654	19.668	N/A
	+/-5%window	37.671to41.637	18.685to20.651	
	29-Mar-12(1W)	39.527	19.726	20.7
Validation Kit: ASL-D-2450-S-2				
Frequency(MHz)	Description	SAR(W/Kg) 1g	SAR(W/Kg) 10g	Tissue Temp.(℃)
2450MHz	Reference result	52.592	24.461	N/A
	+/-5%window	49.962to55.222	23.238to25.684	
	29-Mar-12(1W)	50.414	23.326	20.7
Note: All SAR values are normalized to 1W forward power.				

Frequency(MHz)	850
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	-0.320
Duty Cycle Factor	1
Crest factor	1
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	9.156
SAR 10g(W/Kg)	5.790

Frequency(MHz)	850
Relative permittivity(real part)	54.08
Conductivity(S/m)	0.95
Variation(%)	0.955
Duty Cycle Factor	1
Crest factor	1
Conversion Fator	6.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	9.540
SAR 10g(W/Kg)	5.741

Frequency(MHz)	1900
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	1.186
Duty Cycle Factor	1
Crest factor	1
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	38.096
SAR 10g(W/Kg)	18.906

Frequency(MHz)	1900
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	0.199
Duty Cycle Factor	1
Crest factor	1
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μ V/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	39.527
SAR 10g(W/Kg)	19.726

Frequency(MHz)	2450
Relative permittivity(real part)	52.09
Conductivity(S/m)	1.92
Variation(%)	-3.103
Duty Cycle Factor	1
Crest factor	1
Conversion Fator	4.4
Probe Sensitivity	1.20 1.20 1.20 μ V/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	50.414
SAR 10g(W/Kg)	23.326

4.2. Arrangement Assessment Setup

4.2.1. Test Positions of Device Relative to Head

This specifies exactly two test positions for the handset against the head phantom, the "cheek" position and the "tilted" position. The handset should be tested in both positions on the left and right sides of the SAM phantom. If the handset construction is such that it cannot be positioned using the handset positioning procedures described in 4.2.2.1 and 4.2.2.2 to represent normal use conditions (e.g. asymmetric handset), alternative alignment procedures should be considered with details provided in the test report.

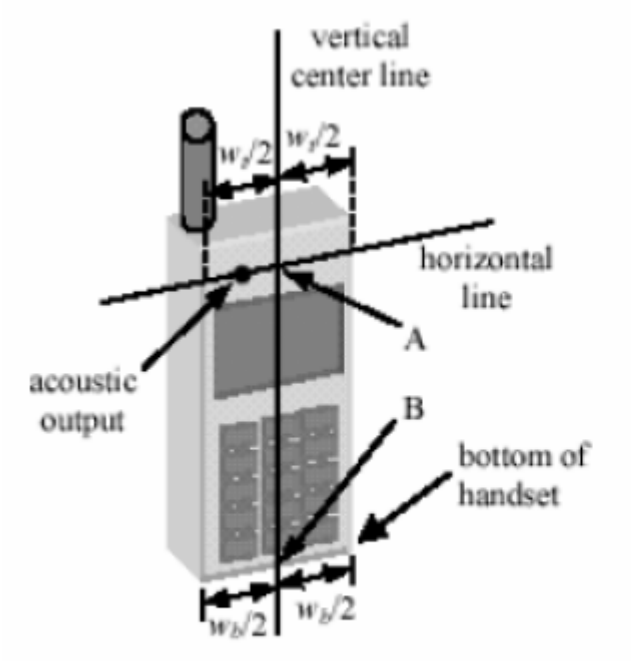


Figure 4.1a Internal Case

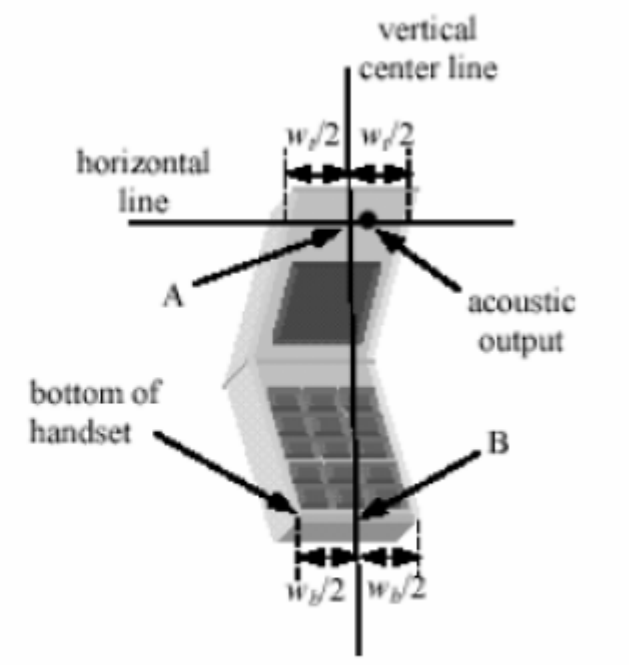


Figure4.1b Clam Shell

4.2.2.1. Definition of the "Cheek" Position

The "cheek" position is defined as follows:

a. Ready the handset for talk operation, if necessary. For example, for hand sets with a cover piece, open the cover. (If the handset can also be used with the cover closed both configurations must be tested.)
b. Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A on Figures 4.1 a and 4.1 b), and the midpoint of the width wb of the bottom of the handset through the center of the acoustic output (see Figure 4.1 a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located

elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 4.1 b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.

c. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see 4.2), such that the plan defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
d. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the pinna.
e. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
f. Rotate the handset around the vertical centerline until the handset (horizontal line) is symmetrical with respect to the line NF.

While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 4.2 the physical angles of rotation should be noted.

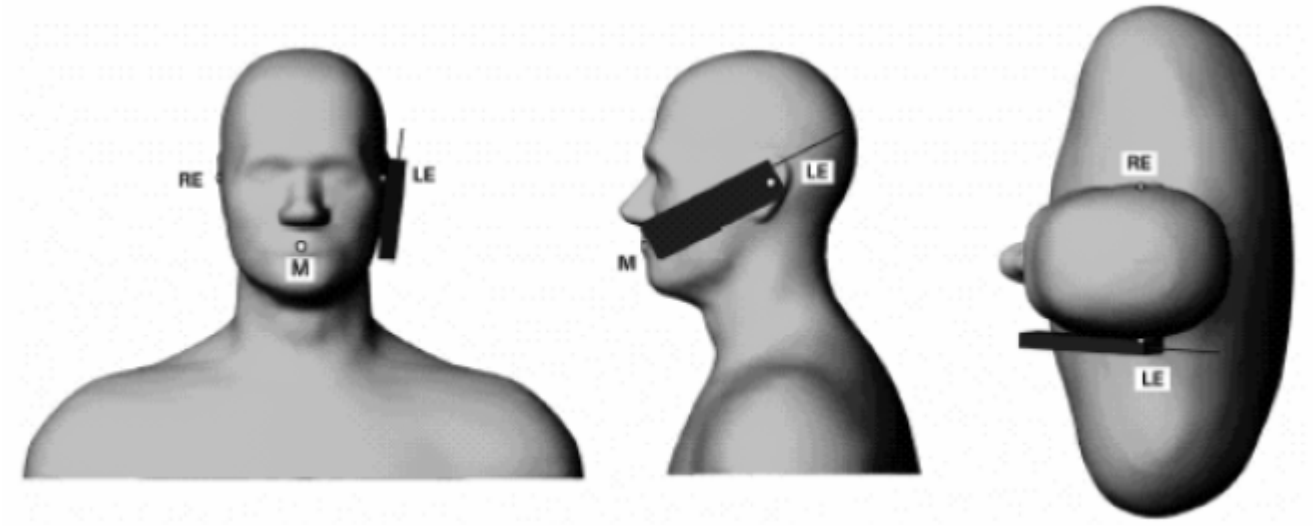


Figure 4.2 – Phone position 1, “cheek” or “touch” position.

4.2.1.2 Definition of the “Tilted” Position

The “tilted” position is defined as follows:

a. Repeat steps (a) – (g) of 4.2.1.1 to place the device in the “cheek position”.

b. While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.

c. Rotate the handset around the horizontal line by 15 degrees.

d. While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna (e.g. the antenna with the back of the phantom head), the angle of the handset should be reduced. In this case, the tilted position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is contact with the phantom (e.g. the antenna with back of the head).

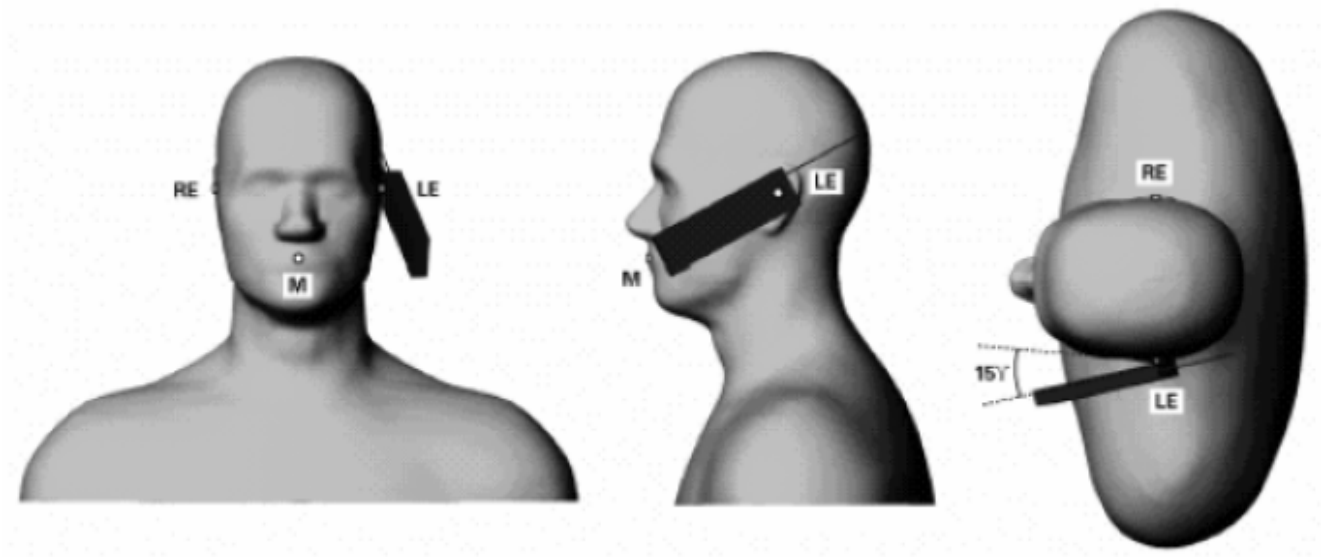


Figure 4.3 – Phone position 2, "tilted" position.

4.2.2 Test Positions for body-worn

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. 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 distance may be use, but not exceed 2.5cm.

4.3. SAR Measurement Procedure

The ALSAS-10U calculates SAR using the following equation,

$$SAR = \frac{\sigma |E|^2}{\rho}$$

σ :represents the simulated tissue conductivity

ρ :represents the tissue density

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are large than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at 1 mm^2) which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at 1 mm^3).

5. SAR Exposure Limits

SAR assessments have been made in line with the requirements of IEEE C95.1-1999, IEEE 1528-2003 , FCC OET Bulletin 65 supplement C.

Type Exposure (W/kg)	Uncontrolled Environment Limit
Spatial Peak SAR (10g cube tissue for head and trunk)	1.60 W/kg
Spatial Average SAR (whole body)	0.08 W/kg
Spatial Peak SAR (10g for limb)	4.00 W/kg

6. Test Equipment List

Instrument	Manufacture	Model No.	Serial No.	Last Calibration
Universal Work Station	Aprel	ALS-UWS	100-00154	NCR
Data Acquisition Package	Aprel	ALS-DAQ-PAQ-3	110-00215	NCR
Probe Mounting Device and Boundary Detection Sensor System	Aprel	ALS-PMDPS-3	120-00265	NCR
Miniature E-Field Probe	Aprel	ALS-E-020	500-00282	Oct.01,2011
Left ear SAM Phantom	Aprel	ALS-P-SAM-L	130-00312	NCR
Right ear SAM Phantom	Aprel	ALS-P-SAM-R	140-00362	NCR
Universal SAM Phantom	Aprel	ALS-P-SU-1	150-00410	NCR
Reference Validation Dipole 850MHz	Aprel	ALS-D-850-S-2	180-00556	May.19,2011
Reference Validation Dipole 1900MHz	Aprel	ALS-D-1900-S-2	210-00707	May.16,2011
Reference Validation Dipole 2450MHz	Aprel	ALS-D-2450-S-2	220-00755	May.19,2011
Dielectric Probe Kit	Aprel	ALS-PR-DIEL	260-00955	NCR
Device Holder 2.0	Aprel	ALS-H-E-SET-2	170-00506	NCR
SAR software	Aprel	ALS-SAR-AL-10	Ver.2.3.8	NCR
CRS C500C Controller	Thermo	ALS-C500	RCF0504291	NCR
CRS F3 Robot	Aprel	ALS-F3-SW	N/A	NCR
Power Amplifier	Mini-Circuit	ZHL- 42	040306	Jul.13,2011
Directional Coupler	Agilent	778D-012	51011	Jul.13,2011
Universal Radio Communication Tester	Agilent	E5515C	104845	Mar.1,2012
Vector Network	Agilent	E5071B	MY4230146	Jul.18,2011
Signal Generator	Agilent	E8257D	N/A	Dec.05,2011
Power Meter	Rohde&Schwarz	NRP	N/A	Dec.05,2011

Note: All equipment upon which need to be calibrated are with calibration period of 1 year.

7. Measurement Uncertainty

Exposure Assessment Measurement Uncertainty

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	√3	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	√3	√cp	√cp	4.4	4.4
Boundary Effect	1.0	rectangular	√3	1	1	0.6	0.6
Linearity	4.7	rectangular	√3	1	1	2.7	2.7
Detection Limit	1.0	rectangular	√3	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	√3	1	1	0.5	0.5
Integration Time	1.7	rectangular	√3	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	√3	1	1	1.7	1.7
Probe Positioner Mech.	0.4	rectangular	√3	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	√3	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	√3	1	1	2.1	2.1
Test Sample Positioning	4.0	normal	1	1	1	4.0	4.0
Device Holder Uncertainty	2.0	normal	1	1	1	2.0	2.0
Drift of Output Power	0.6	rectangular	√3	1	1	0.3	0.3
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	√3	1	1	2.0	2.0
Liquid Conductivity(target)	5.0	rectangular	√3	0.7	0.5	2.0	1.4
Liquid Conductivity(meas.)	0.0	normal	1	0.7	0.5	0.0	0.0

Liquid Permittivity(target)	5.0	rectangular	√3	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	2.4	normal	1	0.6	0.5	1.4	1.2
Combined Uncertainty		RSS				9.3	9.2
Combined Uncertainty (coverage factor=2)		Normal(k=2)				18.7	18.3

8. Test Results

8.1. SAR Test Results Summary

SAR MEASUREMENT					
Ambient Temperature (°C): 21.2 ± 2				Relative Humidity (%): 46	
Liquid Temperature (°C): 20.5 ± 2				Depth of Liquid (cm):>15	
Product: GSM Mobile Phone					
Test Mode: GSM850					
Test Position Head	Antenna Position	Frequency		SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz		
Left-Cheek	Internal	190	836.6	0.610	1.6
Left-Tilted	Internal	190	836.6	0.488	1.6
Right- Cheek	Internal	190	836.6	0.595	1.6
Right -Tilted	Internal	190	836.6	0.448	1.6
Left - Cheek	Internal	128	824.2	0.551	1.6
Left - Cheek	Internal	251	848.8	0.598	1.6
Left- Cheek + BT	Internal	190	836.6	0.641	1.6

SAR MEASUREMENT					
Ambient Temperature (°C): 21.2 ± 2			Relative Humidity (%): 46		
Liquid Temperature (°C): 20.5 ± 2			Depth of Liquid (cm):>15		
Product:GSM Mobile Phone					
Test Mode: PCS 1900					
Test Position Head	Antenna Position	Frequency		SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz		
Left-Cheek	Internal	661	1880.0	1.018	1.6
Left- Tilted	Internal	661	1880.0	0.358	1.6
Right-Cheek	Internal	661	1880.0	1.056	1.6
Right -Tilted	Internal	661	1880.0	0.266	1.6
Left-Cheek	Internal	512	1850.2	0.997	1.6
Left-Cheek	Internal	810	1909.8	1.004	1.6
Right-Cheek	Internal	512	1850.2	0.891	1.6
Right-Cheek	Internal	810	1909.8	0.958	1.6
Right-Cheek + BT	Internal	661	1880.0	0.972	1.6

DUT with Flat Phantom 1.5cm Gap

SAR MEASUREMENT					
Ambient Temperature (°C): 21.2 ± 2			Relative Humidity (%): 46		
Liquid Temperature (°C): 20.5 ± 2			Depth of Liquid (cm):>15		
Product:GSM Mobile Phone					
Test Mode: GPRS850					
Test Position Body	Antenna Position	Frequency		SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz		
Body face	Internal	190	836.6	0.699	1.6
Body back	Internal	190	836.6	0.885	1.6
Body back	Internal	128	824.2	0.736	1.6
Body back	Internal	251	848.8	1.051	1.6
Body back GSM850	Internal	251	848.8	0.698	1.6
Body back+ BT	Internal	251	848.8	0.946	1.6

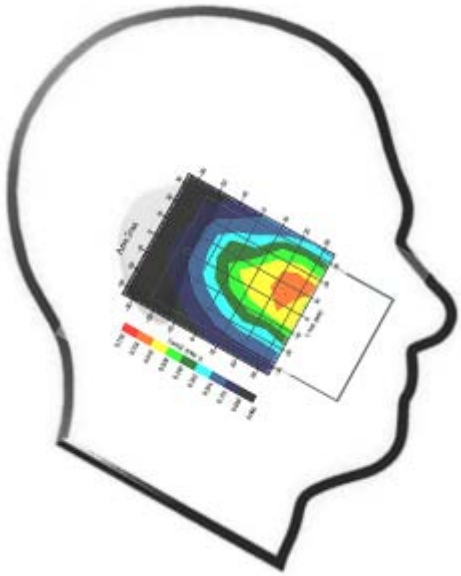
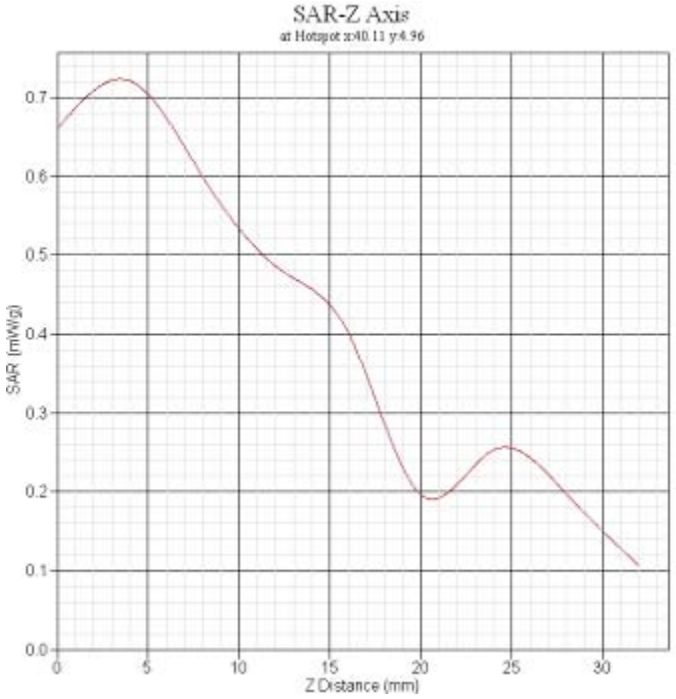
DUT with Flat Phantom 1.5cm Gap

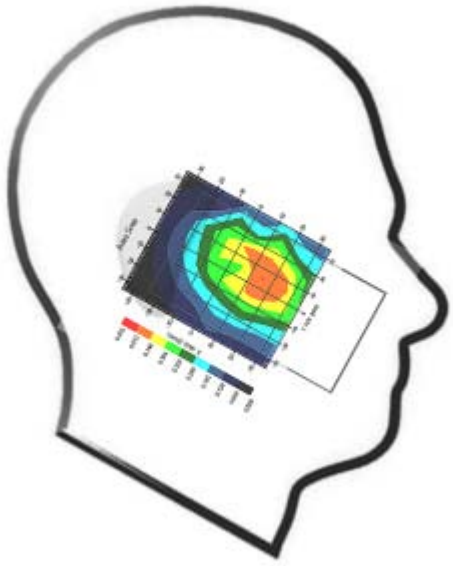
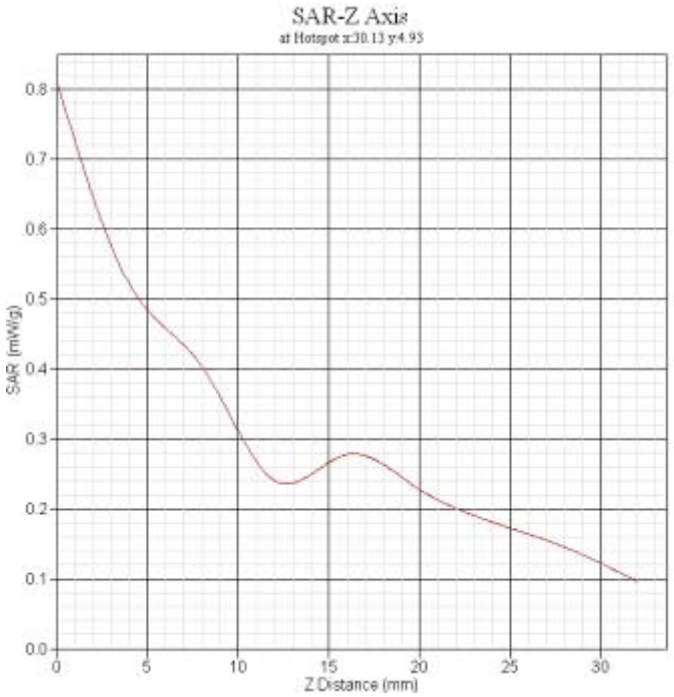
SAR MEASUREMENT					
Ambient Temperature (˚C): 21.2 ± 2			Relative Humidity (%): 46		
Liquid Temperature (˚C): 20.5 ± 2			Depth of Liquid (cm):>15		
Product: GSM Mobile Phone					
Test Mode: GPRS 1900					
Test Position Body	Antenna Position	Frequency		SAR 10g (W/kg)	Limit (W/kg)
		Channel	MHz		
Body face	Internal	661	1880.0	1.111	1.6
Body back	Internal	661	1880.0	0.995	1.6
Body back	Internal	512	1850.2	0.739	1.6
Body back	Internal	810	1909.8	0.724	1.6
Body face	Internal	512	1850.2	0.965	1.6
Body face	Internal	810	1909.8	0.840	1.6
Body face GSM1900	Internal	661	1880.0	0.603	1.6
Body face + BT	Internal	661	1880.0	0.930	1.6

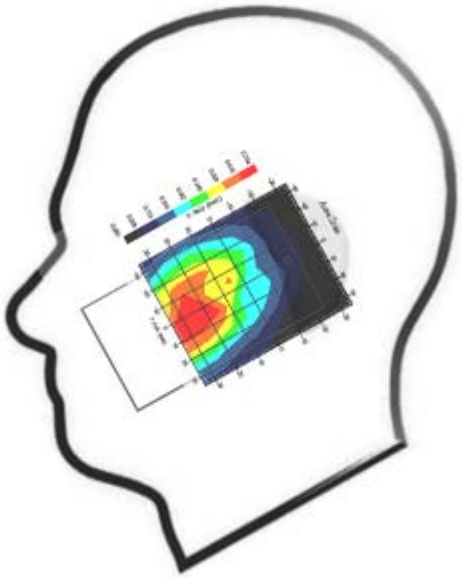
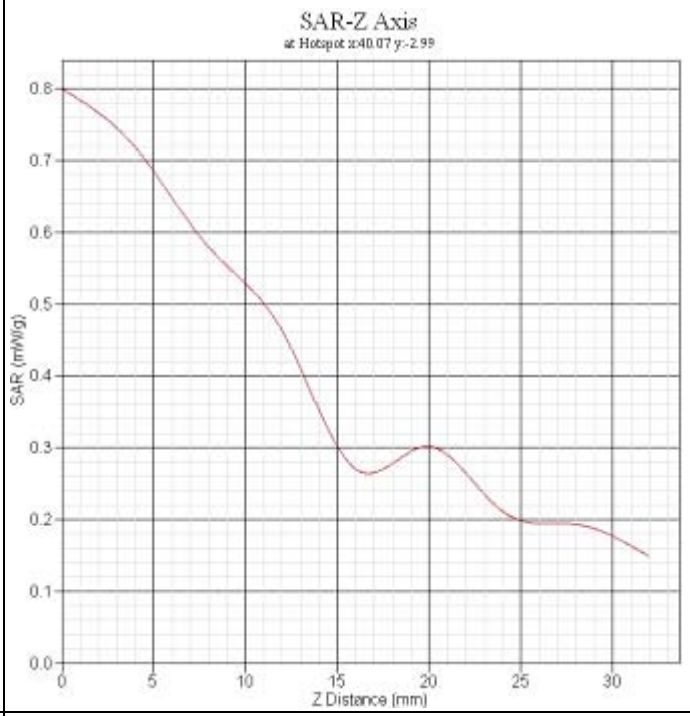
• 8.2. Conducted Power(Unit:dBm)

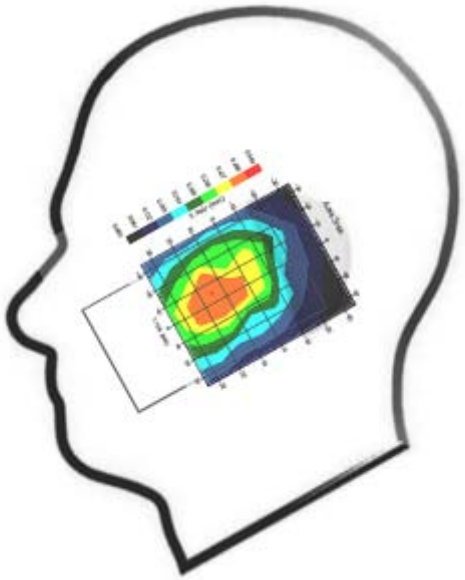
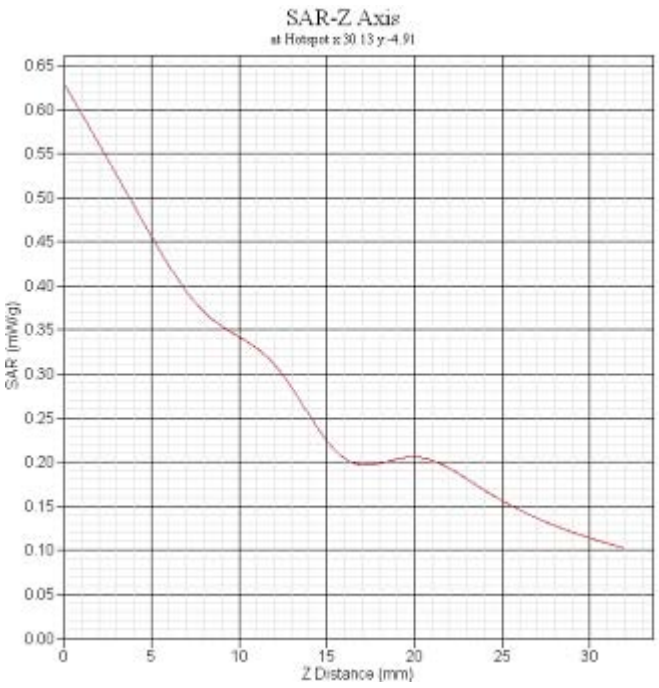
Band	GSM850			GSM1900		
Channel	128	190	251	512	661	810
Frequency(MHz)	824.2	836.6	848.8	1850.2	1880.0	1909.8
GSM	31.35	31.42	31.49	29.64	29.71	29.70
GPRS8(1up)	30.54	30.57	30.60	29.43	29.55	29.51
GPRS10(2up)	30.59	30.61	30.64	28.42	28.57	28.55

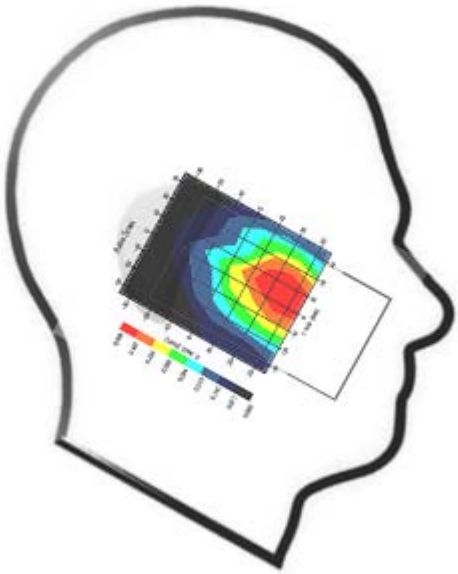
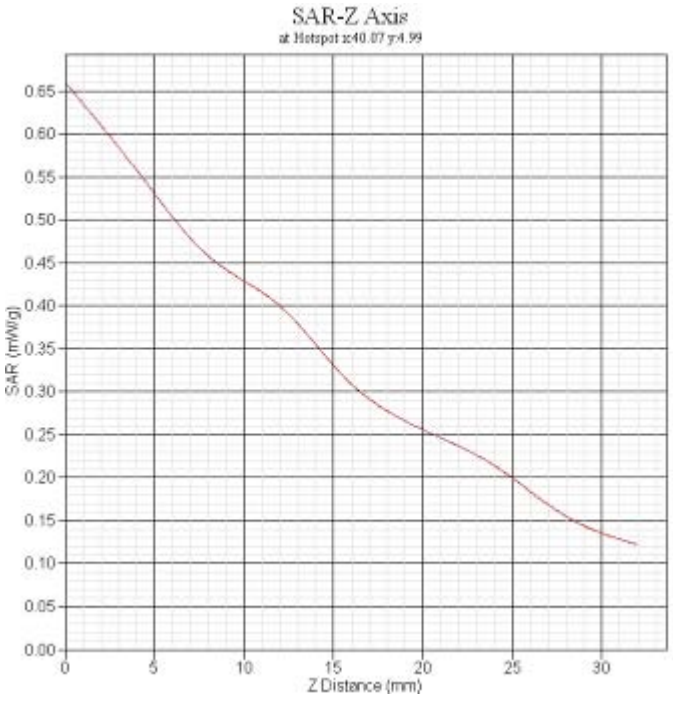
8.3. SAR Measurement Data

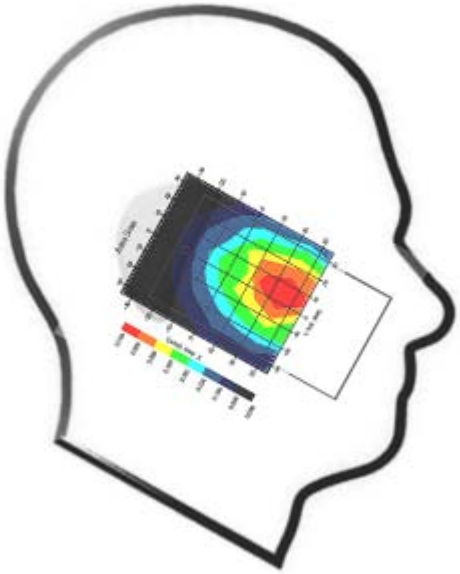
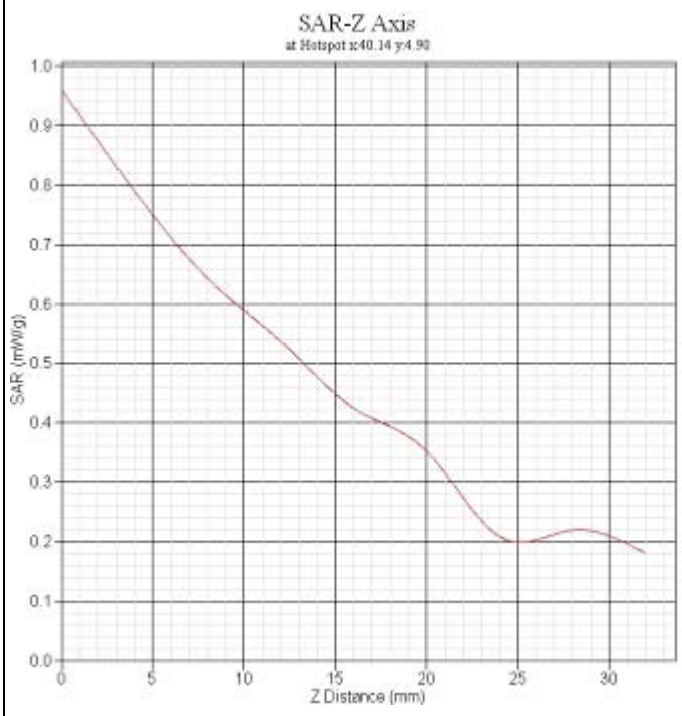
GSM850 left cheek ch190	
Frequency(MHz)	836.6
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	-3.512
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.610
SAR 10g(W/Kg)	0.408

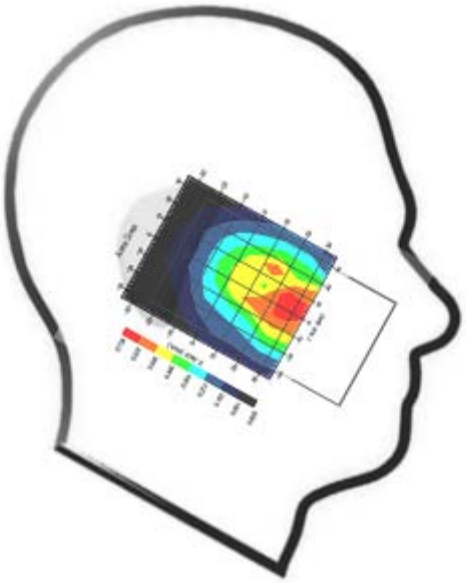
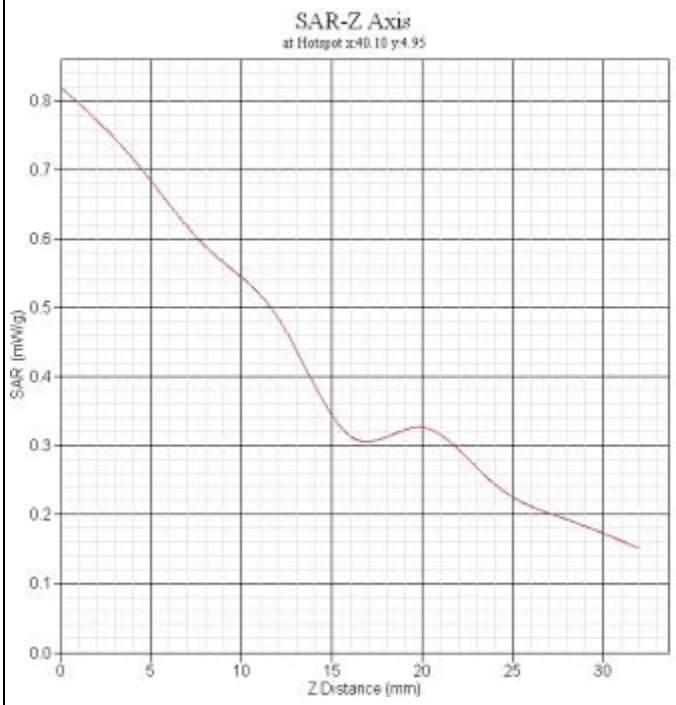
GSM850 left tilt ch190	
Frequency(MHz)	836.6
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	-1.541
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.488
SAR 10g(W/Kg)	0.327

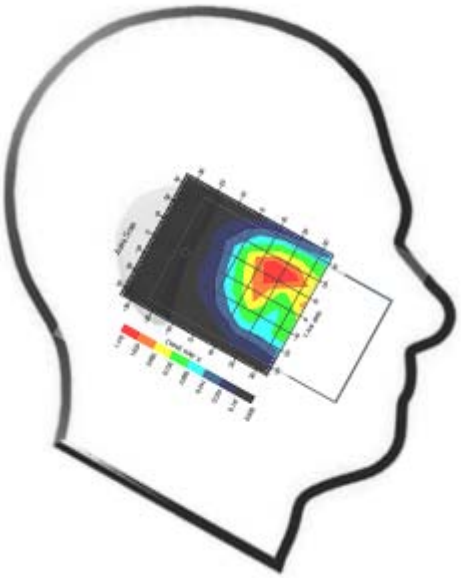
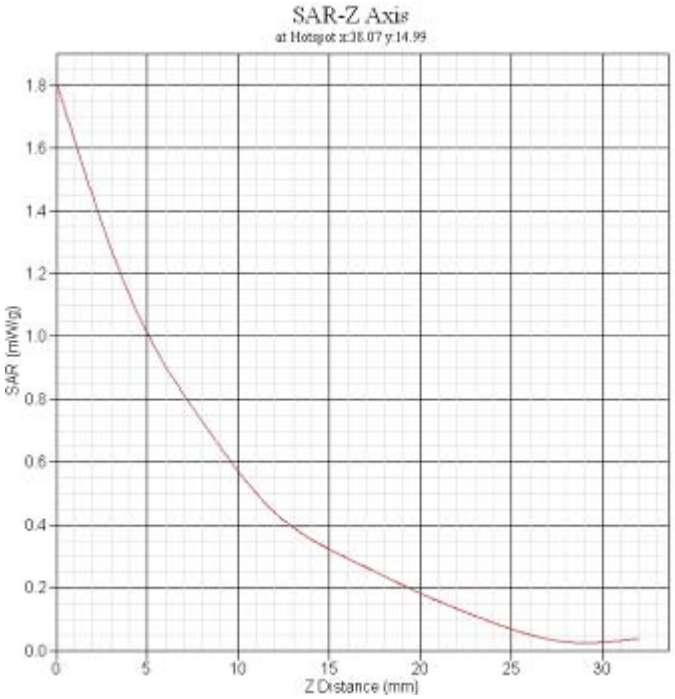
GSM850 Right cheek ch190	
Frequency(MHz)	836.6
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	3.357
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.595
SAR 10g(W/Kg)	0.415

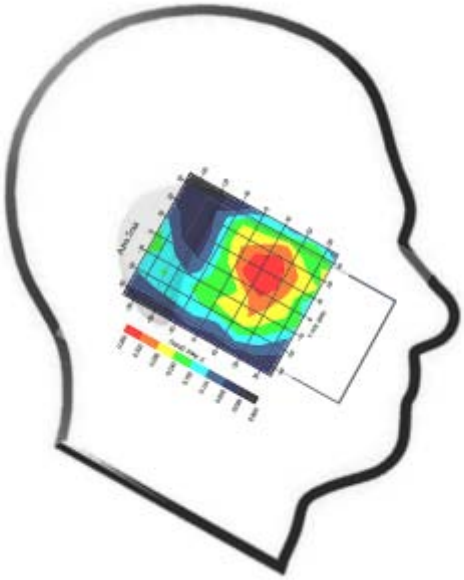
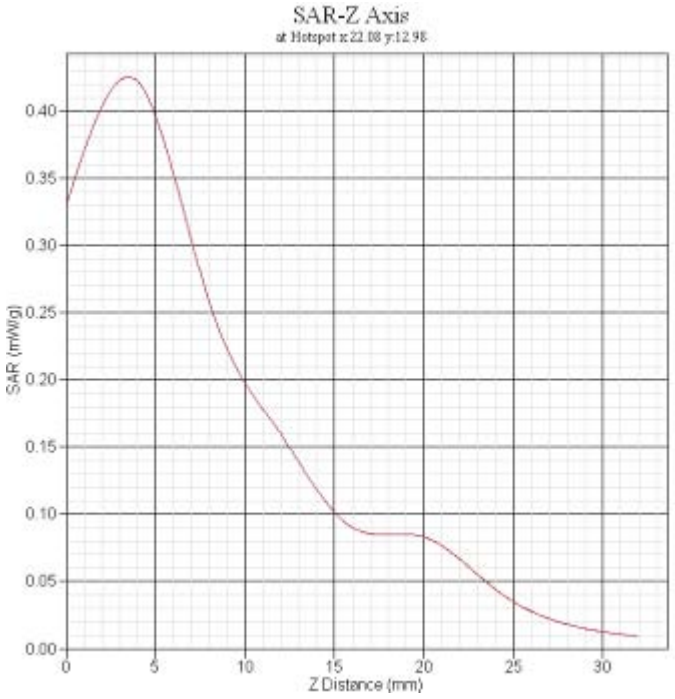
GSM850 Right tilt CH190	
Frequency(MHz)	836.6
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	-0.756
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.448
SAR 10g(W/Kg)	0.298

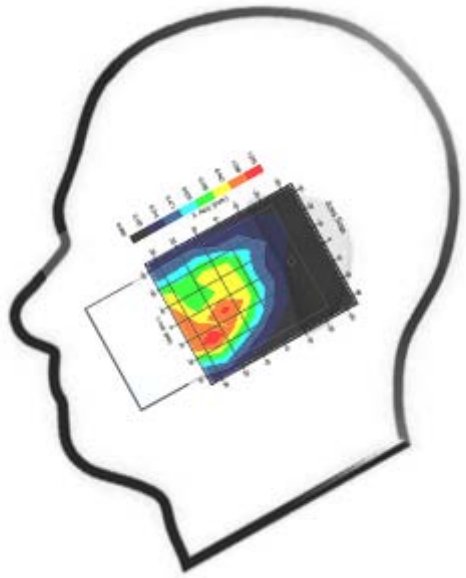
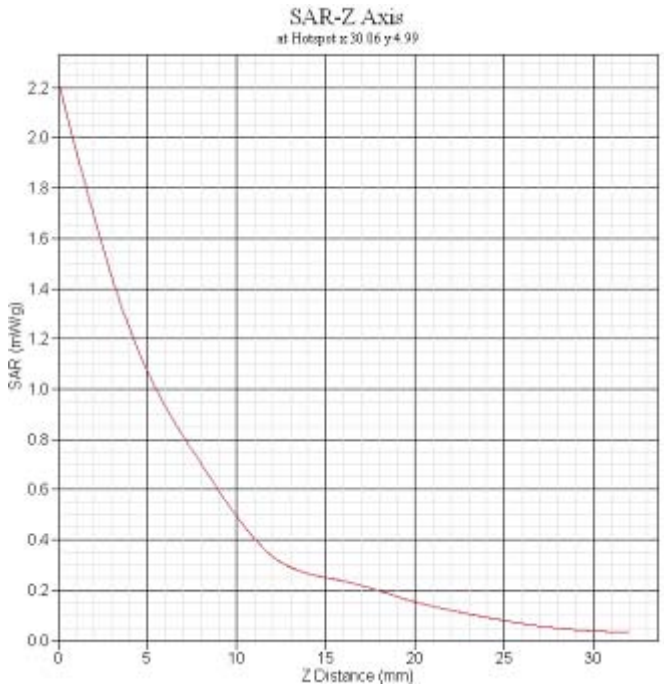
GSM850 left cheek ch128	
Frequency(MHz)	824.2
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	-1.238
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.551
SAR 10g(W/Kg)	0.358

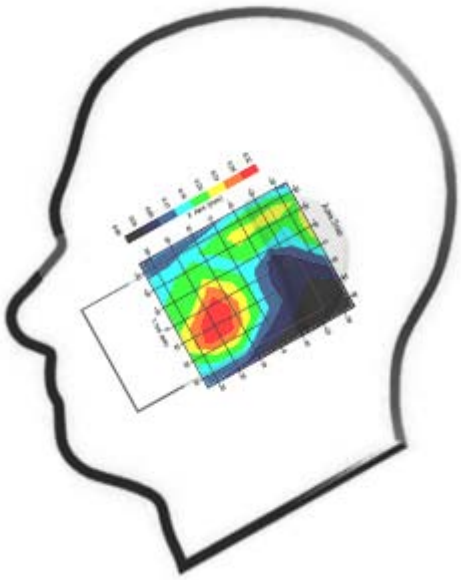
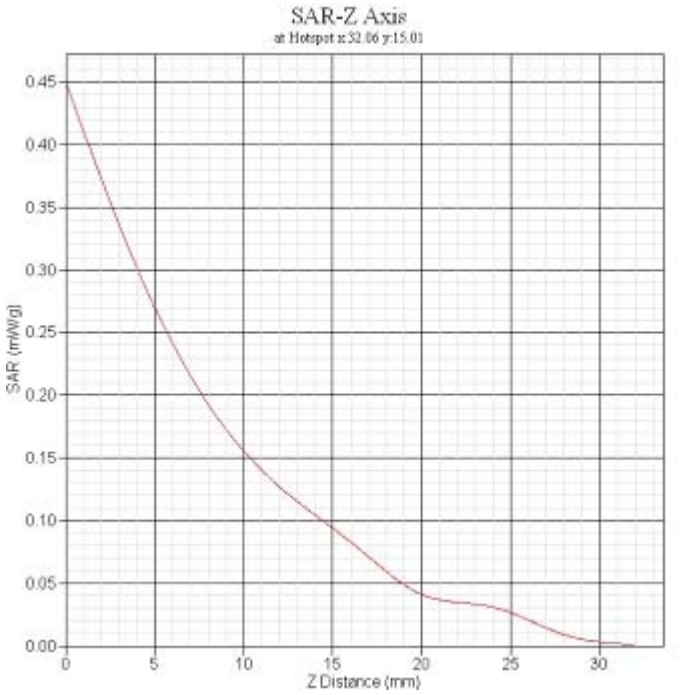
GSM850 left cheek ch251	
Frequency(MHz)	848.8
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	-4.726
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.598
SAR 10g(W/Kg)	0.490

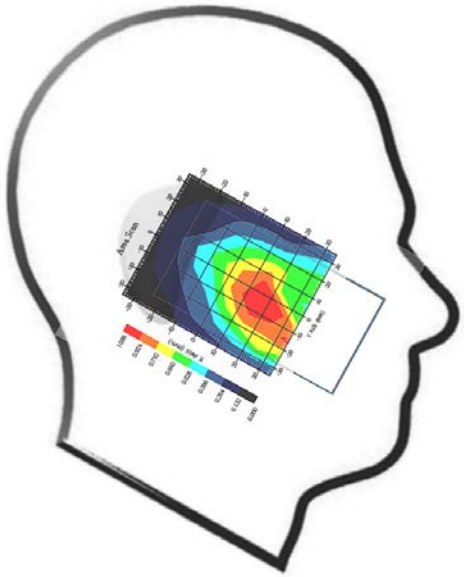
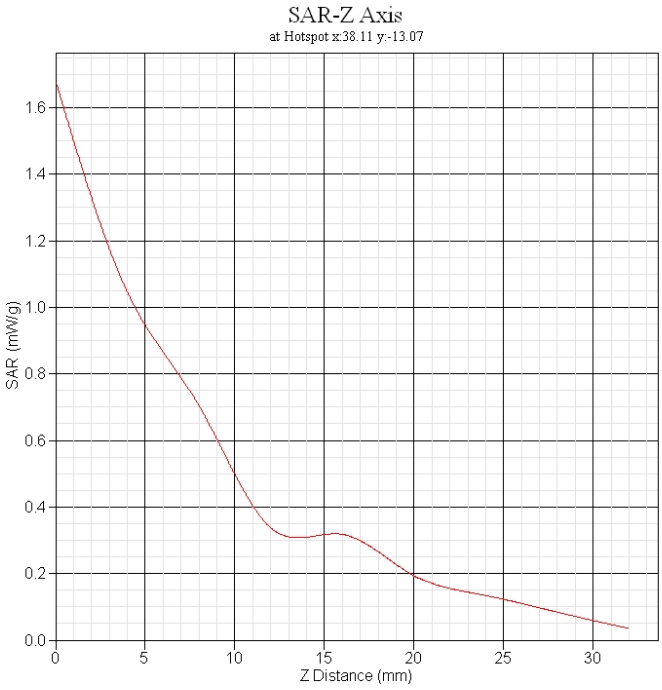
GSM850 left cheek ch190+BT	
Frequency(MHz)	826.6
Relative permittivity(real part)	40.38
Conductivity(S/m)	0.92
Variation(%)	-2.320
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	6.5
Probe Sensitivity	1.20 1.20 1.20 μ V/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.641
SAR 10g(W/Kg)	0.426

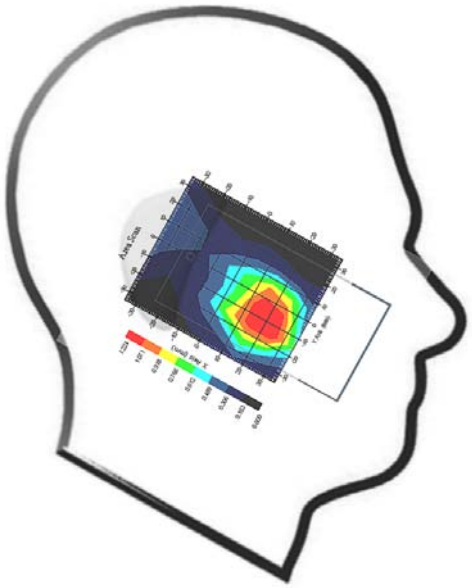
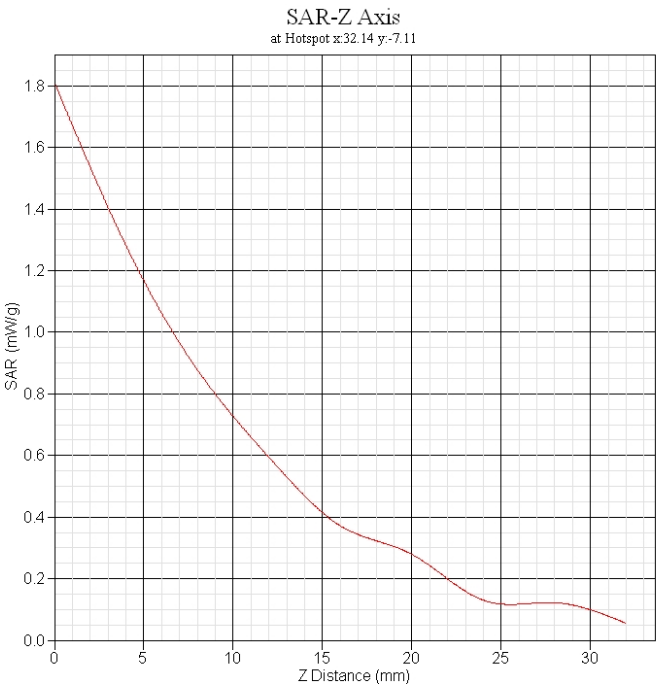
GSM1900 Left cheek CH661	
Frequency(MHz)	1880.0
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	-0.660
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	1.018
SAR 10g(W/Kg)	0.546

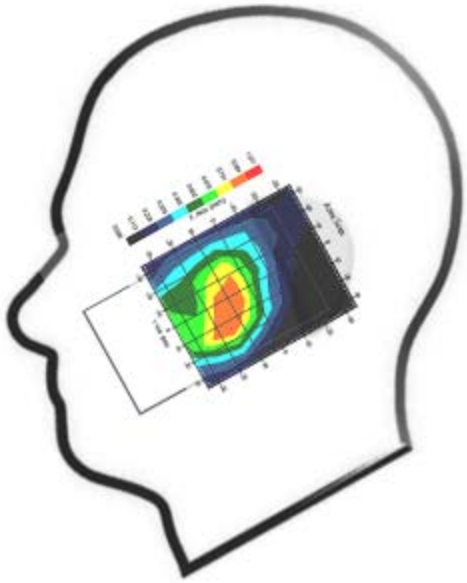
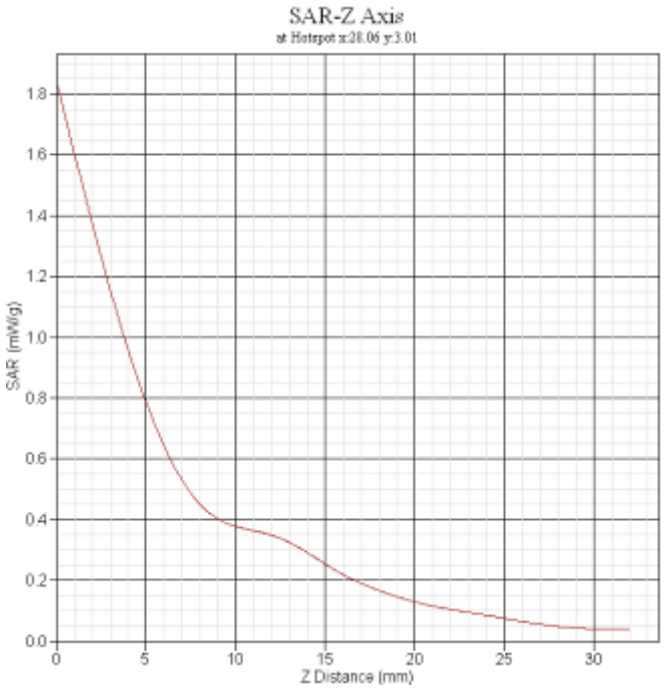
GSM1900 Left tilt CH661	
Frequency(MHz)	1880.0
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	4.980
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.358
SAR 10g(W/Kg)	0.207

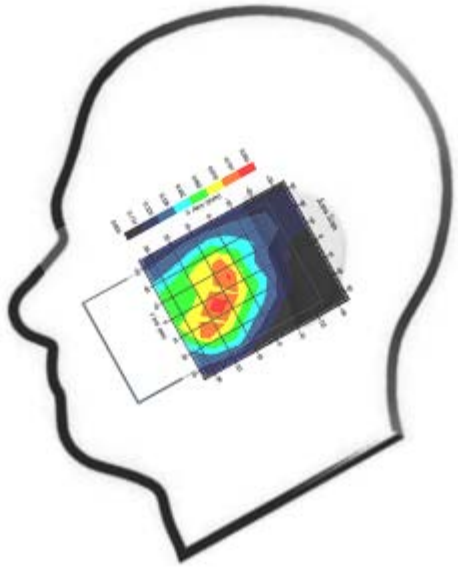
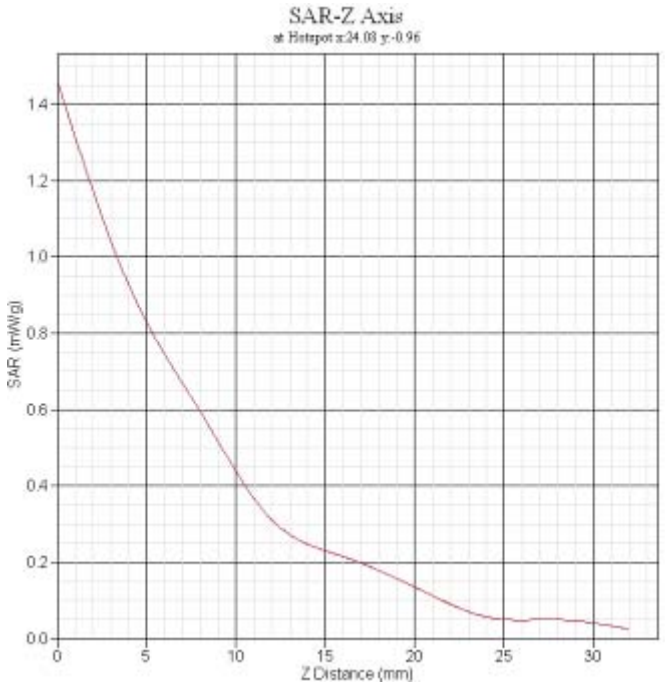
GSM1900 Right cheek CH661	
Frequency(MHz)	1880.0
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	1.152
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	1.056
SAR 10g(W/Kg)	0.553

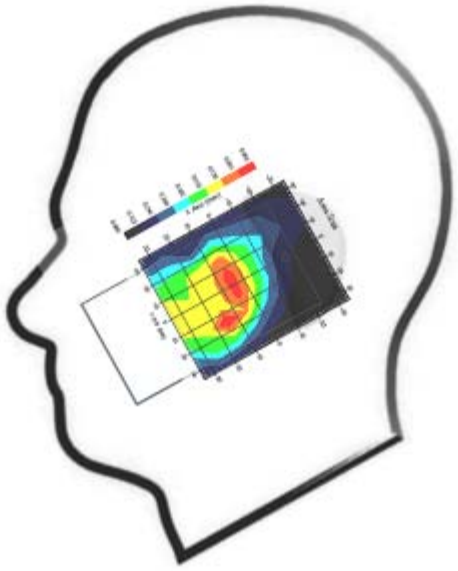
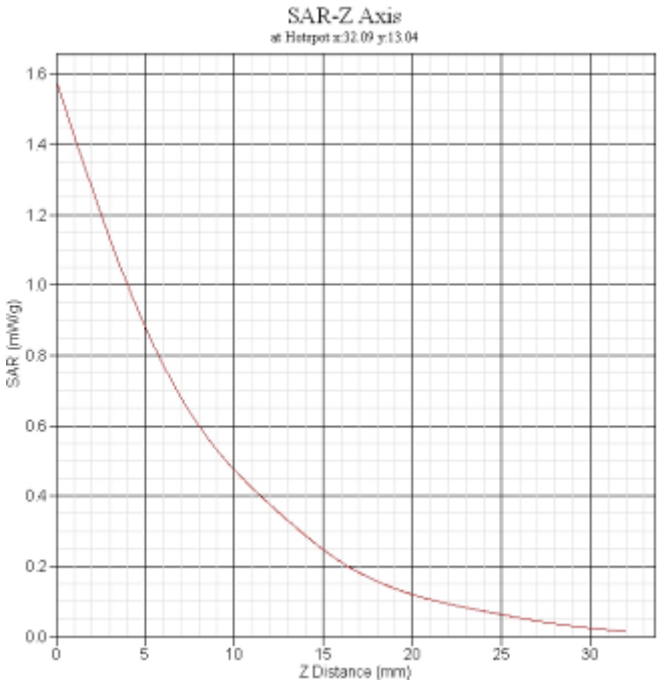
GSM1900 Right tilt CH661	
Frequency(MHz)	1880.0
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	-2.629
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.266
SAR 10g(W/Kg)	0.142

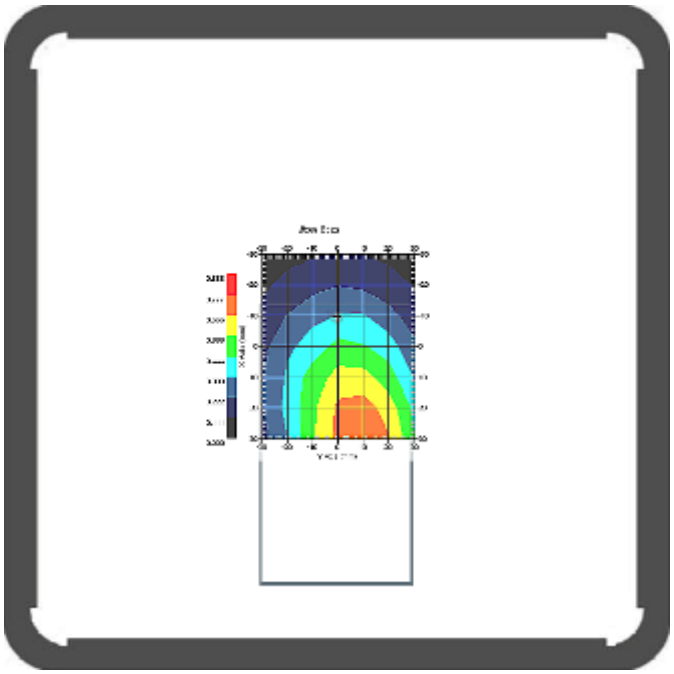
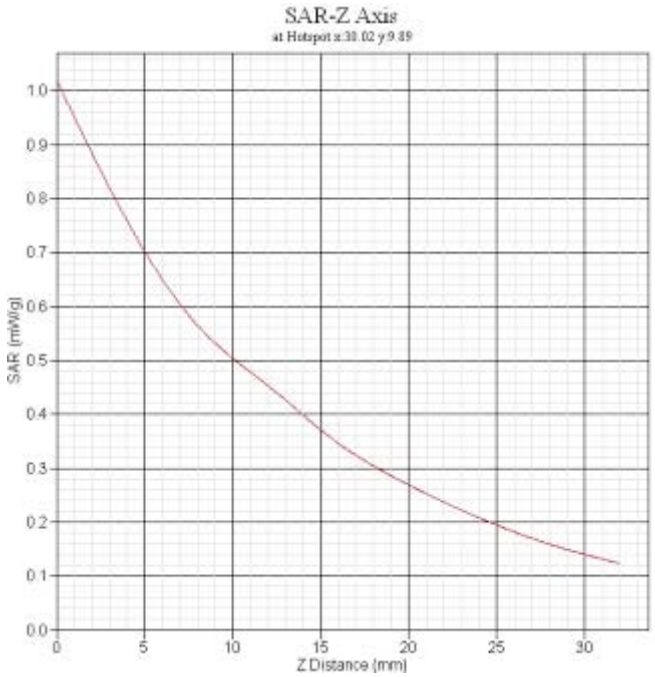
GSM1900 Left cheek CH512	
Frequency(MHz)	1850.2
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	-1.920
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.997
SAR 10g(W/Kg)	0.546

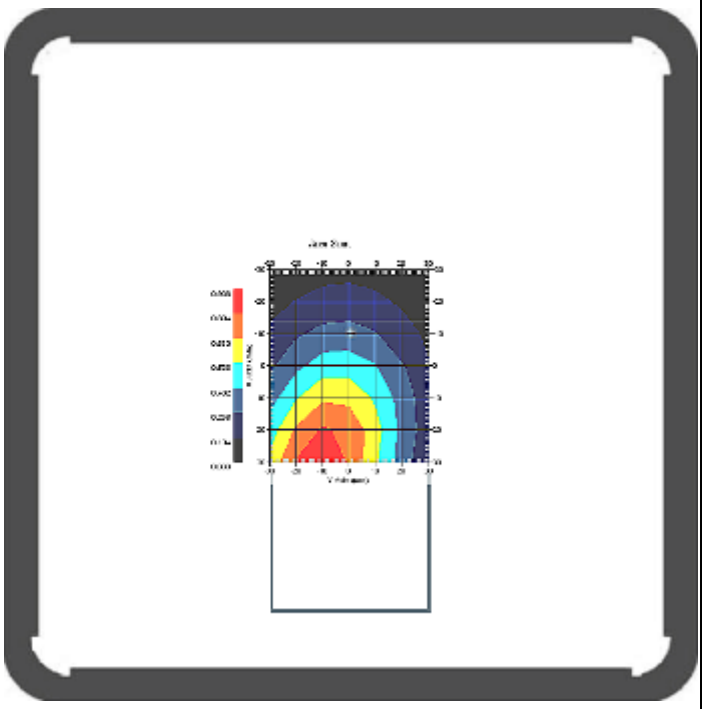
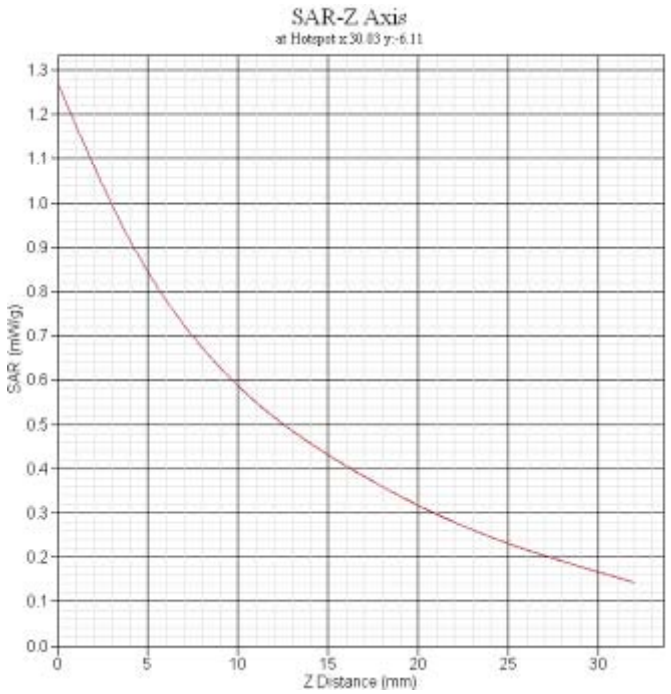
GSM1900 Left cheek CH810	
Frequency(MHz)	1909.8
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	2.712
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	1.004
SAR 10g(W/Kg)	0.560

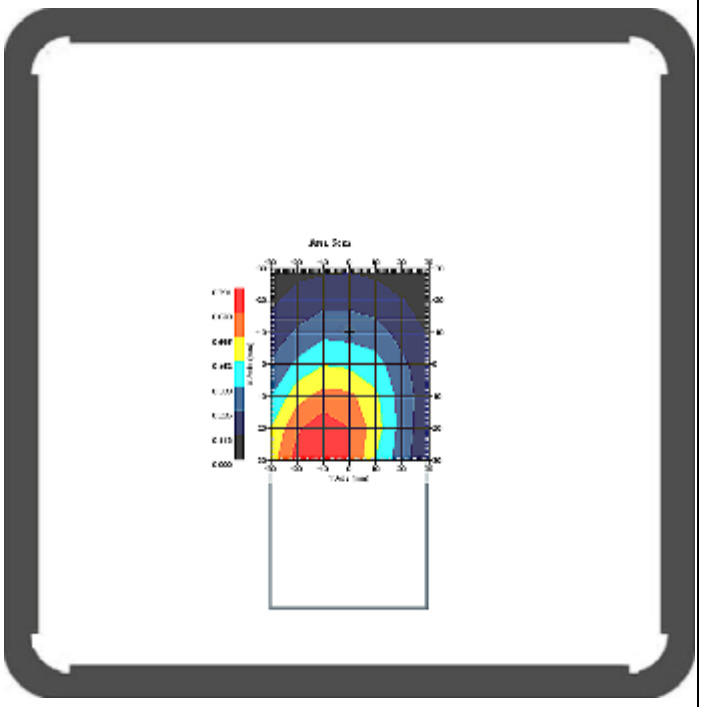
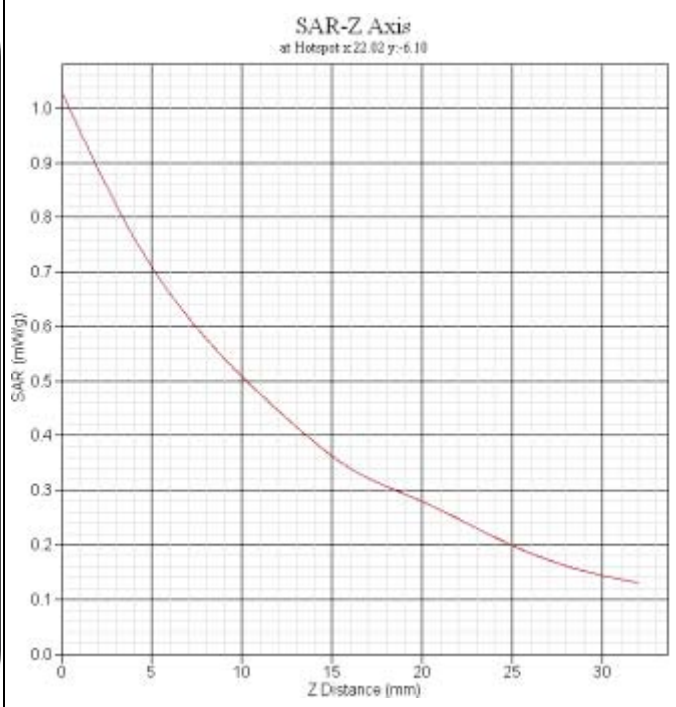
GSM1900 Right cheek CH512	
Frequency(MHz)	1850.2
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	-2.751
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.891
SAR 10g(W/Kg)	0.439

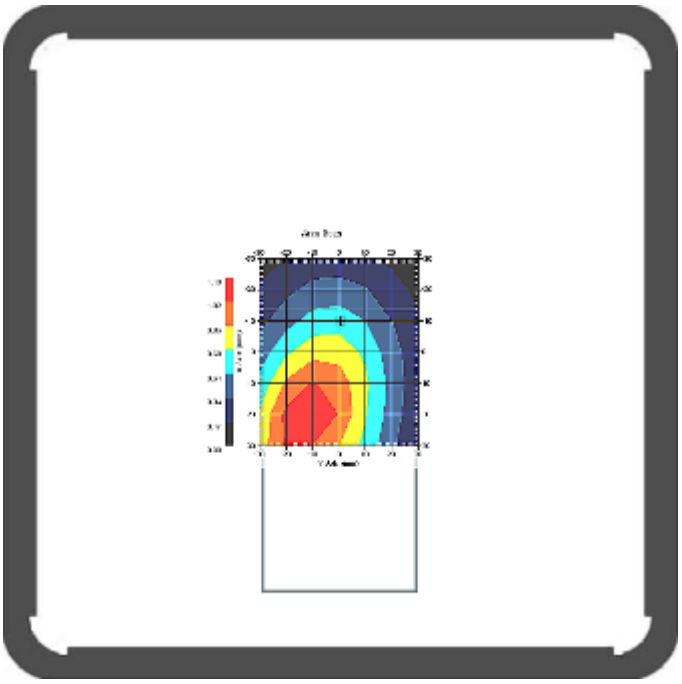
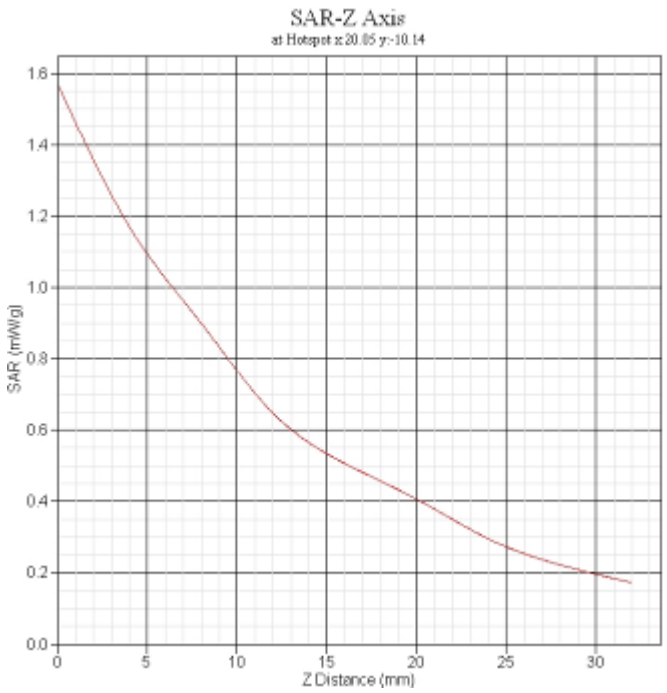
GSM1900 Right cheek CH810	
Frequency(MHz)	1909.8
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	1.631
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.958
SAR 10g(W/Kg)	0.534

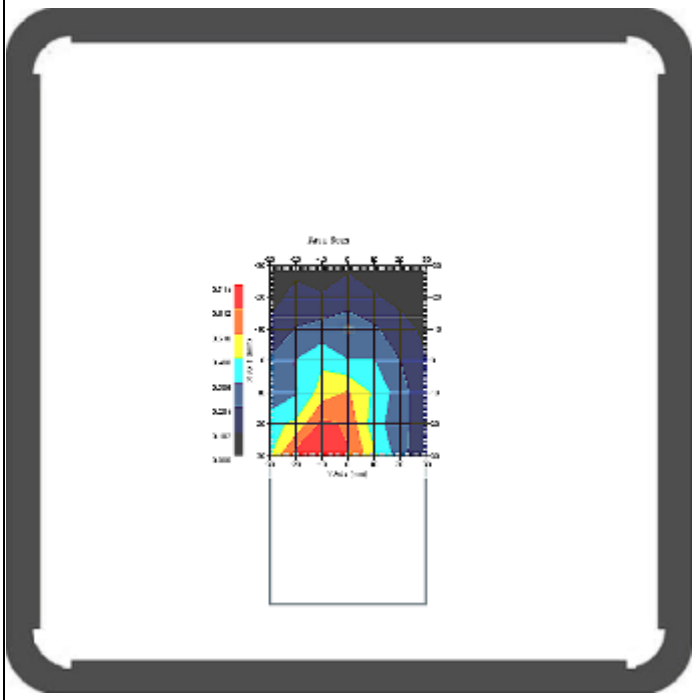
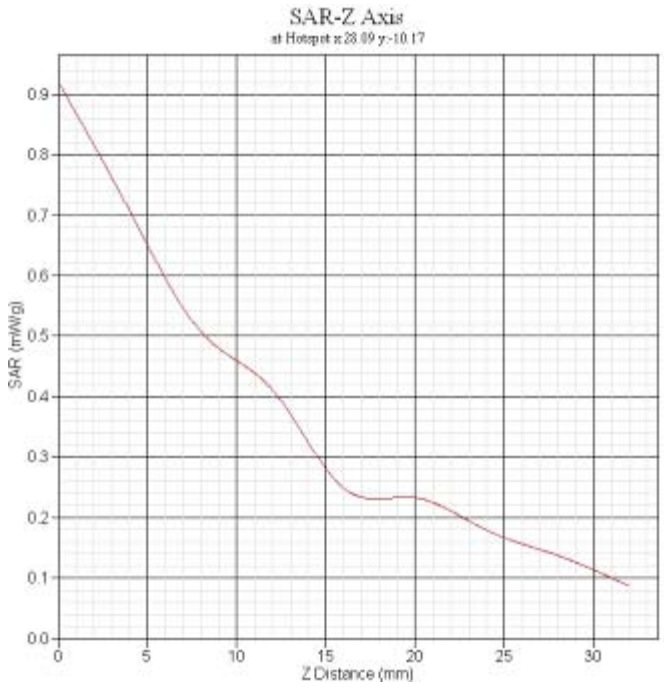
GSM1900 Right cheek CH661+BT	
Frequency(MHz)	1880.0
Relative permittivity(real part)	40.09
Conductivity(S/m)	1.42
Variation(%)	-1.370
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.7
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-29
	
SAR 1g(W/Kg)	0.972
SAR 10g(W/Kg)	0.568

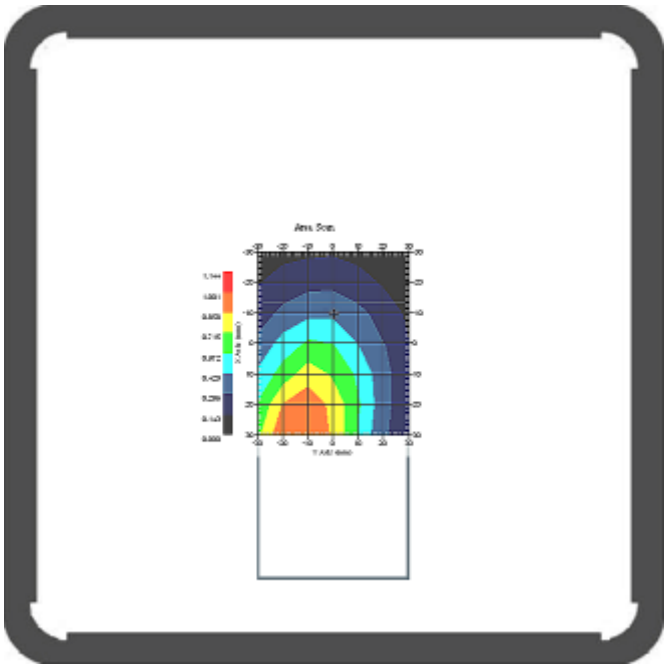
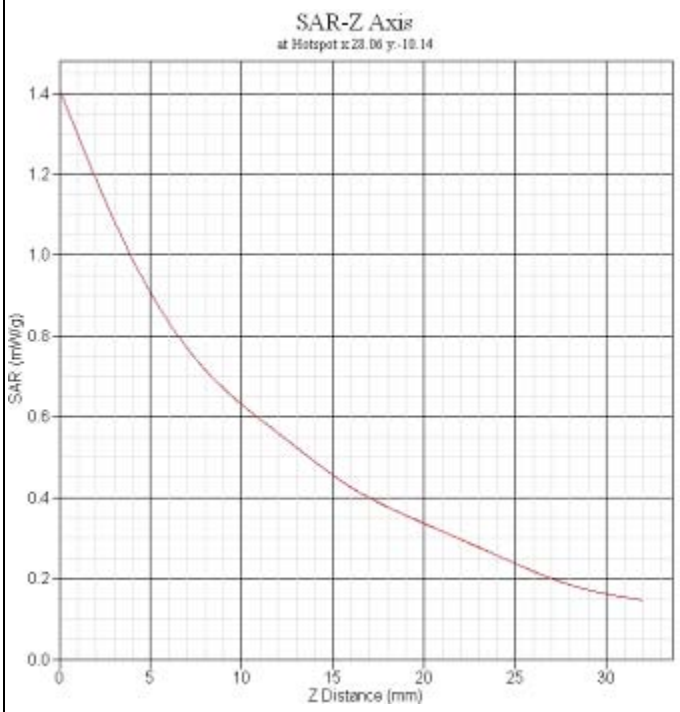
GPRS850 body face CH190	
Frequency(MHz)	826.6
Relative permittivity(real part)	54.08
Conductivity(S/m)	0.95
Variation(%)	0.587
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	6.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.699
SAR 10g(W/Kg)	0.449

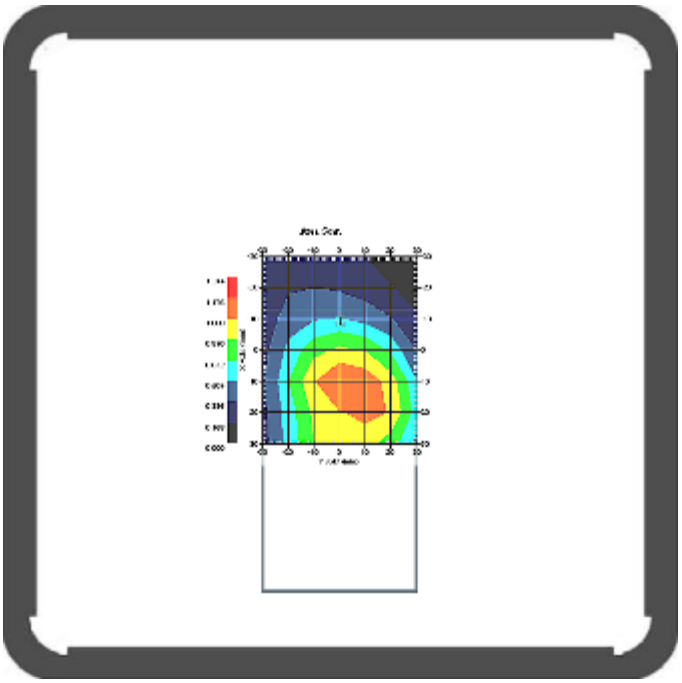
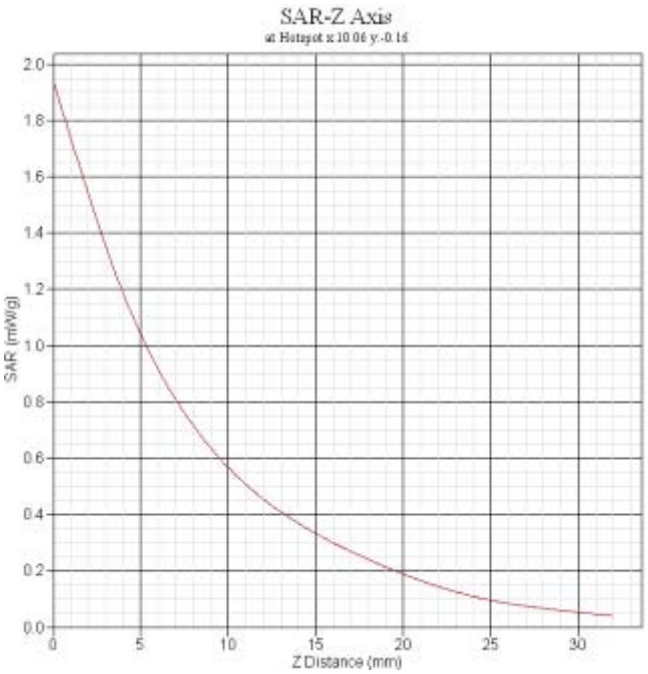
GPRS850 body back CH190	
Frequency(MHz)	826.6
Relative permittivity(real part)	54.08
Conductivity(S/m)	0.95
Variation(%)	-0.986
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	6.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.885
SAR 10g(W/Kg)	0.602

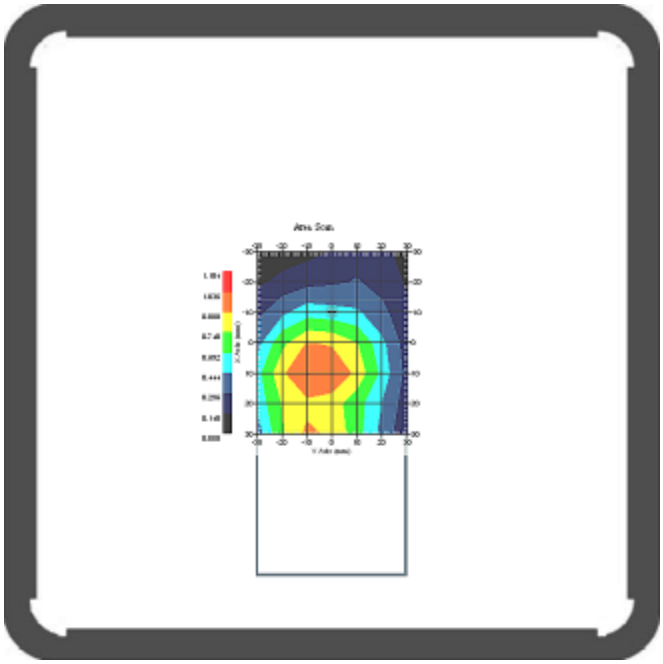
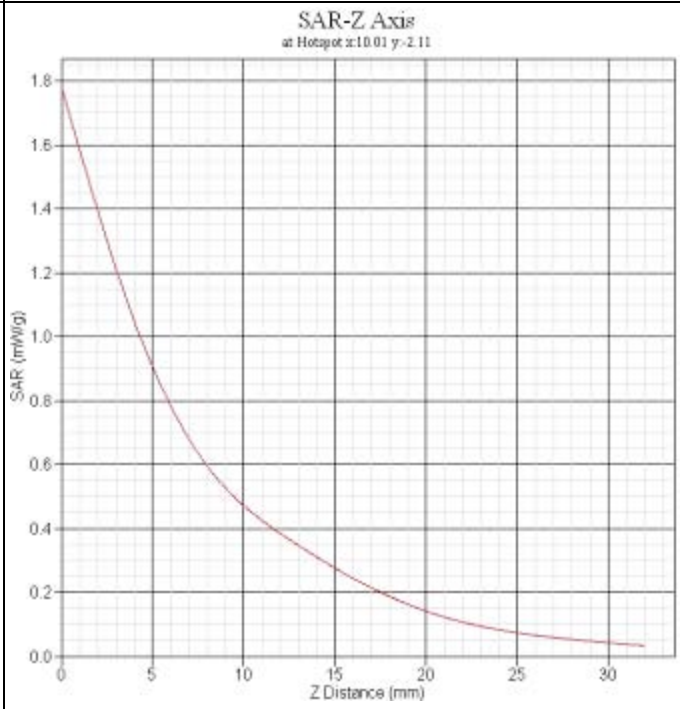
GPRS850 body back CH128	
Frequency(MHz)	824.2
Relative permittivity(real part)	54.08
Conductivity(S/m)	0.95
Variation(%)	2.805
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	6.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.736
SAR 10g(W/Kg)	0.502

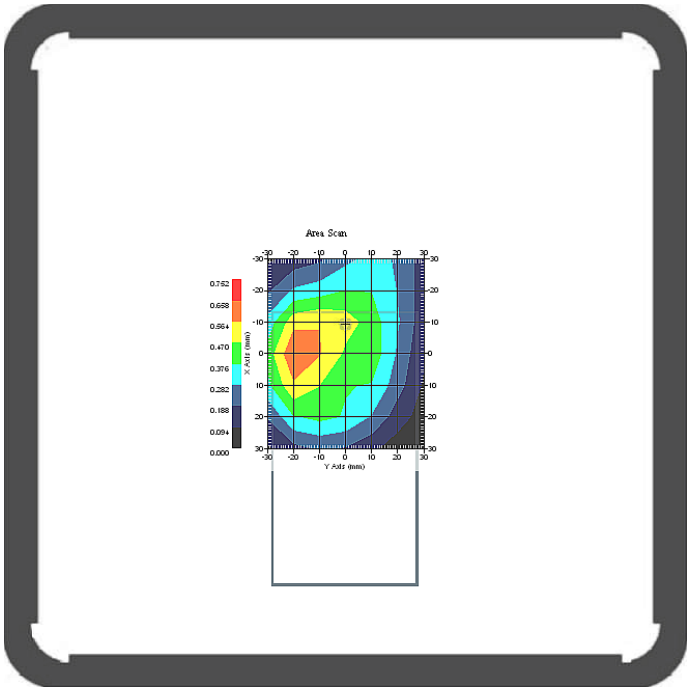
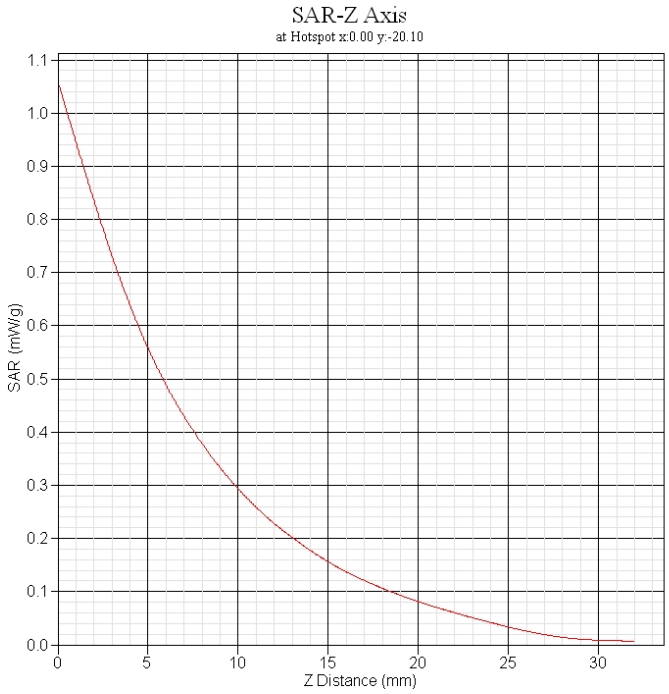
GPRS850 body back CH251	
Frequency(MHz)	848.8
Relative permittivity(real part)	54.08
Conductivity(S/m)	0.95
Variation(%)	-0.530
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	6.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	1.051
SAR 10g(W/Kg)	0.666

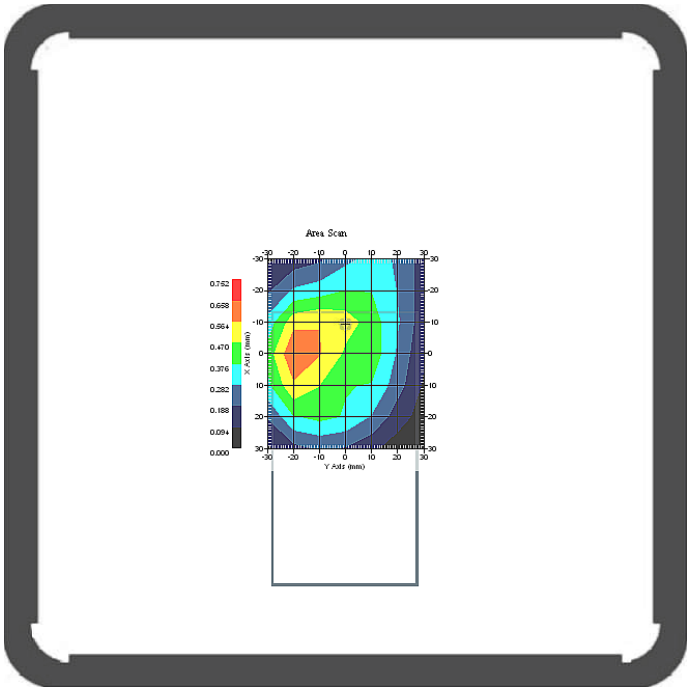
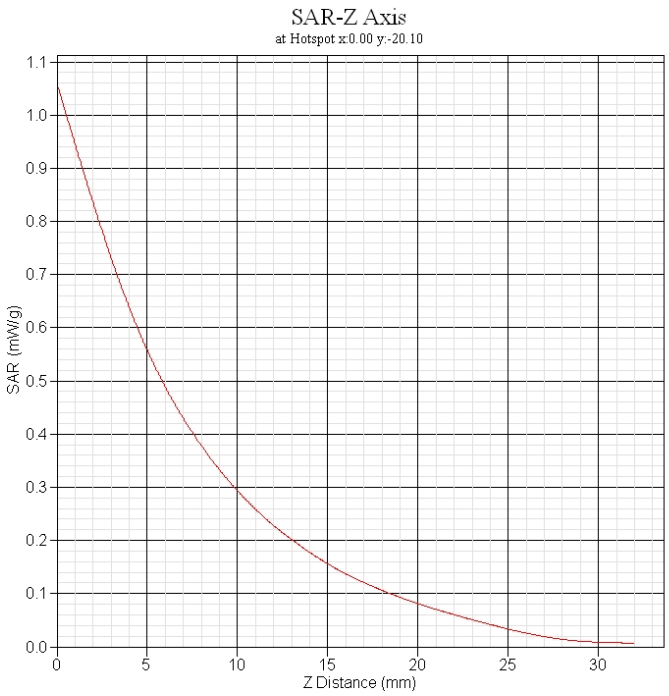
GSM850 body back CH251	
Frequency(MHz)	848.8
Relative permittivity(real part)	54.08
Conductivity(S/m)	0.95
Variation(%)	-1.757
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	6.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.698
SAR 10g(W/Kg)	0.508

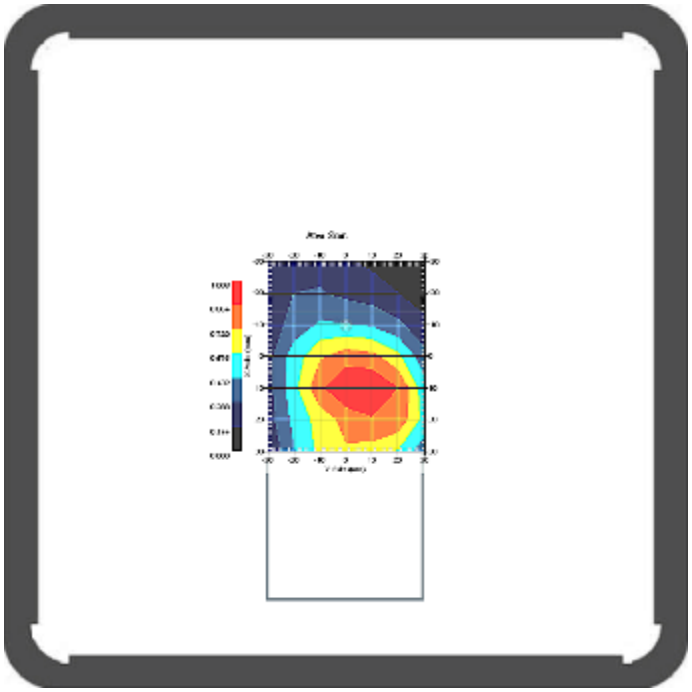
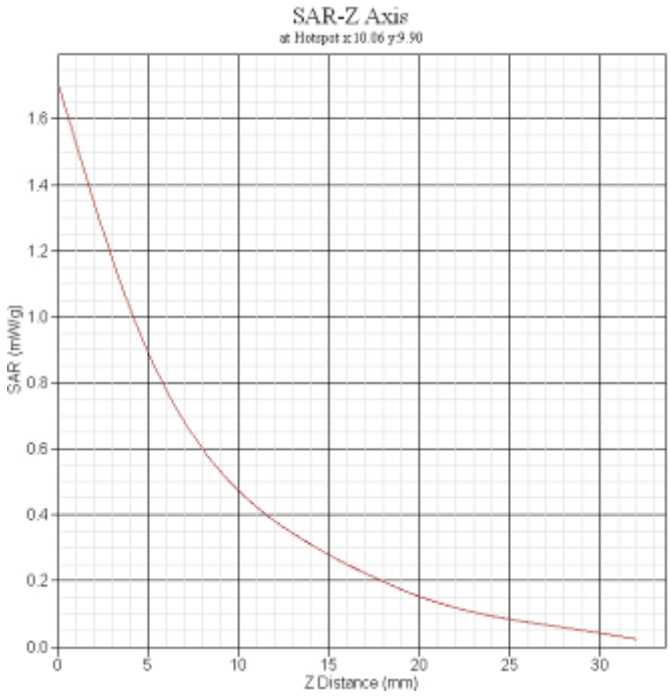
GPRS850 body back CH251+BT	
Frequency(MHz)	848.8
Relative permittivity(real part)	54.08
Conductivity(S/m)	0.95
Variation(%)	3.812
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	6.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.946
SAR 10g(W/Kg)	0.621

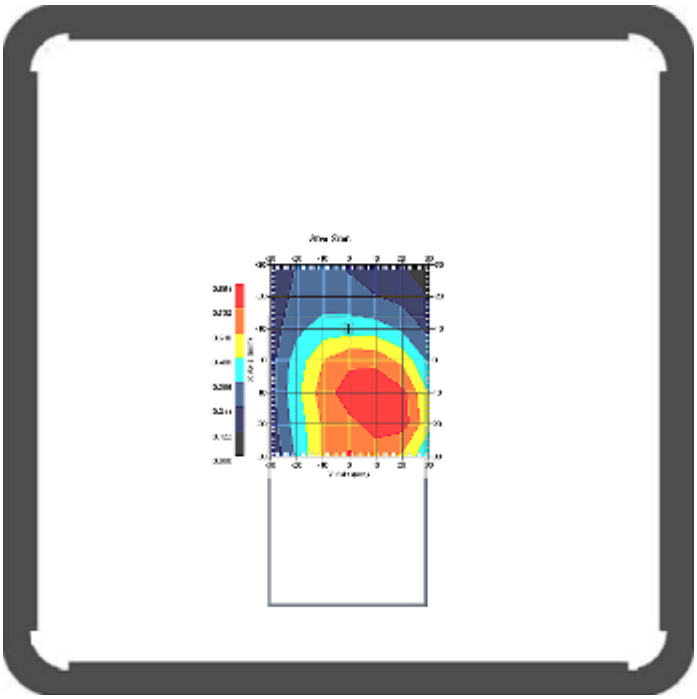
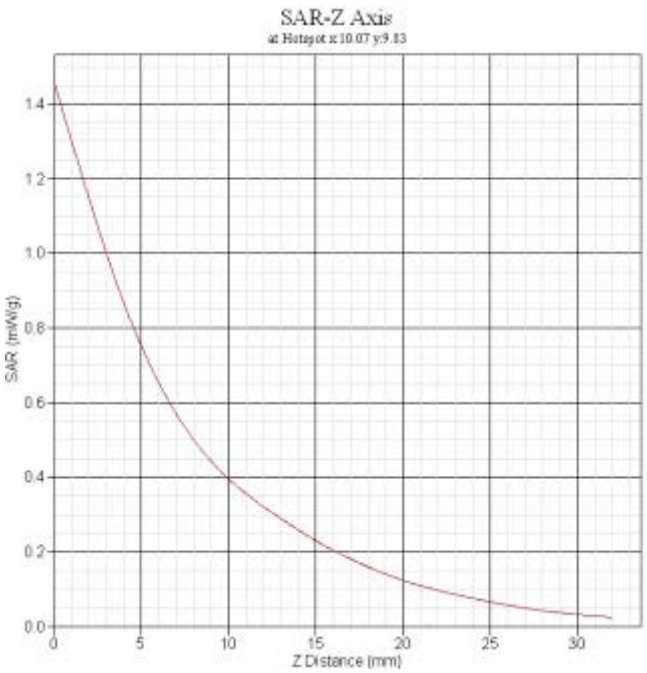
GPRS1900 body face CH661	
Frequency(MHz)	1880.0
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	-2.006
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	1.111
SAR 10g(W/Kg)	0.624

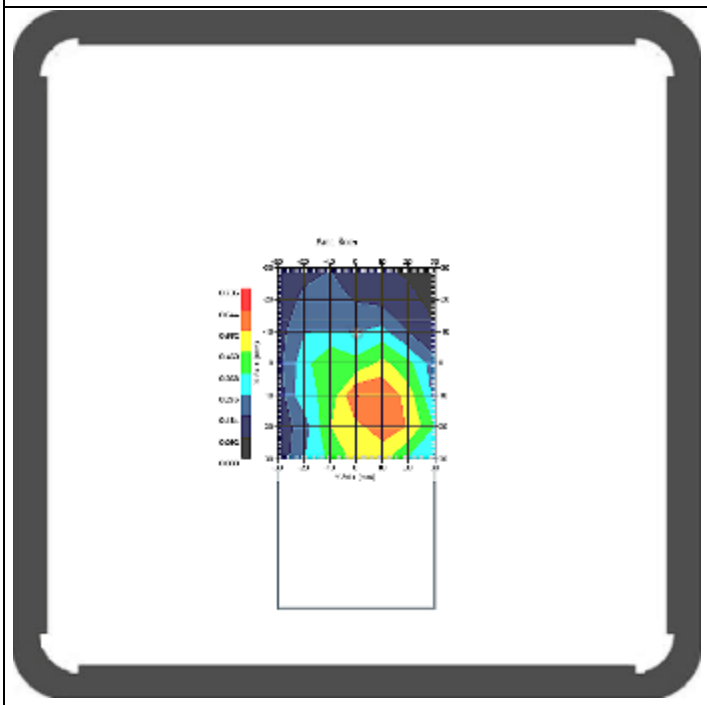
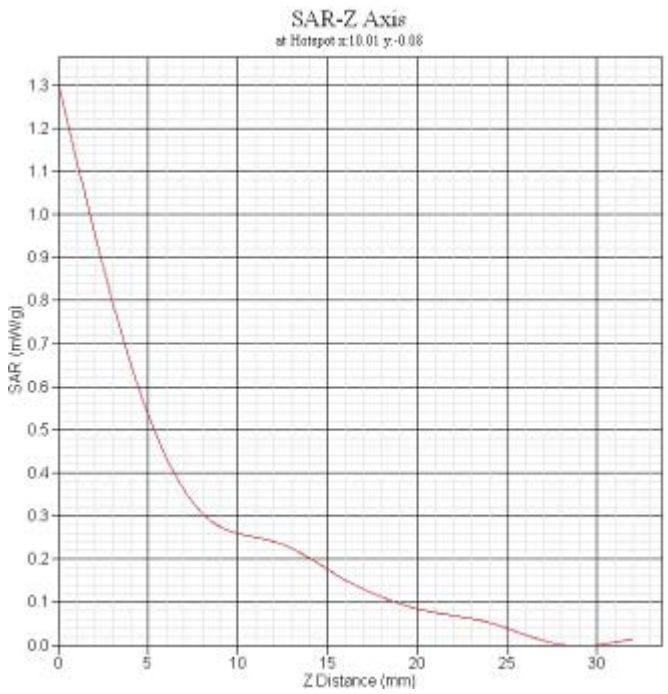
GPRS1900 body back CH661	
Frequency(MHz)	1880.0
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	1.817
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.995
SAR 10g(W/Kg)	0.553

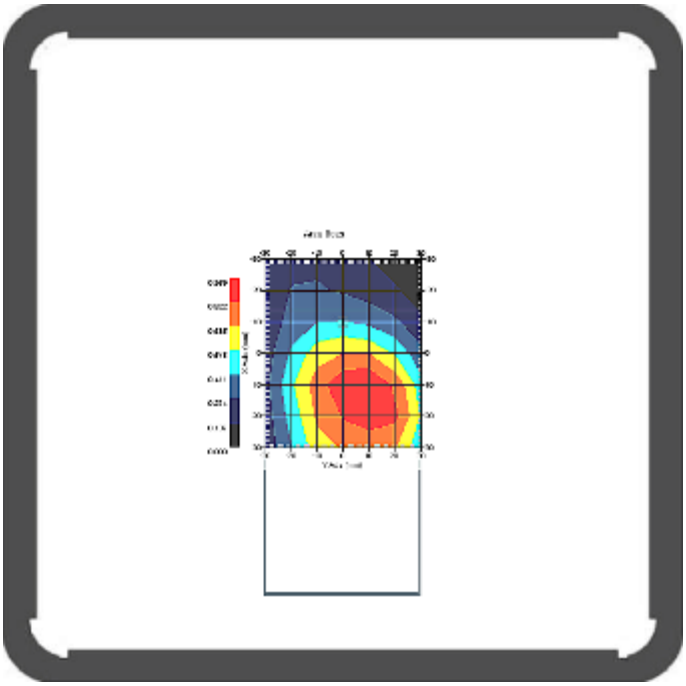
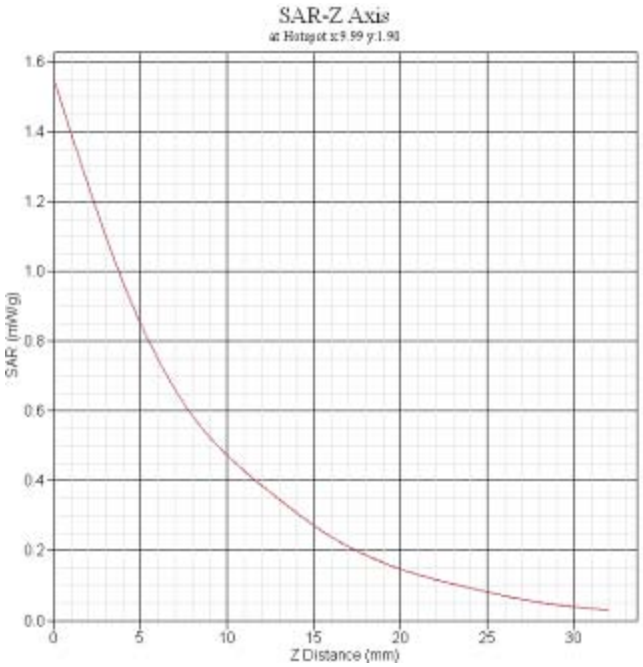
GPRS1900 body back CH512	
Frequency(MHz)	1850.2
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	1.628
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μ V/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.739
SAR 10g(W/Kg)	0.513

GPRS1900 body back CH810	
Frequency(MHz)	1909.8
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	-1.703
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.724
SAR 10g(W/Kg)	0.501

GPRS1900 body face CH512	
Frequency(MHz)	1850.2
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	-1.689
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.965
SAR 10g(W/Kg)	0.534

GPRS1900 body face CH810	
Frequency(MHz)	1909.8
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	-2.742
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.840
SAR 10g(W/Kg)	0.473

GSM1900 body face CH661	
Frequency(MHz)	1880.0
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	2.982
Duty Cycle Factor	8
Crest factor	8
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μV/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.603
SAR 10g(W/Kg)	0.323

GPRS1900 body face CH661+BT	
Frequency(MHz)	1880.0
Relative permittivity(real part)	52.13
Conductivity(S/m)	1.54
Variation(%)	-2.838
Duty Cycle Factor	4
Crest factor	4
Conversion Fator	5.4
Probe Sensitivity	1.20 1.20 1.20 μ V/(V/m)2
Data	2012-03-30
	
SAR 1g(W/Kg)	0.930
SAR 10g(W/Kg)	0.518

NCL CALIBRATION LABORATORIES

Calibration File No.: 1364-1375

Client.: IAC

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

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

Equipment: Miniature Isotropic RF Probe

Record of Calibration

Head and Body

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 500-00273

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole
Project No: ISL-E020-5612

Calibrated: 1st October 2011
Released on: 5th October 2011

Approved By: Stuart Nicol

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

Released By: _____

NCL CALIBRATION LABORATORIES

303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1

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

Introduction

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

Calibration Method

Probes are calibrated using the following methods.

<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

Conditions

Probe 500-00273 was a recalibration.
The probe was received in good working order, although at 1900MHz the uncertainty was higher than our standard (see note)

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, 2011
Power Sensor Anritsu MA2481D	103555	Nov 4, 2011
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2011
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2012

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2012

Attestation

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

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

Stuart Nicol

Jesse Hones

Probe Summary

Probe Type:	E-Field Probe E020
Serial Number:	500-00273
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 μV/(V/m)^2
Channel Y:	1.2 μV/(V/m)^2
Channel Z:	1.2 μV/(V/m)^2
Diode Compression Point:	95 mV

Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Calibration Uncertainty	Tolerance Uncertainty for 5%*	Conversion Factor
450 H	Head	X	X	X	X	X
450 B	Body	X	X	X	X	X
750 H	Head	X	X	X	X	X
750 B	Body	X	X	X	X	X
850 H	**Head**	**42.86**	**0.95**	**3.5**	**3.4**	**6.5**
850 B	**Body**	**53.71**	**1.04**	**3.5**	**3.4**	**6.4**
900 H	**Head**	**41.5**	**0.99**	**3.5**	**3.4**	**6.1**
900 B	**Body**	**53.25**	**1.04**	**3.5**	**3.4**	**6.3**
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**	**36.85**	**1.35**	**3.5**	**2.7**	**5.5**
1800 B	**Body**	**52.38**	**1.5**	**3.5**	**2.7**	**5.4**
1900 H	**Head**	**38.21**	**1.46**	**3.5**	**2.7**	**5.7**
1900 B	**Body**	**52.1**	**1.59**	**3.5**	**2.7**	**5.4**
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	**Head**	**39.8**	**1.49**	**3.5**	**2.9**	**5.0**
2100 B	**Body**	**53.0**	**1.58**	**3.5**	**2.9**	**4.9**
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	**Head**	**38.2**	**1.84**	**3.5**	**3.5**	**4.65**
2450B	**Body**	**50.63**	**1.99**	**3.5**	**3.5**	**4.4**
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

Boundary Effect:

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

Spatial Resolution:

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

DAQ-PAQ Contribution

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

Boundary Effect:

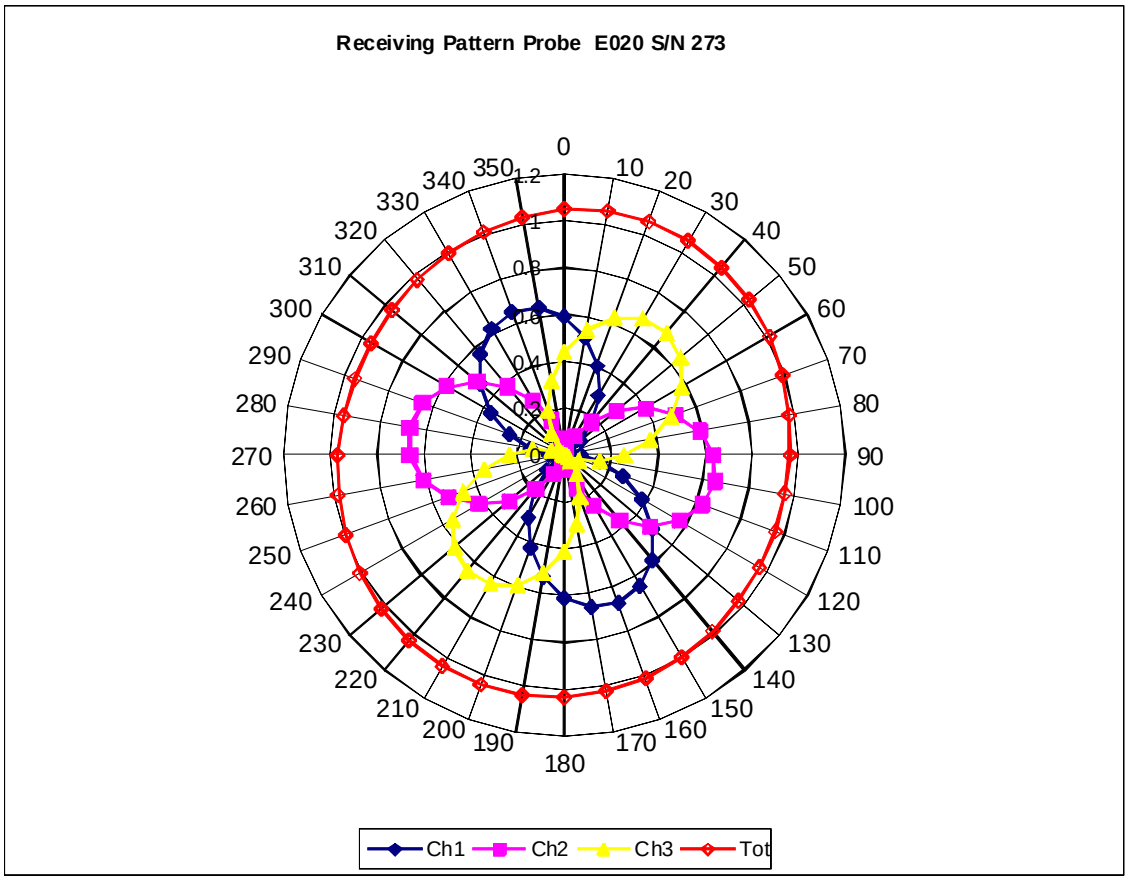
For a distance of 0.58mm the worst case evaluated uncertainty (increase in the probe sensitivity) is less than 2.1%.

NOTES:

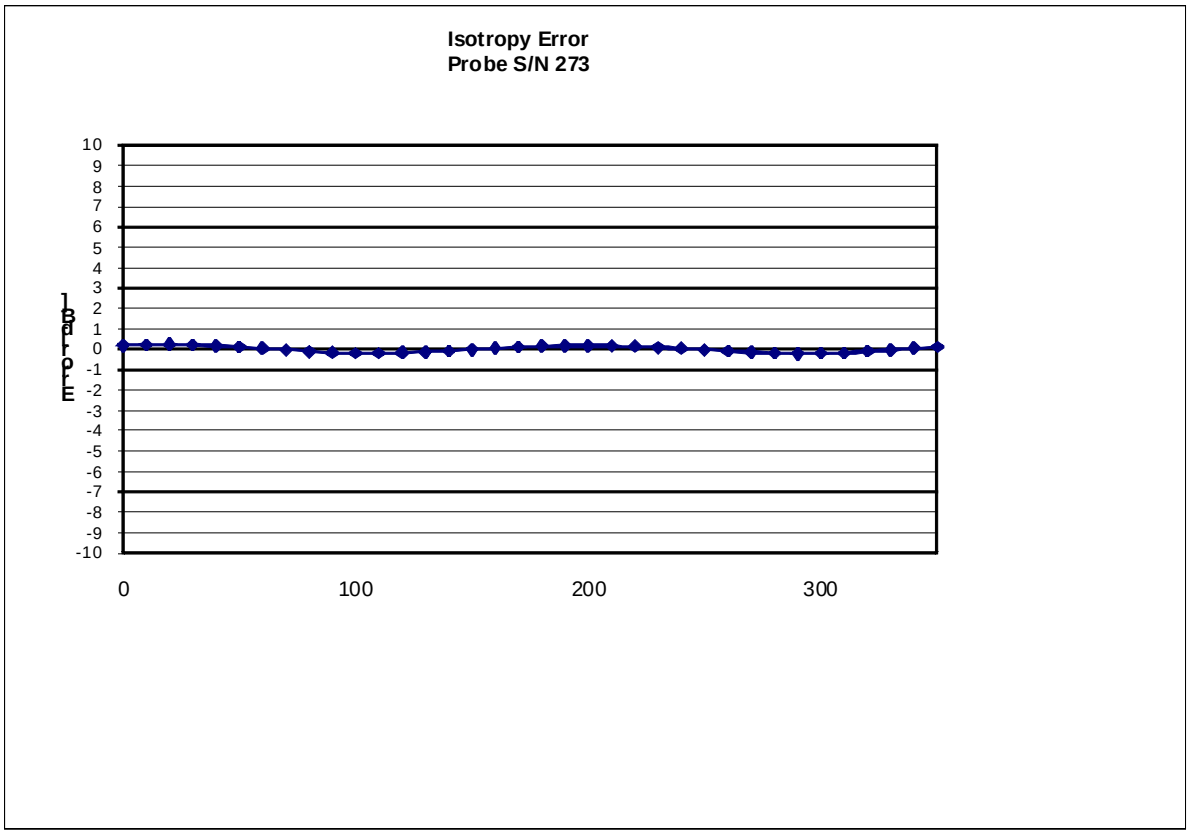
*The maximum deviation from the centre frequency when comparing the lower to upper range is listed.

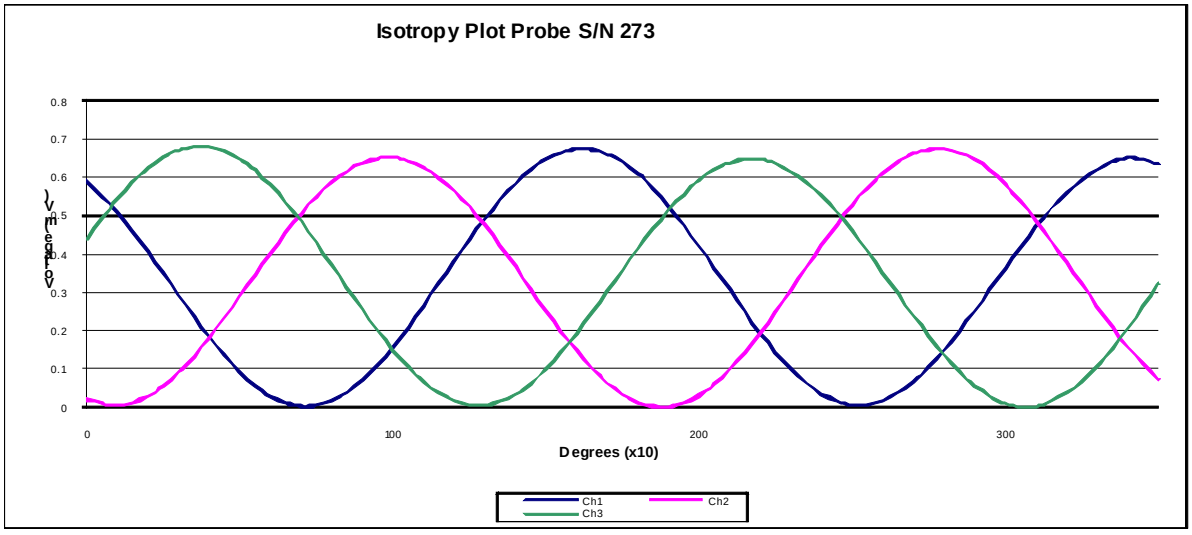
**1800MHz Head was evaluated at close to the 10% allowable deviation; the deviation has now been normalized to within 2%.
***1800MHz Body was evaluated at close to the 10% allowable deviation; the deviation has now been normalized to within 2%.
****1900MHz Body was evaluated at close to the 10% allowable deviation; the deviation has now been normalized to within 2%.
*****2450MHz Head was evaluated at close to the 10% allowable deviation; the deviation has now been normalized to within 2%.
******2450MHz Body was evaluated at close to the 10% allowable deviation; the deviation has now been normalized to within 2%.

Receiving Pattern Air



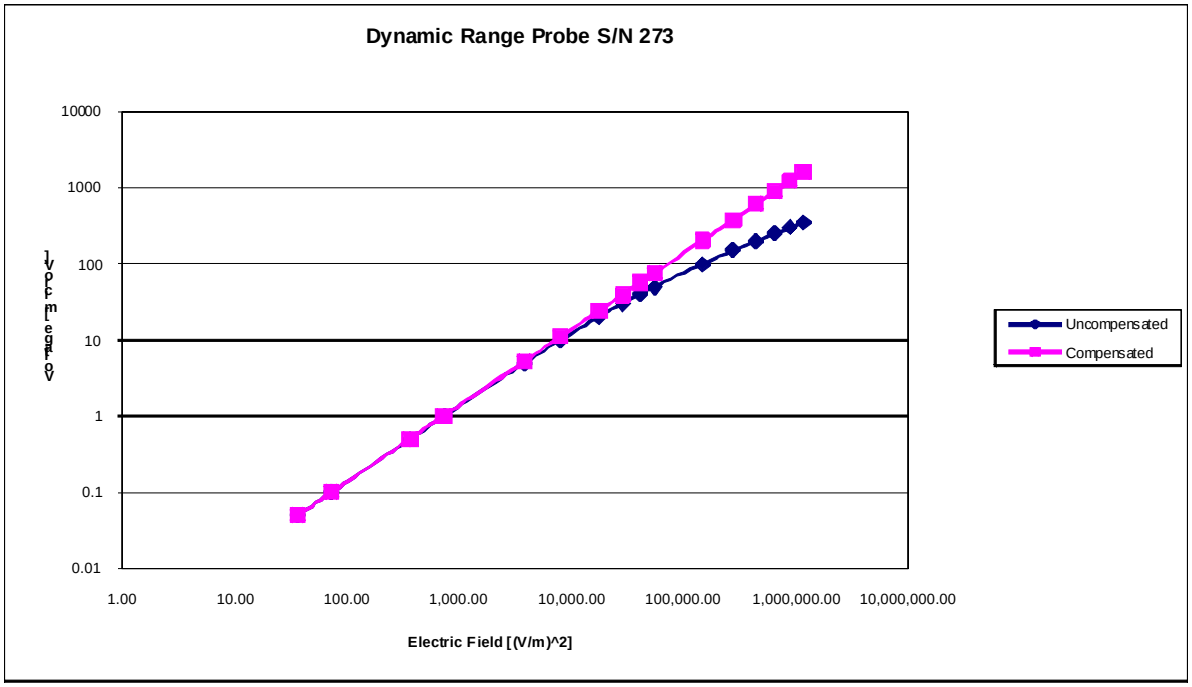
Isotropy Error Air



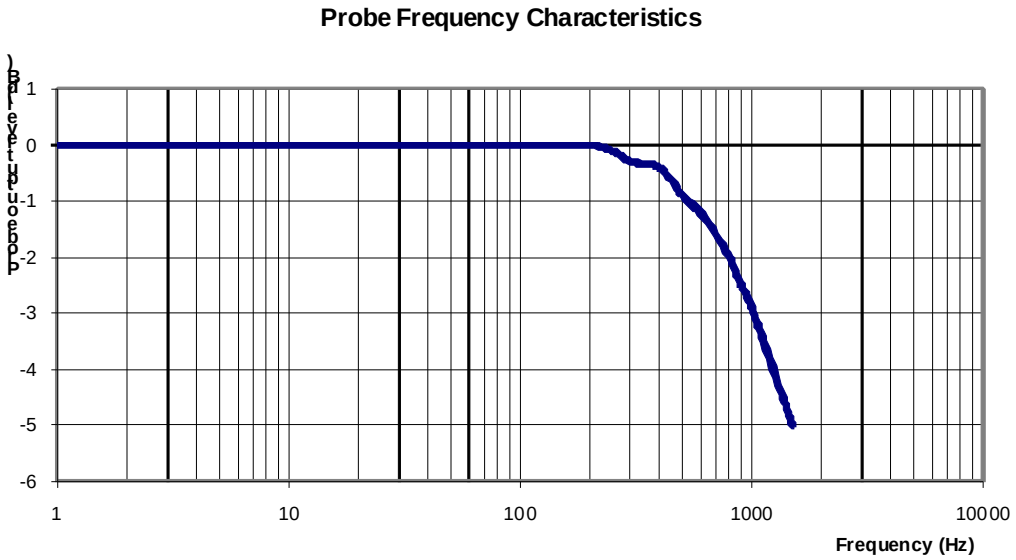


Isotropicity Tissue: 0.10 dB

Dynamic Range



Video Bandwidth



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

Test Equipment

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

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1217/18
Project Number: SGL-IAC-DC-5582-93

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

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

Validation Dipole
835MHz Head & Body

Manufacturer: APREL Laboratories
Part number: ALS-D-835-S-2
Frequency: 835MHz
Serial No: 180-00556

Customer: IAC

Calibrated: 17th May 2011
Released on: 27th May 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES
303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1
Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

Conditions

Dipole 180-00556 was a re-calibration.

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

Dipoles are calibrated on the ALSAS-10U with a feed power normalized to 1Watt.

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	90025437	Nov.4, 2010
Power Sensor Anritsu MA2481D	103555	Nov 4, 2010
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2010
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2011

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2011

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

Calibration Results Summary

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

Mechanical Dimensions

Length: 161.0 mm
Height: 89.8 mm

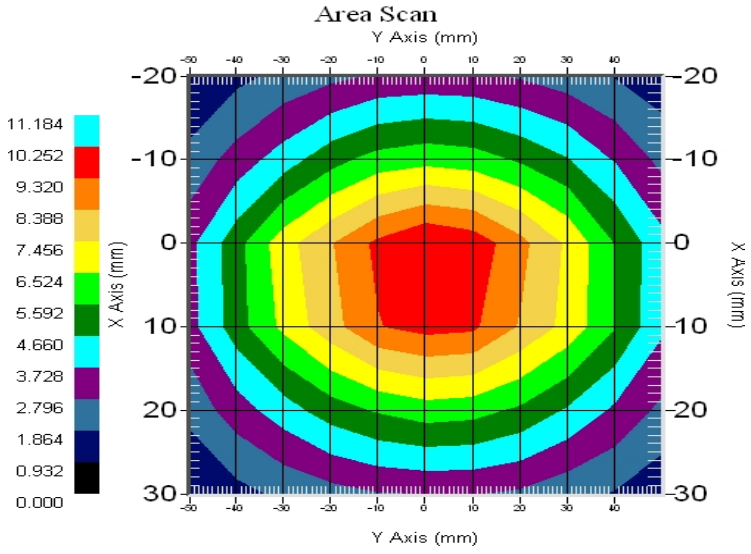
Electrical Specification 835MHz

Tissue Type	Return Loss:	Impedance:	SWR:
Head	-26.655	51.666	1.102U
Body	-22.106	57.482	1.177U

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	835 MHz	9.590	6.003	15.013
Body	835 MHz	9.981	6.006	15.013

835MHz



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 180-00556. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

- 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

Conditions

Dipole 180-00556 was a re-calibration.

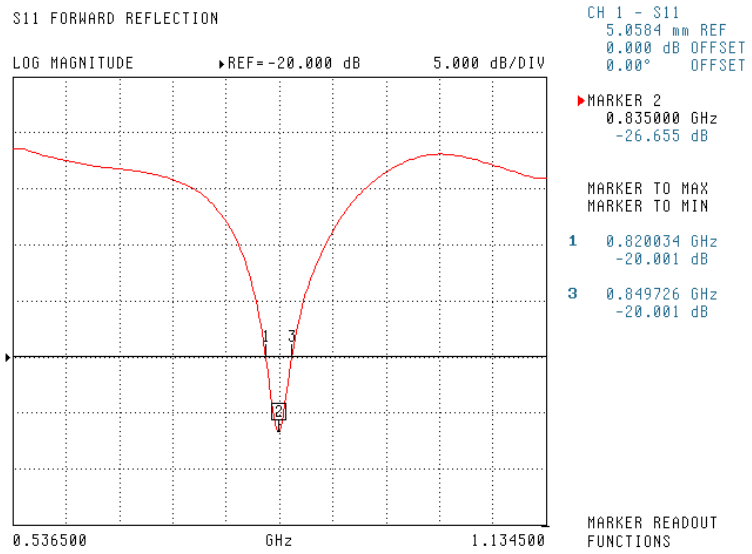
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Electrical Calibration

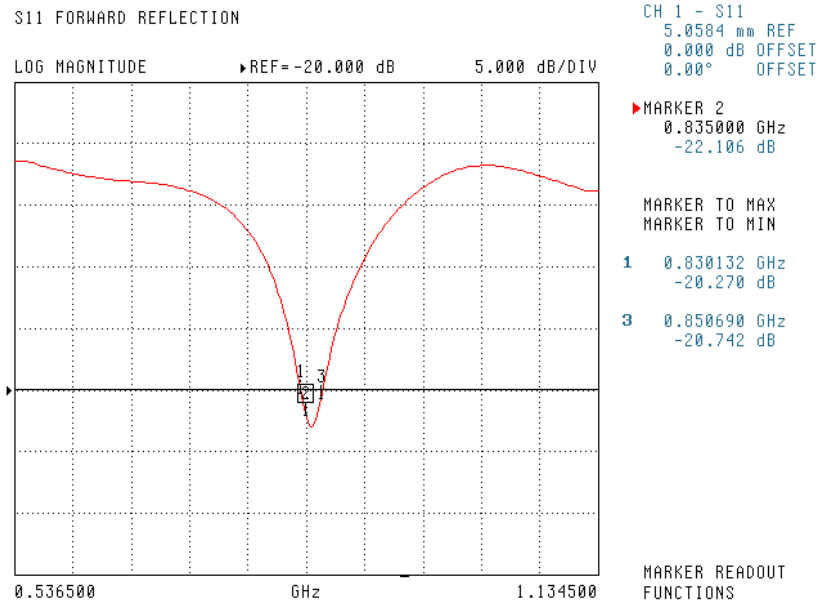
Electrical Specification 835MHz

Tissue Type	Measured Epsilon	Measured Sigma
Head	41.09	0.89
Body	53.15	0.95

Head Tissue



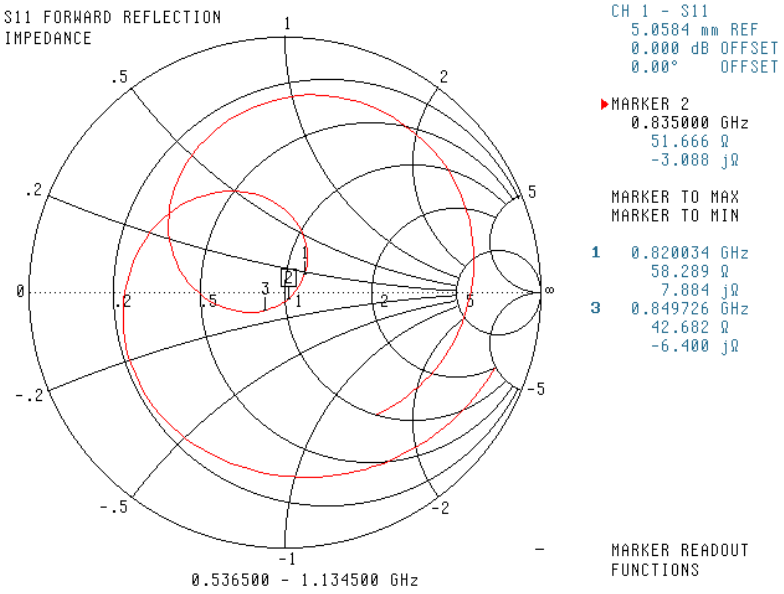
Body Tissue



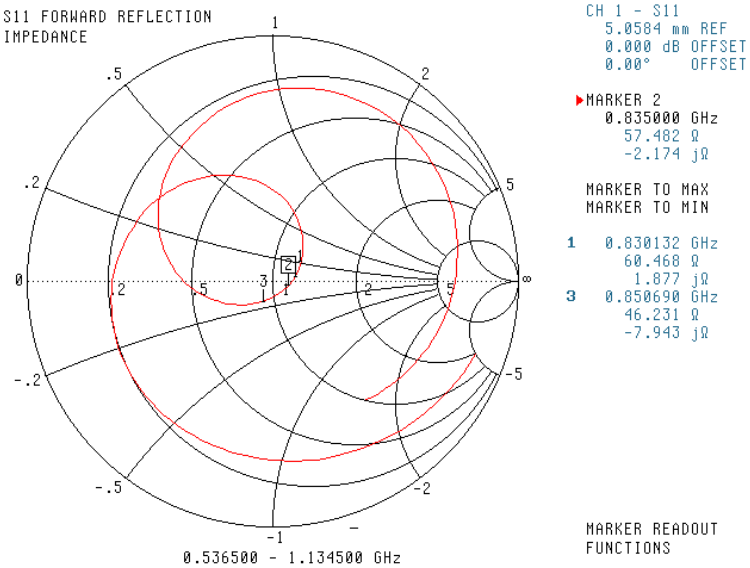
Electrical Specification 835MHz
Impedance

Tissue Type	Measured Epsilon	Measured Sigma
Head	41.09	0.89
Body	53.15	0.95

Head Tissue



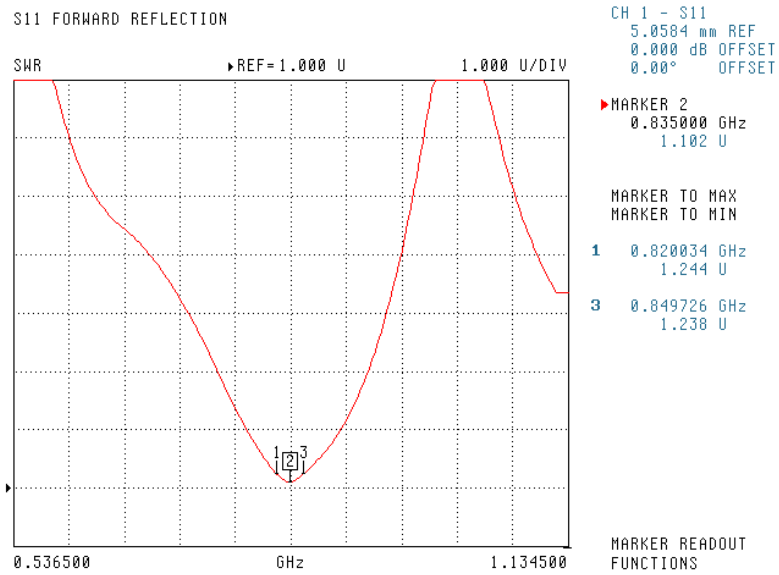
Body Tissue



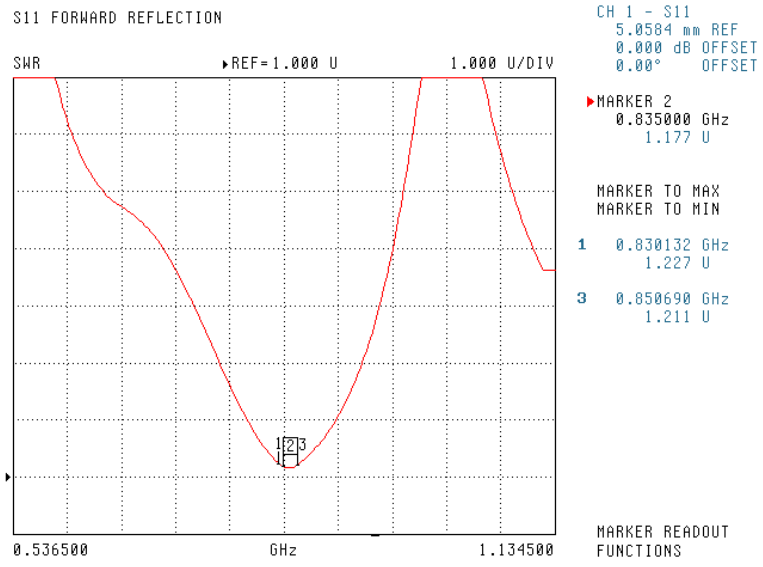
Electrical Specification 835MHz
Standing Wave Ratio

Tissue Type	Measured Epsilon	Measured Sigma
Head	41.09	0.89
Body	53.15	0.95

Head Tissue



Body Tissue



Test Equipment

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

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1219/20
Project Number: SGL-IAC-DC-5582-93

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

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

Validation Dipole
900MHz Head and Body

Manufacturer: APREL Laboratories
Part number: ALS-D-900-S-2
Frequency: 900MHz
Serial No: 190-00606

Customer: IAC

Calibrated: 17th May 2011
Released on: 27th May 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES
303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1
Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

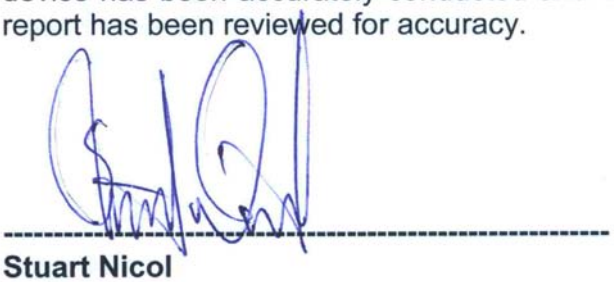
Conditions

Dipole 190-00606 was a re-calibration.

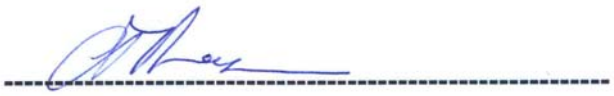
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Dipoles are calibrated on the ALSAS-10U with a feed power normalized to 1Watt.

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	90025437	Nov.4, 2010
Power Sensor Anritsu MA2481D	103555	Nov 4, 2010
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2010
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2011

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2011

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

Calibration Results Summary

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

Mechanical Dimensions

Mechanical Dimensions

Length: 149 mm
Height: 83.3 mm

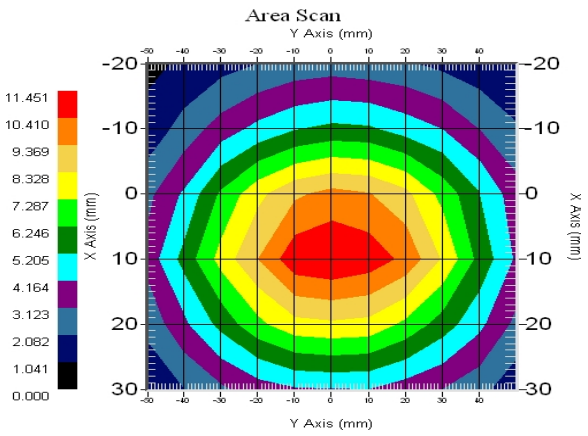
Electrical Specification 900MHz

Tissue Type	Return Loss:	Impedance:	SWR:
Head	-27.083	47.024	1.177U
Body	-23.506	49.945	1.146

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	900 MHz	10.693	6.631	17.015
Body	900 MHz	10.954	6.874	18.010

900MHz



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

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 190-00606. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

- 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

Conditions

Dipole 190-00606 was a re-calibration.

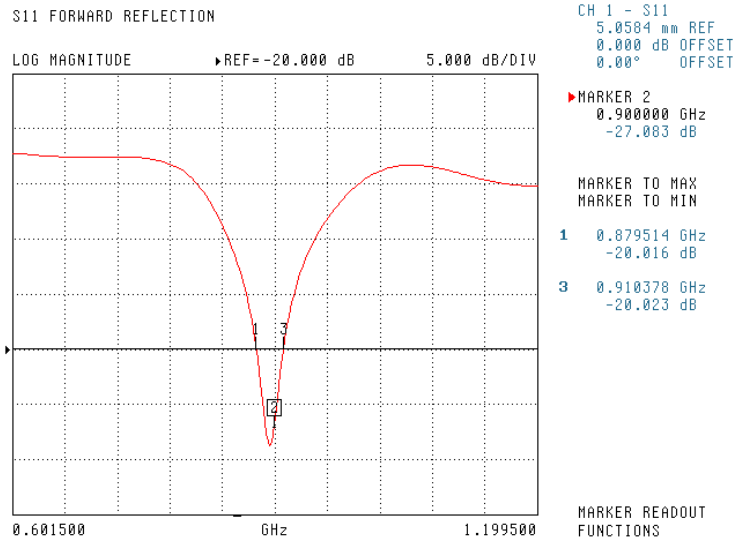
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Electrical Calibration

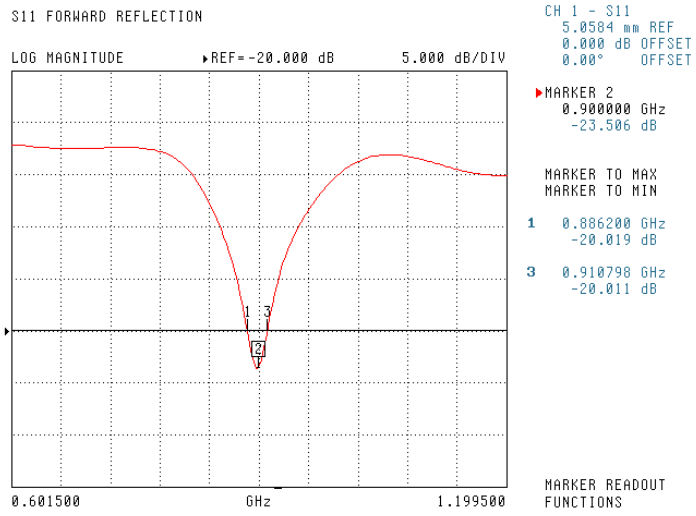
Electrical Specification 900MHz

Tissue Type	Measured Epsilon	Measured Sigma
Head	40.19	0.95
Body	53.89	0.98

Head Tissue



Body Tissue

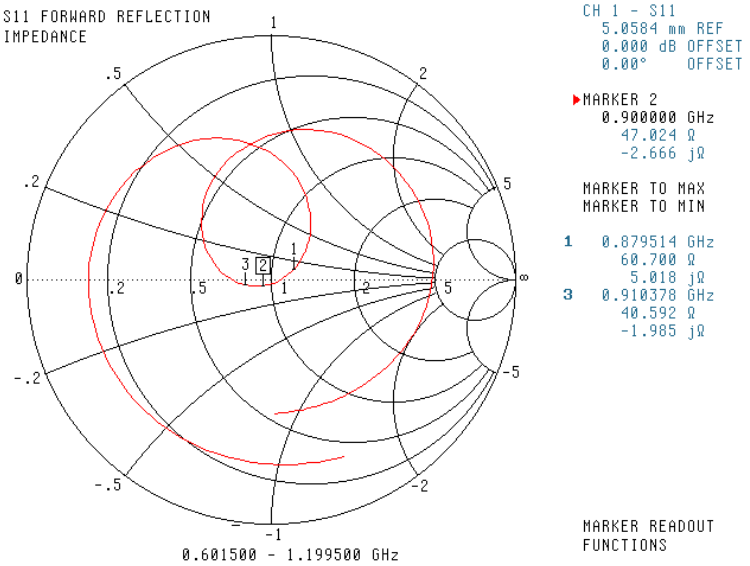


This page has been reviewed for content and attested to by signature within this document.

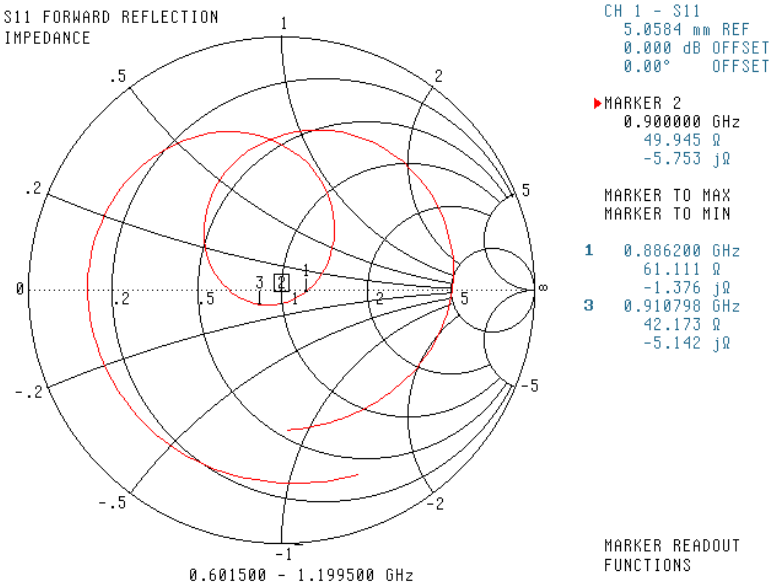
Electrical Specification 900MHz
Impedance

Tissue Type	Measured Epsilon	Measured Sigma
Head	40.19	0.95
Body	53.89	0.98

Head Tissue



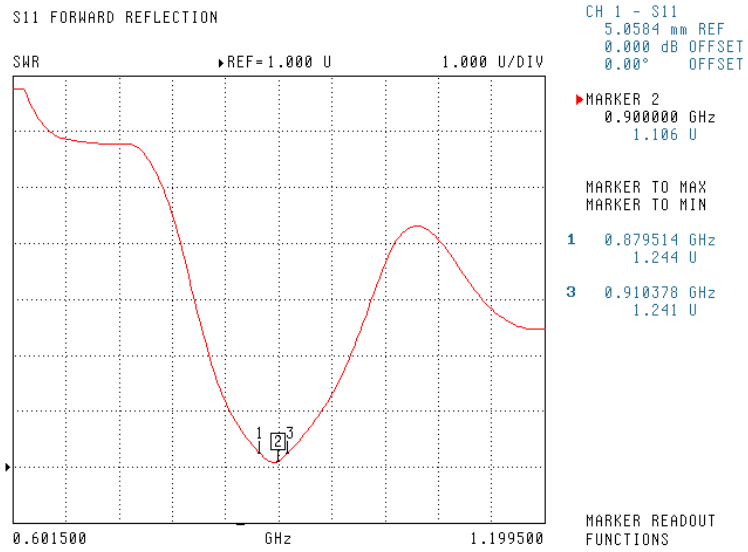
Body Tissue



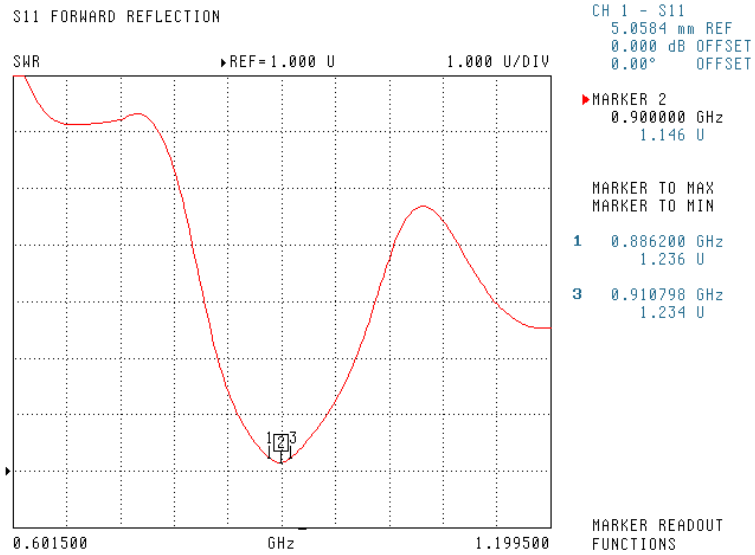
Electrical Specification 900MHz
Standing Wave Ratio

Tissue Type	Measured Epsilon	Measured Sigma
Head	40.19	0.95
Body	53.89	0.98

Head Tissue



Body Tissue



Test Equipment

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

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1221/2
Project Number: SGL-IAC-DC-5582-93

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

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

Validation Dipole
1800MHz Head

Manufacturer: APREL Laboratories
Part number: ALS-D-1800-S-2
Frequency: 1800MHz
Serial No: 200-00657

Customer: IAC

Calibrated: 19th May 2011
Released on: 27th May 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES
303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1
Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

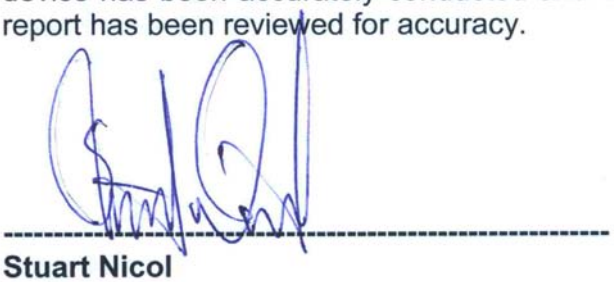
Conditions

Dipole 200-00657 was a re-calibration.

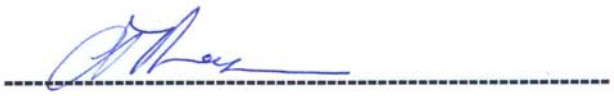
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Dipoles are calibrated on the ALSAS-10U with a feed power normalized to 1Watt.

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	180025437	Nov.4, 2010
Power Sensor Anritsu MA2481D	103555	Nov 4, 2010
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2010
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2011

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2011

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

Calibration Results Summary

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

Mechanical Dimensions

Mechanical Dimensions

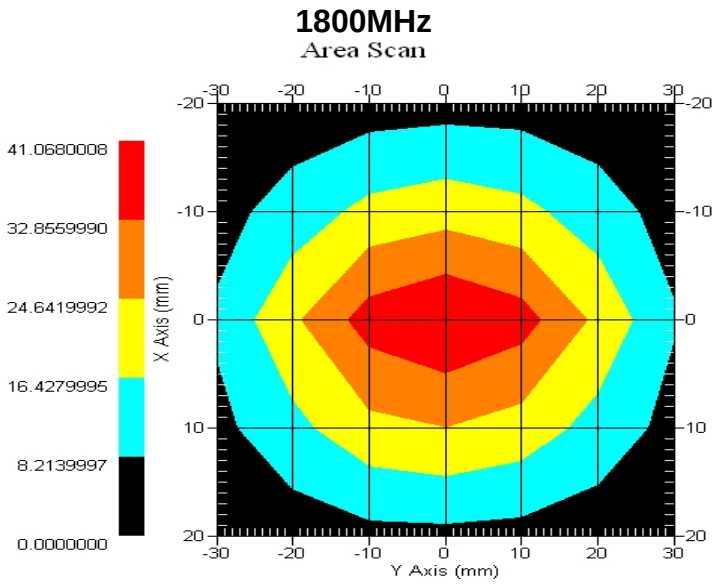
Length: 72.0 mm
Height: 41.2 mm

Electrical Specification 1800MHz

Tissue Type	Return Loss:	Impedance:	SWR:
Head	-29.524	52.089	1.090U
Body	-24.182	56.089	1.133U

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	1800 MHz	37.852	19.248	68.029
Body	1800 MHz	38.102	19.897	70.011



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 200-00657. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

- 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

Conditions

Dipole 200-00657 was a re-calibration.

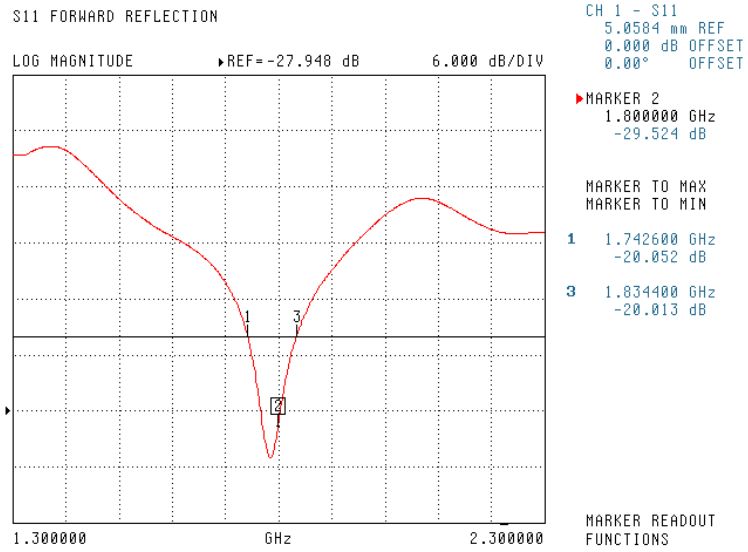
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Electrical Calibration

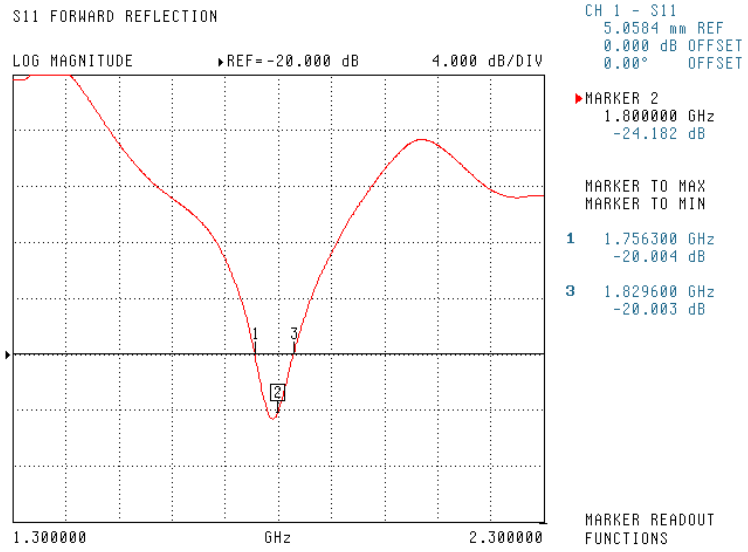
Electrical Specification 1800MHz

Tissue Type	Measured Epsilon	Measured Sigma
Head	39.21	1.37
Body	52.16	1.56

Head Tissue



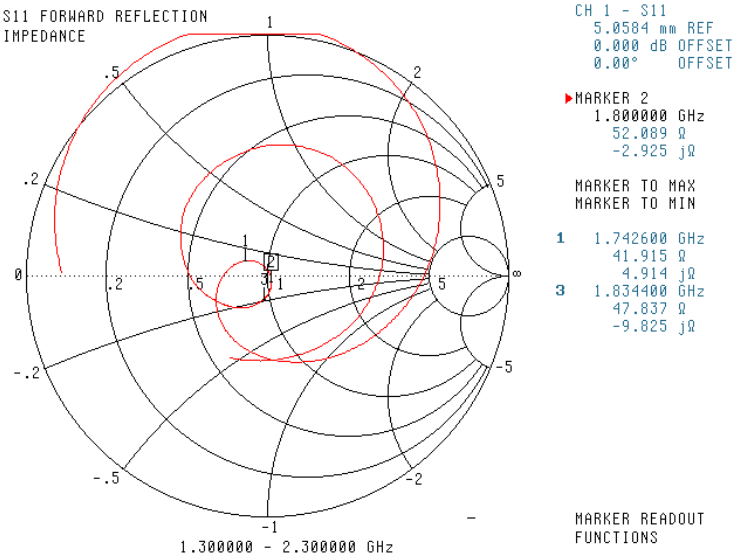
Body Tissue



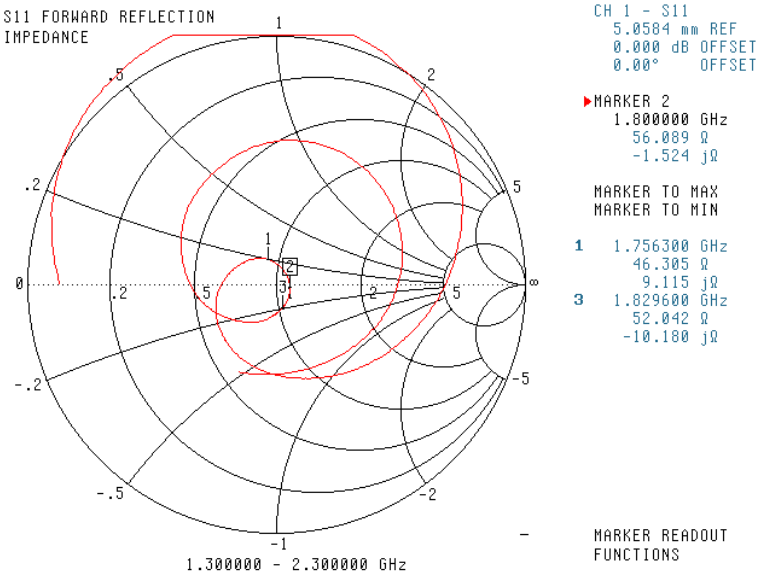
Electrical Specification 1800MHz
Impedance

Tissue Type	Measured Epsilon	Measured Sigma
Head	39.21	1.37
Body	52.16	1.56

Head Tissue



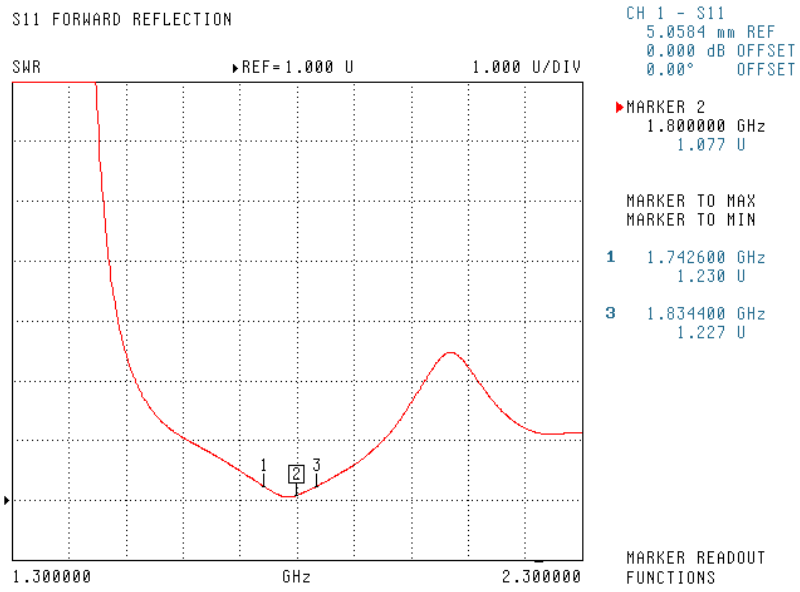
Body Tissue



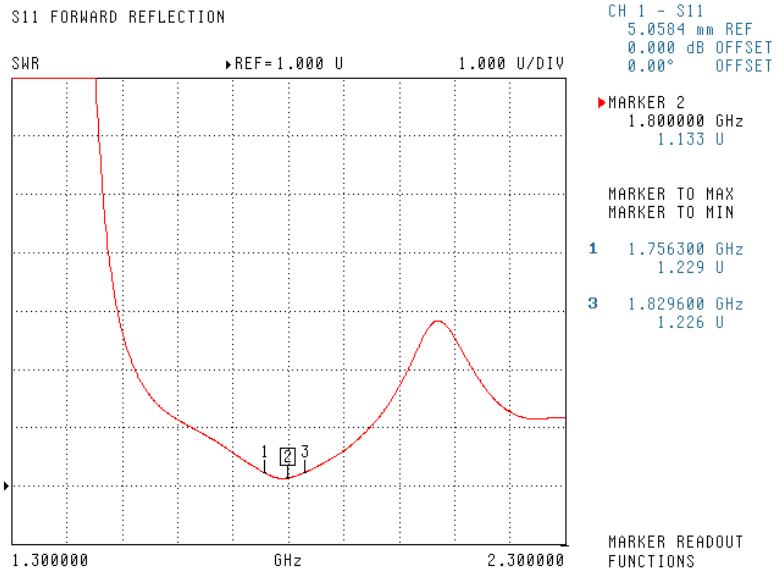
Electrical Specification 1800MHz
Standing Wave Ratio

Tissue Type	Measured Epsilon	Measured Sigma
Head	39.21	1.37
Body	52.16	1.56

Head Tissue



Body Tissue



Test Equipment

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

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1224/5
Project Number: SGL-IAC-DC-5582-93

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

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

Validation Dipole
1900MHz Head & Body

Manufacturer: APREL Laboratories
Part number: ALS-D-1900-S-2
Frequency: 1900MHz
Serial No: 210-00707

Customer: IAC

Calibrated: 16th May 2011
Released on: 27th May 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES
303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1
Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

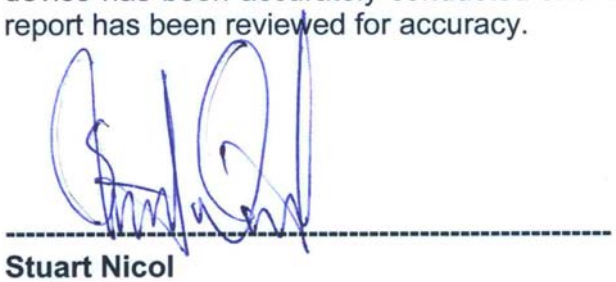
Conditions

Dipole 210-00707 was a new dipole taken from stock.

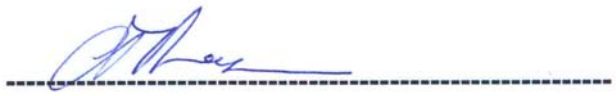
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Dipoles are calibrated on the ALSAS-10U with a feed power normalized to 1Watt.

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	190025437	Nov.4, 2010
Power Sensor Anritsu MA2481D	103555	Nov 4, 2010
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2010
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2011

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2011

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

Calibration Results Summary

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

Mechanical Dimensions

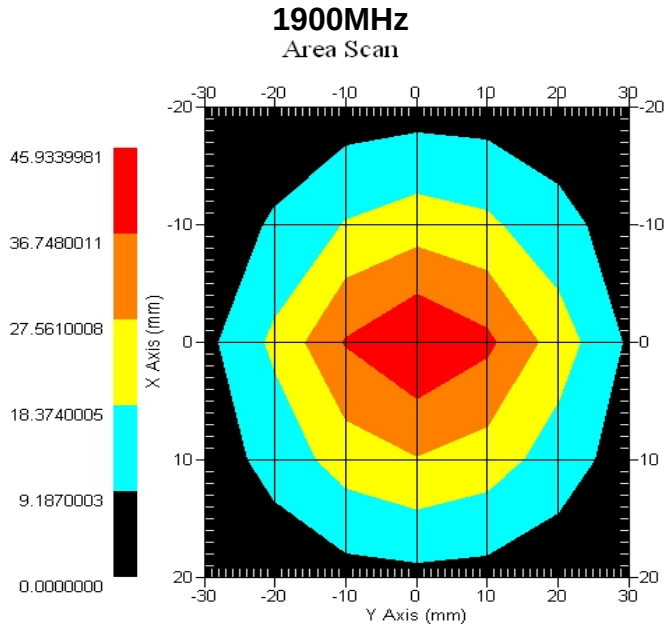
Length: 67.1 mm
Height: 38.9 mm

Electrical Specification 1900MHz

Tissue Type	Return Loss:	Impedance:	SWR:
Head	-31.943	51.262	1.055U
Body	-25.099	57.750	1.119U

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	1900 MHz	39.378	19.668	77.268
Body	1900 MHz	39.654	19.668	77.268



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

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 210-00707. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

- 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

Conditions

Dipole 210-00707 was a new dipole taken from stock.

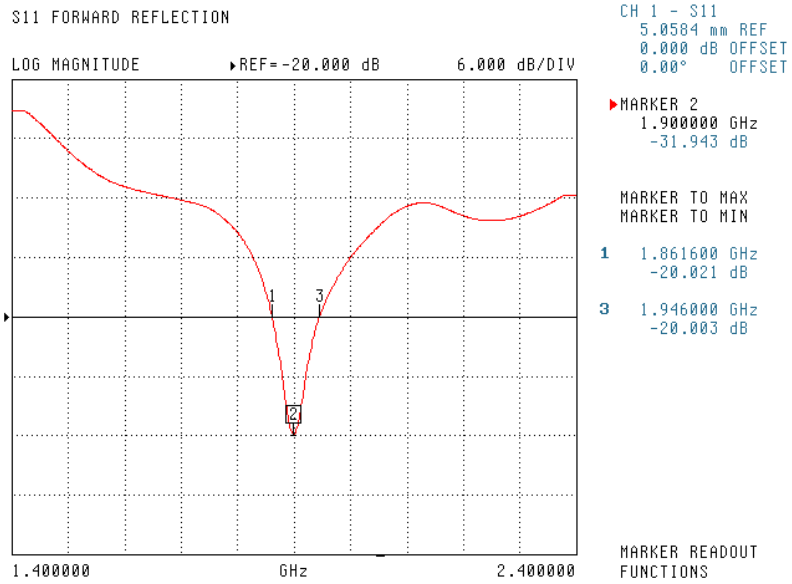
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Electrical Calibration

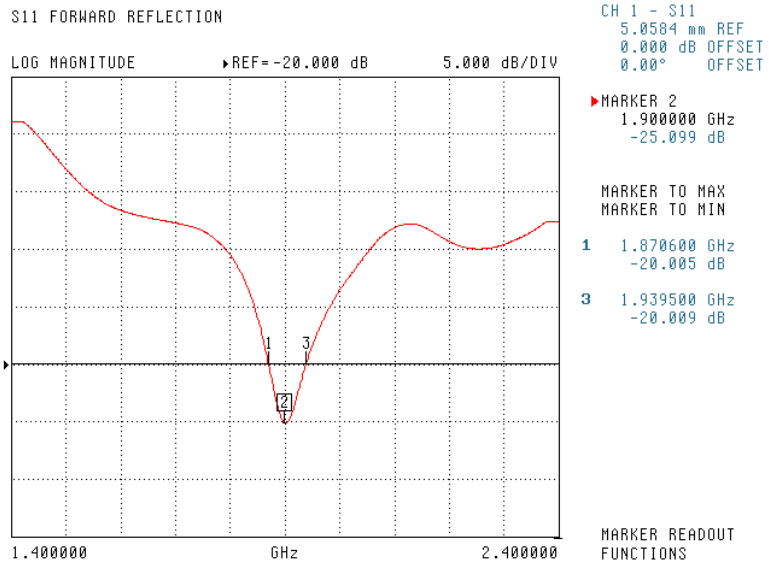
Electrical Specification 1900MHz

Tissue Type	Measured Epsilon	Measured Sigma
Head	38.12	1.41
Body	51.52	1.57

Head Tissue



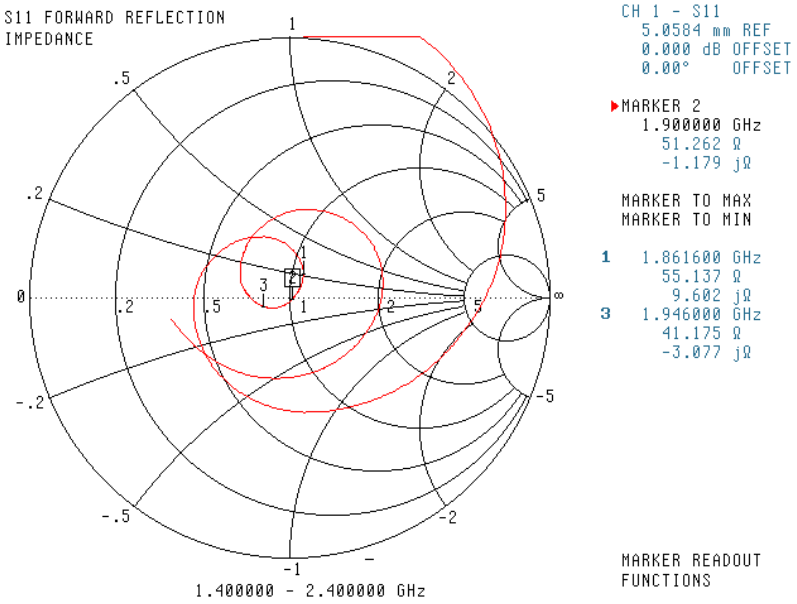
Body Tissue



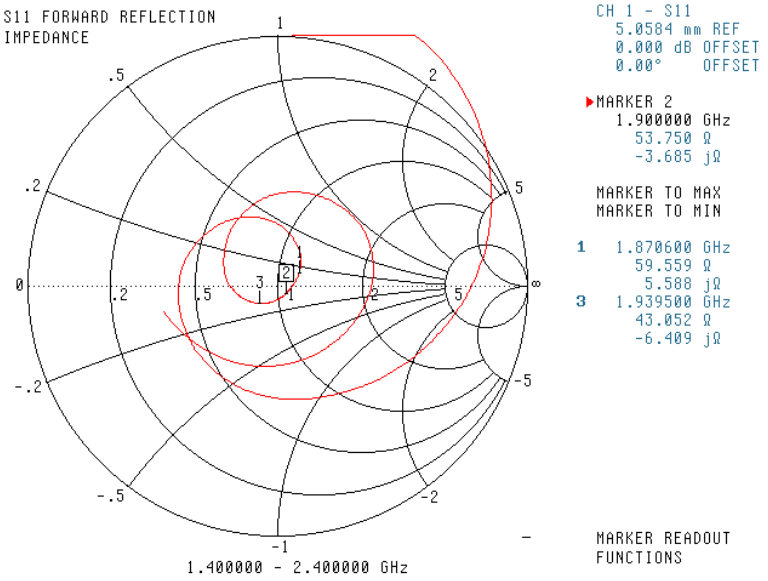
Electrical Specification 1900MHz
Impedance

Tissue Type	Measured Epsilon	Measured Sigma
Head	38.12	1.41
Body	51.52	1.57

Head Tissue



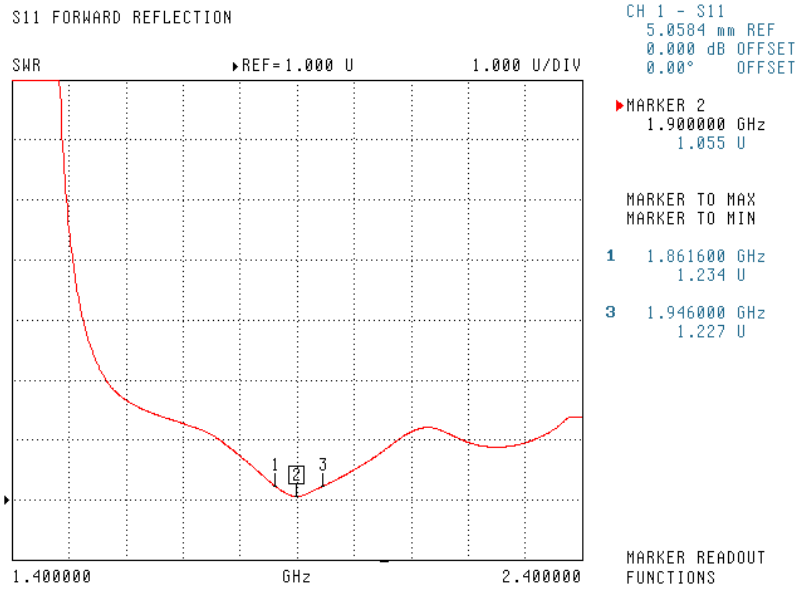
Body Tissue



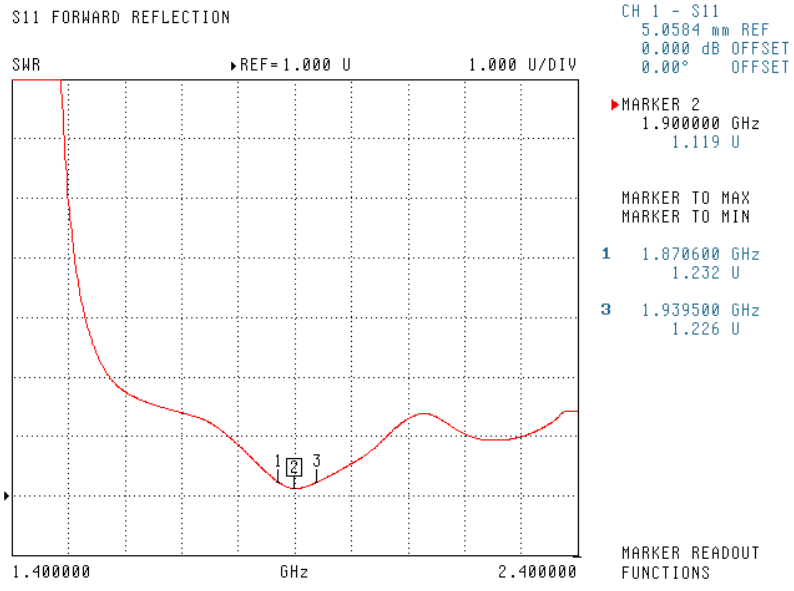
Electrical Specification 1900MHz
Standing Wave Ratio

Tissue Type	Measured Epsilon	Measured Sigma
Head	38.12	1.41
Body	51.52	1.57

Head Tissue



Body Tissue



Test Equipment

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

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1227/8
Project Number: SGL-IAC-DC-5582-93

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

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

Validation Dipole
2100MHz Head & Body

Manufacturer: APREL Laboratories
Part number: ALS-D-2100-S-2
Frequency: 2100MHz
Serial No: 215-00800

Customer: IAC

Calibrated: 16th May 2011
Released on: 27th May 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES
303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1
Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

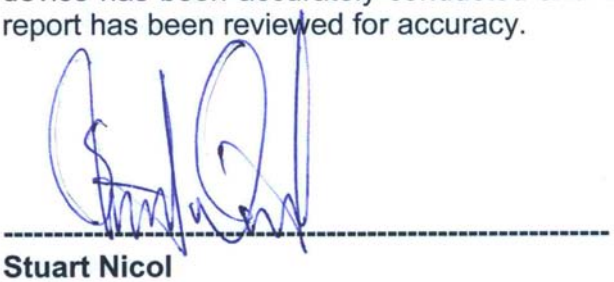
Conditions

Dipole 215-00800 was a re-calibration.

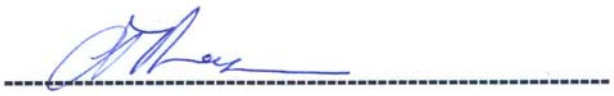
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Dipoles are calibrated on the ALSAS-10U with a feed power normalized to 1Watt.

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	210025437	Nov.4, 2010
Power Sensor Anritsu MA2481D	103555	Nov 4, 2010
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2010
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2011

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2011

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

Calibration Results Summary

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

Mechanical Dimensions

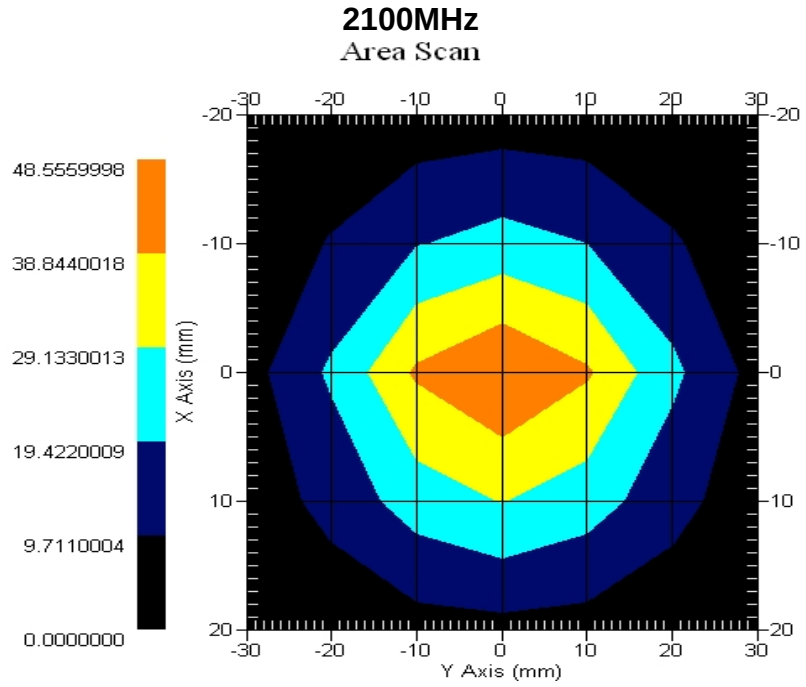
Length: 65.4 mm
Height: 37.5 mm

Electrical Specification 2100MHz

Tissue Type	Return Loss:	Impedance:	SWR:
Head	-28.958	47.271	1.078U
Body	-23.704	44.198	1.141U

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	2100 MHz	43.872	21.004	84.025
Body	2100 MHz	44.210	21.201	84.405



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

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 215-00800. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

- 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

Conditions

Dipole 215-00800 was a re-calibration.

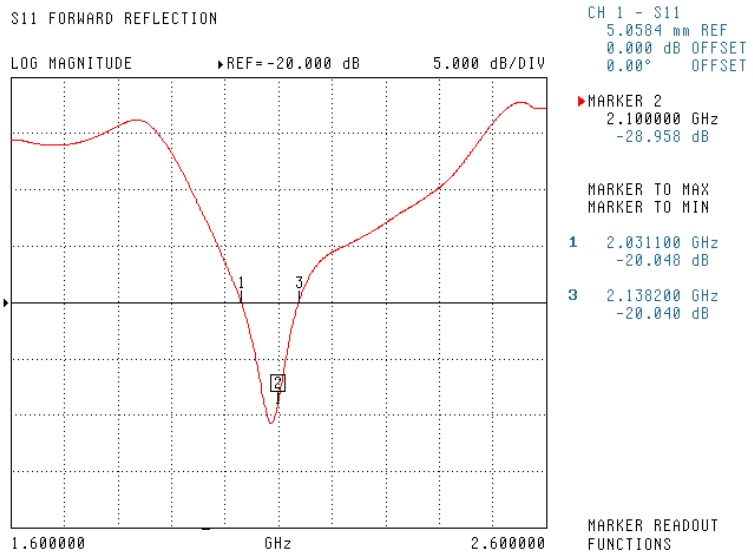
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Electrical Calibration

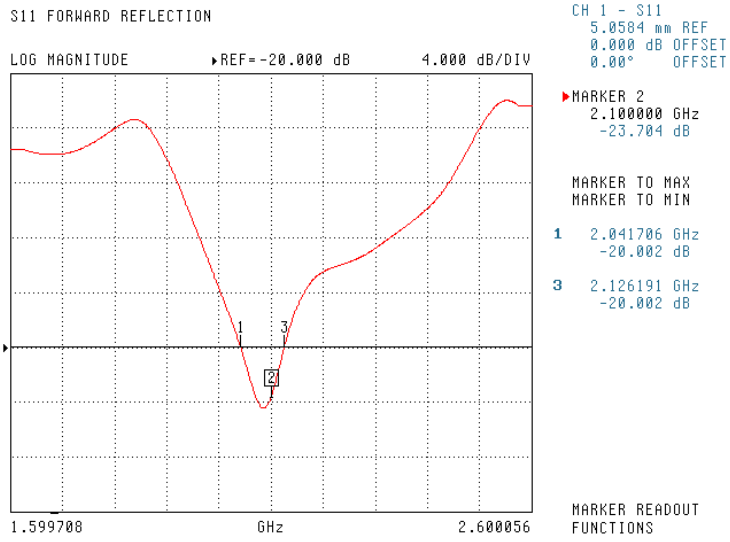
Electrical Specification 2100MHz

Tissue Type	Measured Epsilon	Measured Sigma
Head	39.83	1.41
Body	52.55	1.49

Head Tissue



Body Tissue

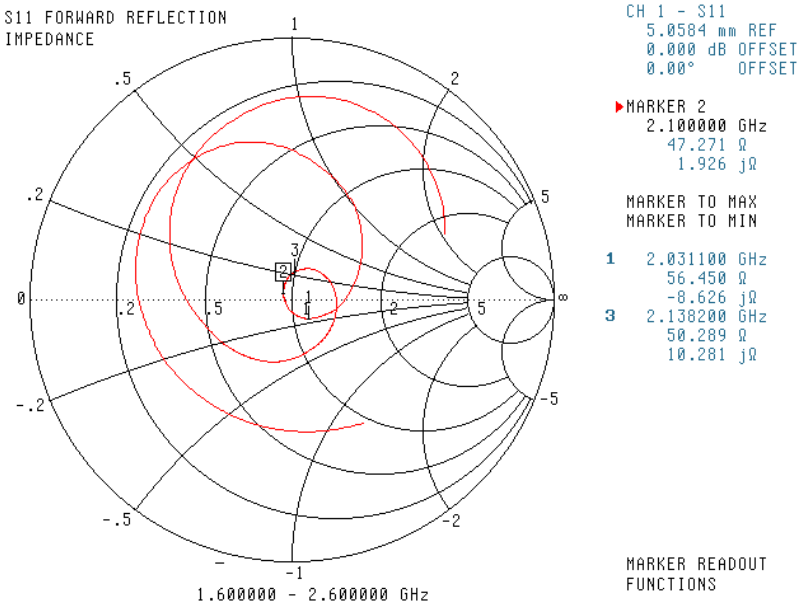


This page has been reviewed for content and attested to by signature within this document.

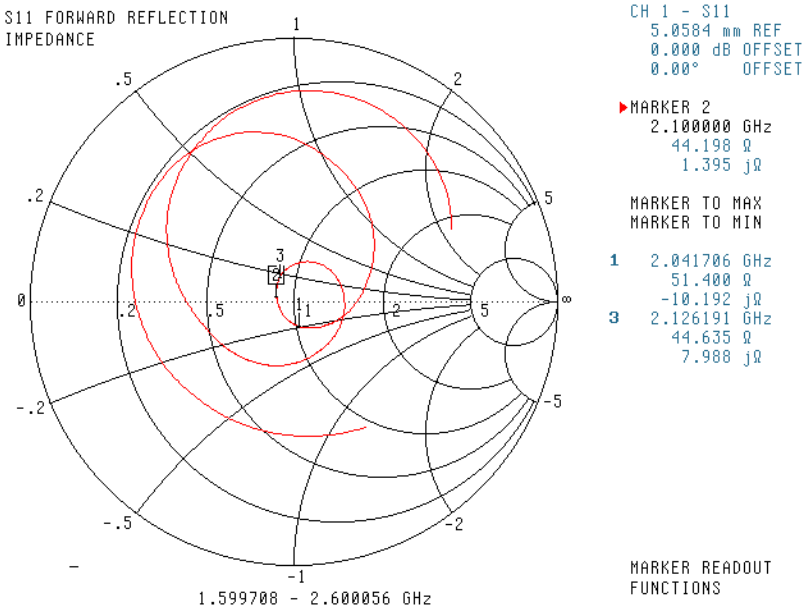
Electrical Specification 2100MHz
Impedance

Tissue Type	Measured Epsilon	Measured Sigma
Head	39.83	1.41
Body	52.55	1.49

Head Tissue



Body Tissue

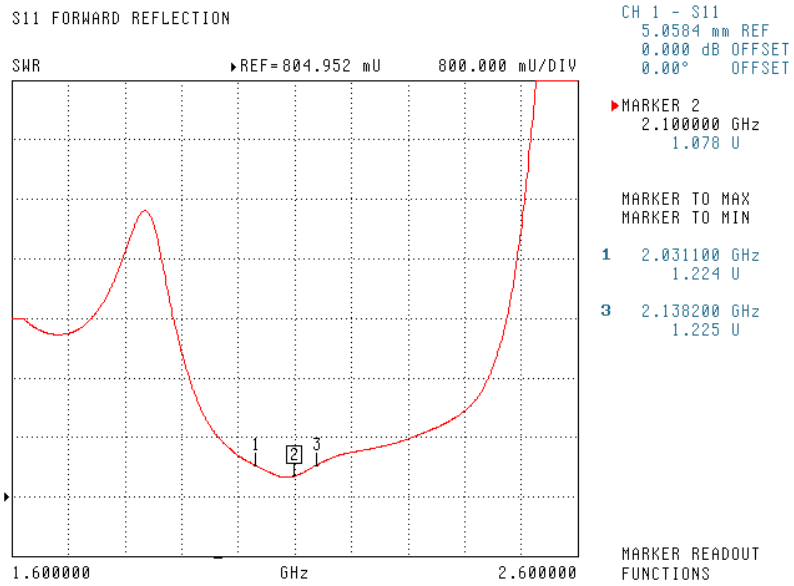


This page has been reviewed for content and attested to by signature within this document.

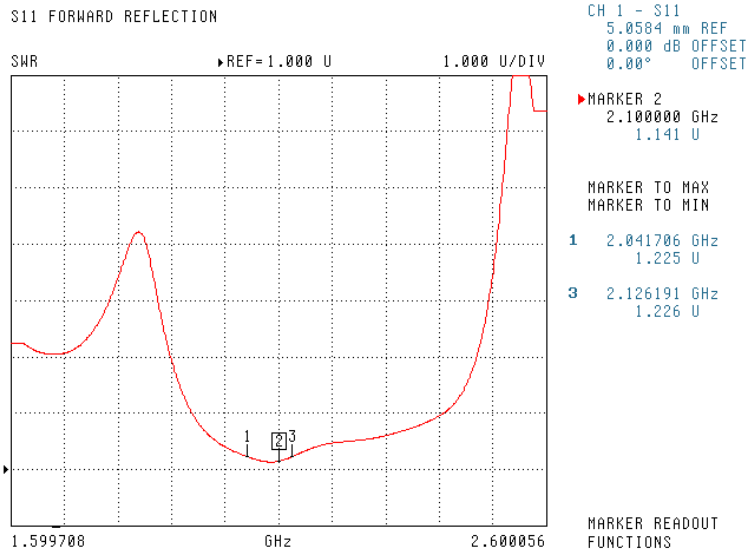
Electrical Specification 2100MHz
Standing Wave Ratio

Tissue Type	Measured Epsilon	Measured Sigma
Head	39.83	1.41
Body	52.55	1.49

Head Tissue



Body Tissue



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

Test Equipment

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

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1229/30
Project Number: SGL-IAC-DC-5582-93

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

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

Validation Dipole
2450MHz Head & Body

Manufacturer: APREL Laboratories
Part number: ALS-D-2450-S-2
Frequency: 2450MHz
Serial No: 220-00755

Customer: IAC

Calibrated: 19th May 2011
Released on: 27th May 2011

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

Released By: _____

NCL CALIBRATION LABORATORIES
303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1
Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

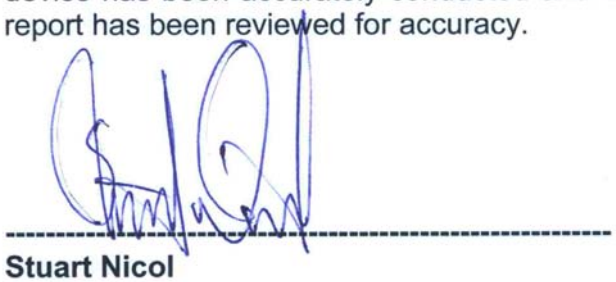
Conditions

Dipole 220-00755 was a re-calibration.

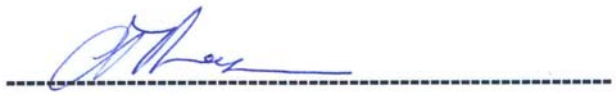
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Dipoles are calibrated on the ALSAS-10U with a feed power normalized to 1Watt.

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, 2010
Power Sensor Anritsu MA2481D	103555	Nov 4, 2010
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2010
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2011

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2011

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

Calibration Results Summary

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

Mechanical Dimensions

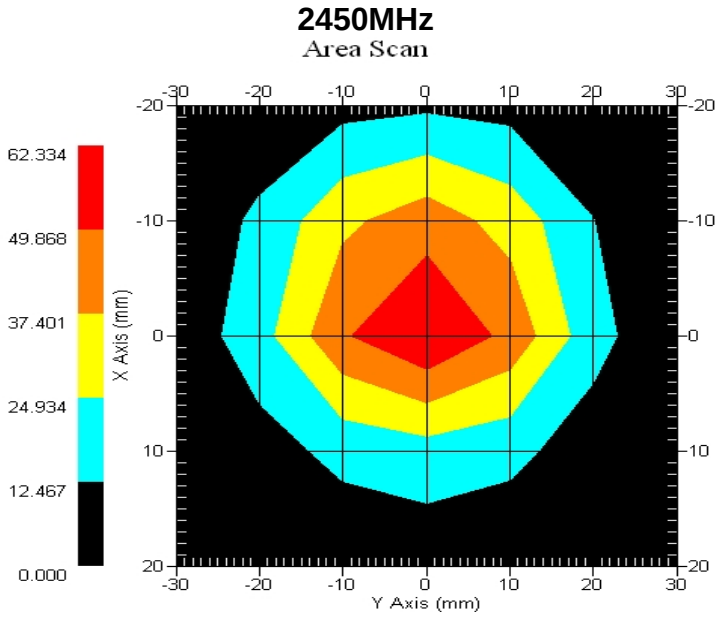
Length: 51.5 mm
Height: 30.4 mm

Electrical Specification 2450MHz

Tissue Type	Return Loss:	Impedance:	SWR:
Head	-34.847	50.047	1.038U
Body	-32.513	50.190	1.029U

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	2450 MHz	52.456	23.603	108.940
Body	2450 MHz	52.592	24.461	104.910



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

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 220-00755. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

- 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

Conditions

Dipole 220-00755 was a new dipole taken from stock.

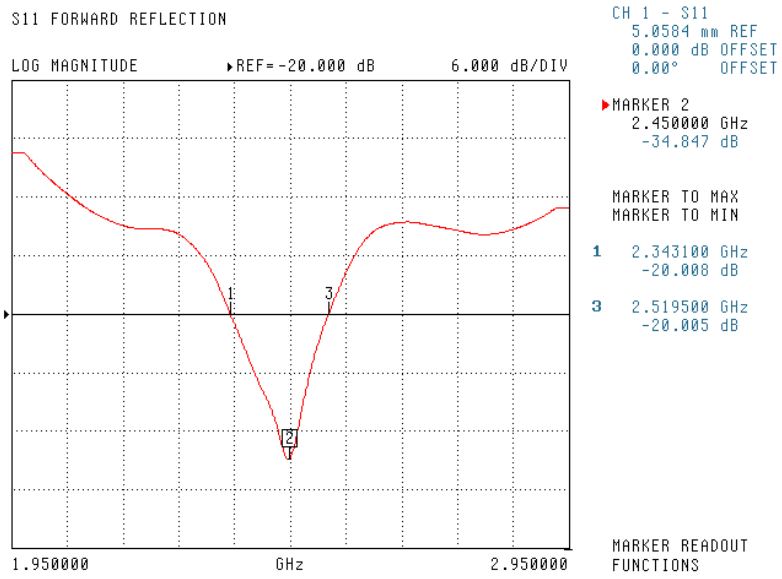
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Electrical Calibration

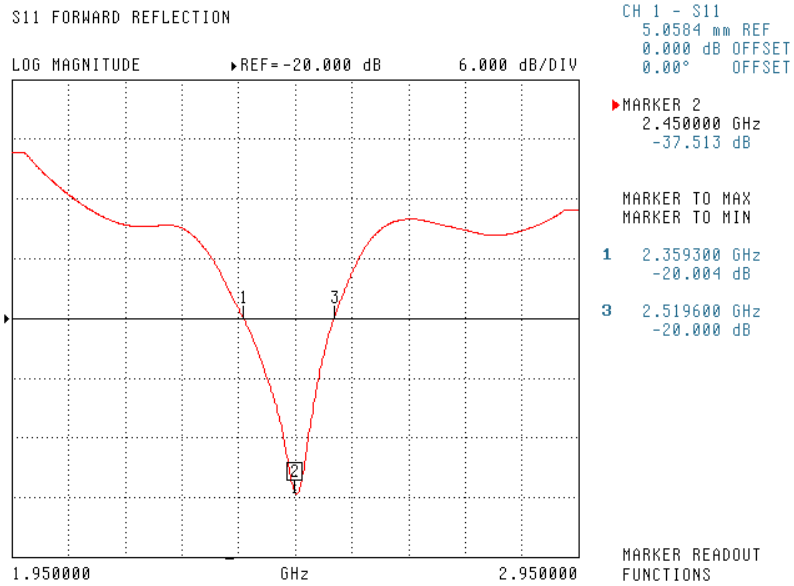
Electrical Specification 2450MHz

Tissue Type	Measured Epsilon	Measured Sigma
Head	37.87	1.82
Body	50.84	1.92

Head Tissue



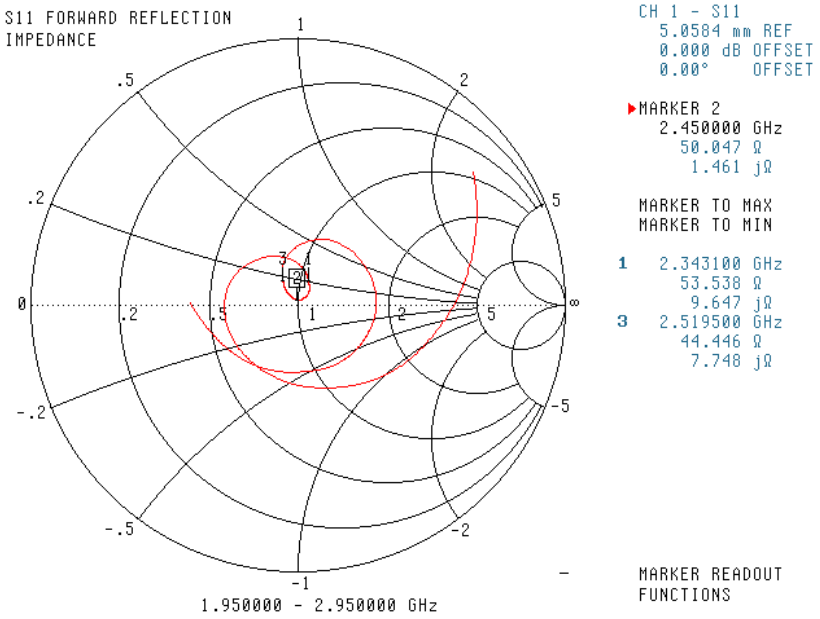
Body Tissue



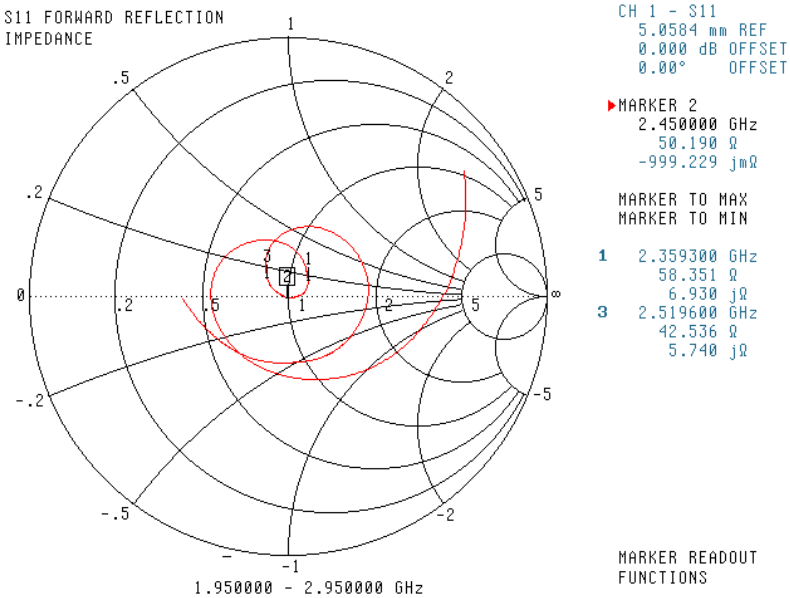
Electrical Specification 2450MHz
Impedance

Tissue Type	Measured Epsilon	Measured Sigma
Head	37.87	1.82
Body	50.84	1.92

Head Tissue



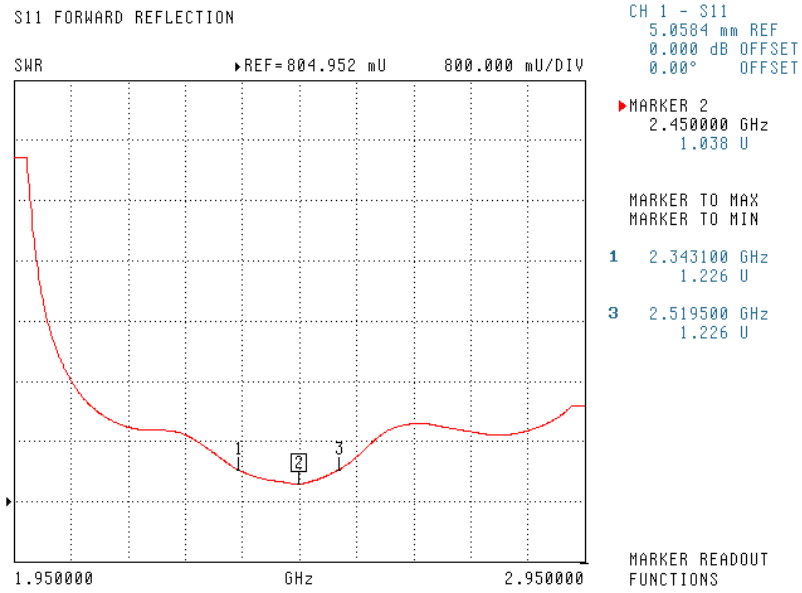
Body Tissue



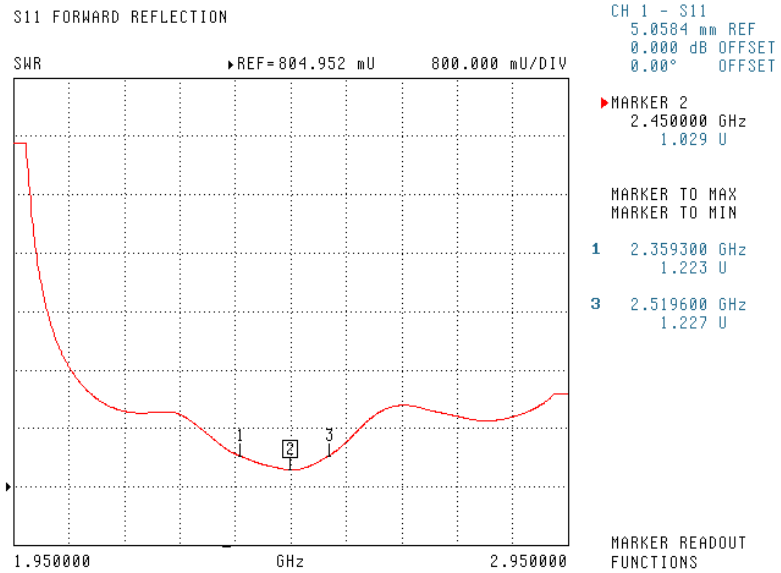
Electrical Specification 2450MHz
Standing Wave Ratio

Tissue Type	Measured Epsilon	Measured Sigma
Head	37.87	1.82
Body	50.84	1.92

Head Tissue



Body Tissue



Test Equipment

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