

SAR EVALUATION REPORT

For

Cellon Communications Technology (Shenzhen) Co., Ltd.

13/F, Skyworth C Building, Gaoxin S.Ave1, Hi-Tech Industrial Park,

Nanshan, Shenzhen, Guangdong, 518057 China

FCC ID: T38UT2001

| | |
|--|--|
| Report Type: Original Report | Product Type: GSM&GPRS Dual Band Mobile Phone |
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| Report Number: RSZ09040201-SAR | |
| Report Date: 2009-05-06 | |
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*".


| Summary of Test Results | |
|--|--|
| Rule Part(s): | CFR 47 §2.1093 |
| Test Procedure(s): | FCC OET Bulletin 65C IEEE 1528-2003 |
| Device Type: | Portable device |
| Exposure Category | Population/Uncontrolled |
| Modulation: | GMSK |
| TX Frequency Range: | 824-849 MHz (Cellular Band) 1850-1910 MHz (PCS Band) |
| Maximum Conducted Power Tested: | 31.99 dBm (Cellular Band) 28.53 dBm(PCS Band) |
| Antenna Type(s): | Internal Antenna |
| Body-Worn Accessories: | Headset |
| Face-Head Accessories: | None |
| Max. SAR Level(s) Measured: | 1.310 W/Kg 1g Head Tissue (Cellular Band) 0.579 W/Kg 1g Body Tissue (Cellular Band) 0.414 W/Kg 1g Head Tissue (PCS Band) 0.425 W/Kg 1g Body Tissue (PCS Band) |
| <p>This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C and IEEE 1528-2003.</p> <p>The results and statements contained in this report pertain only to the device(s) evaluated.</p> | |
| <div style="text-align: center;">  </div> <p>EUT Photo</p> | |

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REFERENCE, STANDARDS, AND GUIDELINES

FCC:

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

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

CE:

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by the EN50360 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

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

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

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

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

CE Limit (10g Tissue)

| EXPOSURE LIMITS | SAR (W/kg) | |
|--|--|--|
| | (General Population / Uncontrolled Exposure Environment) | (Occupational / Controlled Exposure Environment) |
| Spatial Average (averaged over the whole body) | 0.08 | 0.4 |
| Spatial Peak (averaged over any 1 g of tissue) | 2.0 | 10 |
| Spatial Peak (hands/wrists/feet/ankles averaged over 10 g) | 4.0 | 20.0 |

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

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

EUT DESCRIPTION

This Bay Area Compliance Laboratories Corp. test report has been prepared on behalf of Cellon Communications Technology (Shenzhen) Co., Ltd. and their product, model: C2001, FCC ID: T38UT2001 or the EUT (Equipment Under Test) as referred to in the rest of this report.

Technical Specification

| Item | Content |
|--------------------|---|
| Modulation | GMSK |
| Frequency Band | Cellular Band: 824-849 MHz 869-894 MHz PCS Band: 1850-1910 MHz 1930-1990 MHz |
| Dimensions (L*W*H) | 97mm (L)× 43mm (W)× 13mm (H) |
| Weight | 60 g |
| Power Source | 3.7 Vdc/680mAh Rechargeable Battery |
| Normal Operation | Head and Body-worn |

EUT Photo



*Model: C2001
Please refer to Appendix H*

FACILITIES AND ACCREDITATION

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect data is located at

6/F, the 3rd Phase of WanLi Industrial Building,
Shi Hua Road, Fu Tian Free Trade Zone,
Shenzhen, Guangdong, P.R. of China

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



NVLAP LAB CODE 200707-0

The current scope of accreditations can be found at
<http://ts.nist.gov/Standards/scopes/2007070.htm>

DESCRIPTION OF TEST SYSTEM

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



ALSAS-10U System Description

ALSAS-10-U is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller. ALSAS-10U uses the latest methodologies. And FDTD modeling to provide a platform which is repeatable with minimum uncertainty.

Applications

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

Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm² step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments. Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the ALSAS-10U software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

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

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

ALSAS-10U Interpolation and Extrapolation Uncertainty

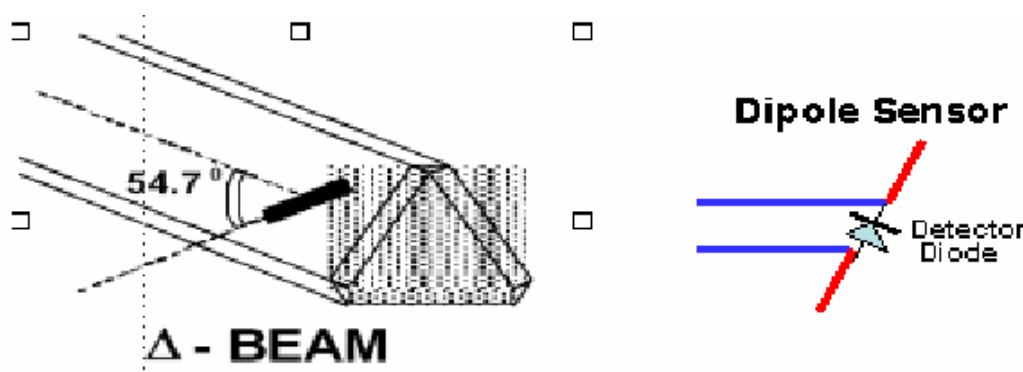
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

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

Isotropic E-Field Probe

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

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



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

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

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

Isotropic E-Field Probe Specification

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

Boundary Detection Unit and Probe Mounting Device

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

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

Daq-Paq (Analog to Digital Electronics)

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

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

Axis Articulated Robot

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



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

ALSAS Universal Workstation

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

Universal Device Positioner

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

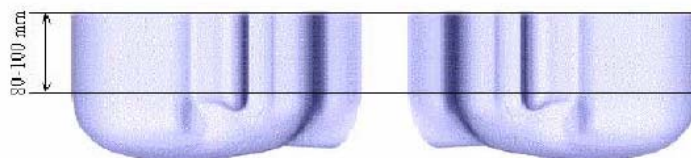


Phantom Types

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

APREL SAM Phantoms

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



APREL Laboratories Universal Phantom

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

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

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



Tissue Dielectric Parameters for Head and Body Phantoms

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

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

IEEE SCC-34/SC-2 P1528 Recommended Tissue Dielectric Parameters

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

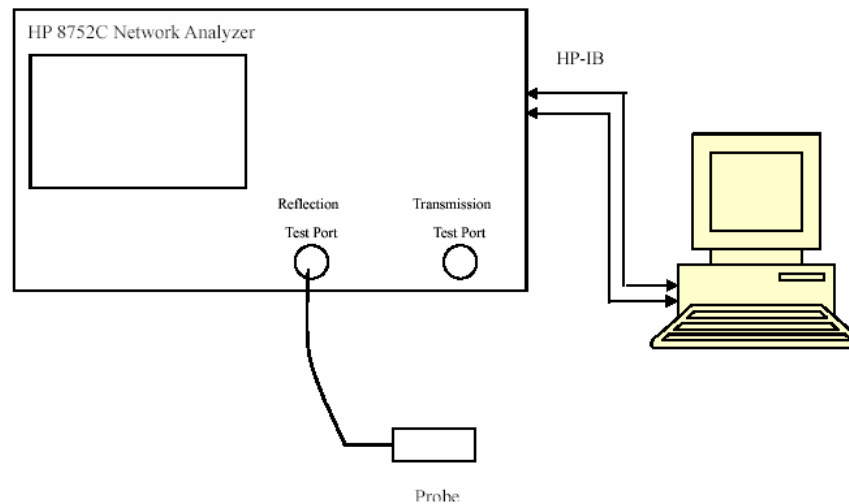
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Info

| Equipment | Model | Calibration Due Date | S/N: |
|--|----------------|----------------------|--------------|
| CRS F3 robot | ALS-F3 | N/A | RAF0805352 |
| CRS F3 Software | ALS-F3-SW | N/A | N/A |
| CRS C500C controller | ALS-C500 | N/A | RCF0805379 |
| Probe mounting device & Boundary Detection Sensor System | ALS-PMDPS-3 | N/A | 120-00270 |
| Universal Work Station | ALS-UWS | N/A | 100-00157 |
| Data Acquisition Package | ALS-DAQ-PAQ-3 | N/A | 110-00212 |
| Miniature E-Field Probe | ALS-E-020 | 2009-08-01 | 273 |
| Dipole, 835MHz | ALS-D-835-S-2 | 2009-08-01 | 180-00558 |
| Dipole,1900MHz | ALS-D-1900-S-2 | 2009-08-01 | 210-00710 |
| Dipole Spacer | ALS-DS-U | N/A | 250-00907 |
| R&S, universal Radio Communication Tester | CMU200 | 2008-06-21 | 1100.0008.02 |
| Device holder/Positioner | ALS-H-E-SET-2 | N/A | 170-00510 |
| Left ear SAM phantom | ALS-P-SAM-L | N/A | 130-00311 |
| Right ear SAM phantom | ALS-P-SAM-R | N/A | 140-00359 |
| UniPhantom | ALS-P-UP-1 | N/A | 150-00413 |
| Simulated Tissue 835 MHz Head | ALS-T-835-1-H | Each Time | 270-01002 |
| Simulated Tissue 835 MHz Body | ALS-T-835-1-B | Each Time | 270-02101 |
| Simulated Tissue 1900 MHz Head | ALS-T-1900-1-H | Each Time | 295-01103 |
| Simulated Tissue 1900 MHz Body | ALS-T-1900-1-B | Each Time | 295-02102 |
| Signal Generator | HP8341B | 2009-11-06 | 2624A00116 |
| Power Amplifier | 5S1G4 | N/A | 71377 |
| Spectrum Analyzer | FSEM30 | 2009-05-08 | 849720/019 |

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

| Frequency (MHz) | Liquid Type | Liquid Parameter | | Result |
|-----------------|-------------|------------------|----------------|--------------|
| | | ϵ_r | σ (S/m) | |
| 850 | Head | 39.94 | 0.87 | In Tolerance |
| 850 | Body | 55.17 | 0.98 | In Tolerance |
| 1900 | Head | 39.39 | 1.47 | In Tolerance |
| 1900 | Body | 52.73 | 1.56 | In Tolerance |

Please refer to the following tables.

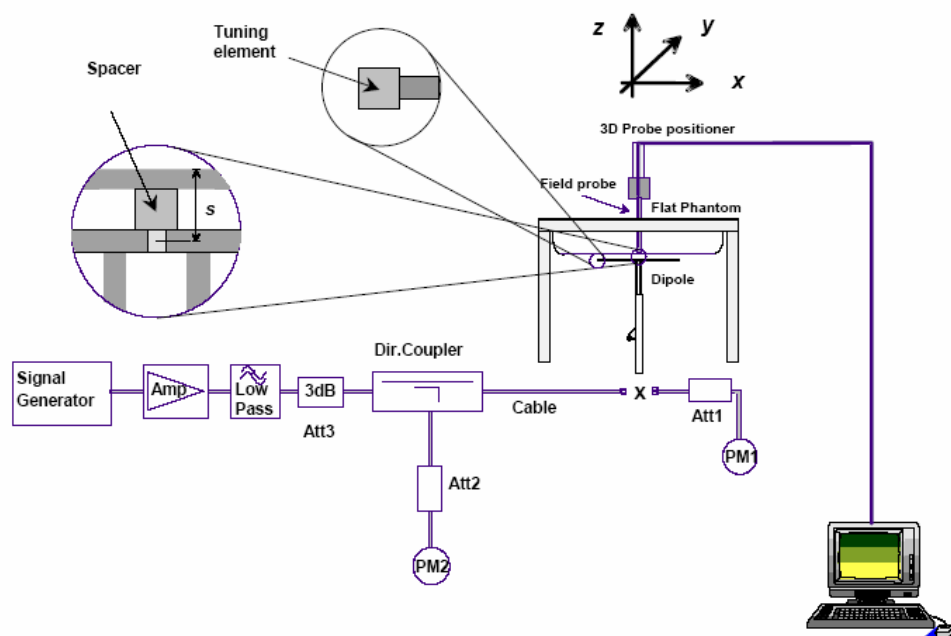
| 850 MHz Head | | | | 850 MHz Body | | |
|--------------|-----------|----------|--|--------------|-----------|-----------|
| Frequency | e' | e'' | | Frequency | e' | e'' |
| 824000000 | 40.029865 | 18.61233 | | 824000000 | 55.237778 | 21.276034 |
| 824500000 | 40.071240 | 18.67464 | | 824500000 | 55.261843 | 21.29966 |
| 825000000 | 40.070036 | 18.69563 | | 825000000 | 55.281151 | 21.280279 |
| 825500000 | 40.051815 | 18.65283 | | 825500000 | 55.308427 | 21.252340 |
| 826000000 | 40.063437 | 18.70183 | | 826000000 | 55.275594 | 21.257914 |
| 826500000 | 40.001918 | 18.71266 | | 826500000 | 55.236672 | 21.276899 |
| 827000000 | 40.040322 | 18.74388 | | 827000000 | 55.274861 | 21.278316 |
| 827500000 | 40.029129 | 18.74645 | | 827500000 | 55.242787 | 21.300332 |
| 828000000 | 40.028530 | 18.65200 | | 828000000 | 55.218219 | 21.252779 |
| 828500000 | 40.045123 | 18.69942 | | 828500000 | 55.232601 | 21.279685 |
| 829000000 | 40.004395 | 18.68908 | | 829000000 | 55.199535 | 21.268751 |
| 829500000 | 40.026259 | 18.75582 | | 829500000 | 55.268717 | 21.263965 |
| 830000000 | 40.014039 | 18.69609 | | 830000000 | 55.196831 | 21.267632 |
| 830500000 | 39.998929 | 18.74141 | | 830500000 | 55.179712 | 21.239705 |
| 831000000 | 39.983075 | 18.74523 | | 831000000 | 55.240298 | 21.271246 |
| 831500000 | 40.010490 | 18.71655 | | 831500000 | 55.208625 | 21.204610 |
| 832000000 | 39.996512 | 18.68872 | | 832000000 | 55.206147 | 21.215507 |
| 832500000 | 39.961408 | 18.69780 | | 832500000 | 55.175802 | 21.181681 |
| 833000000 | 39.938652 | 18.71390 | | 833000000 | 55.166104 | 21.173241 |
| 833500000 | 39.903683 | 18.72295 | | 833500000 | 55.202313 | 21.169551 |
| 834000000 | 39.904754 | 18.71187 | | 834000000 | 55.125158 | 21.186612 |
| 834500000 | 39.949605 | 18.70961 | | 834500000 | 55.206521 | 21.171289 |
| 835000000 | 39.936642 | 18.72304 | | 835000000 | 55.170517 | 21.194855 |
| 835500000 | 39.887012 | 18.71543 | | 835500000 | 55.137415 | 21.167814 |
| 836000000 | 39.891626 | 18.69826 | | 836000000 | 55.141796 | 21.181547 |
| 836500000 | 39.914557 | 18.74829 | | 836500000 | 55.224754 | 21.170904 |
| 837000000 | 39.882111 | 18.80305 | | 837000000 | 55.148334 | 21.231758 |
| 837500000 | 39.917227 | 18.74660 | | 837500000 | 55.184454 | 21.227808 |
| 838000000 | 39.849630 | 18.72859 | | 838000000 | 55.147454 | 21.218830 |
| 838500000 | 39.874726 | 18.71099 | | 838500000 | 55.138509 | 21.182769 |
| 839000000 | 39.882452 | 18.72383 | | 839000000 | 55.124376 | 21.176093 |
| 839500000 | 39.856777 | 18.74580 | | 839500000 | 55.091013 | 21.247802 |
| 840000000 | 39.838847 | 18.68361 | | 840000000 | 55.191306 | 21.197366 |
| 840500000 | 39.839714 | 18.70854 | | 840500000 | 55.089472 | 21.175170 |
| 841000000 | 39.809432 | 18.73176 | | 841000000 | 55.144866 | 21.207305 |
| 841500000 | 39.823662 | 18.71205 | | 841500000 | 55.120975 | 21.231646 |
| 842000000 | 39.778773 | 18.71885 | | 842000000 | 55.136218 | 21.230030 |
| 842500000 | 39.817214 | 18.71292 | | 842500000 | 55.073442 | 21.209406 |
| 843000000 | 39.828317 | 18.66352 | | 843000000 | 55.171059 | 21.181531 |
| 843500000 | 39.783754 | 18.72633 | | 843500000 | 55.074569 | 21.228367 |
| 844000000 | 39.751487 | 18.70423 | | 844000000 | 55.127668 | 21.212099 |
| 844500000 | 39.764301 | 18.77146 | | 844500000 | 55.102610 | 21.204280 |
| 845000000 | 39.775727 | 18.68649 | | 845000000 | 55.091418 | 21.218215 |
| 845500000 | 39.700058 | 18.72729 | | 845500000 | 55.115836 | 21.240050 |
| 846000000 | 39.734988 | 18.72732 | | 846000000 | 55.093158 | 21.280057 |
| 846500000 | 39.716574 | 18.68128 | | 846500000 | 55.110908 | 21.228596 |
| 847000000 | 39.749343 | 18.78320 | | 847000000 | 55.166660 | 21.303045 |
| 847500000 | 39.705883 | 18.68341 | | 847500000 | 55.151950 | 21.307414 |
| 848000000 | 39.664080 | 18.73503 | | 848000000 | 55.151372 | 21.209045 |
| 848500000 | 39.639024 | 18.70112 | | 848500000 | 55.113865 | 21.265495 |
| 849000000 | 39.653604 | 18.73702 | | 849000000 | 55.101348 | 21.247453 |

| 1900 MHz Head | | | | 1900 MHz Body | | |
|---------------|-----------|----------|--|---------------|-----------|-----------|
| Frequency | e' | e'' | | Frequency | e' | e'' |
| 1850000000 | 39.316921 | 13.59078 | | 1850000000 | 52.737675 | 14.507589 |
| 1851200000 | 39.289902 | 13.61856 | | 1851200000 | 52.694928 | 14.505025 |
| 1852400000 | 39.296692 | 13.61347 | | 1852400000 | 52.739146 | 14.498111 |
| 1853600000 | 39.280434 | 13.61962 | | 1853600000 | 52.723112 | 14.501081 |
| 1854800000 | 39.261686 | 13.63630 | | 1854800000 | 52.708402 | 14.513678 |
| 1856000000 | 39.300138 | 13.63867 | | 1856000000 | 52.734113 | 14.494067 |
| 1857200000 | 39.284765 | 13.64131 | | 1857200000 | 52.723342 | 14.474231 |
| 1858400000 | 39.268056 | 13.64175 | | 1858400000 | 52.686870 | 14.498953 |
| 1859600000 | 39.245064 | 13.66106 | | 1859600000 | 52.727178 | 14.491682 |
| 1860800000 | 39.255322 | 13.68080 | | 1860800000 | 52.714200 | 14.510144 |
| 1862000000 | 39.251260 | 13.70642 | | 1862000000 | 52.708181 | 14.540465 |
| 1863200000 | 39.217396 | 13.69352 | | 1863200000 | 52.706455 | 14.563344 |
| 1864400000 | 39.233085 | 13.72185 | | 1864400000 | 52.719809 | 14.558273 |
| 1865600000 | 39.217316 | 13.71876 | | 1865600000 | 52.688186 | 14.535280 |
| 1866800000 | 39.225587 | 13.71573 | | 1866800000 | 52.687732 | 14.571536 |
| 1868000000 | 39.234908 | 13.72404 | | 1868000000 | 52.692727 | 14.544879 |
| 1869200000 | 39.244983 | 13.75282 | | 1869200000 | 52.703816 | 14.581769 |
| 1870400000 | 39.234338 | 13.76751 | | 1870400000 | 52.716561 | 14.588098 |
| 1871600000 | 39.246700 | 13.74693 | | 1871600000 | 52.699973 | 14.606178 |
| 1872800000 | 39.230423 | 13.78609 | | 1872800000 | 52.719983 | 14.620475 |
| 1874000000 | 39.238740 | 13.75902 | | 1874000000 | 52.689490 | 14.578440 |
| 1875200000 | 39.221425 | 13.81079 | | 1875200000 | 52.707723 | 14.626990 |
| 1876400000 | 39.232681 | 13.80283 | | 1876400000 | 52.714703 | 14.634824 |
| 1877600000 | 39.233734 | 13.83117 | | 1877600000 | 52.711090 | 14.663078 |
| 1878800000 | 39.256580 | 13.83691 | | 1878800000 | 52.746440 | 14.678058 |
| 1880000000 | 39.253631 | 13.85876 | | 1880000000 | 52.693101 | 14.671175 |
| 1881200000 | 39.265198 | 13.86552 | | 1881200000 | 52.730691 | 14.680405 |
| 1882400000 | 39.249633 | 13.86233 | | 1882400000 | 52.721742 | 14.666288 |
| 1883600000 | 39.286996 | 13.85290 | | 1883600000 | 52.754126 | 14.665671 |
| 1884800000 | 39.278522 | 13.89914 | | 1884800000 | 52.734418 | 14.675808 |
| 1886000000 | 39.291945 | 13.88971 | | 1886000000 | 52.733842 | 14.646770 |
| 1887200000 | 39.303997 | 13.85424 | | 1887200000 | 52.754063 | 14.660734 |
| 1888400000 | 39.299350 | 13.89205 | | 1888400000 | 52.742009 | 14.671217 |
| 1889600000 | 39.324021 | 13.88148 | | 1889600000 | 52.729971 | 14.681645 |
| 1890800000 | 39.305926 | 13.89786 | | 1890800000 | 52.722133 | 14.684644 |
| 1892000000 | 39.349380 | 13.89333 | | 1892000000 | 52.782022 | 14.706133 |
| 1893200000 | 39.330881 | 13.87114 | | 1893200000 | 52.747255 | 14.715522 |
| 1894400000 | 39.322616 | 13.91714 | | 1894400000 | 52.740180 | 14.703247 |
| 1895600000 | 39.341534 | 13.93999 | | 1895600000 | 52.769357 | 14.730765 |
| 1896800000 | 39.342722 | 13.94418 | | 1896800000 | 52.730146 | 14.755118 |
| 1898000000 | 39.355589 | 13.92900 | | 1898000000 | 52.730697 | 14.743168 |
| 1899200000 | 39.391636 | 13.94095 | | 1899200000 | 52.756664 | 14.759041 |
| 1900400000 | 39.394805 | 13.91995 | | 1900400000 | 52.725862 | 14.768528 |
| 1901600000 | 39.366644 | 13.92481 | | 1901600000 | 52.742854 | 14.814336 |
| 1902800000 | 39.370561 | 13.93316 | | 1902800000 | 52.728277 | 14.801720 |
| 1904000000 | 39.386480 | 13.90405 | | 1904000000 | 52.718419 | 14.770257 |
| 1905200000 | 39.392765 | 13.93480 | | 1905200000 | 52.736553 | 14.793221 |
| 1906400000 | 39.362711 | 13.89915 | | 1906400000 | 52.720706 | 14.810922 |
| 1907600000 | 39.365148 | 13.91439 | | 1907600000 | 52.724326 | 14.818025 |
| 1908800000 | 39.347511 | 13.92157 | | 1908800000 | 52.700646 | 14.799278 |
| 1910000000 | 39.349950 | 13.93681 | | 1910000000 | 52.699407 | 14.832674 |

System Accuracy Verification

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

System Verification Setup Block Diagram



System Accuracy Check Results

| Frequency (MHz) | 1 g SAR (W/Kg) | 10 g SAR (W/Kg) | Result |
|-----------------|----------------|-----------------|--------------|
| 835 | 9.651 | 6.042 | In Tolerance |
| 1900 | 41.691 | 21.315 | In Tolerance |

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

IEEE P1528 recommended reference value for Head Tissue

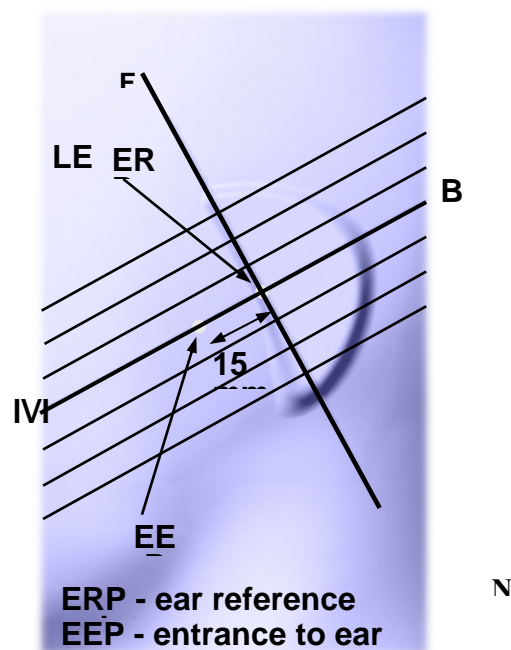
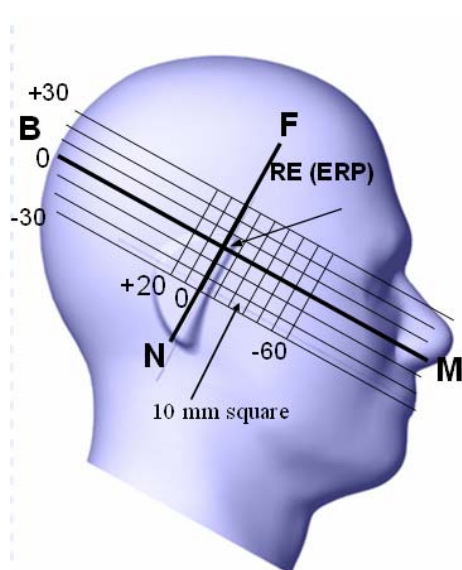
| Frequency (MHz) | 1 g SAR (W/Kg) | 10 g SAR (W/Kg) | Local SAR at surface (above feed point) | Local SAR at surface ($v=2\text{cm}$ offset from feed point) |
|-----------------|----------------|-----------------|---|---|
| 300 | 3.0 | 2.0 | 4.4 | 2.1 |
| 450 | 4.9 | 3.3 | 7.2 | 3.2 |
| 835 | 9.5 | 6.2 | 14.1 | 4.9 |
| 900 | 10.8 | 6.9 | 16.4 | 5.4 |
| 1450 | 29.0 | 16.0 | 50.2 | 6.5 |
| 1800 | 38.1 | 19.8 | 69.5 | 6.8 |
| 1900 | 39.7 | 20.5 | 72.1 | 6.6 |
| 2000 | 41.1 | 21.1 | 74.6 | 6.5 |
| 2450 | 52.4 | 24.0 | 104.2 | 7.7 |
| 3000 | 63.8 | 25.7 | 140.2 | 9.5 |

EUT TEST STRATEGY AND METHODOLOGY

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

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

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



Cheek/Touch Position

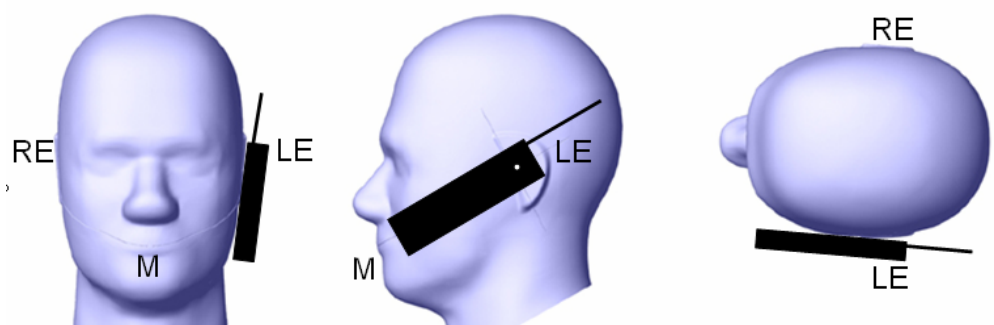
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

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

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

Check /Touch Position



Ear/Tilt Position

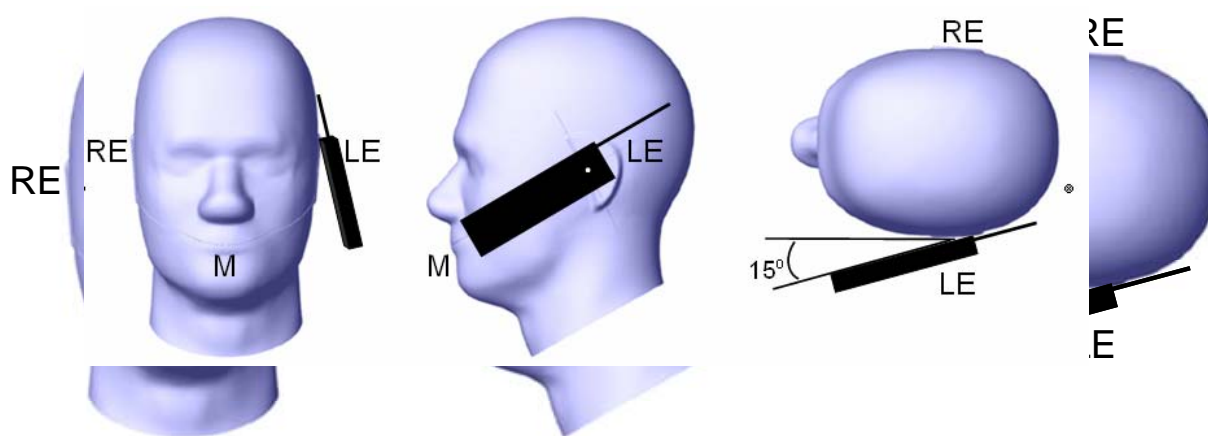
With the handset aligned in the “Cheek/Touch Position”:

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

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

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

Ear /Tilt 15° Position



Test positions for body-worn and other configurations

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

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

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

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

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 15 mm x 15 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 21 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

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

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

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

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation. The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device, could be found in Appendix E.

SAR Test Data

Environmental Conditions

| | |
|---------------------------|-----------|
| Temperature: | 21° C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1010 mbar |

* Testing was performed by Eric Zhang on 2009-04-15.

Cellular Band:

| EUT Position | Frequency (MHz) | Test Type | Test Mode | Antenna Type | Liquid | Phantom | Accessories | Measured 1g SAR Value (W/Kg) | FCC Limit (W/Kg) | Ref. Plot # |
|------------------|-----------------|-----------|-----------|--------------|--------|------------|-------------|------------------------------|------------------|-------------|
| Left Head Cheek | 836.6 | Head | GSM | Integral | Head | Left Head | - | 1.310 | 1.6 | 1 |
| Left Head Cheek | 824.2 | Head | GSM | Integral | Head | Left Head | - | 1.260 | 1.6 | 2 |
| Left Head Cheek | 848.8 | Head | GSM | Integral | Head | Left Head | - | 1.147 | 1.6 | 3 |
| Left Head Tilt | 836.6 | Head | GSM | Integral | Head | Left Head | - | 0.551 | 1.6 | 4 |
| Right Head Cheek | 836.6 | Head | GSM | Integral | Head | Right Head | - | 0.901 | 1.6 | 5 |
| Right Head Tilt | 836.6 | Head | GSM | Integral | Head | Right Head | - | 0.439 | 1.6 | 6 |
| Body-Worn Back | 836.6 | Body | GSM | Integral | Body | Flat | Headset | 0.440 | 1.6 | 7 |
| Body-Worn Back | 824.2 | Body | GSM | Integral | Body | Flat | Headset | 0.579 | 1.6 | 8 |
| Body-Worn Back | 848.8 | Body | GSM | Integral | Body | Flat | Headset | 0.502 | 1.6 | 9 |

PCS Band:

| EUT Position | Frequency (MHz) | Test Type | Test Mode | Antenna Type | Liquid | Phantom | Accessories | Measured 1g SAR Value (W/Kg) | FCC Limit (W/Kg) | Ref. Plot # |
|------------------|-----------------|-----------|-----------|--------------|--------|------------|-------------|------------------------------|------------------|-------------|
| Left Head Cheek | 1880.0 | Head | GSM | Integral | Head | Left Head | - | 0.414 | 1.6 | 10 |
| Left Head Cheek | 1850.2 | Head | GSM | Integral | Head | Left Head | - | 0.307 | 1.6 | 11 |
| Left Head Cheek | 1909.8 | Head | GSM | Integral | Head | Left Head | - | 0.266 | 1.6 | 12 |
| Left Head Tilt | 1880.0 | Head | GSM | Integral | Head | Left Head | - | 0.195 | 1.6 | 13 |
| Right Head Cheek | 1880.0 | Head | GSM | Integral | Head | Right Head | - | 0.315 | 1.6 | 14 |
| Right Head Tilt | 1880.0 | Head | GSM | Integral | Head | Right Head | - | 0.230 | 1.6 | 15 |
| Body-Worn Back | 1880.0 | Body | GSM | Integral | Body | Flat | Headset | 0.425 | 1.6 | 16 |
| Body-Worn Back | 1850.2 | Body | GSM | Integral | Body | Flat | Headset | 0.350 | 1.6 | 17 |
| Body-Worn Back | 1909.8 | Body | GSM | Integral | Body | Flat | Headset | 0.309 | 1.6 | 18 |

APPENDIX A – MEASUREMENT UNCERTAINTY

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

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 | $\sqrt{3}$ | $(1-cp)^{1/2}$ | $(1-cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | $\sqrt{3}$ | \sqrt{cp} | \sqrt{cp} | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | $\sqrt{3}$ | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | $\sqrt{3}$ | 1 | 1 | 0.2 | 0.2 |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | $\sqrt{3}$ | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 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 | 3.2 | rectangular | $\sqrt{3}$ | 1 | 1 | 1.8 | 1.8 |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | $\sqrt{3}$ | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | $\sqrt{3}$ | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.0 | normal | 1 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 5.0 | rectangular | $\sqrt{3}$ | 0.6 | 0.5 | 1.7 | 1.4 |
| Liquid Permittivity(meas.) | 0.0 | normal | 1 | 0.6 | 0.5 | 0.0 | 0.0 |
| Combined Uncertainty | | RSS | | | | 9.4 | 9.2 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.8 | 18.5 |

APPENDIX B – PROBE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-871

Client.: BACL

CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe 835 MHz

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 273

Calibration Procedure: SS/DRB-TP-D01-032-E020-V2

Project No: BACB-ALSAS10U-5323

Calibrated: 1st August 2008

Released on: 1st September 2008

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

Released By: 

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E8

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 273.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure

IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"

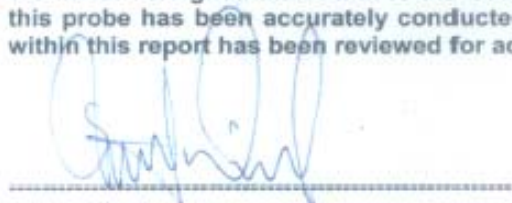
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 273 was a new probe taken from stock prior to calibration.

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

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



Stuart Nicol



Jesse Hones

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

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Calibration Results Summary

| | |
|----------------|---------------------|
| Probe Type: | E-Field Probe E-020 |
| Serial Number: | 273 |
| Frequency: | 835 MHz |
| Sensor Offset: | 1.56 mm |
| Sensor Length: | 2.5 mm |
| Tip Enclosure: | Ertalyte* |
| Tip Diameter: | <5 mm |
| Tip Length: | 60 mm |
| Total Length: | 290 mm |

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

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

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

NCL Calibration LaboratoriesDivision of APREL Laboratories.

Sensitivity in Head Tissue Measured**Frequency:** 835 MHz**Epsilon:** 41.24 (+/-5%) **Sigma:** 0.87 S/m (+/-5%)**ConvF****Channel X:** 6.5**Channel Y:** 6.5**Channel Z:** 6.5

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

Spatial Resolution:

The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Page 4 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

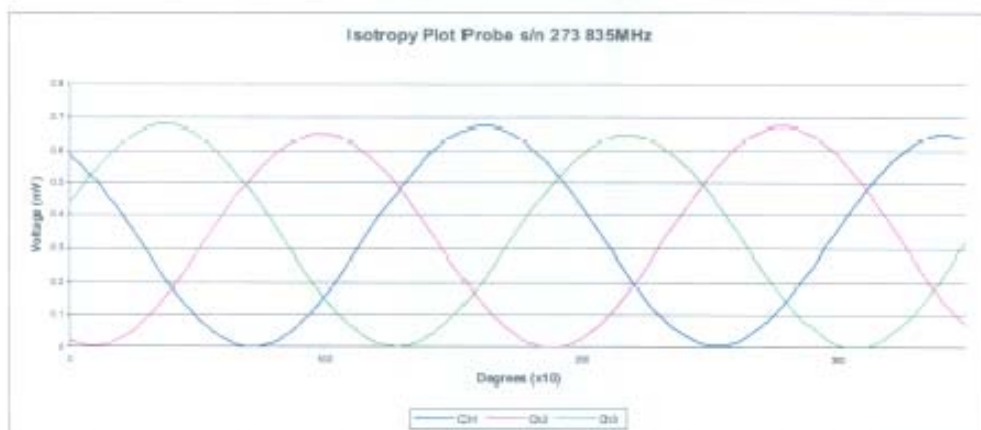
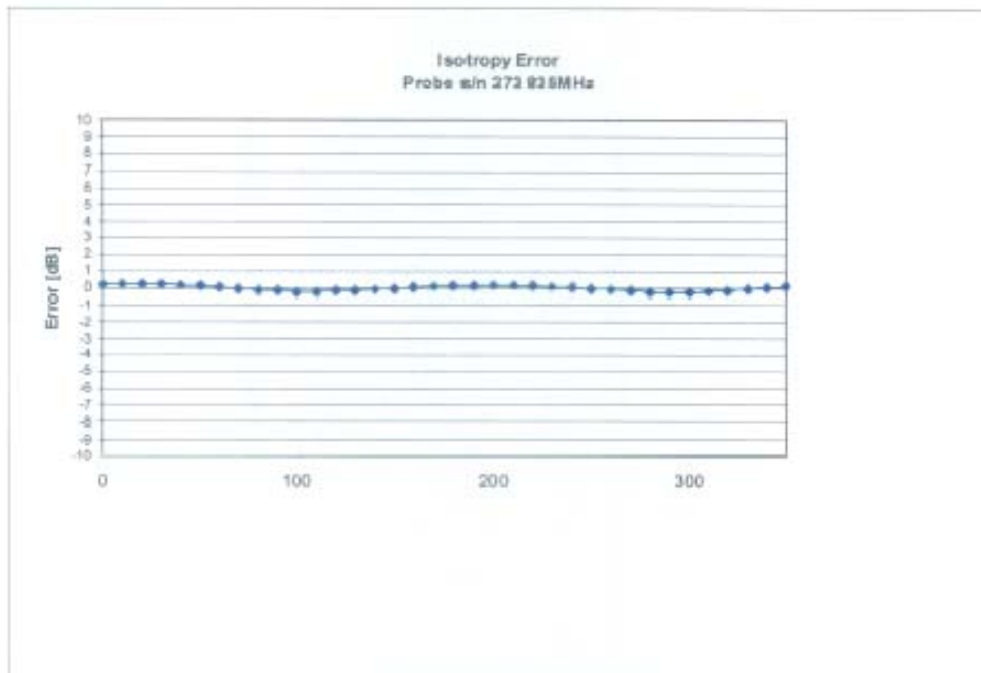
Receiving Pattern 835 MHz (Air)

Page 5 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Isotropy Error 835 MHz (Air)

Isotropy Tissue:

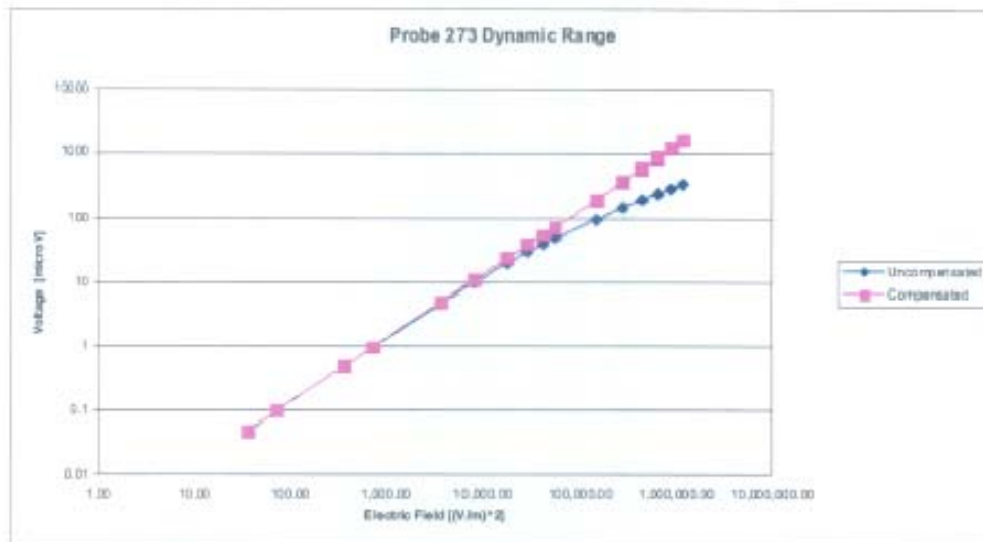
0.10 dB

Page 6 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

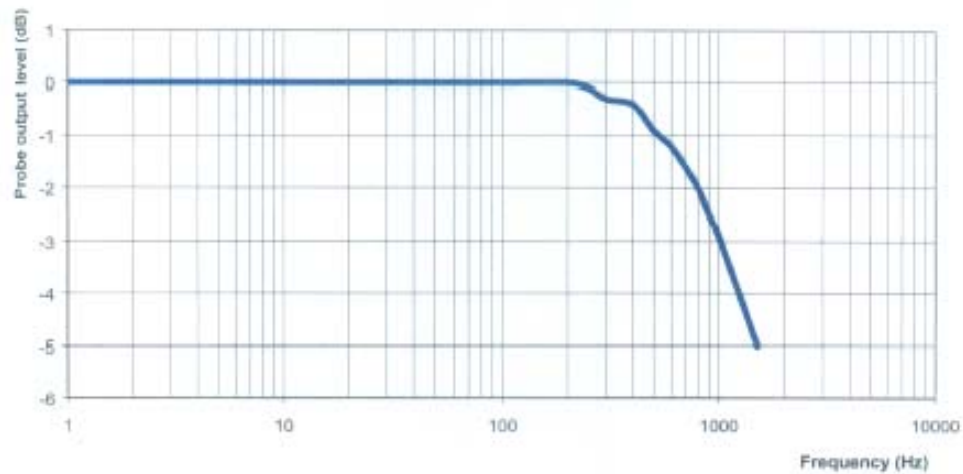
Dynamic Range

Page 7 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories

Video Bandwidth**Probe Frequency Characteristics**

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Conversion Factor Uncertainty Assessment**Frequency:** 835MHz**Epsilon:** 41.24 (+/-5%) **Sigma:** 0.87 S/m (+/-5%)**ConvF****Channel X:** 6.5 7%(K=2)**Channel Y:** 6.5 7%(K=2)**Channel Z:** 6.5 7%(K=2)

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

Boundary Effect:

For a distance of 2.5mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Page 9 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2008.

Page 10 of 10

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

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-872

Client.: BACL

CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe 835 MHz

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 273

Calibration in Body Tissue

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: BACL-ALSAS10U-5323

Calibrated: 1st September 2008

Released on: 1st September 2008

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

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E8

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 273.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 273 was a new probe taken from stock prior to calibration.

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

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

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



Stuart Nicol

Jesse Hones

Page 2 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Calibration Results Summary

| | |
|----------------|---------------------|
| Probe Type: | E-Field Probe E-020 |
| Serial Number: | 273 |
| Frequency: | 835 MHz |
| Sensor Offset: | 1.56 mm |
| Sensor Length: | 2.5 mm |
| Tip Enclosure: | Ertalyte* |
| Tip Diameter: | <5 mm |
| Tip Length: | 60 mm |
| Total Length: | 290 mm |

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

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

Page 3 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Sensitivity in Body Tissue Measured**Frequency:** 835 MHz**Epsilon:** 56.16 (+/-5%) **Sigma:** 0.09 S/m (+/-10%)**ConvF****Channel X:** 6.7**Channel Y:** 6.7**Channel Z:** 6.7

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

Spatial Resolution:

The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Page 4 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

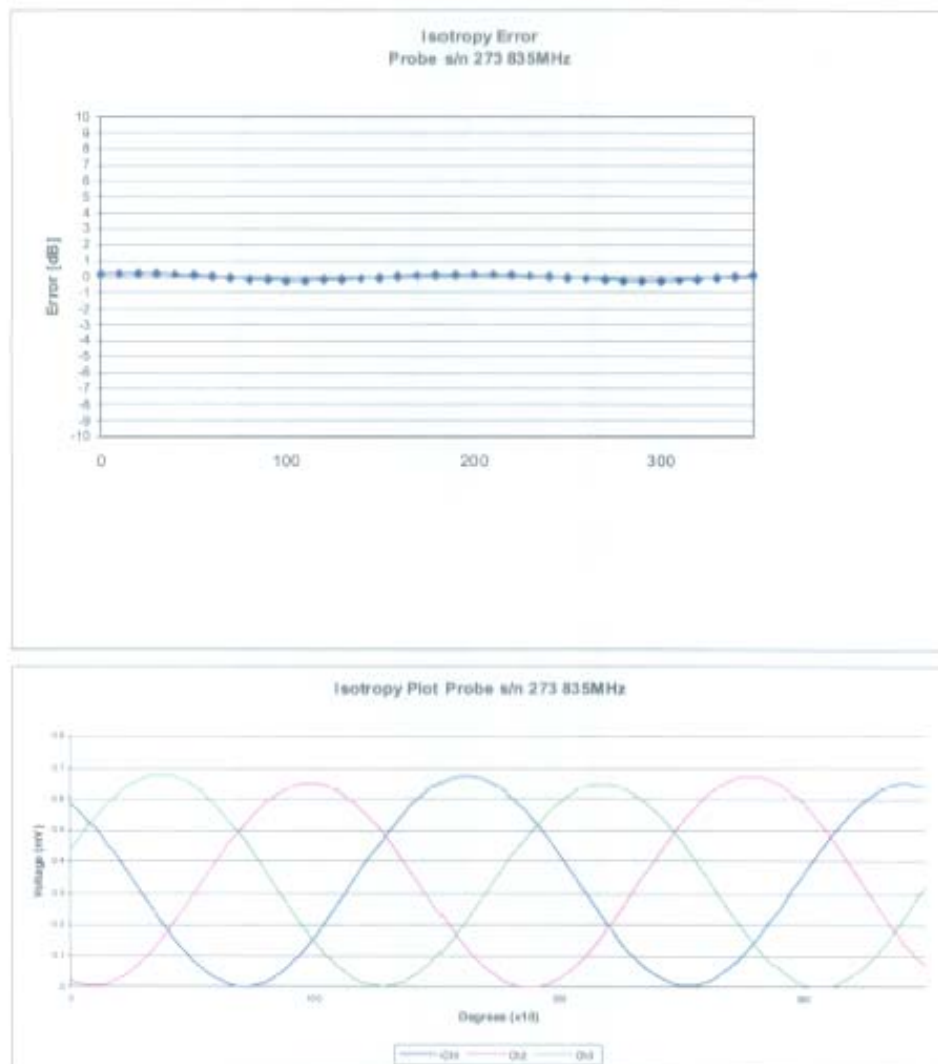
Receiving Pattern 835 MHz (Air)

Page 5 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Isotropy Error 835 MHz (Air)**Isotropy in Tissue:****0.10 dB**

Page 6 of 10

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

11/11/2011

NCL Calibration Laboratories

Division of APREL Laboratories

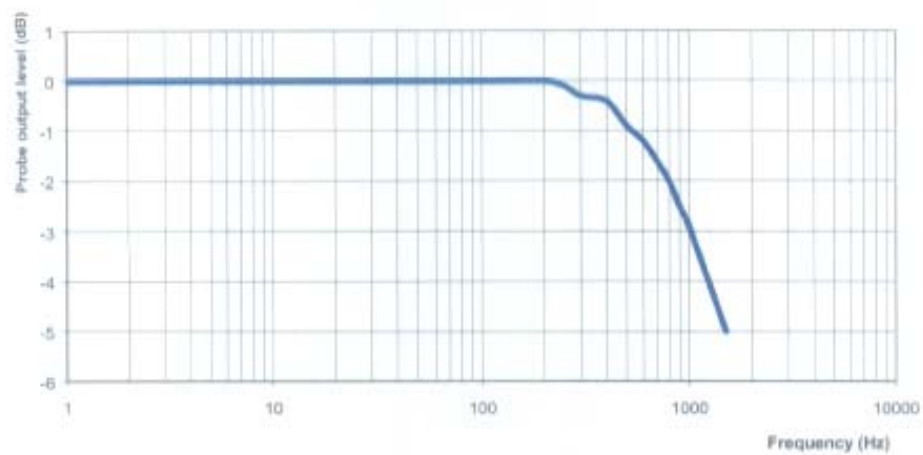
Dynamic Range

Page 7 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Video Bandwidth**Probe Frequency Characteristics**

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

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Conversion Factor Uncertainty Assessment**Frequency:** 835MHz**Epsilon:** 56.16 (+/-5%)**Sigma:** 0.99 S/m (+/-10%)**ConvF****Channel X:** 6.7 7%(K=2)**Channel Y:** 6.7 7%(K=2)**Channel Z:** 6.7 7%(K=2)

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

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Page 9 of 10

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

Page 10 of 10

NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2008.

Page 10 of 10

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

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-877

Client: BACL

CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 273

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: BACB-ALSAS10U-5323

Calibrated: 1st August 2008

Released on: 1st September 2008

This Calibration Certificate is incomplete unless accompanied with the Calibration Results Summary

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4958
FAX: (613) 820-4161

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 273.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 273 was a new probe taken from stock prior to calibration.

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

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


Stuart Nicol
Jesse Hones

Page 2 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories

Calibration Results Summary

| | |
|----------------|---------------------|
| Probe Type: | E-Field Probe E-020 |
| Serial Number: | 273 |
| Frequency: | 1900 MHz |
| Sensor Offset: | 1.56 mm |
| Sensor Length: | 2.5 mm |
| Tip Enclosure: | Ertalyte* |
| Tip Diameter: | <5 mm |
| Tip Length: | 60 mm |
| Total Length: | 290 mm |

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

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

Page 3 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Sensitivity in Head Tissue Measured**Frequency:** 1900 MHz**Epsilon:** 38.50 (+/-5%) **Sigma:** 1.40 S/m (+/-5%)**ConvF****Channel X:** 5.25**Channel Y:** 5.25**Channel Z:** 5.25

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

Spatial Resolution:

The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Page 4 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

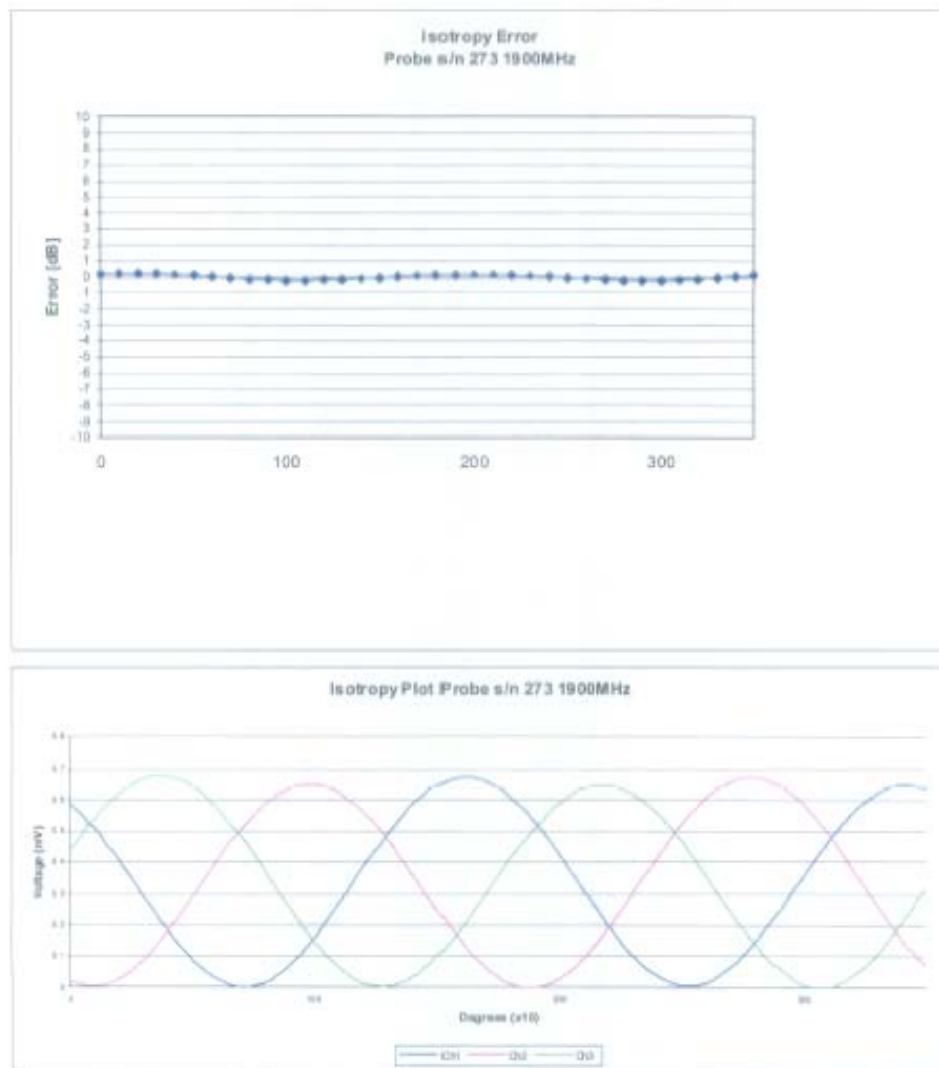
Receiving Pattern 1900 MHz (Air)

Page 5 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Isotropy Error 1900 MHz (Air)**Isotropy in Tissue:****0.10 dB**

Page 6 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

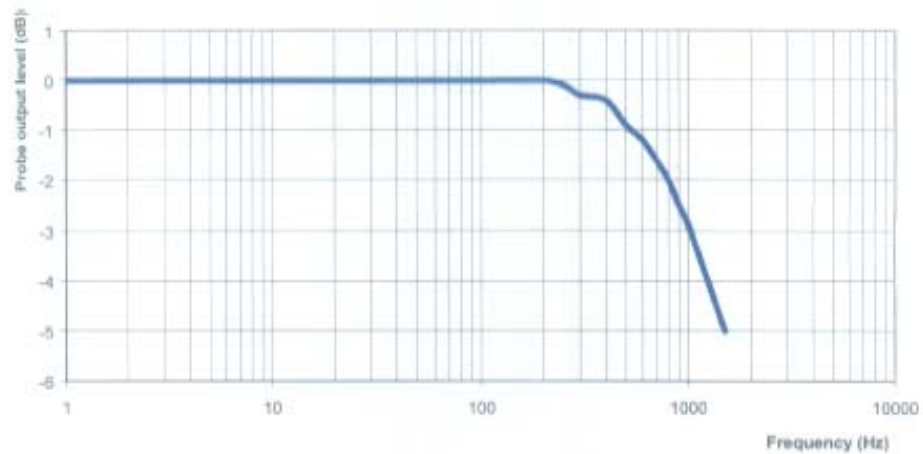
Dynamic Range

Page 7 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Video Bandwidth**Probe Frequency Characteristics**

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

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

11-2-20

NCL Calibration Laboratories

Division of APREL Laboratories.

Conversion Factor Uncertainty Assessment

| | | | |
|-------------------|---------------|---------------|------------------|
| Frequency: | 1900MHz | | |
| Epsilon: | 38.50 (+/-5%) | Sigma: | 1.40 S/m (+/-5%) |
| ConvF | | | |
| Channel X: | 5.25 | 7%(K=2) | |
| Channel Y: | 5.25 | 7%(K=2) | |
| Channel Z: | 5.25 | 7%(K=2) | |

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

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Page 9 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2008.

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

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-278

Client.: BACL

CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 273

Calibration in Body Tissue

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: BACB-ALSAS10U-5323

Calibrated: 1st August 2008
Released on: 1st September 2008

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

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E8

Division of APREL Lab.
TEL: (613) 820-4968
FAX: (613) 820-4161

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 273.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 273 was a new probe taken from stock prior to calibration.

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

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

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


Stuart Nicol
Jesse Hones

Page 2 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Calibration Results Summary

| | |
|-----------------------|---------------------|
| Probe Type: | E-Field Probe E-020 |
| Serial Number: | 273 |
| Frequency: | 1900 MHz |
| Sensor Offset: | 1.56 mm |
| Sensor Length: | 2.5 mm |
| Tip Enclosure: | Ertalyte* |
| Tip Diameter: | <5 mm |
| Tip Length: | 60 mm |
| Total Length: | 290 mm |

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

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

Page 3 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Sensitivity in Body Tissue Measured**Frequency:** 1900 MHz**Epsilon:** 53.05 (+/-5%) **Sigma:** 1.58 S/m (+/-5%)**ConvF****Channel X:** 5.15**Channel Y:** 5.15**Channel Z:** 5.15

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

Spatial Resolution:

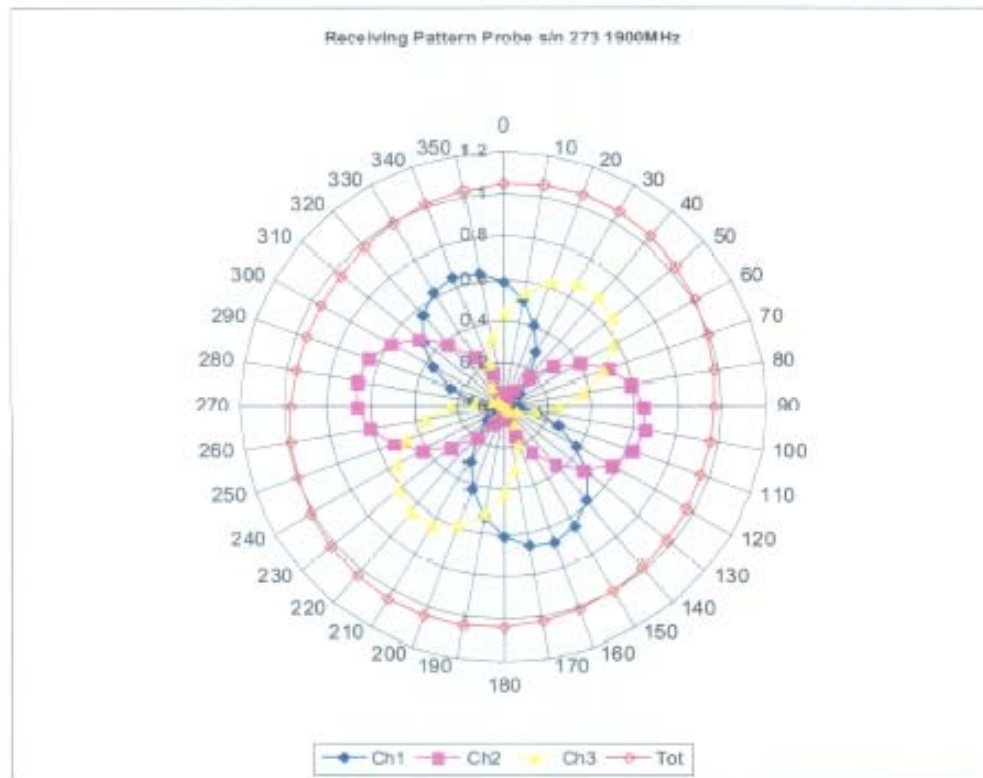
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Page 4 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

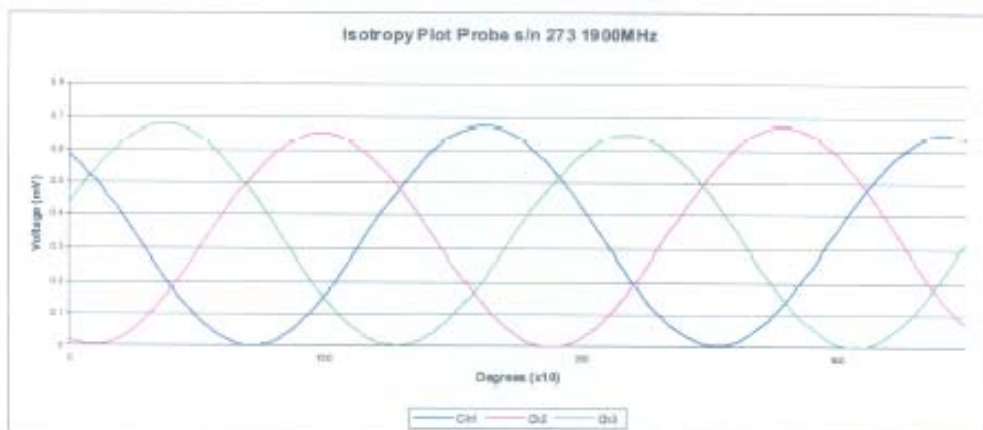
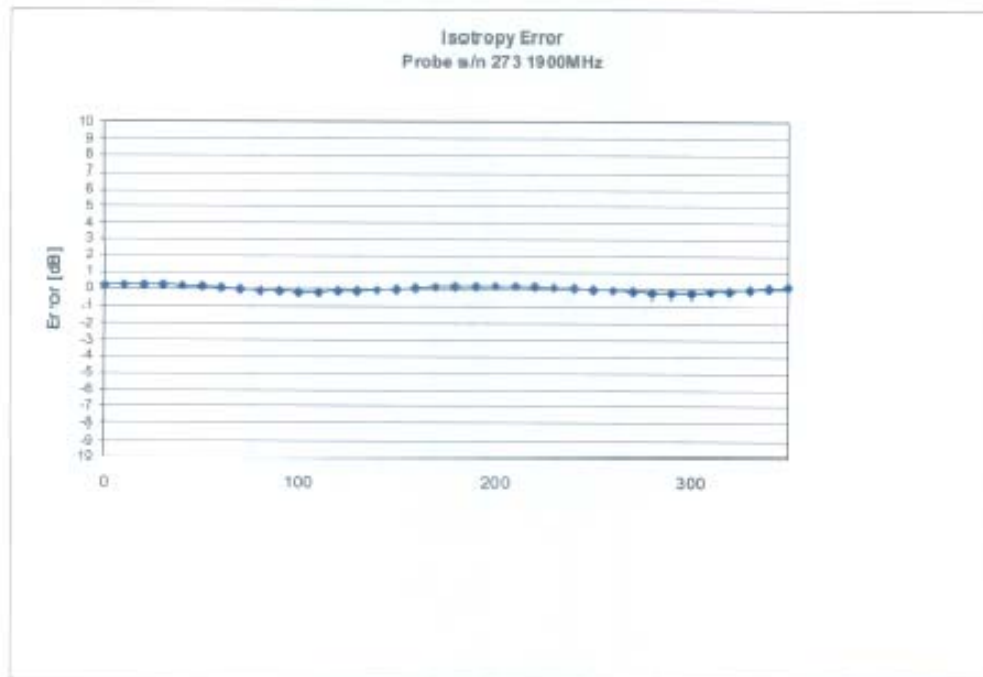
Receiving Pattern 1900 MHz (Air)

Page 5 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

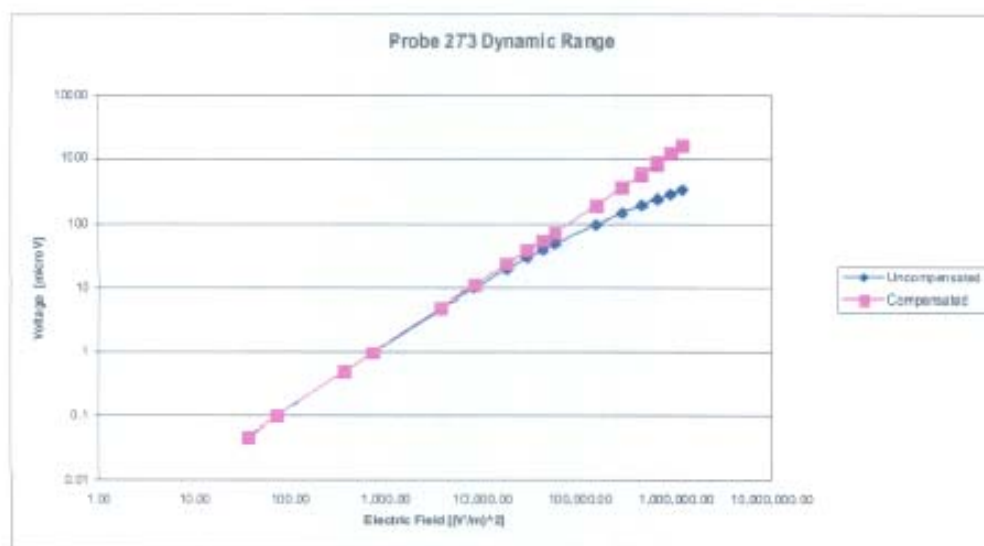
Isotropy Error 1900 MHz (Air)**Isotropy in Tissue:****0.10 dB**

Page 6 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

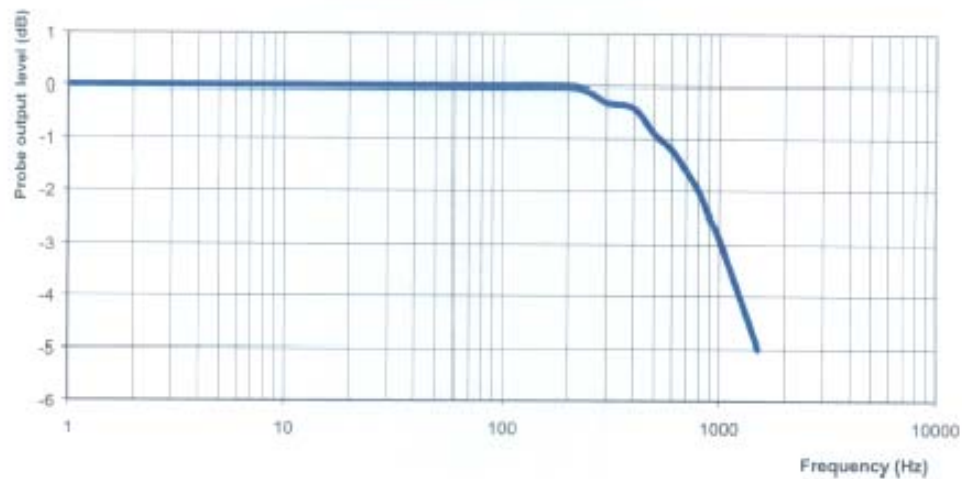
Dynamic Range

Page 7 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Video Bandwidth**Probe Frequency Characteristics**

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

Page 8 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Conversion Factor Uncertainty Assessment**Frequency:** 1900MHz**Epsilon:** 53.05 (+/-5%) **Sigma:** 1.58 S/m (+/-5%)**ConvF****Channel X:** 5.15 7%(K=2)**Channel Y:** 5.15 7%(K=2)**Channel Z:** 5.15 7%(K=2)

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

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Page 9 of 10

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2008.

Page 10 of 10

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

APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No: DC-917
Project Number: BACL-ALSAS10U-5323

CERTIFICATE OF CALIBRATION

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

Validation Dipole

Manufacturer: APREL Laboratories

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

Frequency: 835 MHz

Serial No: 180-00558

Customer: Bay Area Compliance Laboratory

Calibrated: 1st September 2008
Released on: 1st September 2008

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

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4162

NCL Calibration Laboratories

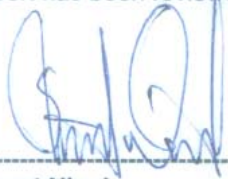
Division of APREL Laboratories.

Conditions

Dipole 180-00558 was new and taken from stock prior to calibration.

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

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



Stuart Nicol



C. Teodorian

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Calibration Results Summary

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

Mechanical Dimensions

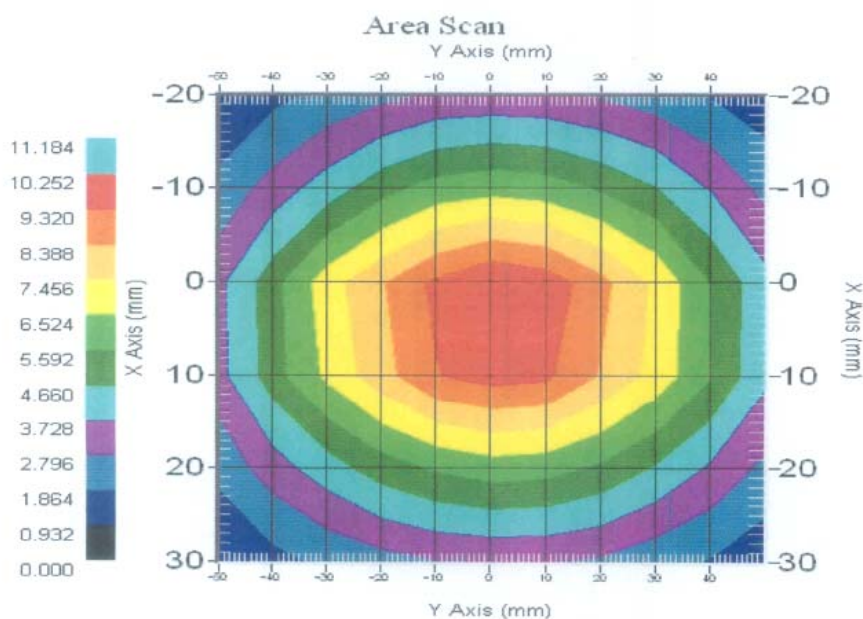
Length: 162.2 mm
Height: 89.4 mm

Electrical Specification

SWR: 1.018 U
Return Loss: -41.371 dB
Impedance: 51.739 Ω

System Validation Results

| Frequency | 1 Gram | 10 Gram | Peak |
|-----------|--------|---------|-------|
| 835 MHz | 9.49 | 6.1 | 14.21 |



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

3

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

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

References

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

Conditions

Dipole 180-00558 was new taken from stock.

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

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

4

NCL Calibration Laboratories

Division of APREL Laboratories.

Dipole Calibration Results**Mechanical Verification**

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

Tissue Validation

| Head Tissue 835MHz | Measured |
|-----------------------------------|----------|
| Dielectric constant, ϵ_r | 41.12 |
| Conductivity, σ [S/m] | 0.92 |

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

5

NCL Calibration Laboratories

Division of APREL Laboratories.

Electrical Calibration

| Test | Result |
|-----------|-----------------|
| S11 RL | -41.371 dB |
| SWR | 1.018 U |
| Impedance | 51.739 Ω |

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

S11 Parameter Return Loss

S11 FORWARD REFLECTION

LOG MAGNITUDE

REF=-37.890 dB

10.000 dB/DIV



CH 1 - S11
REFERENCE PLANE
1.0000 cm

MARKER 2
0.835019 GHz
-41.371 dB

MARKER TO MAX
MARKER TO MIN

1 0.790484 GHz
-10.003 dB

3 0.885531 GHz
-10.088 dB

MARKER READOUT
FUNCTIONS

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6

NCL Calibration Laboratories

Division of APREL Laboratories.

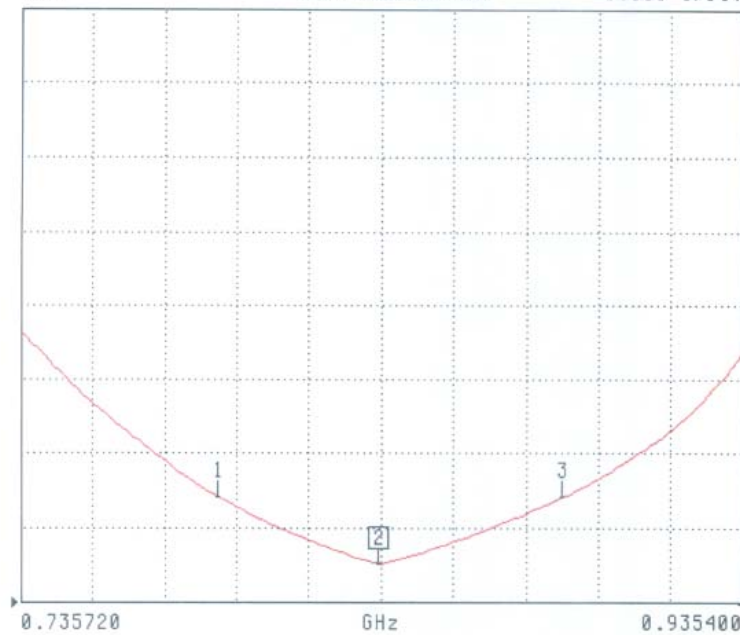
SWR

S11 FORWARD REFLECTION

SWR

REF=500.000 mU

1.000 U/DIV

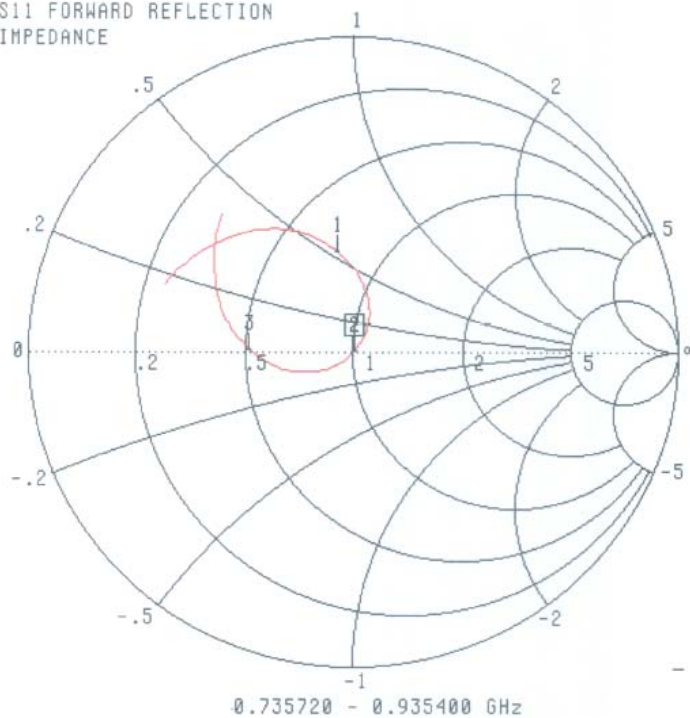
CH 1 - S11
REFERENCE PLANE
1.0000 cmMARKER 2
0.835019 GHz
1.018 UMARKER TO MAX
MARKER TO MIN1 0.790484 GHz
1.925 U3 0.885531 GHz
1.911 UMARKER READOUT
FUNCTIONS

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NCL Calibration Laboratories

Division of APREL Laboratories.

Smith Chart Dipole ImpedanceS11 FORWARD REFLECTION
IMPEDANCECH 1 - S11
REFERENCE PLANE
1.0000 cmMARKER 2
0.835019 GHz
50.739 Ω
-213.015 $j\Omega$ MARKER TO MAX
MARKER TO MIN

| | |
|---|-------------------|
| 1 | 0.790484 GHz |
| | 37.963 Ω |
| | 26.420 $j\Omega$ |
| 3 | 0.885531 GHz |
| | 26.160 Ω |
| | 380.473 $j\Omega$ |

▶ MARKER READOUT
FUNCTIONS

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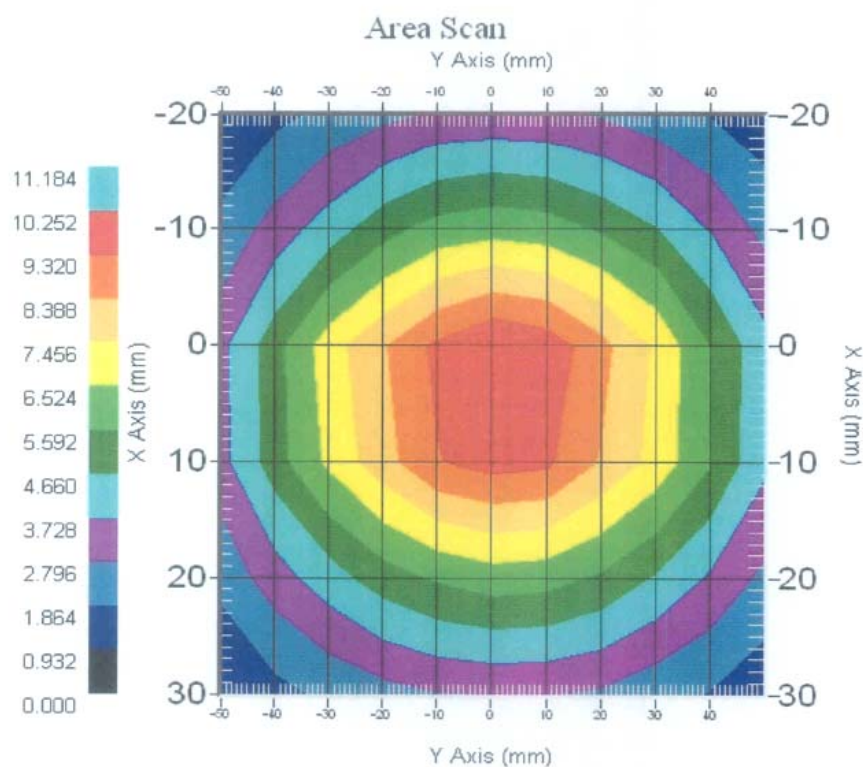
8

NCL Calibration Laboratories

Division of APREL Laboratories.

System Validation Results Using the Electrically Calibrated Dipole

| Head Tissue Frequency | 1 Gram | 10 Gram | Peak Above Feed Point |
|-----------------------|--------|---------|-----------------------|
| 835 MHz | 9.49 | 6.1 | 14.21 |



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NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2008.

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10

NCL CALIBRATION LABORATORIES

Calibration File No: DC-920
Project Number: BACL-ALSAS10U-5323

CERTIFICATE OF CALIBRATION

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

Validation Dipole

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

Customer: Bay Area Compliance Laboratory

Calibrated: 1st September 2008
Released on: 1st September 2008

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

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4162

NCL Calibration Laboratories

Division of APREL Laboratories.


Conditions

Dipole 210-00710 was new and taken from stock prior to calibration.

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

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

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



Stuart Nicol



C. Teodorian

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NCL Calibration Laboratories

Division of APREL Laboratories.

Calibration Results Summary

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

Mechanical Dimensions

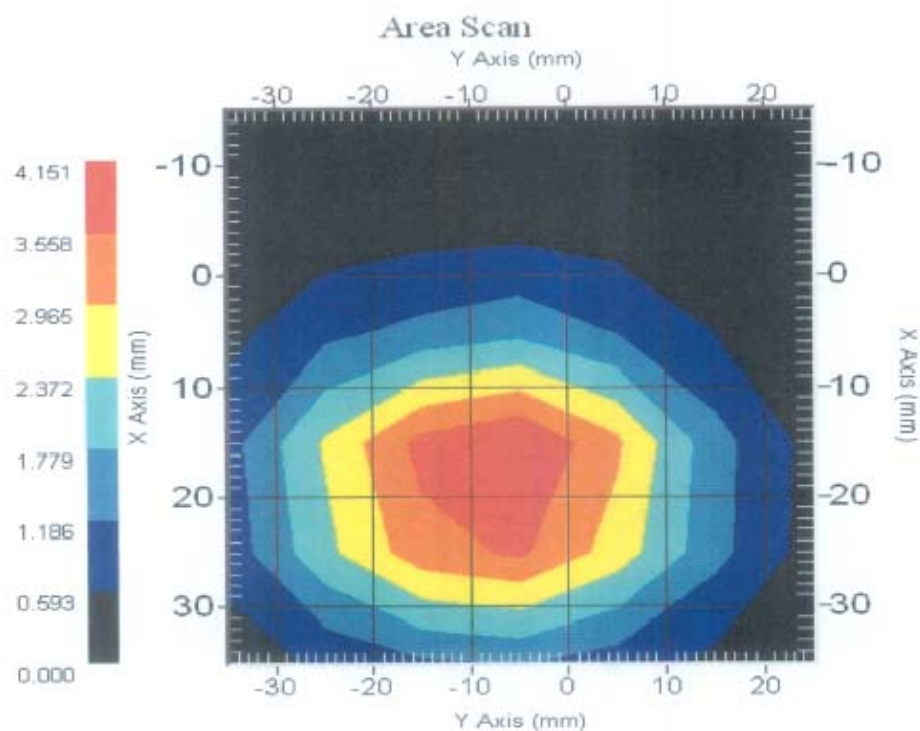
Length: 67.1 mm
Height: 38.9 mm

Electrical Specification

SWR: 1.059 U
Return Loss: -30.831 dB
Impedance: 50.914 Ω

System Validation Results

| Frequency | 1 Gram | 10 Gram | Peak |
|-----------|--------|---------|------|
| 1900 MHz | 38.7 | 20.5 | 69.7 |



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NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

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

References

SSI-TP-018-ALSAS Dipole Calibration Procedure

SSI-TP-016 Tissue Calibration Procedure

IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"

Conditions

Dipole 210-00710 was new taken from stock.

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

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NCL Calibration Laboratories

Division of APREL Laboratories.

Dipole Calibration Results**Mechanical Verification**

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

Tissue Validation

| Head Tissue 1900 MHz | Measured |
|-----------------------------------|----------|
| Dielectric constant, ϵ_r | 40.03 |
| Conductivity, σ [S/m] | 1.38 |

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NCL Calibration Laboratories

Division of APREL Laboratories.

Electrical Calibration

| Test | Result |
|-----------|-----------------|
| S11 R/L | -30.831 dB |
| SWR | 1.059 U |
| Impedance | 50.914 Ω |

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

S11 Parameter Return Loss

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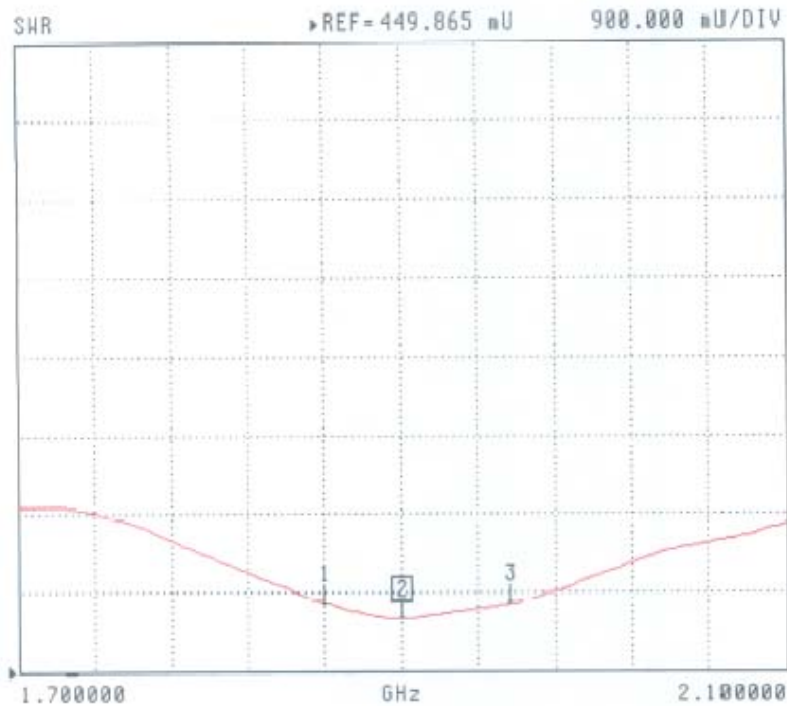
6

NCL Calibration Laboratories

Division of APREL Laboratories.

SWR

S11 FORWARD REFLECTION

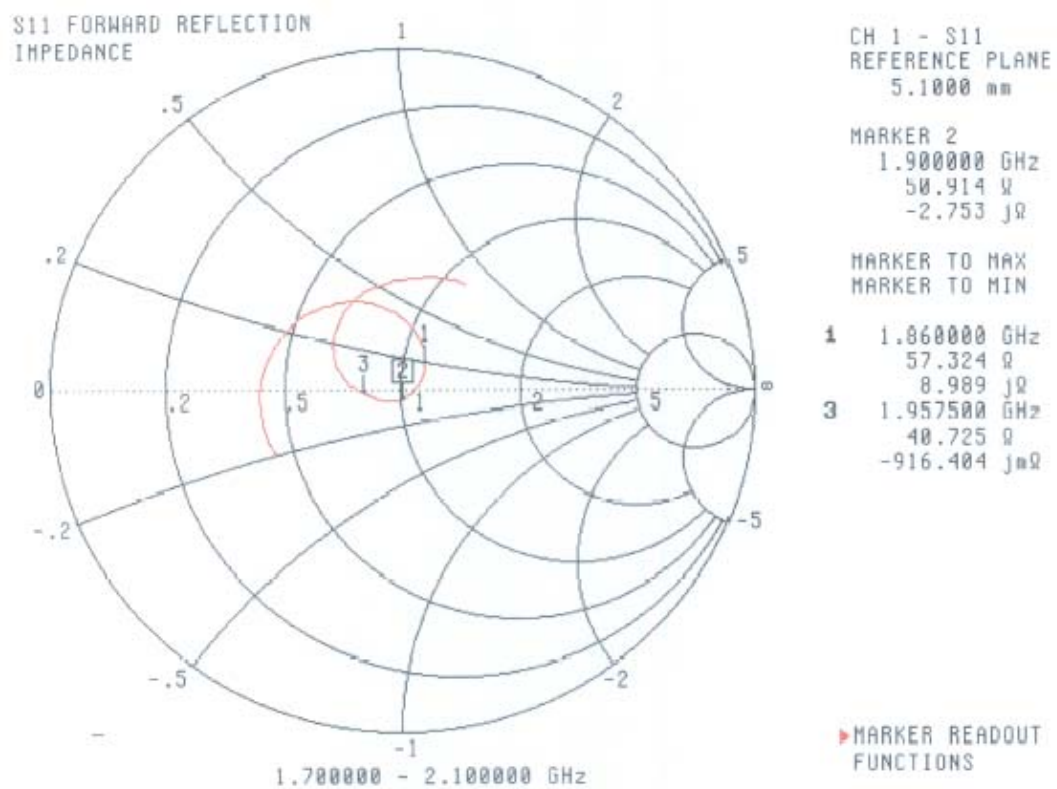
CH 1 - S11
REFERENCE PLANE
5.1000 mmMARKER 2
1.900000 GHz
1.059 UMARKER TO MAX
MARKER TO MIN1 1.860000 GHz
1.241 U3 1.957500 GHz
1.229 UMARKER READOUT
FUNCTIONS

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NCL Calibration Laboratories

Division of APREL Laboratories.

Smith Chart Dipole Impedance

8

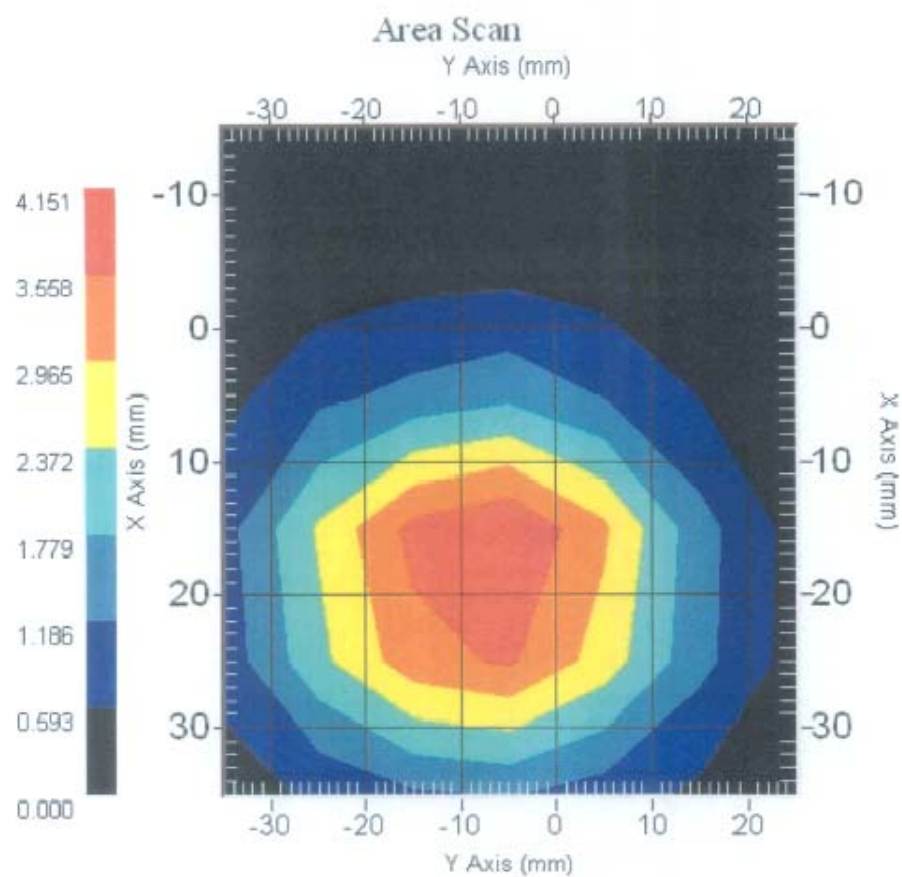
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories

Division of APREL Laboratories.

System Validation Results Using the Electrically Calibrated Dipole

| Head Tissue Frequency | 1 Gram | 10 Gram | Peak Above Feed Point |
|-----------------------|--------|---------|-----------------------|
| 1900 MHz | 38.7 | 20.5 | 69.7 |



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

9

NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2007.

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APPENDIX D – SAR SYSTEM VALIDATION DATA

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

System Performance Check 835MHz Head

Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558

Product Data

Device Name : Dipole 835 MHz
Serial No. : 180-00558
Type : Dipole
Model : ALS-D-835-S-2
Frequency : 835.00 MHz
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 10.066 W/kg
Power Drift-Finish : 9.926 W/kg
Power Drift (%) : -1.391

Phantom Data

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

Tissue Data

Type : HEAD
Serial No. : 270-01002
Frequency : 835.00 MHz
Last Calib. Date : 13-Apr-2009
Temperature : 20.00 °C
Ambient Temp. : 20.00 °C
Humidity : 50.00 RH%
Epsilon : 39.94 F/m
Sigma : 0.87 S/m
Density : 1000.00 kg/cu. m

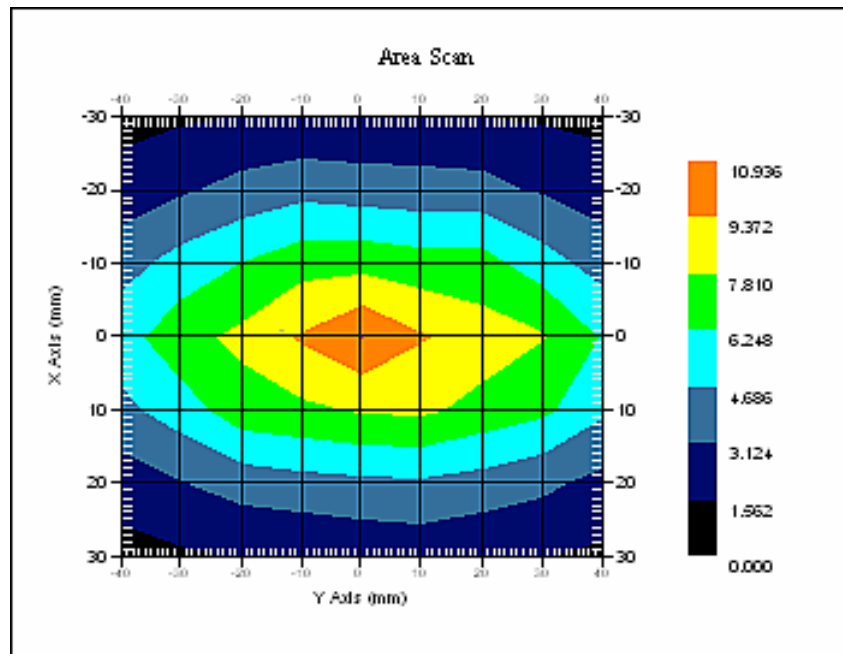
Probe Data

Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 273
Last Calib. Date : 08-Jan-2008
Frequency : 835.00 MHz
Duty Cycle Factor : 1
Conversion Factor : 6.5
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data

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

1 gram SAR value : 9.651 W/kg
10 gram SAR value : 6.042 W/kg
Area Scan Peak SAR : 10.936 W/kg
Zoom Scan Peak SAR : 15.013 W/kg



835 MHz System Validation

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

Device Name : Dipole 1900MHz
Serial No. : 210-00710
Type : Dipole
Model : ALS-D-1900-S-2
Frequency : 1900.00 MHz
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 43.370 W/kg
Power Drift-Finish : 41.609 W/kg
Power Drift (%) : -4.059

Phantom Data

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

Tissue Data

Type : HEAD
Serial No. : 295-01103
Frequency : 1900.00 MHz
Last Calib. Date : 13-Apr-2009
Temperature : 20.00 °C
Ambient Temp. : 20.00 °C
Humidity : 56.00 RH%
Epsilon : 39.39 F/m
Sigma : 1.47 S/m
Density : 1000.00 kg/cu. m

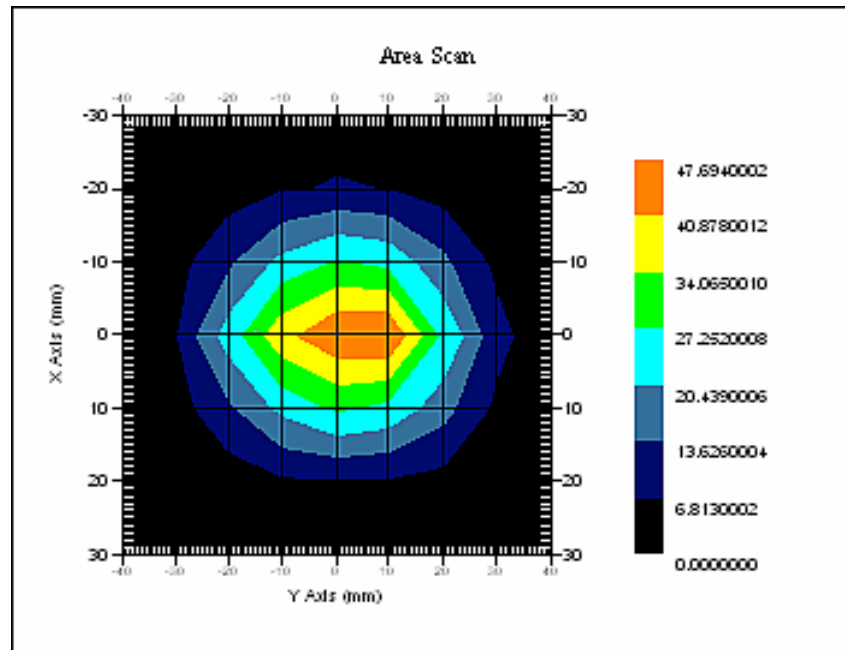
Probe Data

Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 273
Last Calib. Date : 01-Aug-2008
Frequency : 1900.00 MHz
Duty Cycle Factor : 1
Conversion Factor : 5.25
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data

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

1 gram SAR value : 41.691 W/kg
10 gram SAR value : 21.315 W/kg
Area Scan Peak SAR : 45.694 W/kg
Zoom Scan Peak SAR : 80.675 W/kg



1900 MHz System Validation

APPENDIX E – EUT SCAN RESULTS

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

Left Head Cheek (835 MHz Middle Channel)

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x6x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.728 W/kg
Power Drift-Finish : 0.719 W/kg
Power Drift (%) : -1.236

Tissue Data

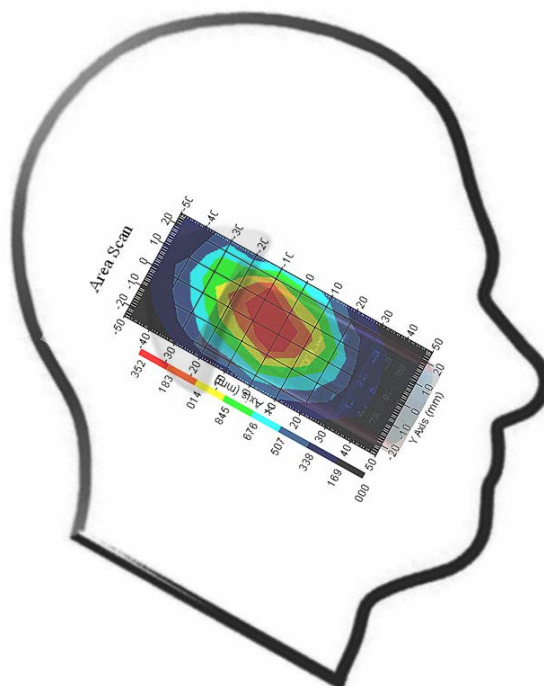
Type : HEAD
Frequency : 835.00 MHz
Epsilon : 39.94 F/m
Sigma : 0.87 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.5
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 1.310 W/kg
10 gram SAR value : 0.678 W/kg
Area Scan Peak SAR : 1.352 W/kg
Zoom Scan Peak SAR : 1.721 W/kg

Plot 1#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Left Head Cheek (835 MHz Low Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.799 W/kg
Power Drift-Finish : 0.761 W/kg
Power Drift (%) : -4.829

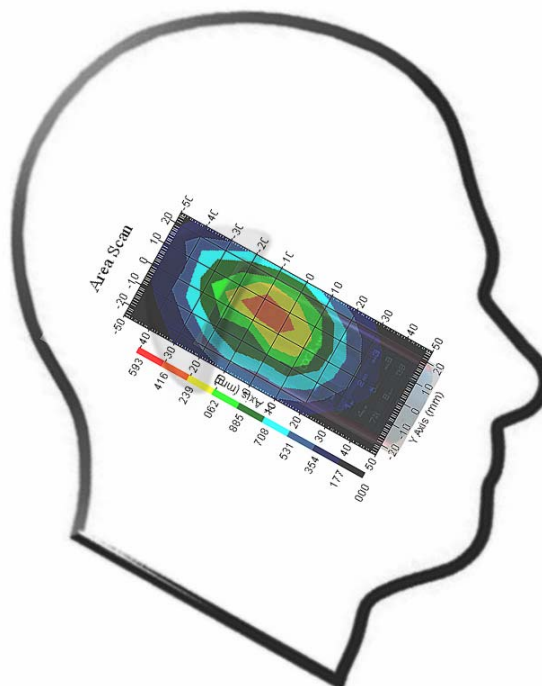
Tissue Data

Type : HEAD
Frequency : 835.00 MHz
Epsilon : 39.94 F/m
Sigma : 0.87 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.5
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 1.260 W/kg
10 gram SAR value : 0.826 W/kg
Area Scan Peak SAR : 1.418 W/kg
Zoom Scan Peak SAR : 2.121 W/kg

Plot 2#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Left Head Cheek (835 MHz High Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.710 W/kg
Power Drift-Finish : 0.736 W/kg
Power Drift (%) : 3.662

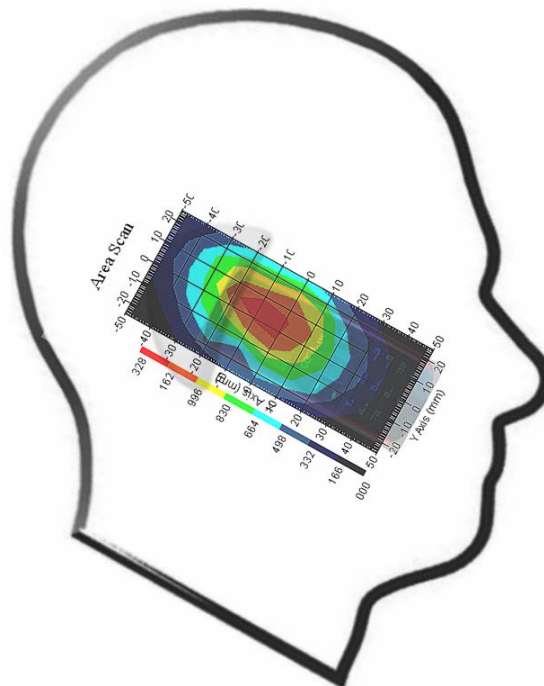
Tissue Data

Type : HEAD
Frequency : 835.00 MHz
Epsilon : 39.94 F/m
Sigma : 0.87 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.5
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 1.147 W/kg
10 gram SAR value : 0.792 W/kg
Area Scan Peak SAR : 1.326 W/kg
Zoom Scan Peak SAR : 2.322 W/kg

Plot 3#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Left Head Tilt (835 MHz Middle Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.506 W/kg
Power Drift-Finish : 0.515 W/kg
Power Drift (%) : 1.779

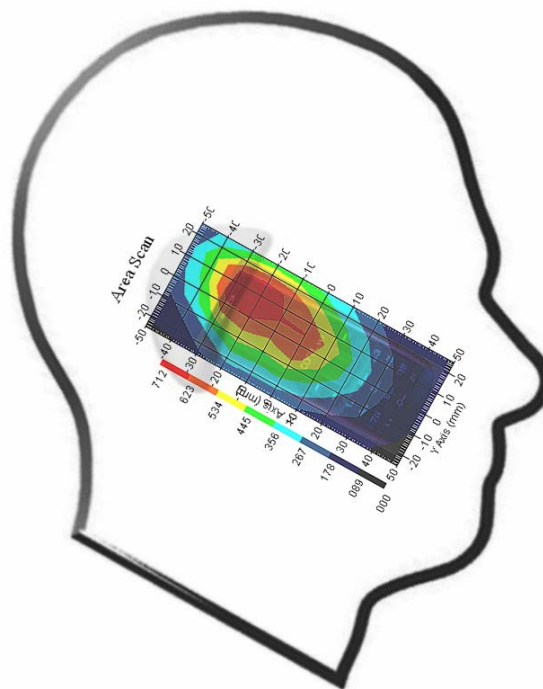
Tissue Data

Type : HEAD
Frequency : 835.00 MHz
Epsilon : 39.94 F/m
Sigma : 0.87 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.5
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.551 W/kg
10 gram SAR value : 0.527 W/kg
Area Scan Peak SAR : 0.712 W/kg
Zoom Scan Peak SAR : 1.040 W/kg

Plot 4#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Right Head Cheek (835 MHz Middle Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.720 W/kg
Power Drift-Finish : 0.753 W/kg
Power Drift (%) : 4.583

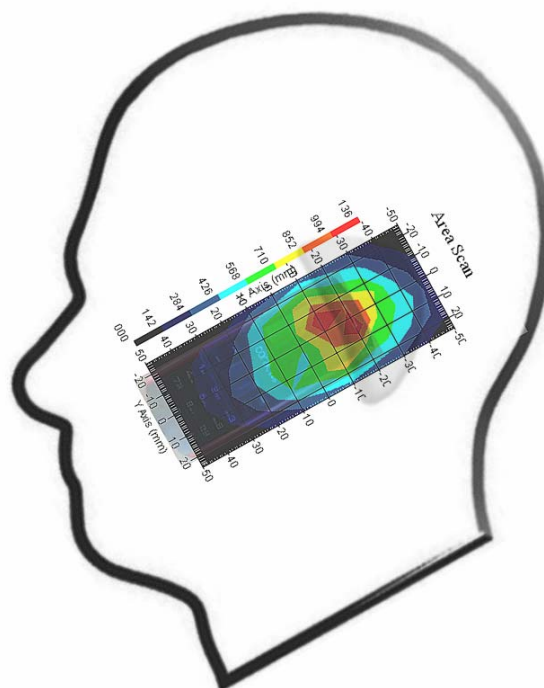
Tissue Data

Type : HEAD
Frequency : 835.00 MHz
Epsilon : 39.94 F/m
Sigma : 0.87 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.5
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.901 W/kg
10 gram SAR value : 0.562 W/kg
Area Scan Peak SAR : 1.136 W/kg
Zoom Scan Peak SAR : 1.981 W/kg

Plot 5#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Right Head Tilt (835 MHz Middle Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.398 W/kg
Power Drift-Finish : 0.387 W/kg
Power Drift (%) : -2.764

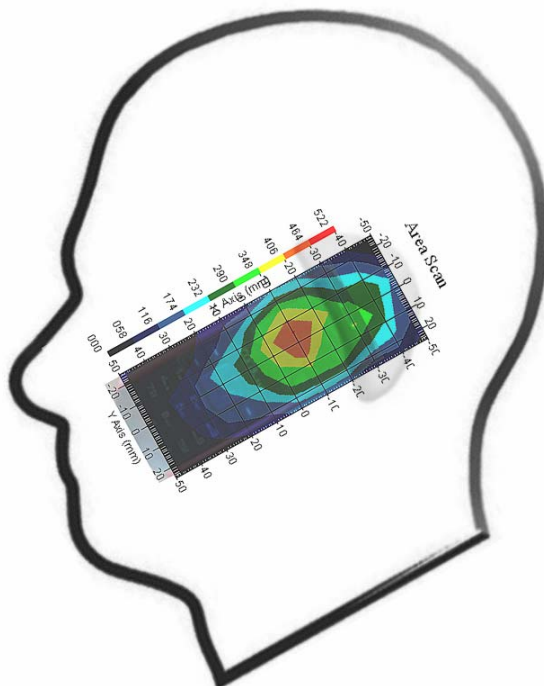
Tissue Data

Type : HEAD
Frequency : 835.00 MHz
Epsilon : 39.94 F/m
Sigma : 0.87 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.5
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.439 W/kg
10 gram SAR value : 0.259 W/kg
Area Scan Peak SAR : 0.467 W/kg
Zoom Scan Peak SAR : 0.670 W/kg

Plot 6#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Body- worn Back (835 MHz Middle Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 6x12x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.395 W/kg
Power Drift-Finish : 0.414 W/kg
Power Drift (%) : 4.810

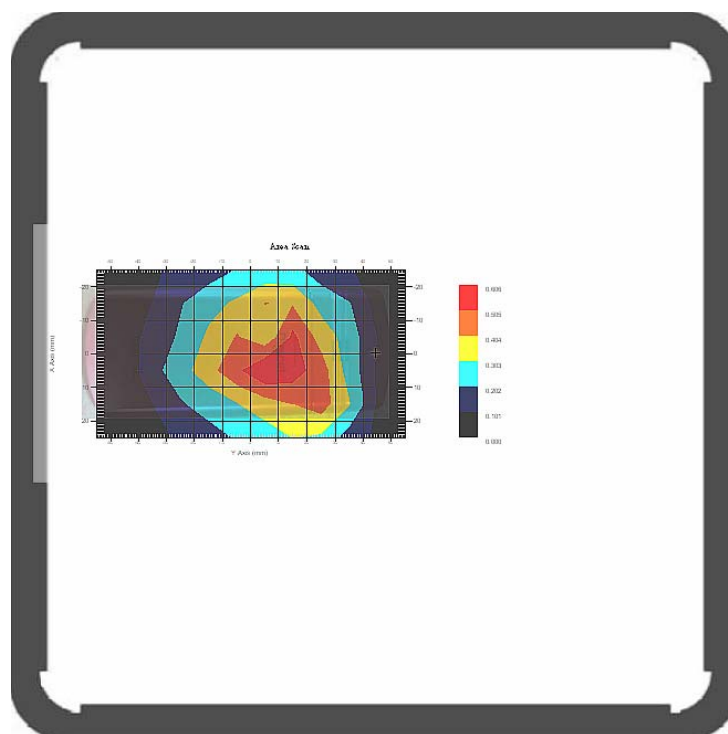
Tissue Data

Type : BODY
Frequency : 835.00 MHz
Epsilon : 55.17 F/m
Sigma : 0.98 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.7
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.440 W/kg
10 gram SAR value : 0.305 W/kg
Area Scan Peak SAR : 0.606 W/kg
Zoom Scan Peak SAR : 0.870 W/kg

Plot 7#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Body- worn Back (835 MHz Low Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 6x12x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.161 W/kg
Power Drift-Finish : 0.154 W/kg
Power Drift (%) : -4.348

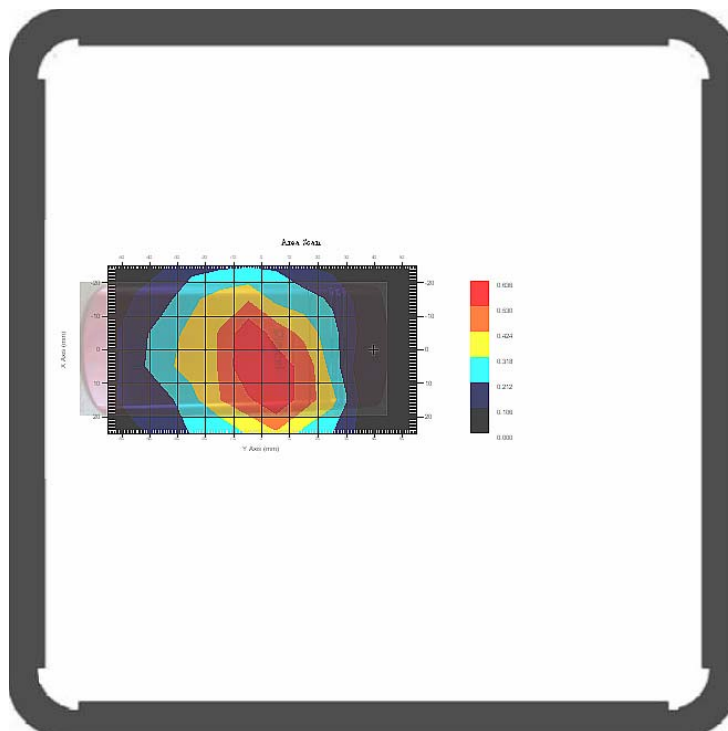
Tissue Data

Type : BODY
Frequency : 835.00 MHz
Epsilon : 55.17 F/m
Sigma : 0.98 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.7
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.579 W/kg
10 gram SAR value : 0.383 W/kg
Area Scan Peak SAR : 0.636 W/kg
Zoom Scan Peak SAR : 1.020 W/kg

Plot 8#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Body- worn Back (835 MHz High Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 6x12x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.173 W/kg
Power Drift-Finish : 0.179 W/kg
Power Drift (%) : 3.625

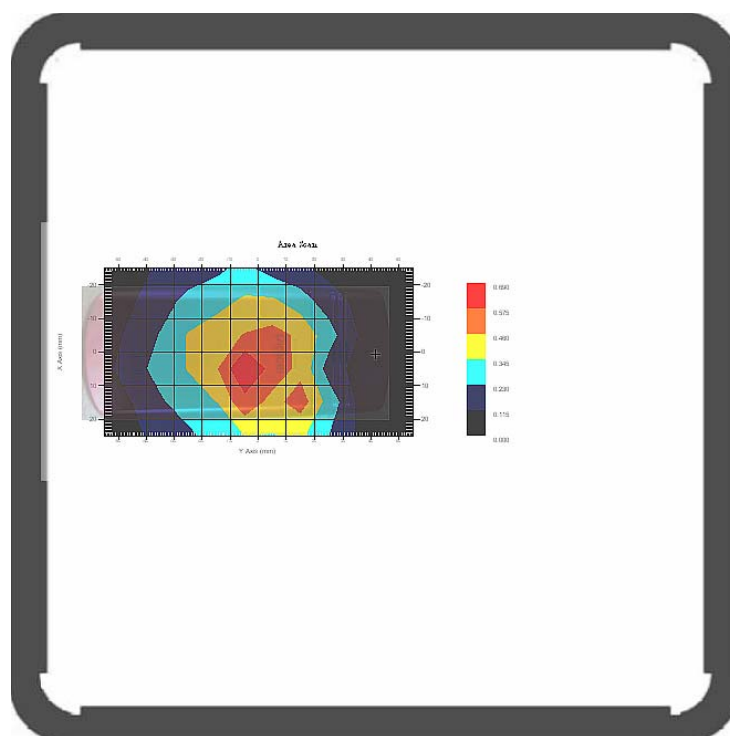
Tissue Data

Type : BODY
Frequency : 835.00 MHz
Epsilon : 55.17 F/m
Sigma : 0.98 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 835.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 6.7
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.502 W/kg
10 gram SAR value : 0.327 W/kg
Area Scan Peak SAR : 0.690 W/kg
Zoom Scan Peak SAR : 0.810 W/kg

Plot 9#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Left Head Cheek (1900 MHz Middle Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type: : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.128 W/kg
Power Drift-Finish : 0.129 W/kg
Power Drift (%) : 0.982

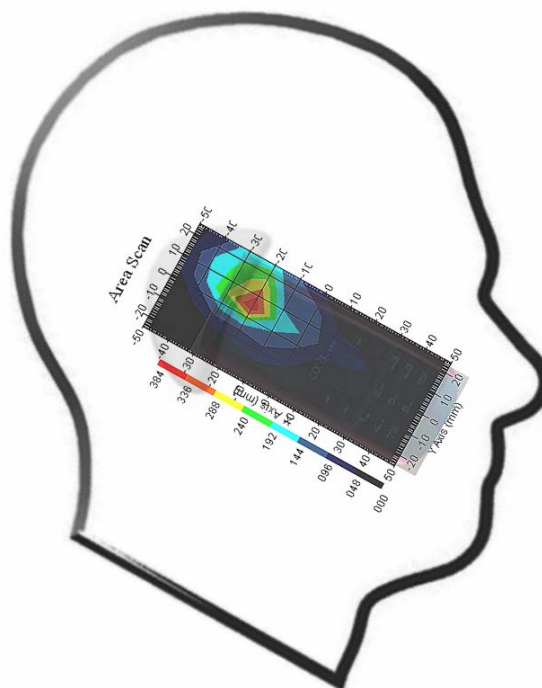
Tissue Data

Type : HEAD
Frequency : 1900.00 MHz
Epsilon : 39.39 F/m
Sigma : 1.47 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.25
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.414 W/kg
10 gram SAR value : 0.237 W/kg
Area Scan Peak SAR : 0.383 W/kg
Zoom Scan Peak SAR : 0.660 W/kg

Plot 10#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Left Head Cheek (1900 MHz Low Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type: : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.120 W/kg
Power Drift-Finish : 0.115 W/kg
Power Drift (%) : -4.167

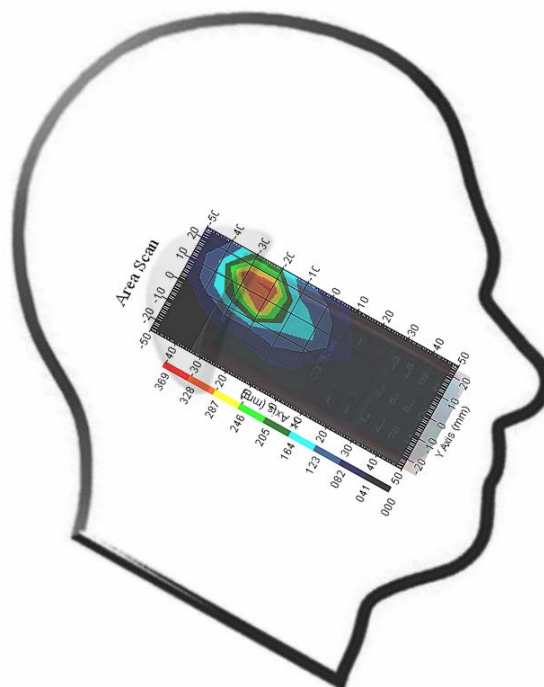
Tissue Data

Type : HEAD
Frequency : 1900.00 MHz
Epsilon : 39.39 F/m
Sigma : 1.47 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.25
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.307 W/kg
10 gram SAR value : 0.143 W/kg
Area Scan Peak SAR : 0.332 W/kg
Zoom Scan Peak SAR : 0.600 W/kg

Plot 11#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Left Head Cheek (1900 MHz High Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type: : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.117 W/kg
Power Drift-Finish : 0.114 W/kg
Power Drift (%) : -2.564

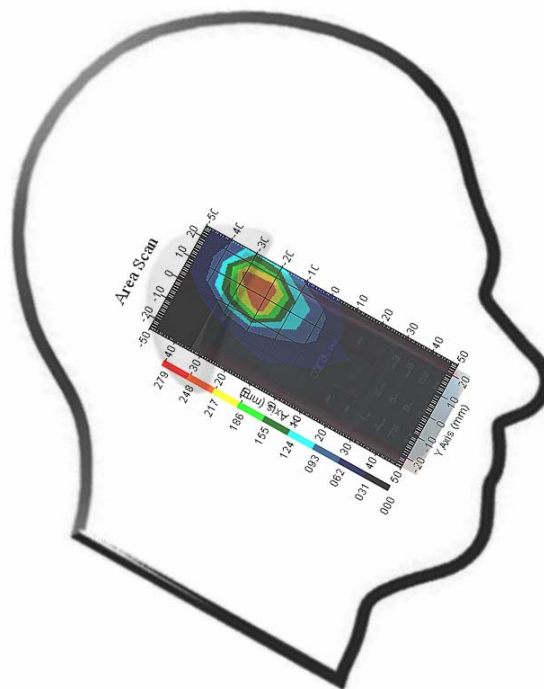
Tissue Data

Type : HEAD
Frequency : 1900.00 MHz
Epsilon : 39.39 F/m
Sigma : 1.47 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.25
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.266 W/kg
10 gram SAR value : 0.107 W/kg
Area Scan Peak SAR : 0.279 W/kg
Zoom Scan Peak SAR : 0.620 W/kg

Plot 12#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Left Head Tilt (1900 MHz Middle Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type: : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.142 W/kg
Power Drift-Finish : 0.135 W/kg
Power Drift (%) : -4.929

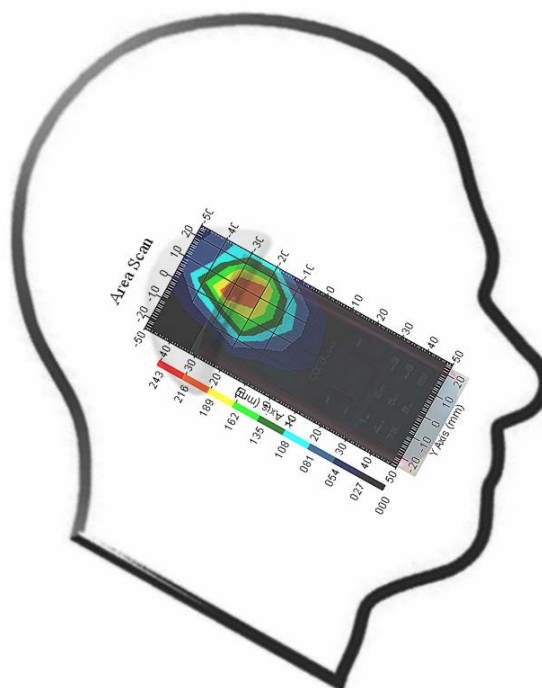
Tissue Data

Type : HEAD
Frequency : 1900.00 MHz
Epsilon : 39.39 F/m
Sigma : 1.47 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.25
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.195 W/kg
10 gram SAR value : 0.092 W/kg
Area Scan Peak SAR : 0.217 W/kg
Zoom Scan Peak SAR : 0.490 W/kg

Plot 13#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Right Head Cheek (1900 MHz Middle Channel)****Measurement Data**

Test mode : GSM
Crest Factor : 8
Scan Type: : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.271 W/kg
Power Drift-Finish : 0.281 W/kg
Power Drift (%) : 3.690

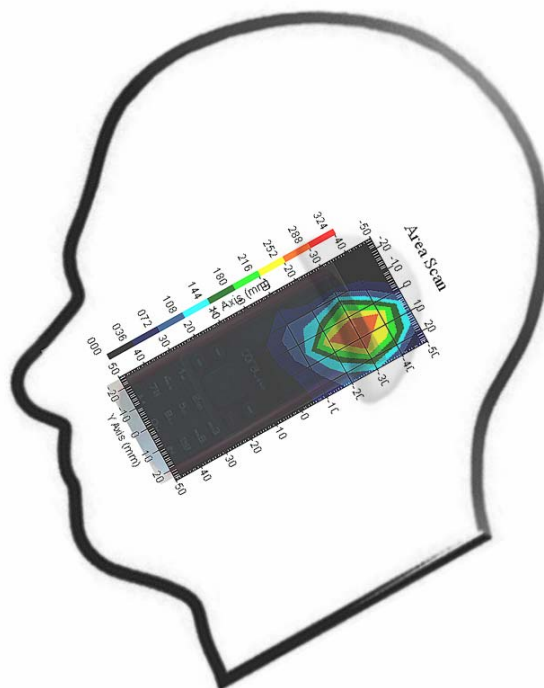
Tissue Data

Type : HEAD
Frequency : 1900.00 MHz
Epsilon : 39.39 F/m
Sigma : 1.47 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.25
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.315 W/kg
10 gram SAR value : 0.146 W/kg
Area Scan Peak SAR : 0.324 W/kg
Zoom Scan Peak SAR : 0.710 W/kg

Plot 14#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Right Head Tilt (1900 MHz Middle Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type: : Complete
Area Scan : 11x6x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.216 W/kg
Power Drift-Finish : 0.209 W/kg
Power Drift (%) : -3.241

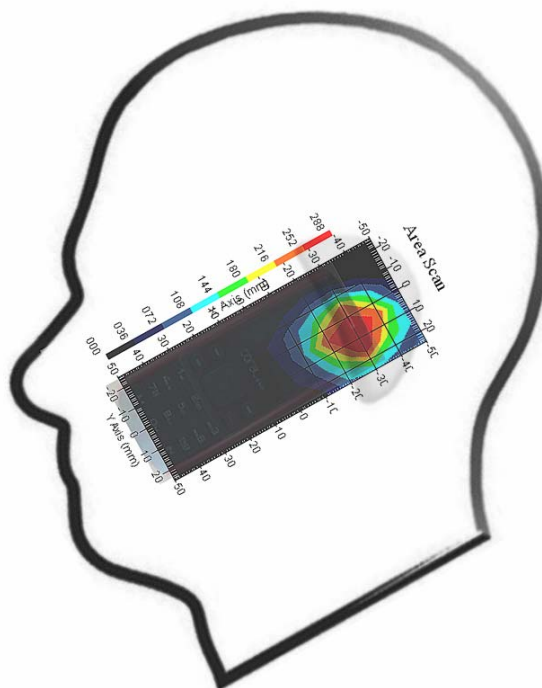
Tissue Data

Type : HEAD
Frequency : 1900.00 MHz
Epsilon : 39.39 F/m
Sigma : 1.47 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.25
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.230 W/kg
10 gram SAR value : 0.134 W/kg
Area Scan Peak SAR : 0.284 W/kg
Zoom Scan Peak SAR : 0.540 W/kg

Plot 15#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Body- worn Back (1900 MHz Middle Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 6x12x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.368 W/kg
Power Drift-Finish : 0.356 W/kg
Power Drift (%) : -3.261

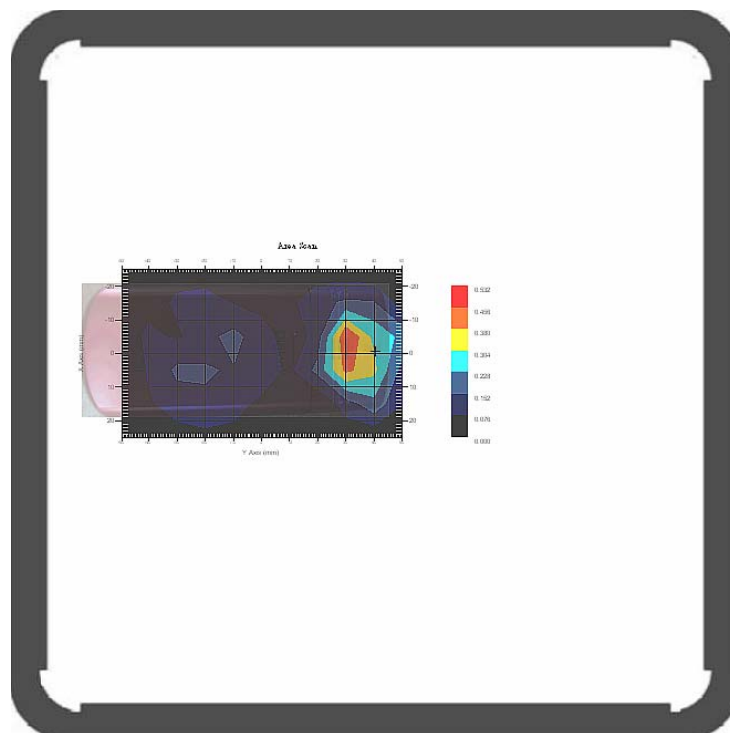
Tissue Data

Type : BODY
Frequency : 1900.00 MHz
Epsilon : 52.73 F/m
Sigma : 1.56 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.15
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.425 W/kg
10 gram SAR value : 0.178 W/kg
Area Scan Peak SAR : 0.458 W/kg
Zoom Scan Peak SAR : 1.050 W/kg

Plot 16#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Body- worn Back (1900 MHz Low Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 6x12x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.361 W/kg
Power Drift-Finish : 0.378 W/kg
Power Drift (%) : 4.709

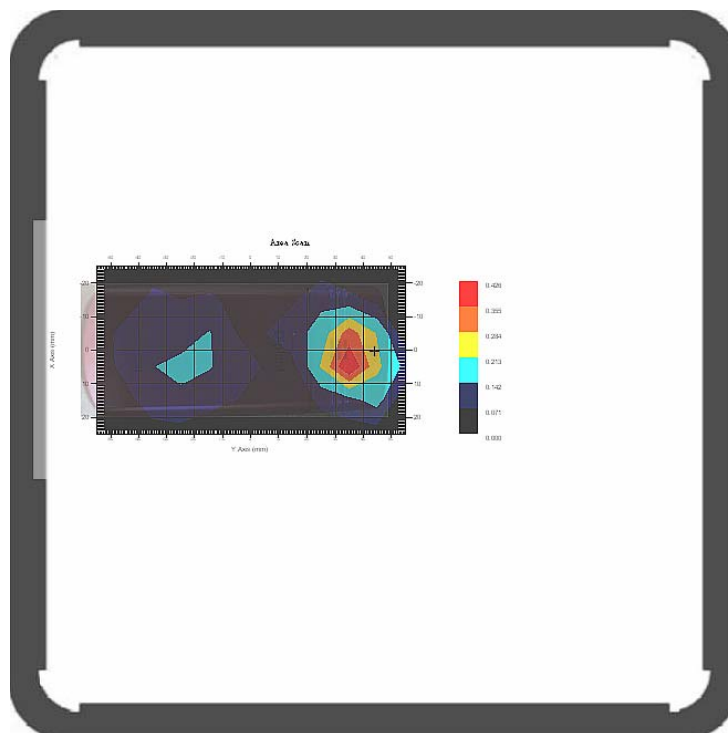
Tissue Data

Type : BODY
Frequency : 1900.00 MHz
Epsilon : 52.73 F/m
Sigma : 1.56 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.15
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.350 W/kg
10 gram SAR value : 0.147 W/kg
Area Scan Peak SAR : 0.425 W/kg
Zoom Scan Peak SAR : 0.680 W/kg

Plot 17#

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**Body- worn Back (1900 MHz High Channel)**

Measurement Data

Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 6x12x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.299 W/kg
Power Drift-Finish : 0.313 W/kg
Power Drift (%) : 4.682

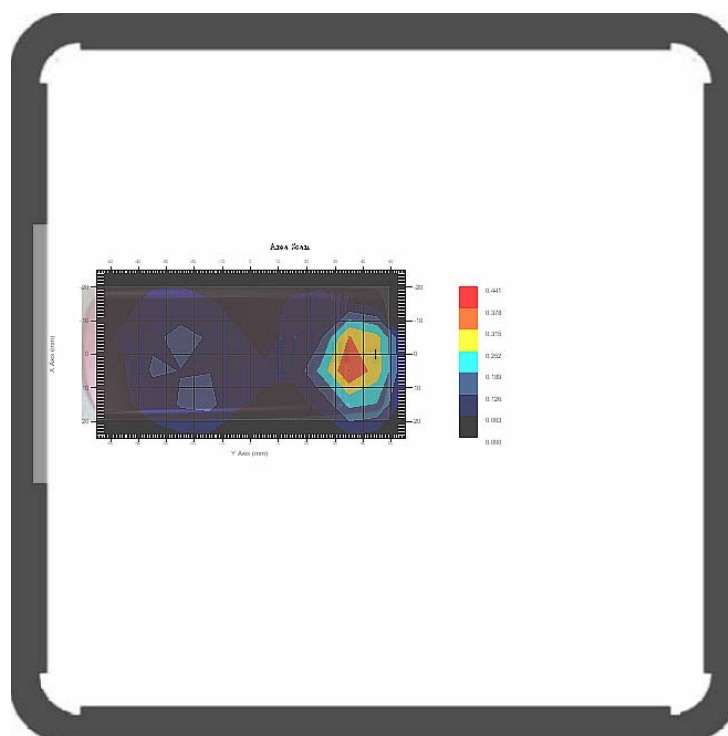
Tissue Data

Type : BODY
Frequency : 1900.00 MHz
Epsilon : 52.73 F/m
Sigma : 1.56 S/m
Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 273
Frequency : 1900.00 MHz
Duty Cycle Factor : 8
Conversion Factor : 5.15
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V/m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.309 W/kg
10 gram SAR value : 0.131 W/kg
Area Scan Peak SAR : 0.379 W/kg
Zoom Scan Peak SAR : 0.720 W/kg

Plot 18#

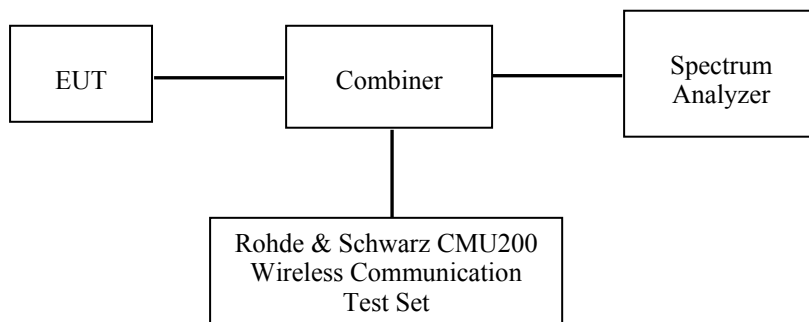
APPENDIX F – CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

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

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.



Test Equipment Lists and Detail

| Manufacturer | Equipment Description | Model No. | Serial No. | Calibration Date |
|-----------------|-----------------------|-----------|--------------|------------------|
| Rohde & Schwarz | Communication Tester | CMU200 | 1100.0008.02 | 2008-06-21 |
| Rohde & Schwarz | Spectrum Analyzer | FSEM30 | 849720/019 | 2008-05-09 |

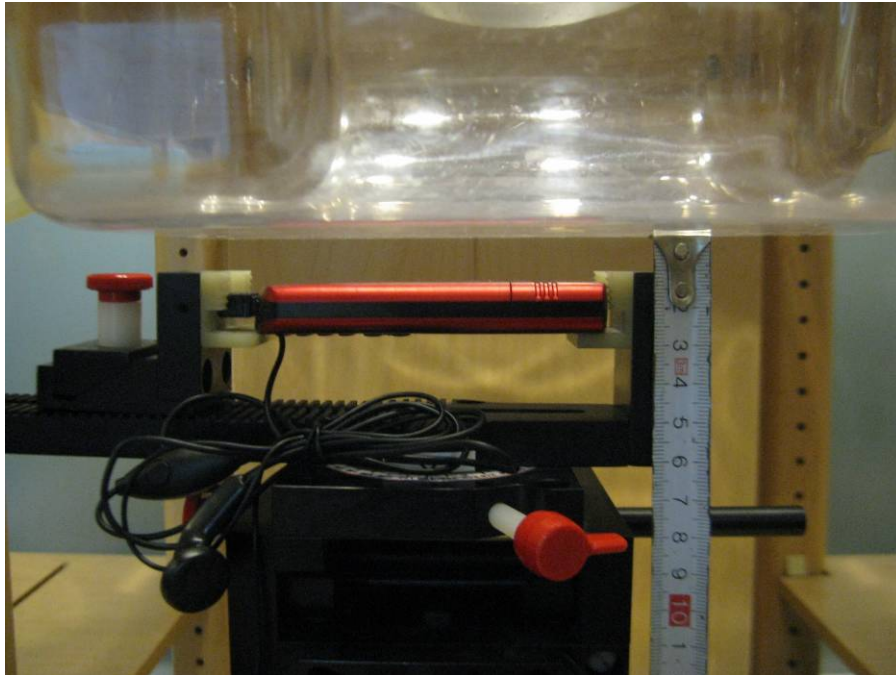
Test Results

| Band | Frequency (MHz) | Conducted Output Power (GSM Mode) | |
|----------|-----------------|-----------------------------------|--------|
| | | (dBm) | (Watt) |
| Cellular | 824.2 | 31.99 | 1.581 |
| | 836.6 | 31.85 | 1.531 |
| | 848.8 | 31.88 | 1.542 |
| PCS | 1850.2 | 28.45 | 0.700 |
| | 1880.0 | 28.41 | 0.693 |
| | 1909.8 | 28.53 | 0.713 |

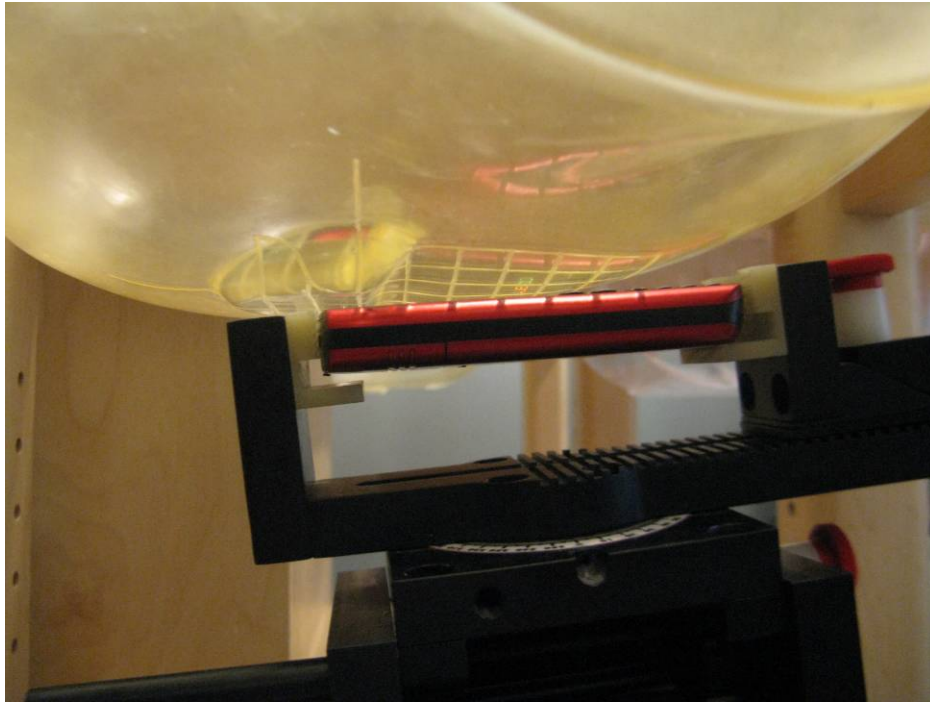
APPENDIX G – EUT TEST POSITION PHOTOS

1.5 cm Body-worn Setup Photo

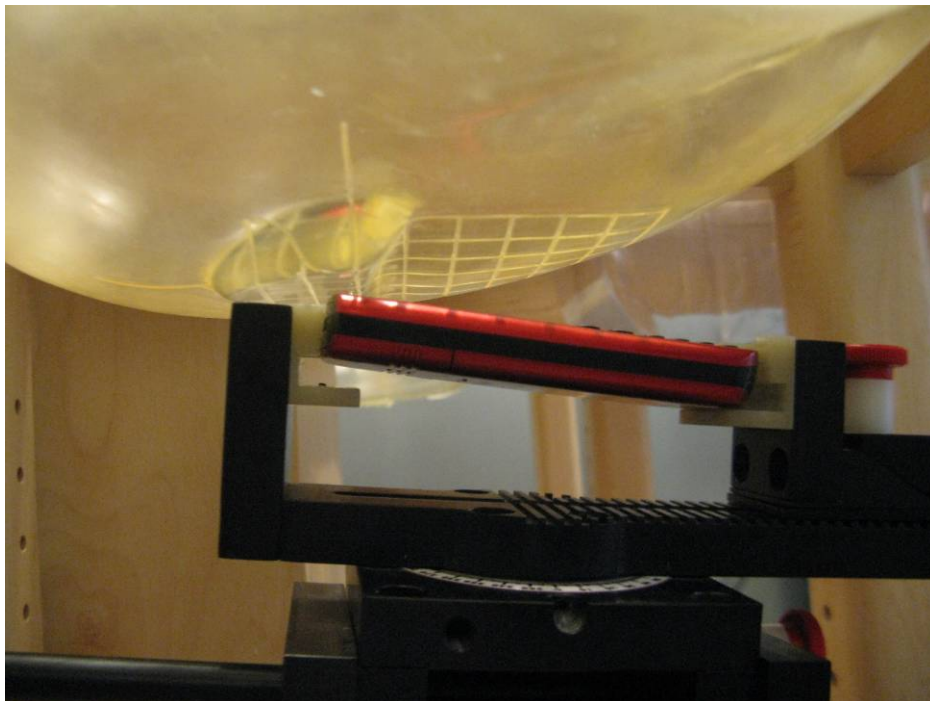
(With Headset)



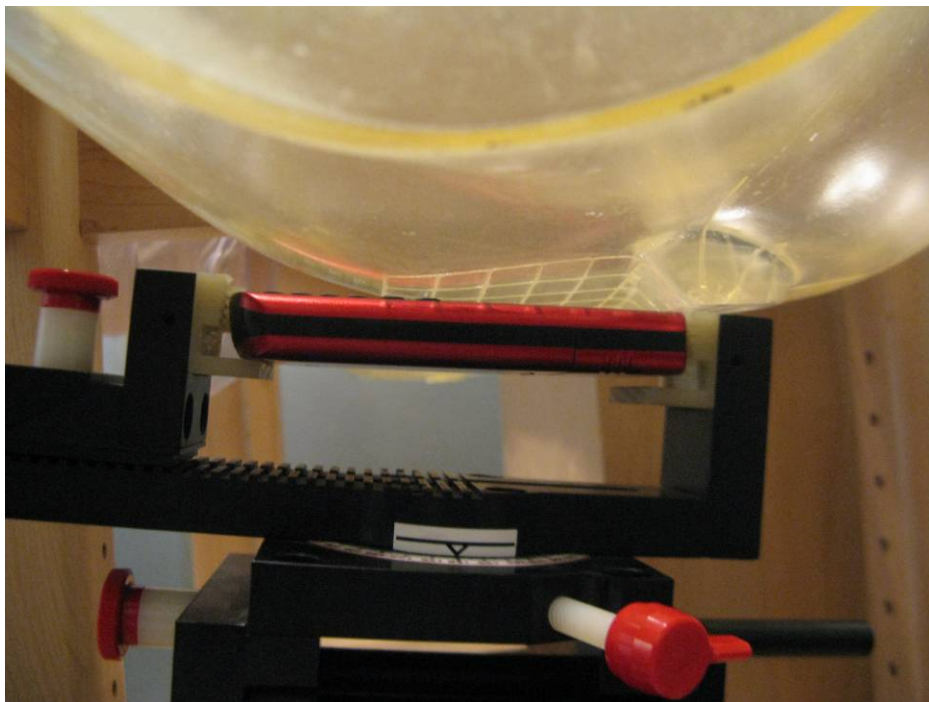
Left Head Touch Setup Photo



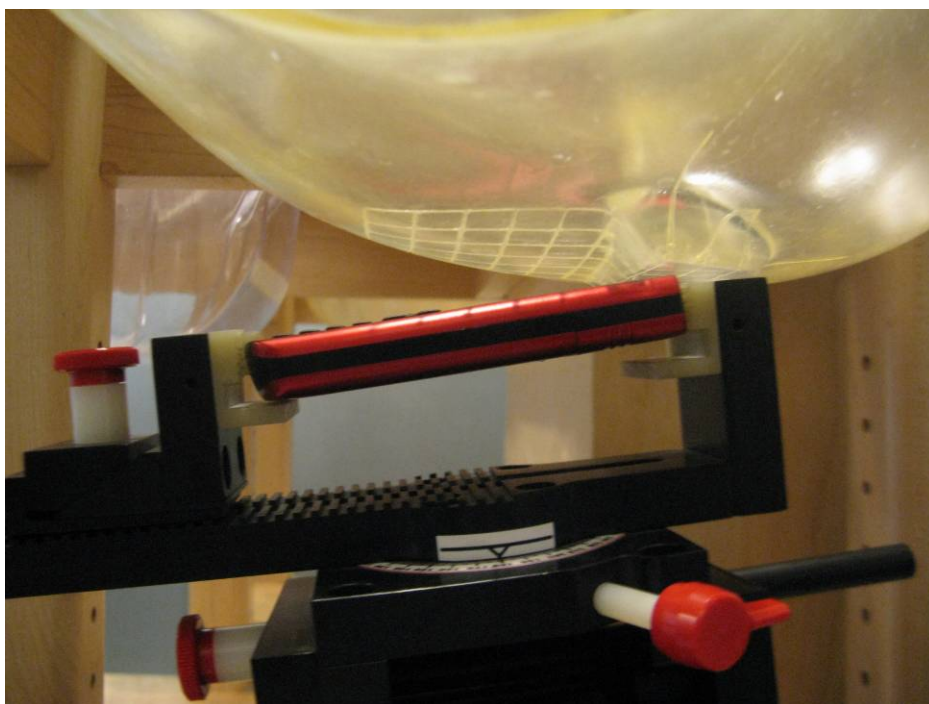
Left Head Tilt Setup Photo



Right Head Touch Setup Photo



Right Head Tilt Setup Photo



APPENDIX H – EUT PHOTOS

EUT - Top View



EUT - Bottom View



EUT- Battery Removed View**EUT - Headset**

APPENDIX I - INFORMATIVE REFERENCES

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