RF EXPOSURE LAB, LLC

2867 Progress Place, Suite 4D • Escondido, CA 92029 • U.S.A.
TEL (760) 737-3131 • FAX (760) 737-9131
http://www.rfexposurelab.com

# CERTIFICATE OF COMPLIANCE
# SAR EVALUATION

| | |
|---|---|
| Shure Incorporated | Dates of Test: May 2, 2005 |
| 5800 W. Touhy Avenue | Test Report Number: SAR.20050501 |
| Niles, IL 60714 | Revision 2 |

| | |
|---|---|
| FCC ID: | DD4UR1 |
| Model(s): | UR1 – J5 Band & L3 Band |
| Serial No.: | Production Unit |
| Equipment Type: | UHF Transceiver |
| Classification: | Part 74 Portable Transmitter Next to Body |
| TX Frequency Range: | 578 – 698 MHz (Excluding 609-613 MHz) |
| RX Frequency Range: | 578 – 698 MHz (Excluding 609-613 MHz) |
| Maximum RF Output: | 20 dBm Conducted |
| Signal Modulation: | FM |
| Antenna Type (Length): | Flexible ½ Wave (117 mm x 2 mm) (J5 – UA820J), (L3 – UA820L3) |
| Application Type: | Certification |
| FCC Rule Parts: | Part 74 |

This wireless mobile and/or portable device has been shown to be compliant for localized specific absorption rate (SAR) for uncontrolled environment/general exposure limits specified in ANSI/IEEE Std. C95.1-1999 and had been tested in accordance with the measurement procedures specified in IEEE 1528-2003 and OET Bulletin 65 Supp. C (See test report).

I attest to the accuracy of the data. All measurements were performed by myself or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RF Exposure Lab, LLC certifies that no party to this application has been denied FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

Jay M. Moulton
Vice President

# Table of Contents

# 1. Introduction

This measurement report shows compliance of the Shure Incorporated Model UR1 Band J5 and Band L3 FCC ID: DD4UR1 with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices. The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on August 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC regulated portable devices. [1]

The test procedures, as described in ANSI C95.1 – 1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [2], ANSI C95.3 – 2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields [3], FCC OET Bulletin 65 Supp. C – 2001 [4], and IEEE Std.1528 – 2003 Recommended Practice [5] were employed.

## SAR Definition [5]

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (*dW*) absorbed by (dissipated in) an incremental mass (*dm*) contained in a volume element (*dV*) of a given density ($\rho$).

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dV}\right)$$

SAR is expressed in units of watts per kilogram (W/kg). *SAR* can be related to the electric field at a point by

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

where:

$\sigma$ = conductivity of the tissue (S/m)

$\rho$ = mass density of the tissue (kg/m$^3$)

*E* = rms electric field strength (V/m)

# 2. SAR Measurement Setup

## Robotic System

The measurements are conducted utilizing the ALSAS-10-U automated dosimetric assessment system. The ALSAS-10-U is designed and manufactured by Aprel Laboratories in Nepean, Ontario, Canada. The system utilizes a Robcomm 3 robot manufactured by ThermoCRS located in Michigan USA.

## System Hardware

The system consists of a six axis articulated arm, controller for precise probe positioning (0.05 mm repeatability), a power supply, a teach pendent for teaching area scans, near field probe, an IBM Pentium 4™ 2.66 GHz PC with Windows XP Pro™, and custom software developed to enable communications between the robot controller software and the host operating system.

An amplifier is located on the articulated arm, which is isolated from the custom designed end effector and robot arm. The end effector provides the mechanical touch detection functionality and probe connection interface. The amplifier is functionally validated within the manufacturer's site and calibrated at NCL Calibration Laboratories. A Data Acquisition Card (DAC) is used to collect the signal as detected by the isotropic e-field probe. The DAC manufacturer calibrates the DAC to NIST standards. A formal validation is executed using all mechanical and electronic components to prove conformity of the measurement platform as a whole.

## System Description

The ALSAS-10-U has been designed to measure devices within the compliance environment to meet all recognized standards. The system also conforms to standards, which are currently being developed by the scientific and manufacturing community.

The course scan resolution is defined by the operator and reflects the requirements of the standard to which the device is being tested. Precise measurements are made within the predefined course scan area and the values are logged.

The user predefines the sample rate for which the measurements are made so as to ensure that the full duty-cycle of a pulse modulation device is covered during the sample. The following algorithm is an example of the function used by the system for linearization of the output for the probe.

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

The Aprel E-Field probe is evaluated to establish the diode compression point.

A complex algorithm is then used to calculate the values within the measured points down to a resolution of 1mm. The data from this process is then used to provide the co-ordinates from which the cube scan is created for the determination of the 1 g and 10 g averages.

Cube scan averaging consists of a number of complex algorithms, which are used to calculate the one, and ten gram averages. The basis for the cube scan process is centered on the location where the maximum measured SAR value was found. When a secondary peak value is found which is within 60% of the initial peak value, the system will report this back to the operator who can then assess the need for further analysis of both the peak values prior to the one and ten-gram cube scan averaging process. The algorithm consists of 3D cubic Spline, and Lagrange extrapolation to the surface, which form the matrix for calculating the measurement output for the one and ten gram average values. The resolution for the physical scan integral is user defined with a final calculated resolution down to 1mm.

In-depth analysis for the differential of the physical scanning resolution for the cube scan analysis has been carried out, to identify the optimum setting for the probe positioning steps, and this has been determined at 8mm increments on the X, & Y planes. The reduction of the physical step increment increased the time taken for analysis but did not provide a better uncertainty or return on measured values.

The final output from the system provides data for the area scan measurements, physical and splined (1mm resolution) cube scan with physical and calculated values (1mm resolution).

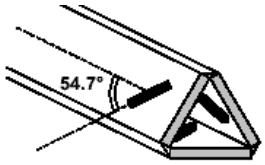
The overall uncertainty for the methodology and algorithms the ALSAS-10-U used during the SAR calculation was evaluated using the data from IEEE 1528 f3 algorithm:

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

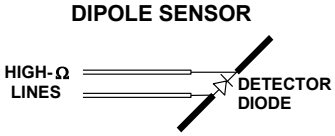
The probe used during the measurement process has been assessed to provide values for diode compression. These values are calculated during the probe calibration exercise and are used in the mathematical calculations for the assessment of SAR.

## E-Field Probe ALS-E-020

The E-field probe used by RF Exposure Lab, LLC, has been fully calibrated and assessed for isotropic, and boundary effect. The probe utilizes a triangular sensor arrangement as detailed in the diagram below right.




Δ-BEAM




The SAR is assessed with the 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 (Z height). The diagram above right shows how the center of the sensor is defined with the location of the diode placed at the center of the dipole. The 5mm default in the Z axis is the optimum height for assessing SAR where the boundary effect is at its least, with the probe located closest to the phantom surface (boundary).

# 3. Robot Specifications

## Specifications

| | |
|---|---|
| Positioner: | ThermoCRS, Robot Model: Robocomm 3 |
| Repeatability: | 0.05 mm |
| No. of axis: | 6 |

## Data Acquisition Card (DAC) System

### Cell Controller

| | |
|---|---|
| Processor: | Pentium 4™ |
| Clock Speed: | 2.66 GHz |
| Operating System: | Windows XP Pro™ |

### Data Converter

| | |
|---|---|
| Features: | Signal Amplifier, End Effector, DAC |
| Software: | ALSAS 10-U Software |

## E-Field Probe

| | |
|---|---|
| Model: | ALS-E-020 |
| Serial Number: | RFE-217 |
| Construction: | Triangular Core Touch Detection System |
| Frequency: | 10MHz to 6GHz |

## Phantom

| | |
|---|---|
| Phantom: | Uniphantom, Right Phantom, Left Phantom |

# 4. Phantom & Simulating Tissue Specifications

## SAM Phantom

The Aprel system utilizes three separate phantoms. Each phantom for SAR assessment testing is a low loss dielectric shell, with shape and dimensions derived from the anthropomorphic data of the 90$^{th}$ percentile adult male head dimensions as tabulated by the US Army. The SAM phantom shell is bisected along the mid sagittai plane into right and left halves. The perimeter sidewalls of each phantom half is extended to allow filling with liquid to a depth of 15 cm that is sufficient to minimize reflections from the upper surface [5]. See photos in Appendix C.

## Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellullose (HEC) gelling agent and saline solution. Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following tables. Other head and body tissue parameters that have not been specified in P1528 are derived from the issue dielectric parameters computed from the 4-Cole-Cole equations.

**Table 5.1 Typical Composition of Ingredients for Tissue**

| Ingredients | | Simulating Tissue | |
|---|---|---|---|
| | | 835 MHz Brain | 835 MHz Muscle |
| Mixing Percentage | | | |
| Water | | 40.45 | 52.40 |
| Sugar | | 57.60 | 45.00 |
| Salt | | 1.45 | 1.40 |
| Bacteriacide | | 0.10 | 0.10 |
| HEC | | 0.40 | 1.00 |
| Dielectric Constant | Target | 41.50 | 56.10 |
| Conductivity (S/m) | Target | 0.90 | 0.95 |

## Device Holder

In combination with the SAM phantom, the mounting device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can easily, accurately, and repeatably be positioned according to the FCC specifications. The device holder can be locked at different phantom locations (left head, right head, and uni-phantom).

# 5. Definition of Reference Points

## Ear Reference Point

Figure 6.2 shows the front, back and side views of the SAM Phantom. The point "M" is the reference point for the center of the mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERPs are 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 6.1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 6.1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

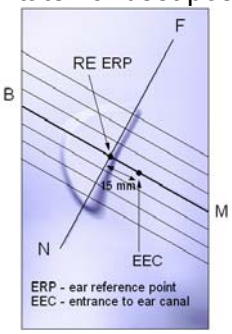



**Figure 6.1 Close-up side view of ERP's**


**Figure 6.2 Front, back and side view of SAM**

## Device Reference Points

Two imaginary lines on the device need to be established: the vertical centerline and the horizontal line. The test device is placed 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" (See Fig. 6.3). The "test device reference point" is than located at the same level as the center of the ear reference point. The test device is positioned so that the "vertical centerline" is bisecting the front surface of the device at it's top and bottom edges, positioning the "ear reference point" on the outer surface of both the left and right head phantoms on the ear reference point [5].

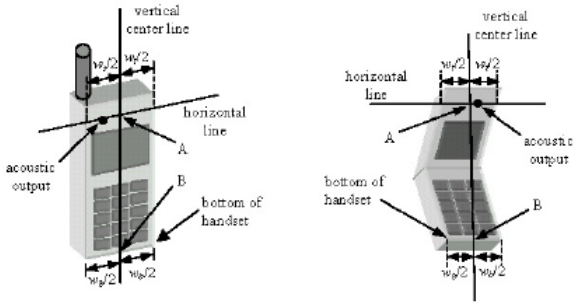



**Figure 6.3 Handset Vertical Center & Horizontal Line Reference Points**

# 6. Test Configuration Positions

## Positioning for Cheek/Touch [5]

1. Position the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7.1), such that the plane defined by the vertical center line and the horizontal line of the device is approximately parallel to the sagittal plane of the phantom.

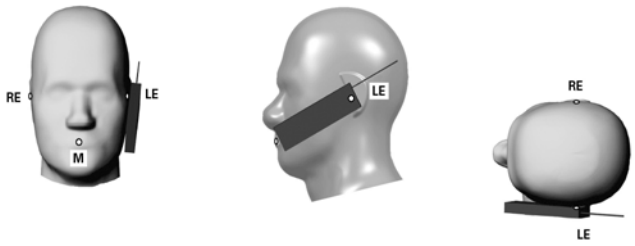



**Figure 7.1 Front, Side and Top View of Cheek/Touch Position**

2. Translate the device towards the phantom along the line passing through RE and LE until the device touches the ear.

3. While maintaining the device in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).

4. Rotate the device around the vertical centerline until the device (horizontal line) is symmetrical with respect to the line NF.

5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the device contact with the ear, rotate the device about the line NF until any point on the device is in contact with a phantom point below the ear (cheek). See Figure 7.2.

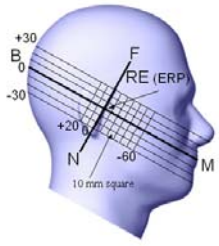



**Figure 7.2 Side view w/ relevant markings**

## Positioning for Ear / 15˚ Tilt [5]

With the test device aligned in the Cheek/Touch Position":

1. While maintaining the orientation of the device, retracted the device parallel to the reference plane far enough to enable a rotation of the device by 15 degrees.

2. Rotate the device around the horizontal line by 15 degrees.

3. While maintaining the orientation of the device, move the device parallel to the reference plane until any part of the device touches the head. (In this position, point A is located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, the angle of the device shall be reduced. The tilted position is obtained when any part of the device is in contact with the ear as well as a second part of the device is in contact with the head (see Figure 7.3).

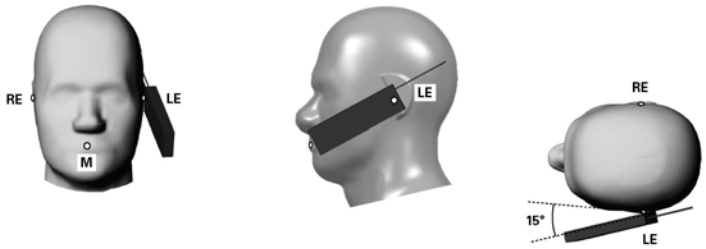



**Figure 7.3 Front, Side and Top View of Ear/15˚ Tilt Position**

## Body Worn Configurations

Body-worn operating configurations are tested with the accessories attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then, when multiple accessories that contain metallic components are supplied with the device, the device is tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (i.e. 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 is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented.

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory(ies), including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worst-case positioning is then documented and used to perform Body SAR testing.

In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and cautions statements are included in the user's manual.

# 7. ANSI/IEEE C95.1 – 1999 RF Exposure Limits [2]

## Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

## Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Table 8.1 Human Exposure Limits**

| | UNCONTROLLED ENVIRONMENT<br>General Population<br>(W/kg) or (mW/g) | CONTROLLED ENVIROMENT<br>Professional Population<br>(W/kg) or (mW/g) |
|---|---|---|
| SPATIAL PEAK SAR[1]<br>Brain | 1.60 | 8.00 |
| SPATIAL AVERAGE SAR[2]<br>Whole Body | 0.08 | 0.40 |
| SPATIAL PEAK SAR[3]<br>Hands, Feet, Ankles, Wrists | 4.00 | 20.00 |

[1] The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
[2] The Spatial Average value of the SAR averaged over the whole body.
[3] The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

# 8. Measurement Uncertainty

See Appendix B SAR Test Data Plots for Measurement Uncertainty.

# 9. System Validation

## Tissue Verification

**Table 10.1 Measured Tissue Parameters**

| Date(s) | 5/02/2005 | 835 MHz Muscle | | 635 MHz Muscle | |
|---|---|---|---|---|---|
| Liquid Temperature (˚C) | 20.0 | Target | Measured | Target | Measured |
| Dielectric Constant: ε | | 41.50 | 53.74 | 55.98 | 56.04 |
| Conductivity: σ | | 0.900 | 0.94 | 0.95 | 0.90 |

See Appendix A for data printout.

## Test System Verification

Prior to assessment, the system is verified to the ±10% of the specifications at 835 MHz by using the system kit. (Graphic Plots Attached)

**Table 10.2 System Dipole Validation Target & Measured**

| System Validation Kit: ALS-D-835-S-2 S/N: RFE-274 | 835 MHz Muscle | Targeted $SAR_{1g}$ (W/kg) 9.5 | Measure $SAR_{1g}$ (W/kg) 9.5 | Deviation (%) 0.0 |
|---|---|---|---|---|

See Appendix A for data plots.

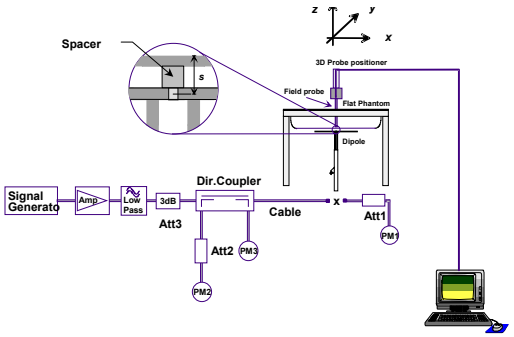



**Figure 10.1 Dipole Validation Test Setup**

# 10. SAR Test Data Summary

## See Measurement Result Data Pages

See Appendix B for SAR Test Data Plots.
See Appendix C for SAR Test Setup Photos.

## Procedures Used To Establish Test Signal

The device was placed into simulated transmit mode using the manufacturer's test codes. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR. When test modes are not available or inappropriate for testing a device, the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

## Device Test Condition

The device is battery operated. Each SAR measurement was taken with a fully charged battery. In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power. If a conducted power deviation of more than 5% occurred, the test was repeated.

## SAR Data Summary – 635 MHz Muscle (J5 Band)

| MEASUREMENT RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUT Position** | **Antenna Position** | **Frequency** | | **Modulation** | **Begin / End Power** | | | **SAR (W/kg)** |
| | | **MHz** | **Ch.** | | **(dBm)** | | **Battery** | |
| Touch | Flexible ½ wave UA820J | 578.10 | G10 - 1 | FM | 19.13 | 19.16 | Standard | 0.66 |
| | | 607.45 | G10 - 14 | FM | 20.03 | 20.02 | Standard | 0.64 |
| | | 637.60 | G5 - 16 | FM | 19.70 | 19.70 | Standard | 0.69 |
| | | | | | **Muscle 1.6 W/kg (mW/g)** averaged over 1 gram | | | |

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Uniphantom ☐Right Head
   SAR Configuration ☐Head ☒Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☒With Belt Clip ☐Without Belt Clip ☐N/A

Jay M. Moulton
Vice President

## SAR Data Summary – 635 MHz Muscle (L3 Band)

| MEASUREMENT RESULTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **EUT Position** | **Antenna Position** | **Frequency** | | **Modulation** | **Begin / End Power** | | | **SAR (W/kg)** |
| | | **MHz** | **Ch.** | | **(dBm)** | | **Battery** | |
| Touch | Flexible ½ wave UA820J | 638.05 | G10 - 1 | FM | 19.68 | 19.68 | Standard | 0.62 |
| | | 667.875 | G10 - 14 | FM | 20.03 | 20.04 | Standard | 0.47 |
| | | 697.60 | G5 - 16 | FM | 20.19 | 20.19 | Standard | 0.50 |
| | | | | | **Muscle 1.6 W/kg (mW/g)** averaged over 1 gram | | | |

5. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP

6. SAR Measurement
   Phantom Configuration ☐Left Head ☒Uniphantom ☐Right Head
   SAR Configuration ☐Head ☒Body

7. Test Signal Call Mode ☒Test Code ☐Base Station Simulator

8. Test Configuration ☒With Belt Clip ☐Without Belt Clip ☐N/A

Jay M. Moulton
Vice President

# 11. Test Equipment List

**Table 12.1 Equipment Specifications**

| Type | Calibration Due Date | Serial Number |
|---|---|---|
| ThermoCRS Robot | N/A | RAF0338198 |
| ThermoCRS Controller | N/A | RCF0338224 |
| ThermoCRS Teach Pendant (Joystick) | N/A | STP0334405 |
| IBM Computer, 2.66 MHz P4 | N/A | 8189D8U KCPR08N |
| Aprel E-Field Probe ALS-E020 | 06/10/2005 | RFE-217 |
| Aprel Dummy Probe | N/A | 023 |
| Aprel Left Phantom | N/A | RFE-267 |
| Aprel Right Phantom | N/A | RFE-268 |
| Aprel UniPhantom | N/A | RFE-273 |
| Aprel Validation Dipole ALS-D-835-S-2 | 02/20/2006 | RFE-274 |
| Aprel Validation Dipole ALS-D-1900-S-2 | 02/20/2006 | RFE-277 |
| Aprel Validation Dipole ALS-D-2450-S-2 | 02/20/2006 | RFE-278 |
| Aprel Validation Dipole ALS-D-900-S-2 | 02/20/2006 | RFE-275 |
| Agilent (HP) 437B Power Meter | 12/14/2005 | 3125U08837 |
| Agilent (HP) 8481B Power Sensor | 12/14/2005 | 3318A05384 |
| Agilent (HP) 8350B Signal Generator | 03/03/2006 | 2749A10226 |
| Agilent (HP) 83525A RF Plug-In | 03/03/2006 | 2647A01172 |
| Agilent (HP) 8753C Vector Network Analyzer | 02/03/2006 | 3135A01724 |
| Agilent (HP) 85047A S-Parameter Test Set | 02/03/2006 | 2904A00595 |
| Aprel Dielectric Probe Assembly | N/A | 0011 |
| Microwave Power Devices 510-10E Amplifier | 03/03/2006 | 6063-001 |
| Microwave Power Devices 1020-9E Amplifier | 03/03/2006 | 5618-1 |
| Brain Equivalent Matter (835 MHz) | N/A | N/A |
| Brain Equivalent Matter (1900 MHz) | N/A | N/A |
| Brain Equivalent Matter (900 MHz) | N/A | N/A |
| Muscle Equivalent Matter (835 MHz) | N/A | N/A |
| Muscle Equivalent Matter (1900 MHz) | N/A | N/A |
| Muscle Equivalent Matter (900 MHz) | N/A | N/A |
| Muscle Equivalent Matter (2450 MHz) | N/A | N/A |
| Muscle Equivalent Matter (5200 MHz) | N/A | N/A |

# 12. Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body is a very complex phenomena that depends on the mass, shape, and size of the body; the orientation of the body with respect to the field vectors; and, the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

The validation test was conducted at 835 MHz. All correction factors utilized were from the 835 MHz calibrations. The tissue used was measured at 635 MHz for calculating the maximum SAR value. The 835 MHz correction factors are more conservative then the values would be at 635 MHz. Therefore, the SAR value reported in this document would be the most conservative value.

# 13. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation, August 1996

[2] ANSI/IEEE C95.1 – 1999, American National Standard Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300kHz to 100GHz, New York: IEEE, 1992.

[3] ANSI/IEEE C95.3 – 2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 1992.

[4] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, July 2001.

[5] IEEE Standard 1528 – 2003, IEEE Recommended Practice for Determining the Peak-Spatial Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques, October 2003.

# Appendix A – System Validation Plots and Data

```
**********************************************************
Test Result for UIM Dielectric Parameter
Mon 02/May/2005 08:47:35
Freq  Frequency(GHz)
FCC_eH      FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sH      FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB      FCC Limits for Body Epsilon
FCC_sB      FCC Limits for Body Sigma
Test_e      Epsilon  of  UIM
Test_s      Sigma of UIM
**********************************************************
```

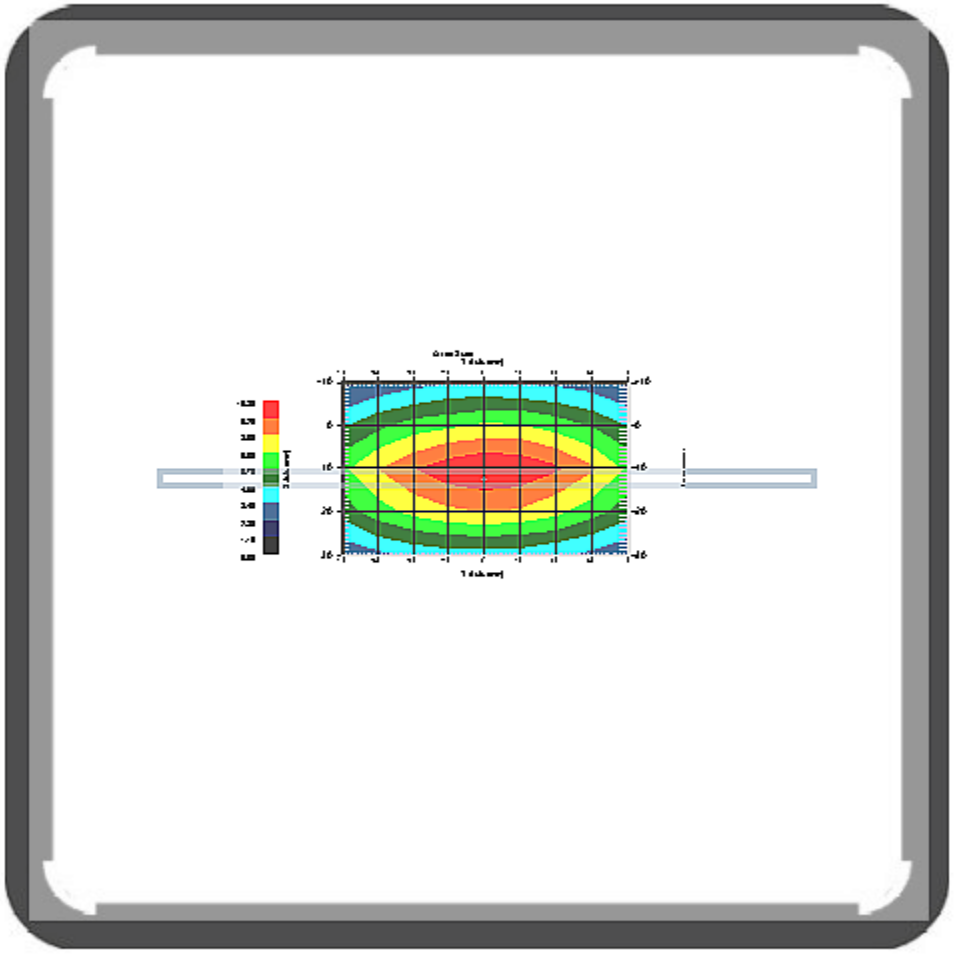
| Freq | FCC_eB | FCC_sB | Test_e | Test_s |
|---|---|---|---|---|
| 0.4350 | 56.85 | 0.94 | 58.42 | 0.87 |
| 0.5350 | 56.37 | 0.95 | 57.23 | 0.89 |
| 0.6350 | 55.98 | 0.95 | 56.04 | 0.90 |
| 0.7350 | 55.59 | 0.96 | 54.75 | 0.92 |
| 0.8350 | 55.20 | 0.97 | 53.74 | 0.94 |
| 0.9350 | 54.96 | 1.07 | 52.76 | 1.04 |
| 1.0350 | 54.78 | 1.11 | 51.83 | 1.09 |
| 1.1350 | 54.59 | 1.16 | 51.05 | 1.19 |

# SAR Test Report

```
Operator          : Jay
Validation Date   : 02-May-2005
Measurement Date  : 02-May-2005
Starting Time     : 02-May-2005  10:15:50 AM
End Time          : 02-May-2005  10:29:49 AM
Scanning Time     : 839 secs

Product Data
Device Name       : Validation
Serial No.        : 835
Type              : Dipole
Model             : ALS-D-835-S-2
Frequency         : 835.00 MHz
Max. Transmit Pwr : 1 W
Drift Time        : 0 min(s)
Length            : 161
Width             : 3.6
Depth             : 89.8
Antenna Type      : Internal
Power Drift-Start : 6.86
Power Drift-Finish: 6.63
Power Drift       : 0.23

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

Tissue Data
Type              : Body
Serial No.        : 835
Frequency         : 835 MHz
Calibration Date  : 02-May-2005
Temperature       : 20 °C
Ambient Temp.     : 21 °C
Humidity          : 51 RH%
Epsilon           : 53.74 F/m
Sigma             : 0.94 S/m
Density           : 1000 kg/cu. m

Probe Data
Name              : RFEL 217
Model             : E020
Type              : E-Field Triangle
Serial No.        : 217
Calibration Date  : 10-Jun-2004
Frequency         : 835 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.1
Probe Sensitivity: 1.20  1.20  1.20   µV/(V/sq. m)
Compression Point: 95
Offset            : 1.56
```

Measurement Data
Crest Factor : 1
Scan Type : Complete
Set-up Date : 02-May-2005
Set-up Time : 8:39:27 AM

Other Data
DUT Position : Touch
Separation : 0
Channel : Mid - 835



1 gram SAR value : 9.50 W/kg
10 gram SAR value : 6.18 W/kg
Area Scan Peak SAR : 10.33
Zoom Scan Peak SAR : 16.00

# Exposure Assessment Measurement Uncertainty

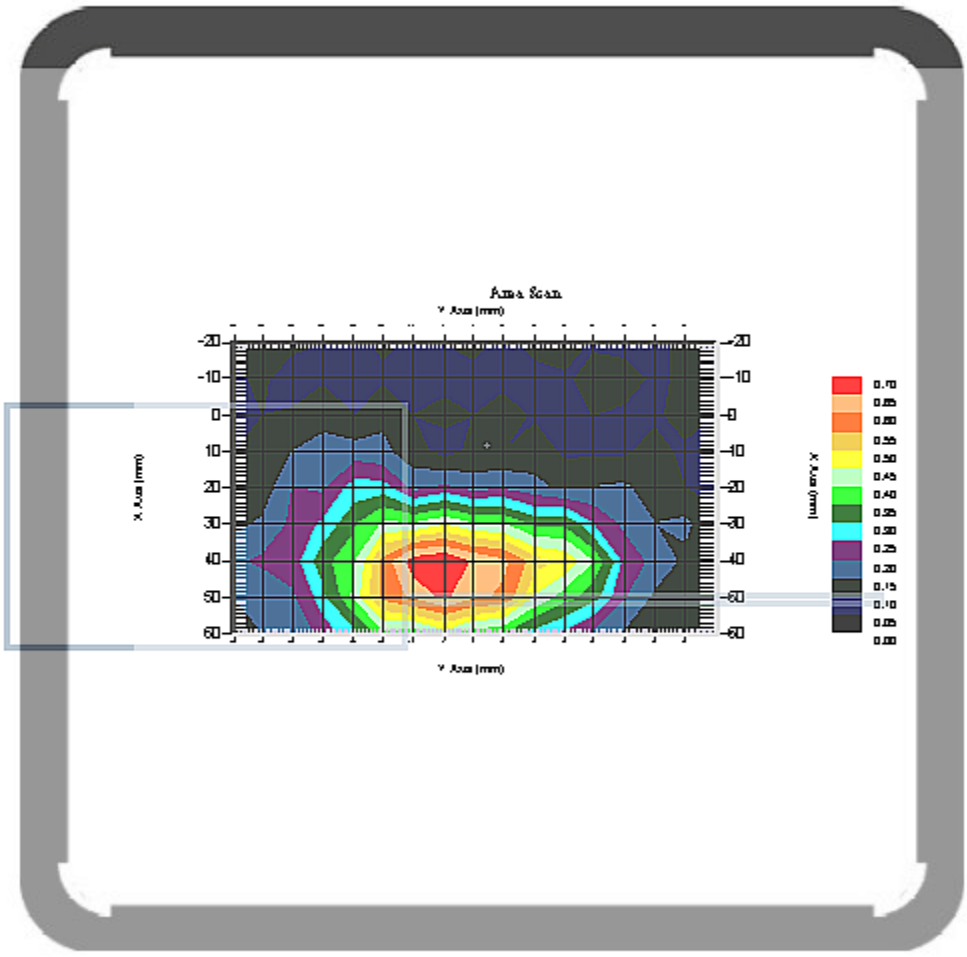
| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | •3 | $(1\text{-}cp)^{1/2}$ | $(1\text{-}cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | •3 | •cp | •cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | •3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | •3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | •3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | •3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | •3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.4 | rectangular | •3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | •3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | •3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.1 | rectangular | •3 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 2.0 | rectangular | •3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.4 | rectangular | •3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |

# Appendix B – SAR Test Data Plots

# SAR Test Report

```
Operator          : Jay
Validation Date   : 02-May-2005
Measurement Date  : 02-May-2005
Starting Time     : 02-May-2005  10:56:16 AM
End Time          : 02-May-2005  11:27:12 AM
Scanning Time     : 1856 secs

Product Data
Device Name       : Shure
Serial No.        : 001
Type              : Other
Model             : UR1 - J5
Frequency         : 635.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time        : 0 min(s)
Length            : 98
Width             : 60
Depth             : 18
Antenna Type      : Whip
Power Drift-Start : 0.04
Power Drift-Finish: 0.09
Power Drift       : 0.05

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

Tissue Data
Type             : Body
Serial No.       : 635
Frequency        : 635 MHz
Calibration Date : 02-May-2005
Temperature      : 20 °C
Ambient Temp.    : 22 °C
Humidity         : 50 RH%
Epsilon          : 56.04 F/m
Sigma            : 0.9 S/m
Density          : 1000 kg/cu. m

Probe Data
Name             : RFEL 217
Model            : E020
Type             : E-Field Triangle
Serial No.       : 217
Calibration Date : 10-Jun-2004
Frequency        : 835 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.1
Probe Sensitivity: 1.20  1.20  1.20   µV/(V/sq. m)
Compression Point: 95
Offset           : 1.56
```

```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Set-up Date       : 02-May-2005
Set-up Time       : 10:44:52 AM

Other Data
DUT Position      : Rotated Left 90°
Separation        : 0
Channel           : Low - G10 C1
```




```
1 gram SAR value    : 0.66 W/kg
10 gram SAR value   : 0.42 W/kg
Area Scan Peak SAR : 0.70
Zoom Scan Peak SAR : 1.34
```

# Exposure Assessment Measurement Uncertainty

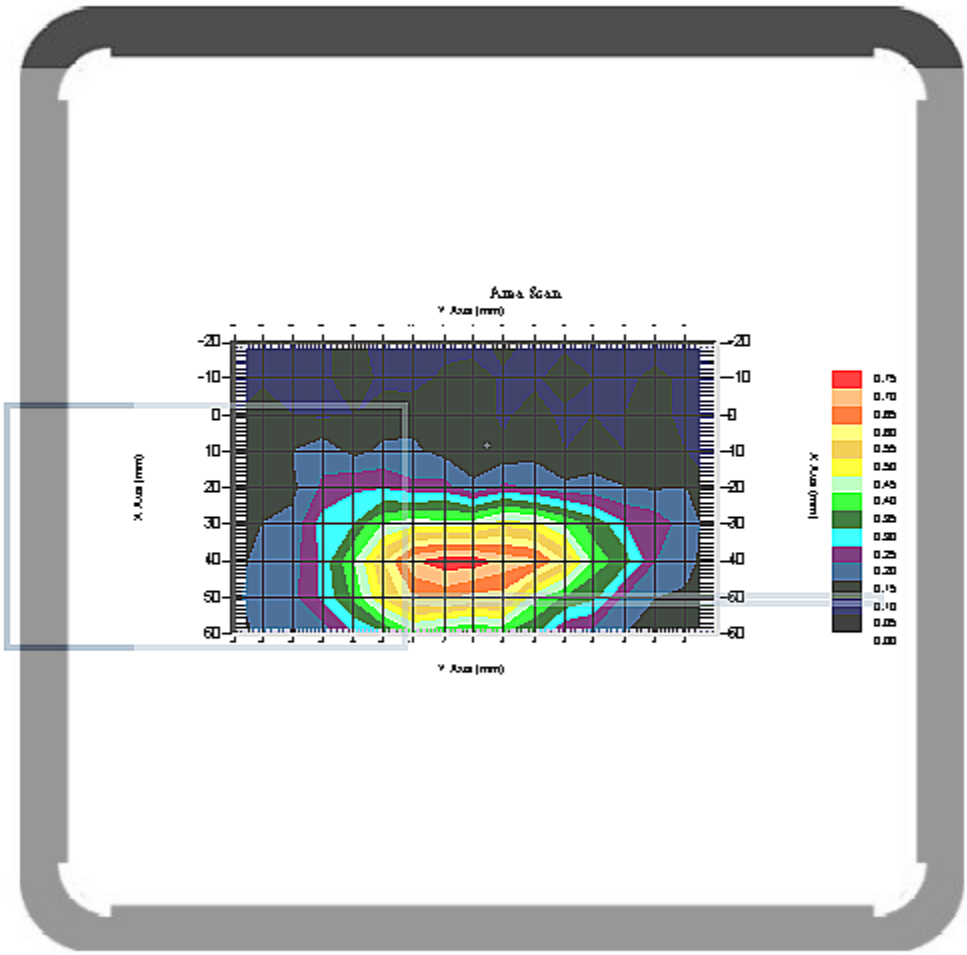
| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | •3 | $(1\text{-cp})^{1/2}$ | $(1\text{-cp})^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | •3 | •cp | •cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | •3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | •3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | •3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | •3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | •3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.1 | rectangular | •3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | •3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | •3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.1 | rectangular | •3 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 2.0 | rectangular | •3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.6 | rectangular | •3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |

# SAR Test Report

```
Operator          : Jay
Validation Date   : 02-May-2005
Measurement Date  : 02-May-2005
Starting Time     : 02-May-2005  11:32:43 AM
End Time          : 02-May-2005  12:03:24 PM
Scanning Time     : 1841 secs

Product Data
Device Name       : Shure
Serial No.        : 001
Type              : Other
Model             : UR1 - J5
Frequency         : 635.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time        : 0 min(s)
Length            : 98
Width             : 60
Depth             : 18
Antenna Type      : Whip
Power Drift-Start : 0.09
Power Drift-Finish: 0.08
Power Drift       : 0.01

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

Tissue Data
Type              : Body
Serial No.        : 635
Frequency         : 635 MHz
Calibration Date  : 02-May-2005
Temperature       : 20 °C
Ambient Temp.     : 22 °C
Humidity          : 50 RH%
Epsilon           : 56.04 F/m
Sigma             : 0.9 S/m
Density           : 1000 kg/cu. m

Probe Data
Name              : RFEL 217
Model             : E020
Type              : E-Field Triangle
Serial No.        : 217
Calibration Date  : 10-Jun-2004
Frequency         : 835 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.1
Probe Sensitivity: 1.20  1.20  1.20   µV/(V/sq. m)
Compression Point: 95
Offset            : 1.56
```

Measurement Data
Crest Factor : 1
Scan Type : Complete
Set-up Date : 02-May-2005
Set-up Time : 10:44:52 AM

Other Data
DUT Position : Rotated Left 90°
Separation : 0
Channel : Mid - G10 C14




1 gram SAR value : 0.64 W/kg
10 gram SAR value : 0.42 W/kg
Area Scan Peak SAR : 0.73
Zoom Scan Peak SAR : 1.40

# Exposure Assessment Measurement Uncertainty

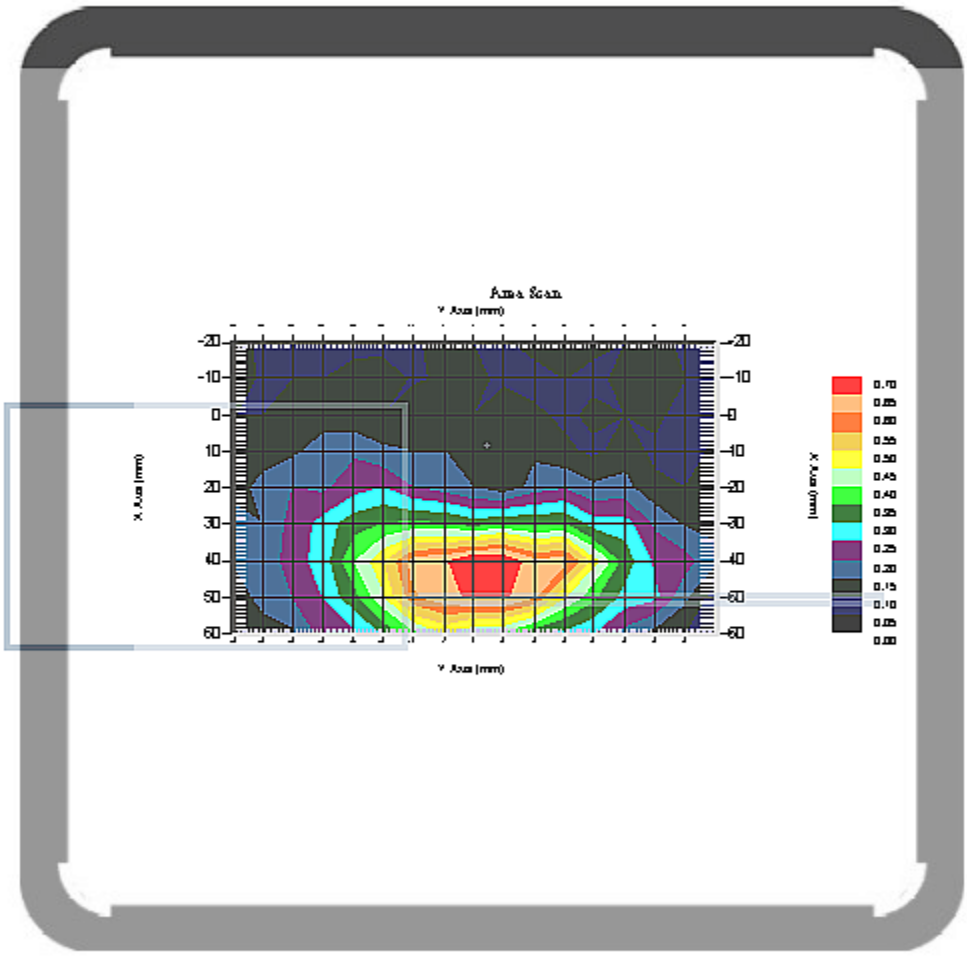
| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | •3 | $(1\text{-}cp)^{1/2}$ | $(1\text{-}cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | •3 | •cp | •cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | •3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | •3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | •3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | •3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | •3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.0 | rectangular | •3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | •3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | •3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.1 | rectangular | •3 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 2.0 | rectangular | •3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.6 | rectangular | •3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |

# SAR Test Report

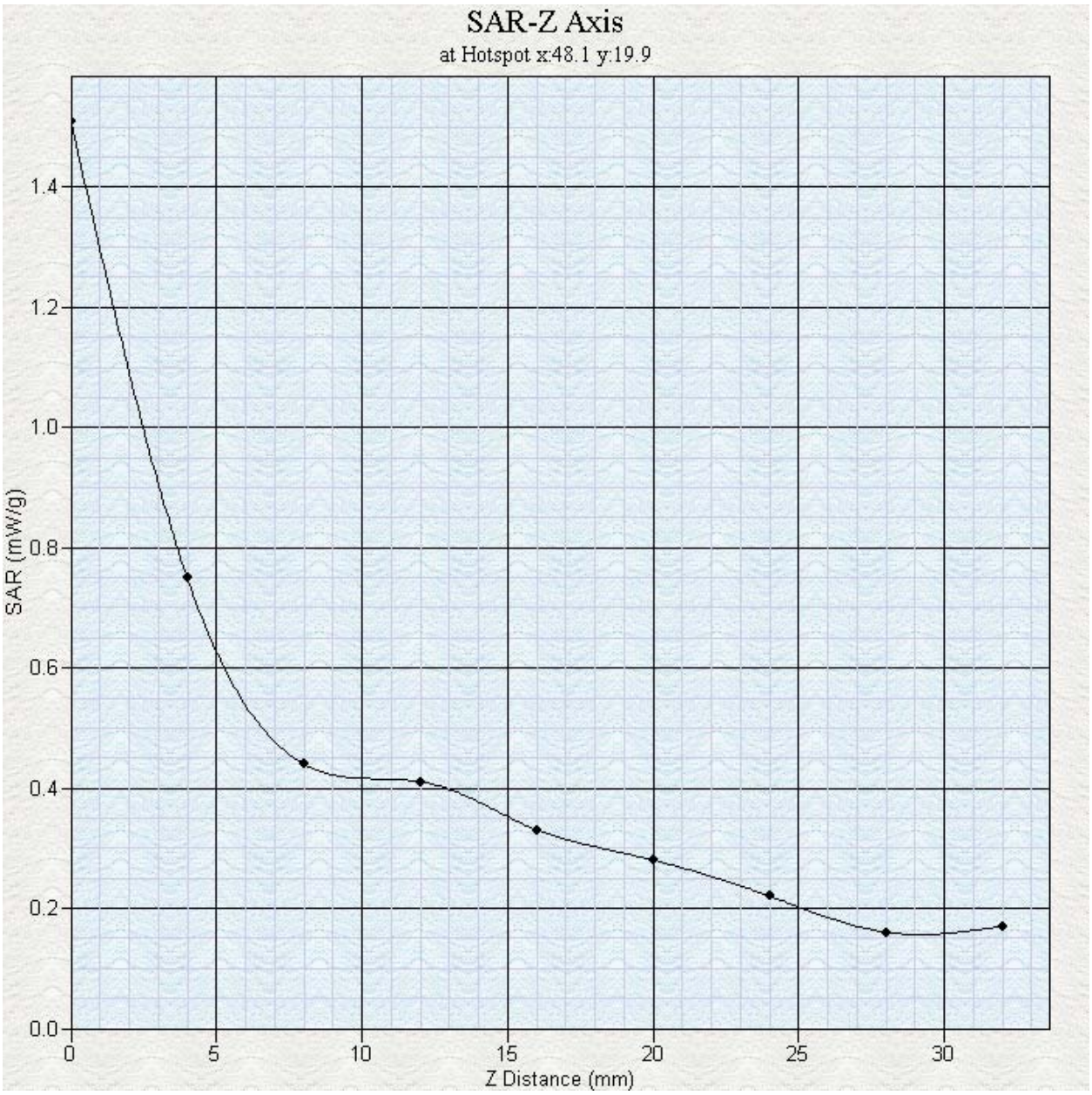
```
Operator          : Jay
Validation Date   : 02-May-2005
Measurement Date  : 02-May-2005
Starting Time     : 02-May-2005  12:08:50 PM
End Time          : 02-May-2005  12:39:37 PM
Scanning Time     : 1847 secs

Product Data
Device Name       : Shure
Serial No.        : 001
Type              : Other
Model             : UR1 - J5
Frequency         : 635.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time        : 0 min(s)
Length            : 98
Width             : 60
Depth             : 18
Antenna Type      : Whip
Power Drift-Start : 0.11
Power Drift-Finish: 0.12
Power Drift       : 0.01

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

Tissue Data
Type              : Body
Serial No.        : 635
Frequency         : 635 MHz
Calibration Date  : 02-May-2005
Temperature       : 20 °C
Ambient Temp.     : 22 °C
Humidity          : 50 RH%
Epsilon           : 56.04 F/m
Sigma             : 0.9 S/m
Density           : 1000 kg/cu. m

Probe Data
Name              : RFEL 217
Model             : E020
Type              : E-Field Triangle
Serial No.        : 217
Calibration Date  : 10-Jun-2004
Frequency         : 835 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.1
Probe Sensitivity: 1.20  1.20  1.20   µV/(V/sq. m)
Compression Point: 95
Offset            : 1.56
```

Measurement Data
Crest Factor : 1
Scan Type : Complete
Set-up Date : 02-May-2005
Set-up Time : 10:44:52 AM

Other Data
DUT Position : Rotated Left 90°
Separation : 0
Channel : High - G5 C16




1 gram SAR value : 0.69 W/kg
10 gram SAR value : 0.44 W/kg
Area Scan Peak SAR : 0.70
Zoom Scan Peak SAR : 1.51


SAR-Z Axis
at Hotspot x:48.1 y:19.9
SAR (mW/g)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
30
Z Distance (mm)

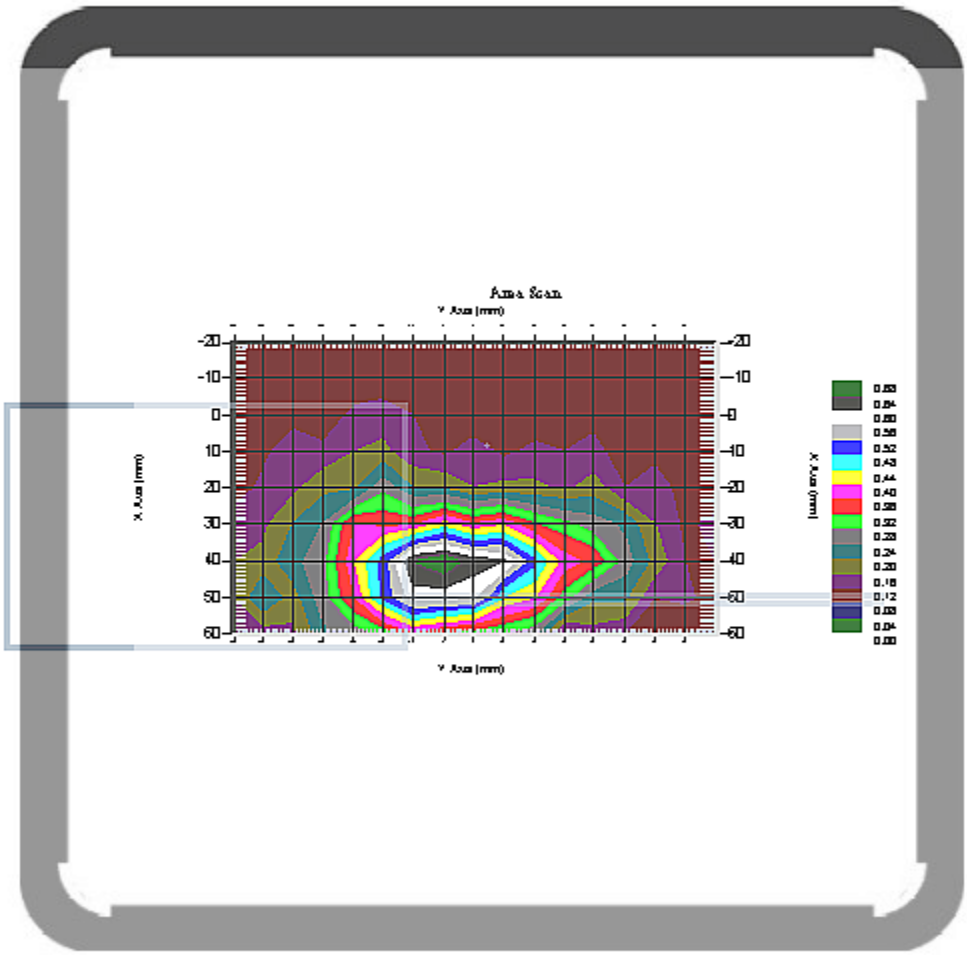
# Exposure Assessment Measurement Uncertainty

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | •3 | $(1\text{-cp})^{1/2}$ | $(1\text{-cp})^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | •3 | •cp | •cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | •3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | •3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | •3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | •3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | •3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.0 | rectangular | •3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | •3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | •3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.1 | rectangular | •3 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 2.0 | rectangular | •3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.6 | rectangular | •3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |

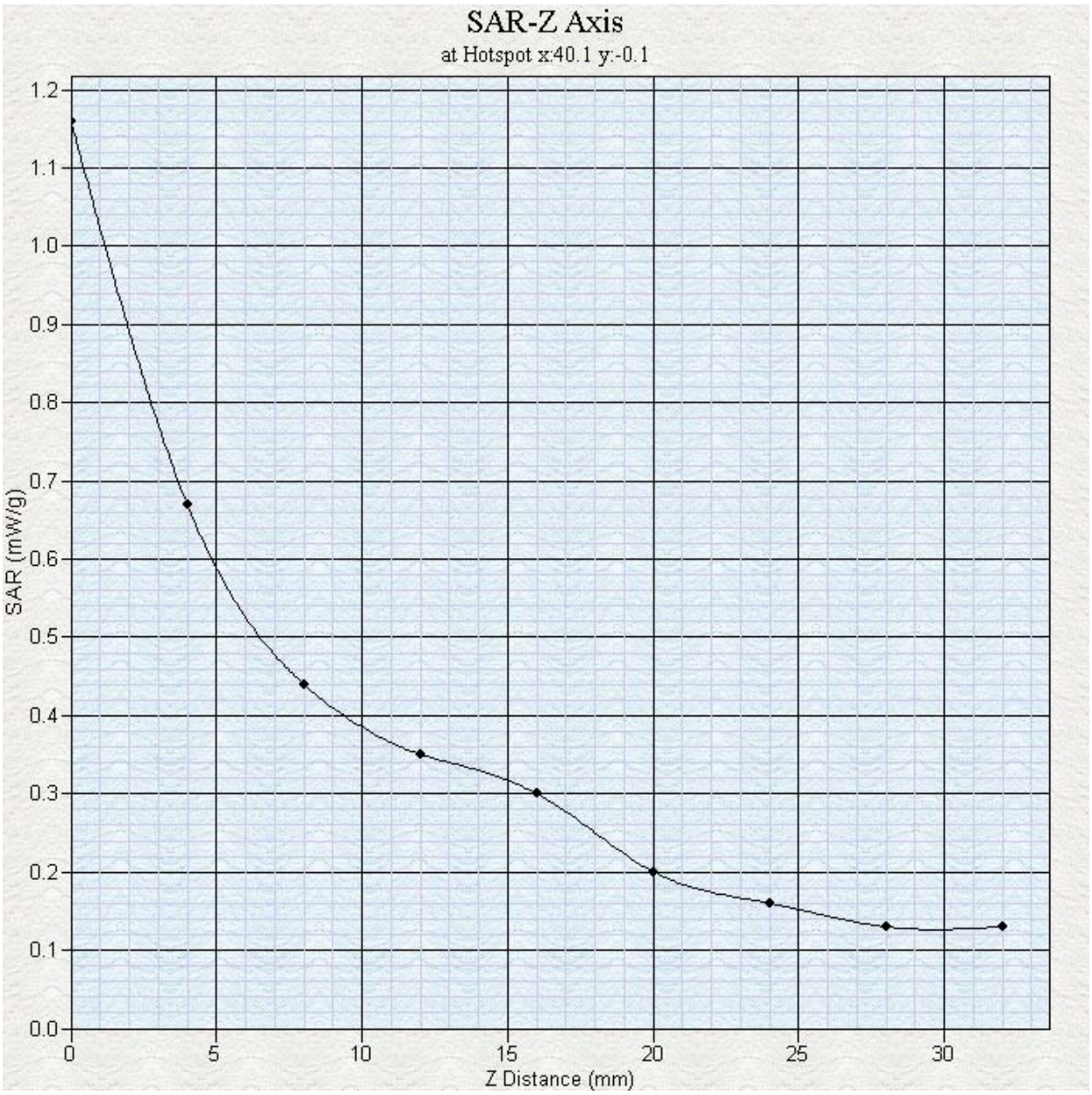
# SAR Test Report

```
Operator          : Jay
Validation Date   : 02-May-2005
Measurement Date  : 02-May-2005
Starting Time     : 02-May-2005  12:46:24 PM
End Time          : 02-May-2005  01:17:07 PM
Scanning Time     : 1843 secs

Product Data
Device Name       : Shure
Serial No.        : 001
Type              : Other
Model             : UR1 – L3
Frequency         : 635.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time        : 0 min(s)
Length            : 98
Width             : 60
Depth             : 18
Antenna Type      : Whip
Power Drift-Start : 0.10
Power Drift-Finish: 0.09
Power Drift       : 0.01

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

Tissue Data
Type             : Body
Serial No.       : 635
Frequency        : 635 MHz
Calibration Date : 02-May-2005
Temperature      : 20 °C
Ambient Temp.    : 22 °C
Humidity         : 50 RH%
Epsilon          : 56.04 F/m
Sigma            : 0.9 S/m
Density          : 1000 kg/cu. m

Probe Data
Name             : RFEL 217
Model            : E020
Type             : E-Field Triangle
Serial No.       : 217
Calibration Date : 10-Jun-2004
Frequency        : 835 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.1
Probe Sensitivity: 1.20  1.20  1.20   µV/(V/sq. m)
Compression Point: 95
Offset           : 1.56
```

```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Set-up Date       : 02-May-2005
Set-up Time       : 10:44:52 AM

Other Data
DUT Position      : Rotated Left 90°
Separation        : 0
Channel           : Low - G10 C1
```




```
1 gram SAR value   : 0.62 W/kg
10 gram SAR value  : 0.40 W/kg
Area Scan Peak SAR : 0.67
Zoom Scan Peak SAR : 1.16
```


SAR-Z Axis
at Hotspot x:40.1 y:-0.1
SAR (mW/g)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
5
10
15
20
25
30
Z Distance (mm)

# Exposure Assessment Measurement Uncertainty

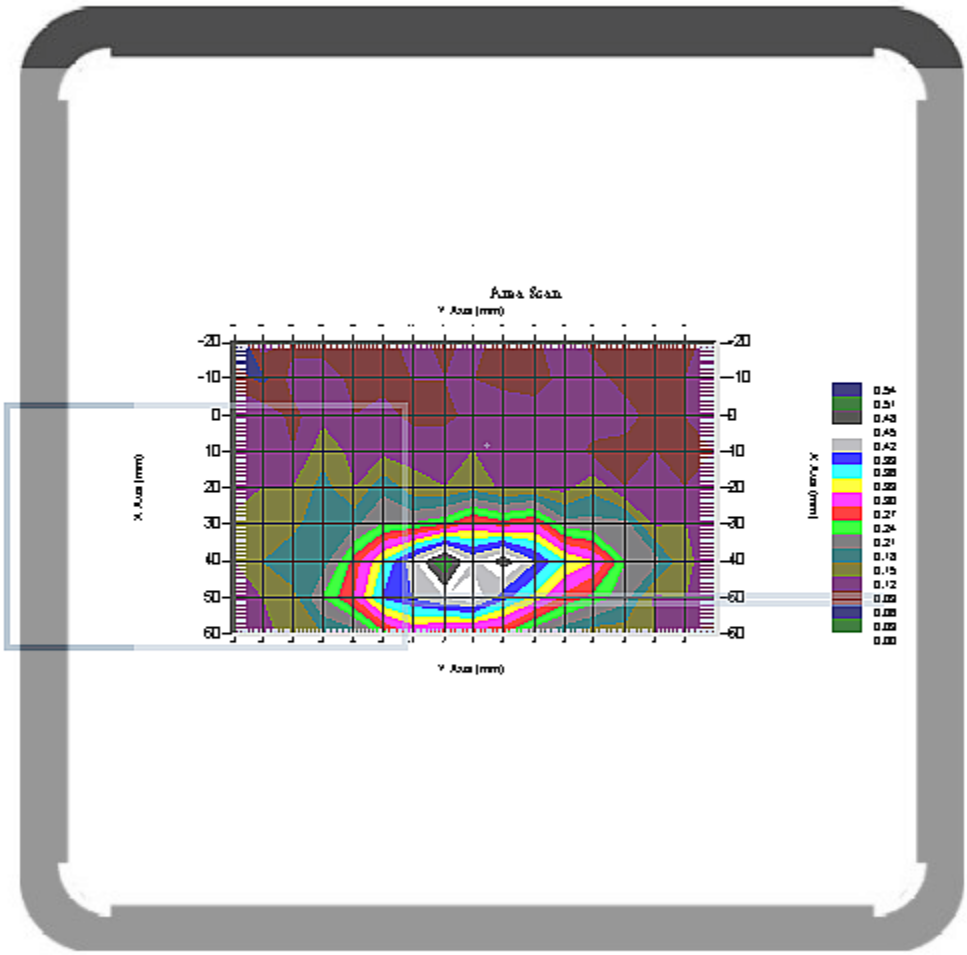
| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | •3 | $(1\text{-}cp)^{1/2}$ | $(1\text{-}cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | •3 | •cp | •cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | •3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | •3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | •3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | •3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | •3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.0 | rectangular | •3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | •3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | •3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.1 | rectangular | •3 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 2.0 | rectangular | •3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.6 | rectangular | •3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |

# SAR Test Report

```
Operator          : Jay
Validation Date   : 02-May-2005
Measurement Date  : 02-May-2005
Starting Time     : 02-May-2005  02:57:26 PM
End Time          : 02-May-2005  03:28:08 PM
Scanning Time     : 1842 secs

Product Data
Device Name       : Shure
Serial No.        : 001
Type              : Other
Model             : UR1 – L3
Frequency         : 635.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time        : 0 min(s)
Length            : 98
Width             : 60
Depth             : 18
Antenna Type      : Whip
Power Drift-Start : 0.07
Power Drift-Finish: 0.08
Power Drift       : 0.01

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

Tissue Data
Type              : Body
Serial No.        : 635
Frequency         : 635 MHz
Calibration Date  : 02-May-2005
Temperature       : 20 °C
Ambient Temp.     : 22 °C
Humidity          : 50 RH%
Epsilon           : 56.04 F/m
Sigma             : 0.9 S/m
Density           : 1000 kg/cu. m

Probe Data
Name              : RFEL 217
Model             : E020
Type              : E-Field Triangle
Serial No.        : 217
Calibration Date  : 10-Jun-2004
Frequency         : 835 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.1
Probe Sensitivity: 1.20  1.20  1.20   µV/(V/sq. m)
Compression Point: 95
Offset            : 1.56
```

Measurement Data
Crest Factor : 1
Scan Type : Complete
Set-up Date : 02-May-2005
Set-up Time : 10:44:52 AM

Other Data
DUT Position : Rotated Left 90°
Separation : 0
Channel : Mid - G10 C14




1 gram SAR value : 0.47 W/kg
10 gram SAR value : 0.30 W/kg
Area Scan Peak SAR : 0.51
Zoom Scan Peak SAR : 0.99

# Exposure Assessment Measurement Uncertainty

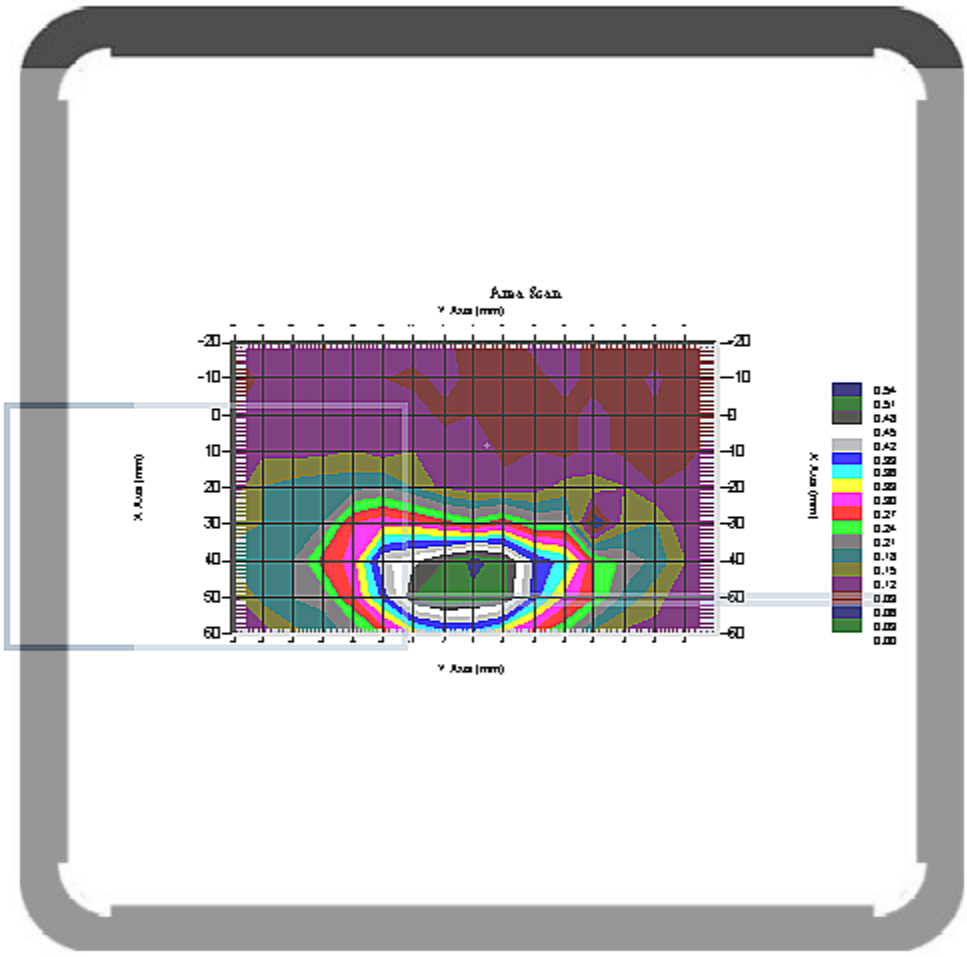
| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | •3 | $(1\text{-}cp)^{1/2}$ | $(1\text{-}cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | •3 | •cp | •cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | •3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | •3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | •3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | •3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | •3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.0 | rectangular | •3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | •3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | •3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.1 | rectangular | •3 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 2.0 | rectangular | •3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.6 | rectangular | •3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |

# SAR Test Report

```
Operator          : Jay
Validation Date   : 02-May-2005
Measurement Date  : 02-May-2005
Starting Time     : 02-May-2005  03:34:29 PM
End Time          : 02-May-2005  04:05:13 PM
Scanning Time     : 1844 secs

Product Data
Device Name       : Shure
Serial No.        : 001
Type              : Other
Model             : UR1 – L3
Frequency         : 635.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time        : 0 min(s)
Length            : 98
Width             : 60
Depth             : 18
Antenna Type      : Whip
Power Drift-Start : 0.07
Power Drift-Finish: 0.07
Power Drift       : 0.00

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

Tissue Data
Type             : Body
Serial No.       : 635
Frequency        : 635 MHz
Calibration Date : 02-May-2005
Temperature      : 20 °C
Ambient Temp.    : 22 °C
Humidity         : 50 RH%
Epsilon          : 56.04 F/m
Sigma            : 0.9 S/m
Density          : 1000 kg/cu. m

Probe Data
Name             : RFEL 217
Model            : E020
Type             : E-Field Triangle
Serial No.       : 217
Calibration Date : 10-Jun-2004
Frequency        : 835 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.1
Probe Sensitivity: 1.20  1.20  1.20   µV/(V/sq. m)
Compression Point: 95
Offset           : 1.56
```

Measurement Data
Crest Factor : 1
Scan Type : Complete
Set-up Date : 02-May-2005
Set-up Time : 10:44:52 AM

Other Data
DUT Position : Rotated Left 90°
Separation : 0
Channel : High - G5 C16

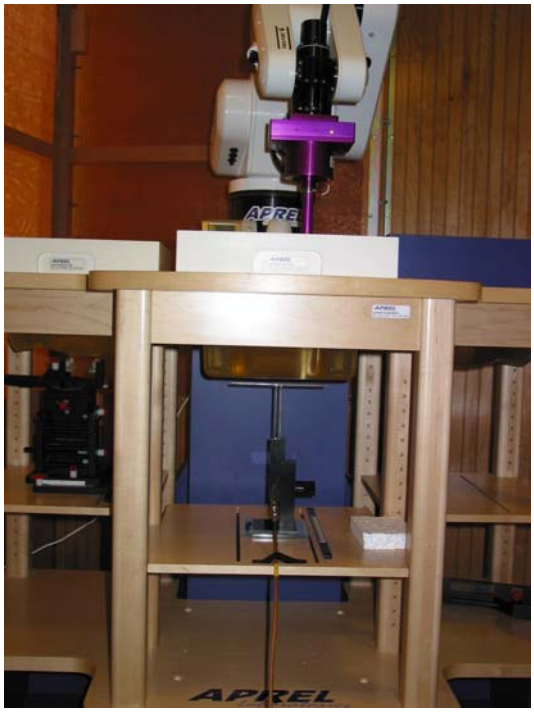



1 gram SAR value : 0.50 W/kg
10 gram SAR value : 0.34 W/kg
Area Scan Peak SAR : 0.52
Zoom Scan Peak SAR : 0.90

# Exposure Assessment Measurement Uncertainty

| Source of Uncertainty | Tolerance Value | Probability Distribution | Divisor | $c_i^1$ (1-g) | $c_i^1$ (10-g) | Standard Uncertainty (1-g) | Standard Uncertainty (10-g) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Measurement System | | | | | | | |
| | | | | | | | |
| Probe Calibration | 3.5 | normal | 1 | 1 | 1 | 3.5 | 3.5 |
| Axial Isotropy | 3.7 | rectangular | •3 | $(1\text{-}cp)^{1/2}$ | $(1\text{-}cp)^{1/2}$ | 1.5 | 1.5 |
| Hemispherical Isotropy | 10.9 | rectangular | •3 | •cp | •cp | 4.4 | 4.4 |
| Boundary Effect | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | rectangular | •3 | 1 | 1 | 2.7 | 2.7 |
| Detection Limit | 1.0 | rectangular | •3 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 1.0 | normal | 1 | 1 | 1 | 1.0 | 1.0 |
| Response Time | 0.8 | rectangular | •3 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 1.7 | rectangular | •3 | 1 | 1 | 1.0 | 1.0 |
| RF Ambient Condition | 3.0 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner Mech. | 0.4 | rectangular | •3 | 1 | 1 | 0.2 | 0.2 |
| | | | | | | | |
| Restriction | | | | | | | |
| Probe Positioning with respect to Phantom Shell | 2.9 | rectangular | •3 | 1 | 1 | 1.7 | 1.7 |
| Extrapolation and Integration | 3.7 | rectangular | •3 | 1 | 1 | 2.1 | 2.1 |
| Test Sample Positioning | 4.0 | normal | 1 | 1 | 1 | 4.0 | 4.0 |
| Device Holder Uncertainty | 2.0 | normal | 1 | 1 | 1 | 2.0 | 2.0 |
| Drift of Output Power | 0.0 | rectangular | •3 | 1 | 1 | 0.0 | 0.0 |
| | | | | | | | |
| Phantom and Setup | | | | | | | |
| Phantom Uncertainty(shape & thickness tolerance) | 3.4 | rectangular | •3 | 1 | 1 | 2.0 | 2.0 |
| Liquid Conductivity(target) | 5.0 | rectangular | •3 | 0.7 | 0.5 | 2.0 | 1.4 |
| Liquid Conductivity(meas.) | 0.1 | rectangular | •3 | 0.7 | 0.5 | 0.0 | 0.0 |
| Liquid Permittivity(target) | 2.0 | rectangular | •3 | 0.6 | 0.5 | 0.7 | 0.6 |
| Liquid Permittivity(meas.) | 5.6 | rectangular | •3 | 0.6 | 0.5 | 1.9 | 1.6 |
| Combined Uncertainty | | RSS | | | | 9.3 | 9.1 |
| Combined Uncertainty (coverage factor=2) | | Normal(k=2) | | | | 18.6 | 18.2 |

# Appendix C – SAR Test Setup Photos

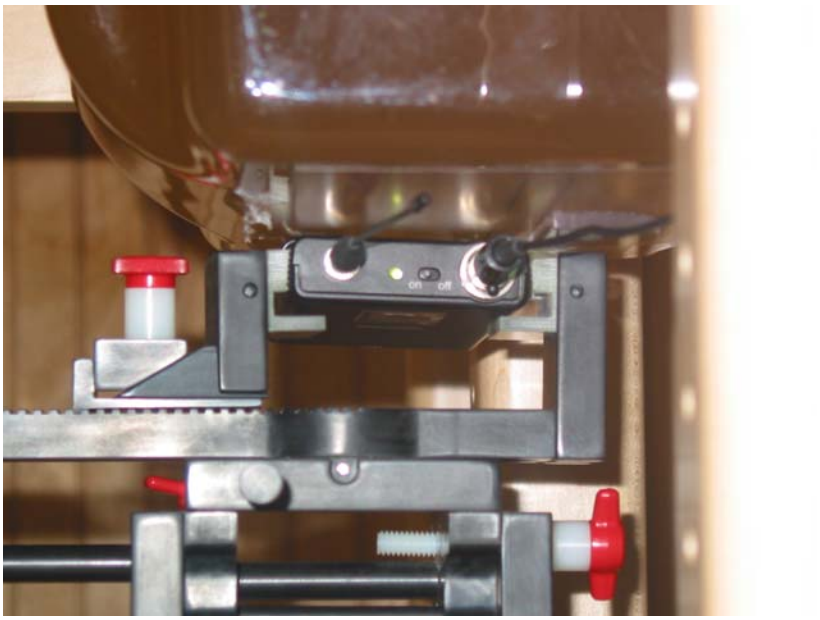



System Body Configuration

Body Tissue Depth

Touch Position

**Touch Position**

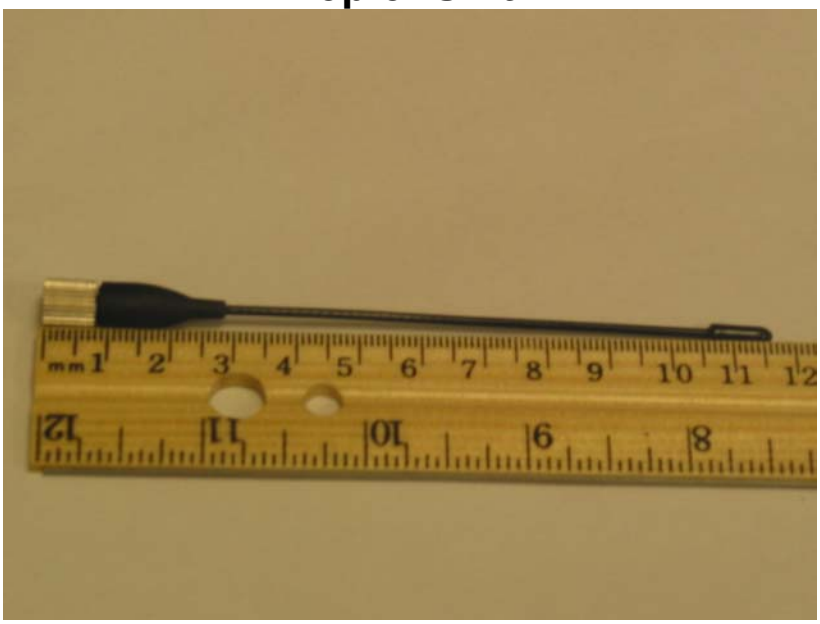


**Touch Position**


**Front of Unit**

**Back of Unit**

**Top of Unit**




**Antenna Length**