



SAR EVALUATION REPORT

For

Weierwei Electron Science& Technology Co., Ltd.

Room 18F07, New Asia Digital Electronics Plaza,

Xitier Road, Guangzhou, Guangdong, China

FCC ID: YC2VEV-V8

Report Type: Original Report	Product Type: FM UHF Portable Transceiver
Test Engineer: <u>Arthur Tie</u> 	
Report Number: <u>R1005135-SAR</u>	
Report Date: <u>2010-07-01</u>	
Victor Zhang 	
Reviewed By: <u>Test Engineer, RF Lead</u>	
Prepared By: (11) Bay Area Compliance Laboratories Corp. (BACL) 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP*, NIST, or any agency of the Federal Government.

* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*” (Rev. 2)

SAR Evaluation Results	
Rule Part(s):	FCC §2.1093 & IEEE 1528
Test Procedure(s):	FCC OET Bulletin 65 Supplement C & IEEE 1528
Exposure Category:	Occupational/Controlled Exposure
Device Type:	FM UHF Portable Transceiver
Modulation Type:	FM
TX Frequency Range:	400~470 MHz
Maximum Conducted Power Tested:	36.90 dBm
Antenna Type(s) Tested:	External Antenna
Body-Worn Accessories:	Belt Clip and Headset
Face-Head Accessories:	None
Battery Type (s) Tested:	7.4 Vdc Rechargeable Li-On Battery
Max. SAR Level(s) Measured:	Body-Worn: 1.68 W/Kg (1 g Body Tissue) Face-Hold: 1.575 W/Kg (1 g Head Tissue) (with 50% Duty Cycle)
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.	
The results and statements contained in this report pertain only to the device(s) evaluated.	
	
EUT Photo	

TABLE OF CONTENTS

REFERENCE, STANDARDS AND GUILDELINE.....	5
SAR LIMITS	6
EUT DESCRIPTION.....	7
EUT PHOTO	7
FACILITIES AND ACCREDITATION.....	8
DESCRIPTION OF TEST SYSTEM	9
MEASUREMENT SYSTEM DIAGRAM.....	11
SYSTEM COMPONENTS	12
DASY4 MEASUREMENT SERVER.....	12
DATA ACQUISITION ELECTRONICS.....	13
PROBES	13
TESTING EQUIPMENT	20
EQUIPMENTS LIST & CALIBRATION INFO	20
SAR MEASUREMENT SYSTEM VERIFICATION.....	21
SYSTEM ACCURACY VERIFICATION	21
SAR MEASUREMENT RESULTS.....	22
SAR TEST DATA	22
APPENDIX A – MEASUREMENT UNCERTAINTY	23
APPENDIX B – PROBE CALIBRATION CERTIFICATES.....	25
APPENDIX C – DIPOLE CALIBRATION CERTIFICATES.....	34
APPENDIX D - TEST SYSTEM VERIFICATIONS SCANS	39
LIQUID MEASUREMENT RESULT	39
APPENDIX E – EUT SCAN RESTLTS.....	41
APPENDIX F – OUTPUT POWER MEASUREMENT	53
TEST BLOCK DIAGRAM AND PROCEDURE	53
TEST EQUIPMENT LISTS AND DETAILS	53
TEST RESULTS.....	53
APPENDIX G – TEST SET UP PHOTOS	54
BODY WORN - BACK TOUCH TO FLAT PHANTOM	54
FACE HELD - 2.5 CM SEPARATION TO FLAT PHANTOM.....	54
APPENDIX H- EUT PHOTOS	55
EUT – FRONT VIEW	55
EUT – BACK VIEW	55
EUT – BACK VIEW WITH CLIP	56
EUT – BATTERY OFF VIEW.....	56
EUT – BATTERY VIEW.....	57
EUT – CHARGER.....	57
APPENDIX I - INFORMATIVE REFERENCES	58

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1005135-SAR	Original Report	2010-07-01

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.

There was no SAR of any concern measured on the device for any of the investigated configurations.

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).

Occupational/Controlled Environments Spatial Peak limit 8.0 w/kg (FCC) & 10 w/kg (CE) applied to the EUT.

EUT DESCRIPTION

The Weierwei Electron Science & Technology Co., Ltd. product, model VEV-V8 (FCC ID: YC2VEV-V8) or the "EUT" as referred to in this report is a FM two way radio operates at UHF band.

Items	Technical Specification
Frequency Range	400-470 MHz
Modulation	FM
Rated Power Output	5Watt/1Watt
Channel Spacing	12.5 kHz/25 kHz
Dimension	98(H) x 53(W) x 30(D)mm
Weight (with battery)	Approx.220g
Channel Number	128
Frequency Deviation	Not more than $\pm 2.5/\pm 5.0$ kHz
Operation Mode	Face-Hold Body-worn (With Headset and Belt Clip)

*The data gathered are from a typical production sample provided by the manufacturer, serial number: 10032150043.

EUT Photo



Additional EUT photos in Exhibit H

FACILITIES AND ACCREDITATION

The test site used by Bay Area Compliance Laboratories Corp. (BACL) to collect data is located at 1274 Anvilwood Ave, Sunnyvale, California 94089, USA.

BACL is a National Institute of Standards and Technology (NIST) accredited laboratory under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0).



The current scope of accreditations can be found at: <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG) which is the fourth generation of the system shown in the figure hereinafter:



The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than $\pm 0.02\text{mm}$. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The SAR measurements were conducted with the dosimetric probe ET3DV6 SN: 1604 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure with accuracy of better than $\pm 10\%$. The spherical isotropy was evaluated with the procedure and found to be better than $\pm 0.25\text{dB}$.

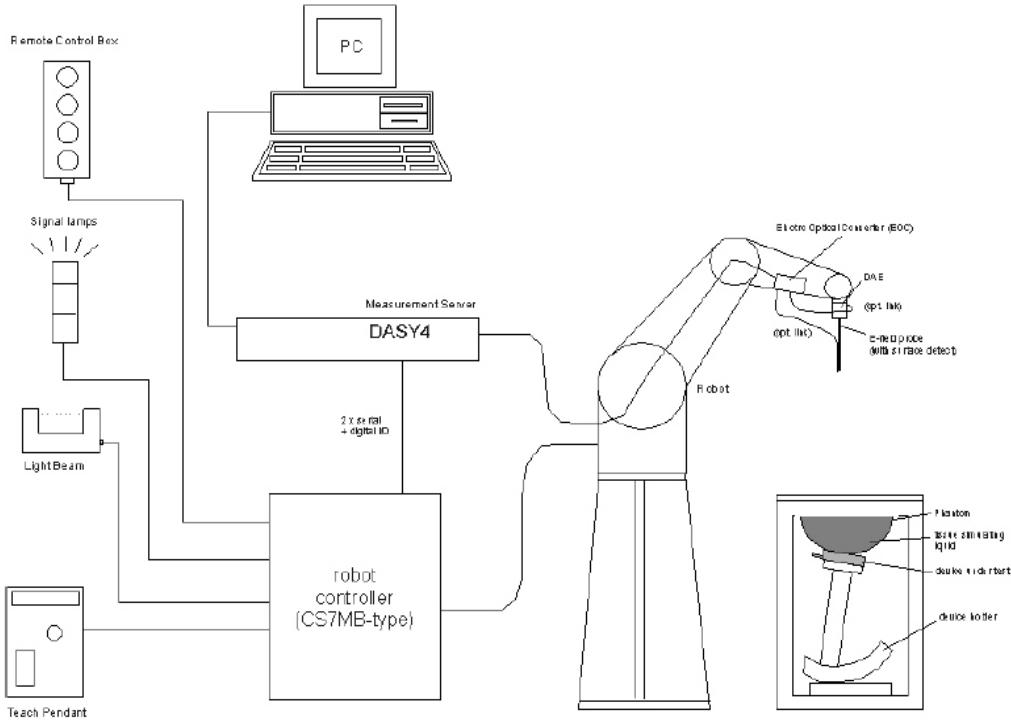
The phantom used was the Generic Twin Phantom. The ear was simulated as a spacer of 4 mm thickness between the earpiece of the phone and the tissue simulating liquid. The Tissue simulation liquid used for each test is in according with the FCC OET65 supplement C as listed below.

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		Body	
	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

Measurement System Diagram



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A Data Acquisition Electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-Optical Converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.

- DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

System Components

- DASY4 Measurement Server
- Data Acquisition Electronics
- Probes
- Light Beam Unit
- Medium
- SAM Twin Phantom
- Device Holder for SAM Twin Phantom
- System Validation Kits
- Robot

DASY4 Measurement Server

The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.



The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server.

Data Acquisition Electronics

The data acquisition electronics DAE3 consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.



Probes

The DASY system can support many different probe types.

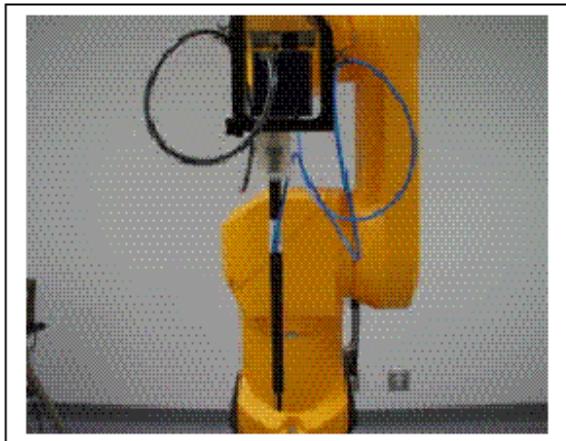
Dosimetric Probes: These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (± 2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

Free Space Probes: These are electric and magnetic field probes specially designed for measurements in free space. The z-sensor is aligned to the probe axis and the rotation angle of the x-sensor is specified. This allows the DASY system to automatically align the probe to the measurement grid for field component measurement. The free space probes are generally not calibrated in liquid. (The H-field probes can be used in liquids without any change of parameters.)

Temperature Probes: Small and sensitive temperature probes for general use. They use a completely different parameter set and different evaluation procedures. Temperature rise features allow direct SAR evaluations with these probes.

ET3DV6 Probe Specification

Construction Symmetrical design with triangular core
 Built-in optical fiber for surface detection System
 Built-in shielding against static charges
 Calibration In air from 10 MHz to 2.5 GHz
 In brain and muscle simulating tissue at
 Frequencies of 450 MHz, 900 MHz and
 1.8 GHz (accuracy $\pm 8\%$)
 Frequency 10 MHz to > 6 GHz; Linearity: ± 0.2 dB
 (30 MHz to 3 GHz)
 Directivity ± 0.2 dB in brain tissue (rotation around
 probe axis)
 ± 0.4 dB in brain tissue (rotation normal probe axis)
 Dynamic 5 mw/g to > 100 mw/g;
 Range Linearity: ± 0.2 dB
 Surface ± 0.2 mm repeatability in air and clear liquids
 Detection over diffuse reflecting surfaces.
 Dimensions Overall length: 330 mm
 Tip length: 16 mm



Photograph of the probe

Body diameter: 12 mm

Tip diameter: 6.8 mm

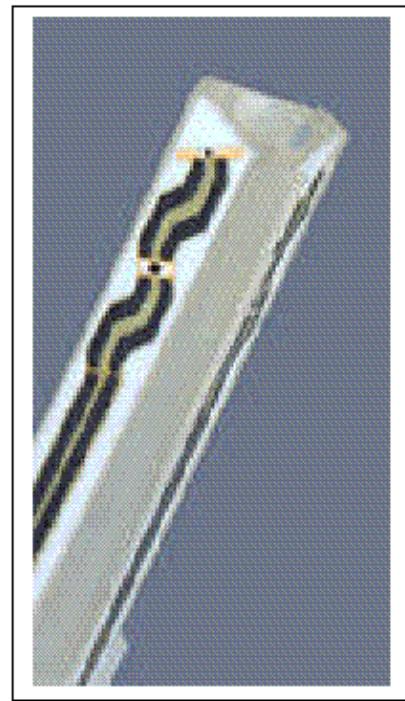
Distance from probe tip to dipole centers: 2.7 mm

Application General dosimetric up to 3 GHz

Compliance tests of mobile phones

Fast automatic scanning in arbitrary phantoms

The SAR measurements were conducted with the dosimetric probe ET3DV6 designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY3 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.



**Inside view of
ET3DV6 E-field Probe**

E-Field Probe Calibration Process

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Data Evaluation

The DASY4 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	dcpi

Device parameters: - Frequency f
 - Crest factor cf

Media parameters: - Conductivity σ
 - Density ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

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

With V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

$dcpi$ = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$E - \text{fieldprobes} : \quad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$H - \text{fieldprobes} : \quad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

With V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
 $\mu\text{V}/(\text{V}/\text{m})^2$ for E-field probes

$ConF$ = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = diode compression point (DASY parameter)

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

With SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm³

Note that the density is normally set to 1, to account for actual brain density rather than the density of the simulation liquid.

Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, so that the robot coordinates are valid for the probe tip. The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Medium

Parameters

The parameters of the tissue simulating liquid strongly influence the SAR in the liquid. The parameters for the different frequencies are defined in the corresponding compliance standards (e.g., EN 50361, IEEE 1528-2003).

Parameter measurements

Several measurement systems are available for measuring the dielectric parameters of liquids:

- The open coax test method (e.g., HP85070 dielectric probe kit) is easy to use, but has only moderate accuracy. It is calibrated with open, short, and deionized water and the calibrations a critical process.
- The transmission line method (e.g., model 1500T from DAMASKOS, INC.) measures the transmission and reflection in a liquid filled high precision line. It needs standard two port calibration and is probably more accurate than the open coax method.
- The reflection line method measures the reflection in a liquid filled shorted precision line, the method is not suitable for these liquids because of its low sensitivity.
- The slotted line method scans the field magnitude and phase along a liquid filled line. The evaluation is straight forward and only needs a simple response calibration. The method is very accurate, but can only be used in high loss liquids and at frequencies above 100 to 200MHz. Cleaning the line can be tedious.

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left hand
- Right hand
- Flat phantom

The phantom table comes in two sizes: A 100 x 50 x 85 cm (L x W x H) table for use with free standing robots (DASY4 professional system option) or as a second phantom and a 100 x 75 x 85 cm(L x W x H) table with reinforcements for table mounted robots (DASY4 compact system option) .

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different liquids) A white cover is provided to tap the phantom during σ -periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.



The phantom can be used with the following tissue simulating liquids:

- Water-sugar based liquids can be left permanently in the phantom. Always cover the liquid if the system is not used, otherwise the parameters will change due to water evaporation.
- Glycol based liquids should be used with care. As glycol is a softener for most plastics, the liquid should be taken out of the phantom and the phantom should be dried when the system is not used (desirable at least once a week).
- Do not use other organic solvents without previously testing the phantom resistiveness.

Device Holder for SAM Twin Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source in 5mm distance, a positioning uncertainty of $\pm 0.5\text{mm}$ would produce a SAR uncertainty of $\pm 20\%$. An accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions, in which the devices must be measured, are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centers for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.



The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon_r = 3$ and loss tangent $\tan \delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

System Validation Kits

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. For that purpose a well defined SAR distribution in the flat section of the SAM twin phantom is produced.

System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder. Dipoles are available for the variety of frequencies between 300MHz and 6 GHz (dipoles for other frequencies or media and other calibration conditions are available upon request).

The dipoles are highly symmetric and matched at the center frequency for the specified liquid and distance to the flat phantom (or flat section of the SAM-twin phantom). The accurate distance between the liquid surface and the dipole center is achieved with a distance holder that snaps on the dipole.

Robot

The DASY4 system uses the high precision industrial robots RX60L, RX90 and RX90L, as well as the RX60BL and RX90BL types out of the newer series from Stäubli SA (France). The RX robot series offers many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance-free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchrony motors; no stepper motors)
- Low ELF interference (the closed metallic construction shields against motor control fields)

For the newly delivered DASY4 systems as well as for the older DASY3 systems delivered since 1999, the CS7MB robot controller version from Stäubli is used. Previously delivered systems have either a CS7 or CS7M controller; the differences to the CS7MB are mainly in the hardware, but some procedures in the robot software from Stäubli are also not completely the same. The following descriptions about robot hard- and software correspond to CS7MB controller with software version 13.1 (edit S5). The actual commands, procedures and configurations, also including details in hardware, might differ if an older robot controller is in use. In this case please also refer to the Stäubli manuals for further information.



TESTING EQUIPMENT

Equipments List & Calibration Info

Type / Model	Calibration Due Date	S/N:
DASY4 Professional Dissymmetric System	N/A	N/A
Robot RX60L	N/A	CS7MBSP / 467
Robot Controller	N/A	F01/5J72A1/A/01
Dell Computer Dimension 3000	N/A	N/A
SPEAG EDC3	N/A	N/A
SPEAG DAE3	2010-11-22	456
DASY4 Measurement Server	N/A	1176
SPEAG E-Field Probe ES3DV2	2010-09-23	3019
Antenna, Dipole, D450V2	2011-06-25	1010
SPEAG Generic Twin Phantom	N/A	N/A
Brain Equivalent Matter (450 MHz)	Each Time	N/A
Muscle Equivalent Matter (450 MHz)	Each Time	N/A
Agilent, Spectrum Analyzer E4446A	2011-05-28	US44300386
Microwave Amp. 8349A	N/A	2644A02662
Power Meter Agilent E4419B	2010-10-10	MY4121511
Power Sensor Agilent E4412A	2010-10-10	MY41497252
Agilent E5515C	2011-04-23	GB44051221
Dielectric Probe Kit HP85070A	N/A	US99360201
Agilent, Signal Generator, 8648C	2010-09-18	3347M00143
Amplifier, ST181-20	N/A	E012-0101
Antenna, Horn SAS-200/571	2011-04-20	A052704

SAR MEASUREMENT SYSTEM VERIFICATION

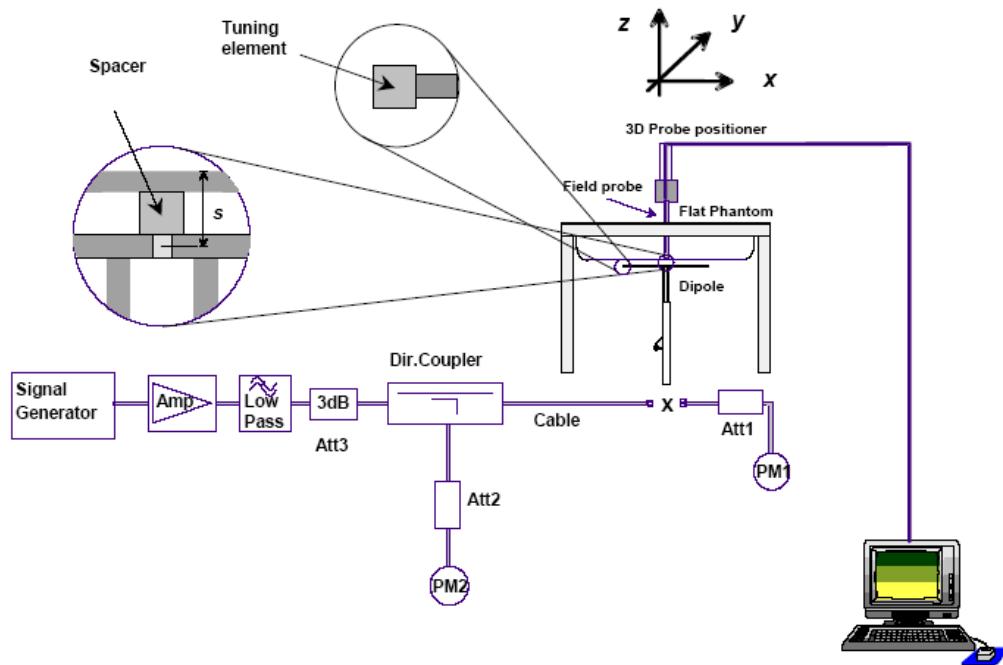
System Accuracy Verification

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.

IEEE P1528 recommended reference value for Head

Frequency (MHz)	1 g SAR	10 g SAR	Local SAR at surface (above feed point)	Local SAR at surface (v=2cm 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

System Setup Block Diagram



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

Test Environmental Conditions

Temperature:	20° C - 22° C
Relative Humidity:	55% - 60° C
ATM Pressure:	101.4 kPa

* Testing was performed by Arthur Tie on 2010-6-29 in SAR chamber.

Test Position	Channel Spacing	Accessory	Frequency (MHz)	Liquid Type	Phantom Type	1 g SAR (W/Kg) Value	SAR of 50% Duty Cycle (W/Kg)	FCC Limit (W/Kg)	Ref. Plot
2.5 cm Face up to Flat Phantom	25 kHz	None	400.025	Head	Flat	2.04	1.02	8.0	1
2.5 cm Face up to Flat Phantom	25 kHz	None	435.000	Head	Flat	2.58	1.29	8.0	2
2.5 cm Face up to Flat Phantom	25 kHz	None	469.975	Head	Flat	1.73	0.865	8.0	3
2.5 cm Face up to Flat Phantom	12.5 kHz	None	400.025	Head	Flat	2.43	1.215	8.0	4
2.5 cm Face up to Flat Phantom	12.5 kHz	None	435.000	Head	Flat	3.15	1.575	8.0	5
2.5 cm Face up to Flat Phantom	12.5 kHz	None	469.975	Head	Flat	2.02	1.01	8.0	6
Back Touch to Flat Phantom (With Belt Clip)	25 kHz	Belt clip, Headset	400.025	Body	Flat	2.38	1.19	8.0	7
Back Touch to Flat Phantom (With Belt Clip)	25 kHz	Belt clip, Headset	435.000	Body	Flat	3.36	1.68	8.0	8
Back Touch to Flat Phantom (With Belt Clip)	25 kHz	Belt clip, Headset	469.975	Body	Flat	2.25	1.125	8.0	9
Back Touch to Flat Phantom (With Belt Clip)	12.5 kHz	Belt clip, Headset	400.025	Body	Flat	2.26	1.13	8.0	10
Back Touch to Flat Phantom (With Belt Clip)	12.5 kHz	Belt clip, Headset	435.000	Body	Flat	3.26	1.63	8.0	11
Back Touch to Flat Phantom (With Belt Clip)	12.5 kHz	Belt clip, Headset	469.975	Body	Flat	3.17	1.585	8.0	12

APPENDIX A – MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the DASY4 measurement system and is given in the following Table.

DASY4 Uncertainty Budget According to IEEE 1528								
Error Description	Uncertainty Value	Prob. Dist.	Div.	(c i) 1g	(c i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v i) veff
Measurement System								
Probe Calibration	± 5.9%	N	1	1	1	± 5.9%	± 5.9%	∞
Axial Isotropy	± 4.7%	R	$\sqrt{3}$	0.7	0.7	± 1.9%	± 1.9%	∞
Hemispherical Isotropy	± 9.6%	R	$\sqrt{3}$	0.7	0.7	± 3.9%	± 3.9%	∞
Boundary Effects	± 1.0%	R	$\sqrt{3}$	1	1	± 0.6%	± 0.6%	∞
Linearity	± 4.7%	R	$\sqrt{3}$	1	1	± 2.7%	± 2.7%	∞
System Detection Limits	± 1.0%	R	$\sqrt{3}$	1	1	± 0.6%	± 0.6%	∞
Readout Electronics	± 0.3%	N	1	1	1	± 0.3%	± 0.3%	∞
Response Time	± 0.8%	R	$\sqrt{3}$	1	1	± 0.5%	± 0.5%	∞
Integration Time	± 2.6%	R	$\sqrt{3}$	1	1	± 1.5%	± 1.5%	∞
RF Ambient Conditions	± 3.0%	R	$\sqrt{3}$	1	1	± 1.7%	± 1.7%	∞
Probe Positioner	± 0.4%	R	$\sqrt{3}$	1	1	± 0.2%	± 0.2%	∞
Probe Positioning	± 2.9%	R	$\sqrt{3}$	1	1	± 1.7%	± 1.7%	∞
Max. SAR Eval.	± 1.0%	R	$\sqrt{3}$	1	1	± 0.6%	± 0.6%	∞
Test Sample Related								
Device Positioning	± 2.9%	N	1	1	1	± 2.9%	± 2.9%	145
Device Holder	± 3.6%	N	1	1	1	± 3.6%	± 2.6%	5
Power Drift	± 5.0%	R		1	1	± 2.9%	± 2.9%	∞
Phantom and Setup								
Phantom Uncertainty	± 4.0%	R	$\sqrt{3}$	1	1	± 2.3%	± 2.3%	∞
Liquid Conductivity (Target)	± 5.0%	R	$\sqrt{3}$	0.64	0.43	± 1.8%	± 1.2%	∞
Liquid Conductivity (meas.)	± 2.5%	N	1	0.64	0.43	± 1.6%	± 1.1%	∞
Liquid Permittivity (Target)	± 5.0%	R	$\sqrt{3}$	0.6	0.49	± 1.7%	± 1.4%	∞
Liquid Permittivity (Target)	± 2.5%	N	1	0.6	0.49	± 1.5%	± 1%	∞
Combined Std. Uncertainty						± 10.8%	± 10.6%	330
Expanded STD Uncertainty						± 21.6%	± 21.1%	

DASY4 Uncertainty Budget According to CENELEC EN 50361								
Error Description	Uncertainty Value	Prob. Dist.	Div.	(c i) 1g	(c i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v i) veff
Measurement System								
Probe Calibration	± 5.9%	N	1	1	1	± 5.9%	± 5.9%	∞
Axial Isotropy	± 4.7%	R	$\sqrt{3}$	0.7	0.7	± 1.9%	± 1.9%	∞
Spherical Isotropy	± 9.6%	R	$\sqrt{3}$	0.7	0.7	± 3.9%	± 3.9%	∞
Probe Linearity	± 4.7%	R	$\sqrt{3}$	1	1	± 2.7%	± 0.6%	∞
Detection Limits	± 1.0%	R	$\sqrt{3}$	1	1	± 0.6%	± 2.7%	∞
Boundary Effects	± 1.0%	R	$\sqrt{3}$	1	1	± 0.6%	± 0.6%	∞
Readout Electronics	± 0.3%	N	1	1	1	± 0.3%	± 0.3%	∞
Response Time	± 0.8%	N	1	1	1	± 0.8%	± 0.5%	∞
Noise	± 0.0%	N	1	1	1	± 0.0%	± 1.5%	∞
Integration Time	± 2.6%	N	1	1	1	± 2.6%	± 1.7%	∞
Mechanical Constraints								
Scanning System	± 0.4%	R	$\sqrt{3}$	1	1	± 0.2%	± 1.7%	∞
Phantom Shell	± 4.0%	R	$\sqrt{3}$	1	1	± 2.3%	± 0.6%	∞
Probe Positioning	± 2.9%	R	$\sqrt{3}$	1	1	± 1.7%	± 2.9%	∞
Device Positioning	± 2.9%	N	1	1	1	± 2.9%	± 2.6%	145
Physical Parameters								
Liquid Conductivity (Target)	± 5.0%	R	$\sqrt{3}$	0.7	0.5	± 2.0%	± 1.2%	∞
Liquid Conductivity (meas.)	± 4.3%	R	$\sqrt{3}$	0.7	0.5	± 1.7%	± 1.1%	∞
Liquid Permittivity (Target)	± 5.0%	R	$\sqrt{3}$	0.6	0.5	± 1.7%	± 1.4%	∞
Liquid Permittivity (Target)	± 4.3%	R	$\sqrt{3}$	0.6	0.5	± 1.5%	± 1%	∞
Power Drift	± 5.0%	R	$\sqrt{3}$	1	1	± 2.9%	± 10.6%	∞
RF Ambient Conditions	± 3.0%	R	$\sqrt{3}$	1	1	± 1.7%	± 21.1%	∞
Post-Processing								
Extrap. and Integration	± 1.0%	R	$\sqrt{3}$	1	1	± 0.6%	± 2.3%	∞
Combined Std. Uncertainty						± 10.9%	± 10.6%	18125
Expanded Std. Uncertainty						± 21.7%	± 12.1%	

APPENDIX B – PROBE CALIBRATION CERTIFICATES

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**Client **BACL**Certificate No: **ES3-3019_Sep09**

CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3019**Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v5, QA CAL-23.v3 and QA CAL-25.v2
 Calibration procedure for dosimetric E-field probes**Calibration date: **September 22, 2009**Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41488087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: 55054 (3c)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 20 dB Attenuator	SN: 55086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 680	9-Sep-08 (No. DAE4-680_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8548C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

Calibrated by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Approved by:	Name	Function	Signature
	Niels Kuster	Quality Manager	

Issued: September 22, 2009

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: **ES3-3019_Sep09**

Page 1 of 9

Verified

Greeman
Sept. 28, 2009

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM_{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization ϕ	ϕ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx,y,z**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ES3DV2 SN:3019

September 22, 2009

Probe ES3DV2

SN:3019

Manufactured: December 5, 2002
Last calibrated: October 9, 2003
Recalibrated: September 22, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ES3DV2 SN:3019

September 22, 2009

DASY - Parameters of Probe: ES3DV2 SN:3019

Sensitivity in Free Space ^A			Diode Compression ^B		
NormX	1.07 \pm 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	95 mV	
NormY	1.17 \pm 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	93 mV	
NormZ	0.99 \pm 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	97 mV	

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 835 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR _{be} [%]	Without Correction Algorithm	7.9	5.0
SAR _{bc} [%]	With Correction Algorithm	0.9	0.6

TSL 1900 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR _{be} [%]	Without Correction Algorithm	9.0	6.1
SAR _{bc} [%]	With Correction Algorithm	0.9	0.3

Sensor OffsetProbe Tip to Sensor Center **2.1** mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

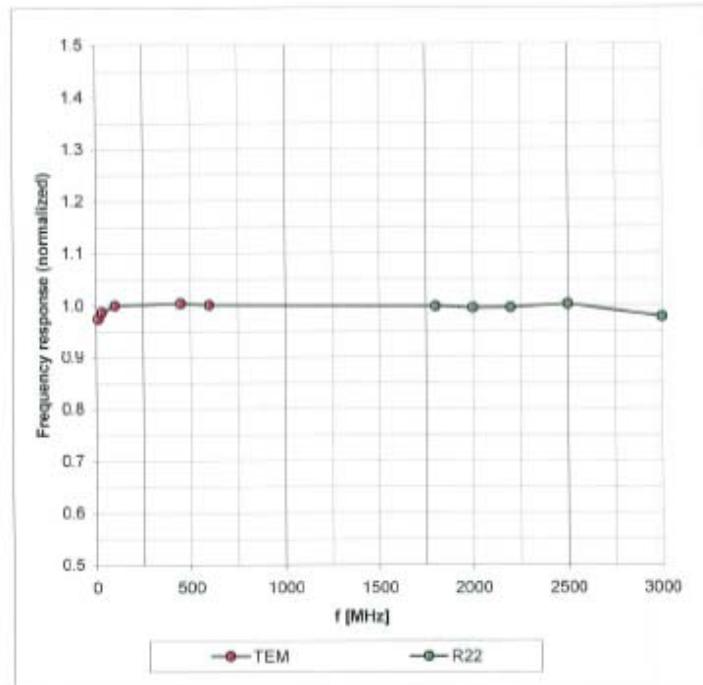
^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL. (see Page 8).^B Numerical linearization parameter: uncertainty not required.

ES3DV2 SN:3019

September 22, 2009

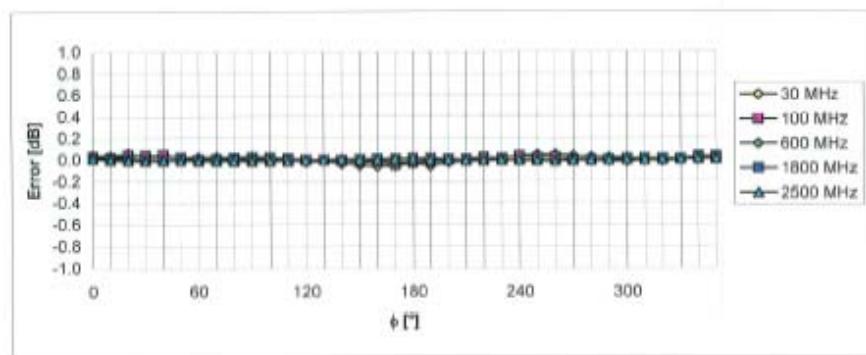
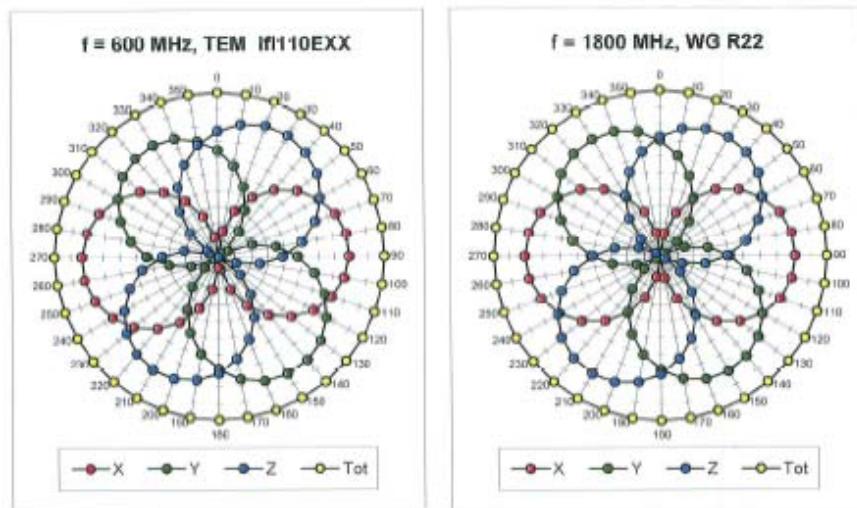
Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

ES3DV2 SN:3019

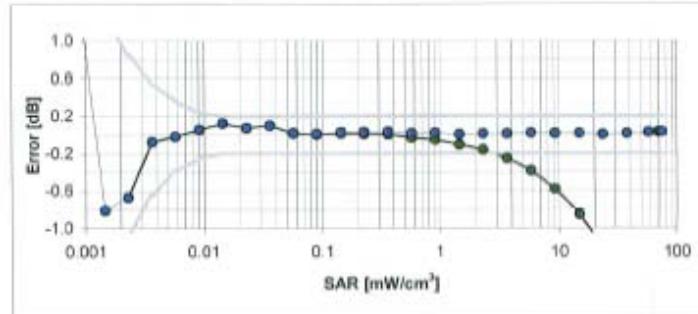
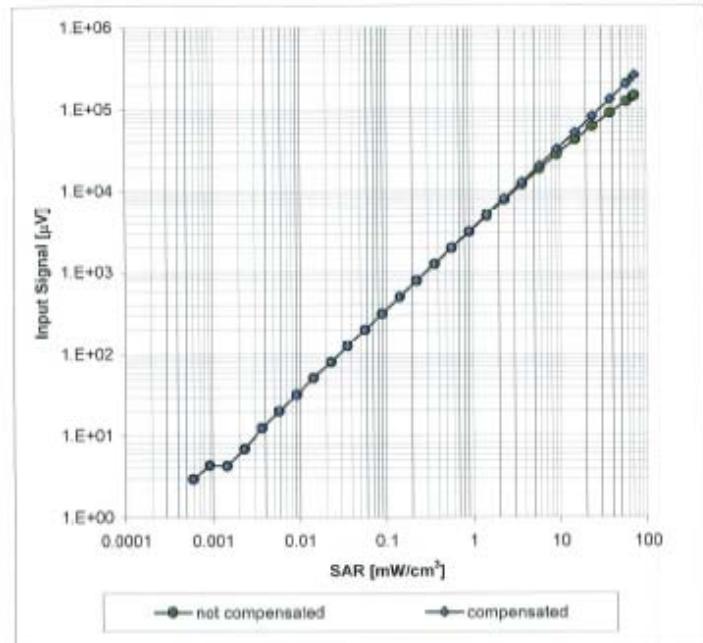
September 22, 2009

Receiving Pattern (ϕ), $\theta = 0^\circ$ Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ES3DV2 SN:3019

September 22, 2009

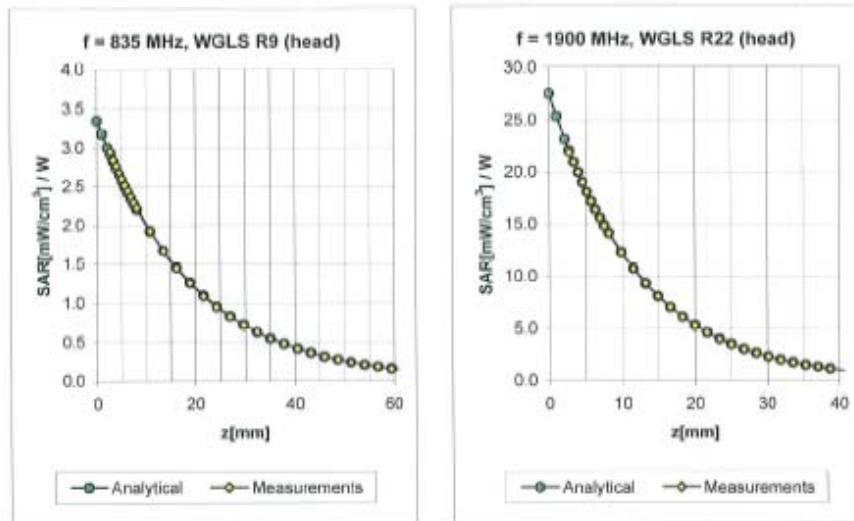
Dynamic Range $f(\text{SAR}_{\text{head}})$
(Waveguide R22, $f = 1800$ MHz)

Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ES3DV2 SN:3019

September 22, 2009

Conversion Factor Assessment



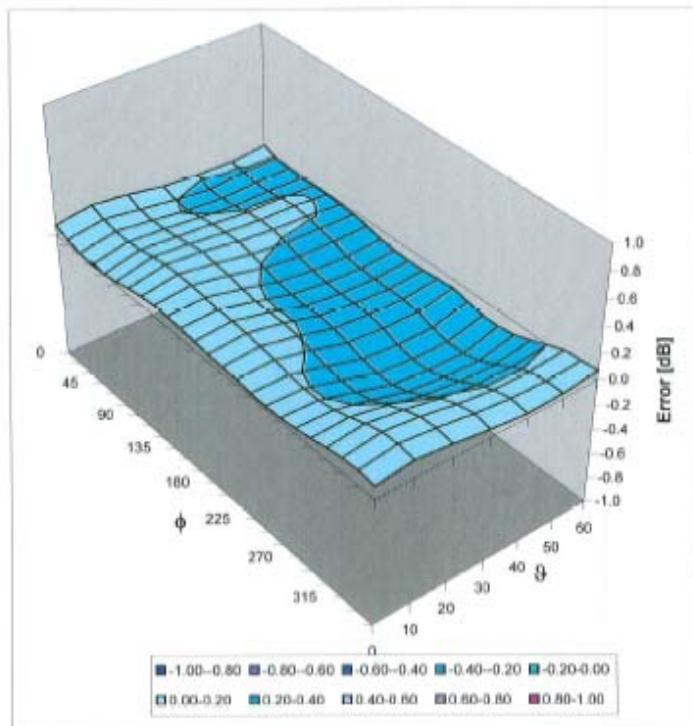
f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
450	$\pm 50 / \pm 100$	Head	$43.5 \pm 5\%$	$0.87 \pm 5\%$	0.23	1.33	$6.28 \pm 13.3\%$ (k=2)	
835	$\pm 50 / \pm 100$	Head	$41.5 \pm 5\%$	$0.90 \pm 5\%$	0.43	1.38	$6.17 \pm 11.0\%$ (k=2)	
1900	$\pm 50 / \pm 100$	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.19	2.93	$4.82 \pm 11.0\%$ (k=2)	
2450	$\pm 50 / \pm 100$	Head	$39.2 \pm 5\%$	$1.80 \pm 5\%$	0.28	2.16	$4.15 \pm 11.0\%$ (k=2)	

450	$\pm 50 / \pm 100$	Body	$56.7 \pm 5\%$	$0.94 \pm 5\%$	0.15	1.00	$6.93 \pm 13.3\%$ (k=2)
835	$\pm 50 / \pm 100$	Body	$55.2 \pm 5\%$	$0.97 \pm 5\%$	0.38	1.51	$6.01 \pm 11.0\%$ (k=2)
1900	$\pm 50 / \pm 100$	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.22	5.71	$4.36 \pm 11.0\%$ (k=2)
2450	$\pm 50 / \pm 100$	Body	$52.7 \pm 5\%$	$1.95 \pm 5\%$	0.52	1.20	$3.90 \pm 11.0\%$ (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the R55 of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ES3DV2 SN:3019

September 22, 2009

Deviation from Isotropy in HSLError (ϕ, θ), $f = 900$ MHzUncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Ave, Sunnyvale, CA 94089
Tel: (408)732-9162 / Fax: (408)732-9164

Verification of Calibration Report

Report Number: CAL 2010-06-25

Description: Dipole Antenna

Manufacturer: Schmid & Partner Engineering AG

Model Number: D450V2

Serial Number: SN: 1010

Date of Calibration: 25 Jun 2010

Condition Received: In Tolerance

Condition Returned: In Tolerance

Conditions and results of calibration: See attachment

This device has been instrumented, measured and calibrated in accordance with the Bay Area Compliance Laboratories Corp. ("BACL") Quality Assurance Manual procedures and the results being traceable to the National Institute of Standards and Technology (NIST). The BACL Quality System is accredited by NVLAP to ISO/IEC 17025:2005. Unless stated otherwise; Measurement Uncertainties are derived from ISO Guide to the Determination of Uncertainties with a Coverage Factor of $k = 2$ for a 95% level of confidence, no sampling plan or other process was used for this calibration (unless stated otherwise), the results reported herein apply only to the calibration of the item described above, and limitations of use (if any) shall be stated this Calibration Report.

Calibrated By:

Victor Zhang

06/26/2010

Date

Reviewed By:

Hans Mellberg

2010-06-29

Date

Quality Assurance:

Steve Hubbard

6-29-10

Date

Attachment**Ambient Environment of Calibration**

Temperature	Relative Humidity	Pressure
25 °C	47.5 %	101.38 k Pa

Equipment List

Description	Manufacturer	Model	Serial #	Cal Date
Signal Generator	Rohde & Schwarz	SMIQ	849192/0085/DE23746	2010-03-31
Network Analyzer	HP	8753D	3410A04346	2010-06-03
Power meter	Agilent	E4419B	MY41291511	2008-10-10
Power Sensor	Agilent	E9301A	MY41497252	2010-02-19
Reference Probe	SPEAG	ET3DV2	3019	2009-09-22

Measurement Conditions

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Flat Phantom	
Distance Dipole Center-TSL	15 mm	
Area Scan resolution	dx,dy = 15 mm	
Zoom Scan resolution	dx,dy,dz = 15 mm	
Frequency	450 MHz ± 1MHz	

Calibration is performed According to the Following Standards:

1. IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
2. IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devise used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
3. DASY 4 System Handbook

Calibration Data:**Head TSL Parameters**

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL Parameters	22.0 °C	43.5	0.87 mho/m
Measured Head TSL Parameters	(22.0±0.3) °C	43.6	0.88 mho/m
Head TSL Temperature during test	(23.0±0.3) °C		

SAR result with Head TSL

SAR average over 1 cm ³ (1g) of Head TSL	Condition	
SAR measured	500 mW input power	2.39 mW / g
SAR normalized	Normalized to 1W	4.78 mW / g
SAR for nominal Head TSL parameters ¹	Normalized to 1W	4.80 mW / g ± 9.6 % (k=2)

SAR average over 10 cm ³ (10g) of Head TSL	Condition	
SAR measured	500 mW input power	1.65 mW / g
SAR normalized	Normalized to 1W	3.30 mW / g
SAR for nominal Head TSL parameters ¹	Normalized to 1W	3.31 mW / g ± 17.1% (k=2)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.449 Ω
Return Loss	-19.021 dB

¹Correction to nominal TSL parameters according to DASY 4 System Handbook, chapter "SAR Sensitivities"

DASY4 Validation Report for Head TSL

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

DUT: Dipole 450 MHz; Type: D450V2; Serial: D450V2 - SN: 1010

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

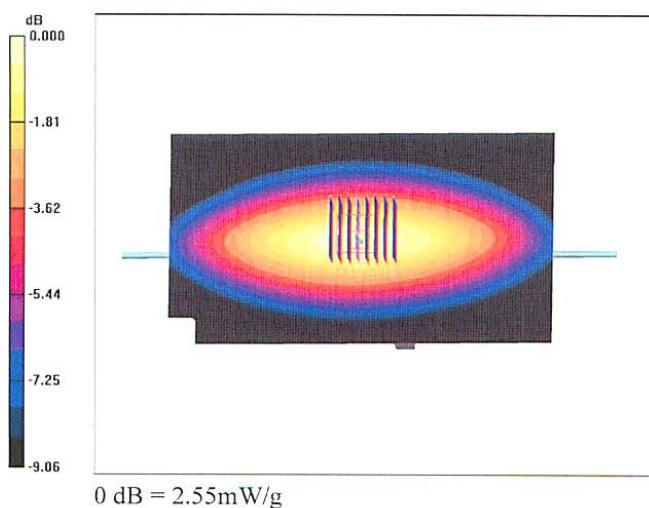
d = 15 mm, Pin = 0.5W/Area Scan (81x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.54 mW/g

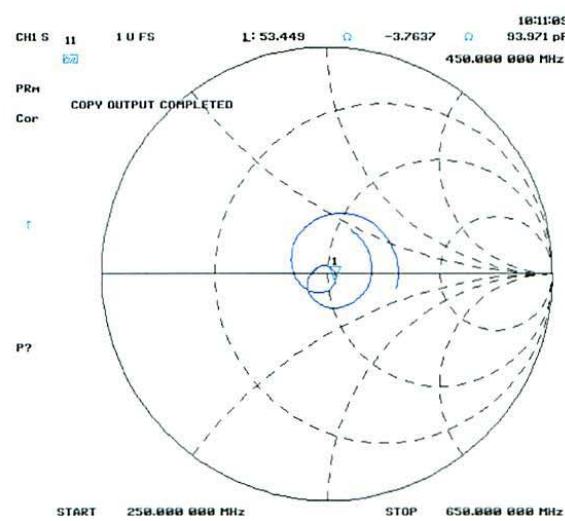
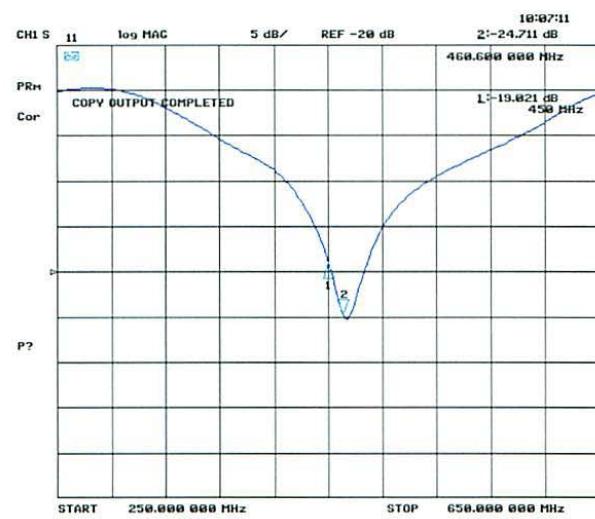
d = 15 mm, Pin = 0.5W/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.0 V/m; Power Drift = 0.107 dB

Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.65 mW/g

Maximum value of SAR (measured) = 2.55 mW/g



Impedance Measurement Plot for Head TSL**Return Loss Measurement Plot for Head TSL**

APPENDIX D - TEST SYSTEM VERIFICATIONS SCANS**Liquid Measurement Result**

Testing was performed by Arthur Tie on 2010-06-29

Simulant	Freq. [MHz]	Parameters	Liquid Temp [°C]	Target Value	Measured Value	Deviation [%]	Limits [%]
Head	450	ϵ_r	22	44	43.6	-0.9	± 5
		σ	22	0.87	0.88	1.2	± 5
		1g SAR	22	4.9	5.02	2.45	± 10

ϵ_r = relative permittivity, σ = conductivity and $\rho=1000$ kg/m³

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**System Performance Test (450 MHz Head Tissue)****Dipole 450 MHz; Type: D450V2; Serial: D450V2 - SN: 1010**

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

System Performance Check 450 MHz – 1W/Area Scan (81x141x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 5.07 mW/g

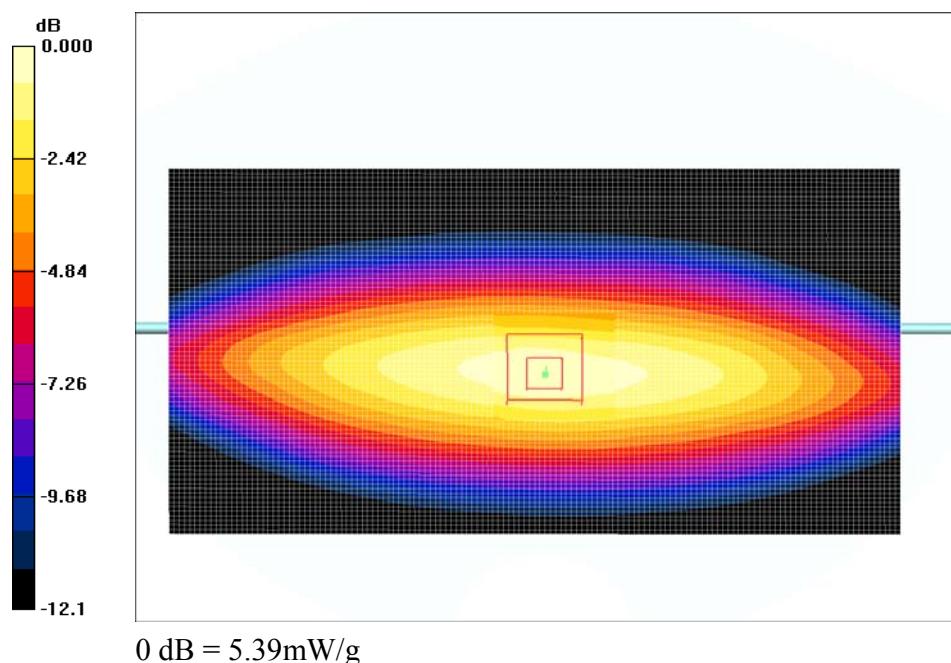
System Performance Check 450 MHz – 1W/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 80.3 V/m; Power Drift = -0.097 dB

Peak SAR (extrapolated) = 8.73 W/kg

SAR (1 g) = 5.02 mW/g; SAR (10 g) = 3.27 mW/g

Maximum value of SAR (measured) = 5.39 mW/g

**450 MHz System Validation**

APPENDIX E – EUT SCAN RESTLTS

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

2.5 cm Face up to the Flat Phantom (Low Channel)

Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043

Communication System: UHF-25 kHz; Frequency: 400.025 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

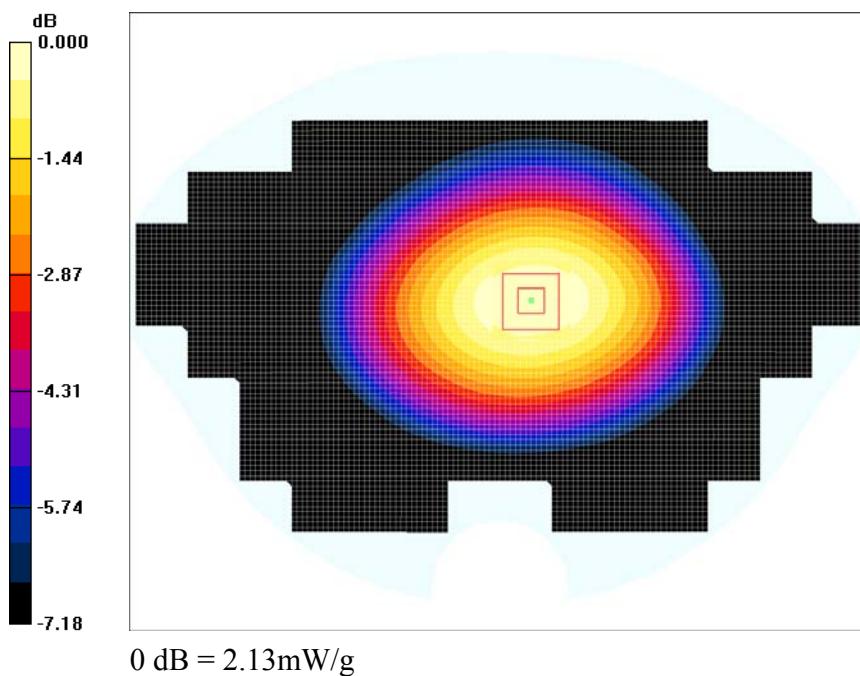
DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

2.5 cm Face up to the Flat Phantom/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.18 mW/g

2.5 cm Face up to the Flat Phantom/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 48.2 V/m; Power Drift = -0.206 dB
Peak SAR (extrapolated) = 2.63 W/kg

SAR (1 g) = 2.04 mW/g; SAR (10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.13 mW/g



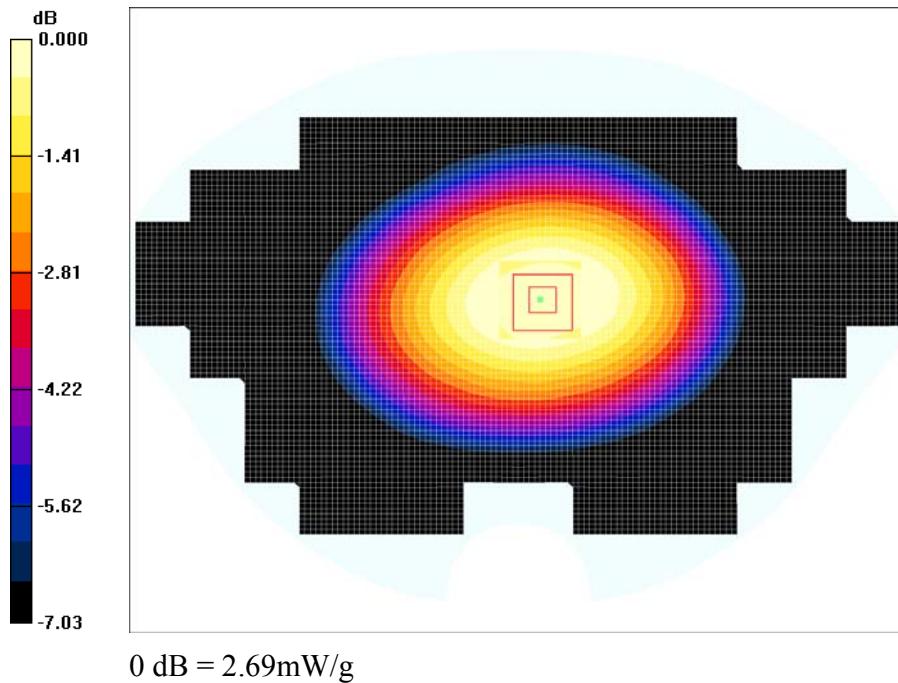
Plot #1

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**2.5 cm Face up to the Flat Phantom (Middle Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-25 kHz; Frequency: 435 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

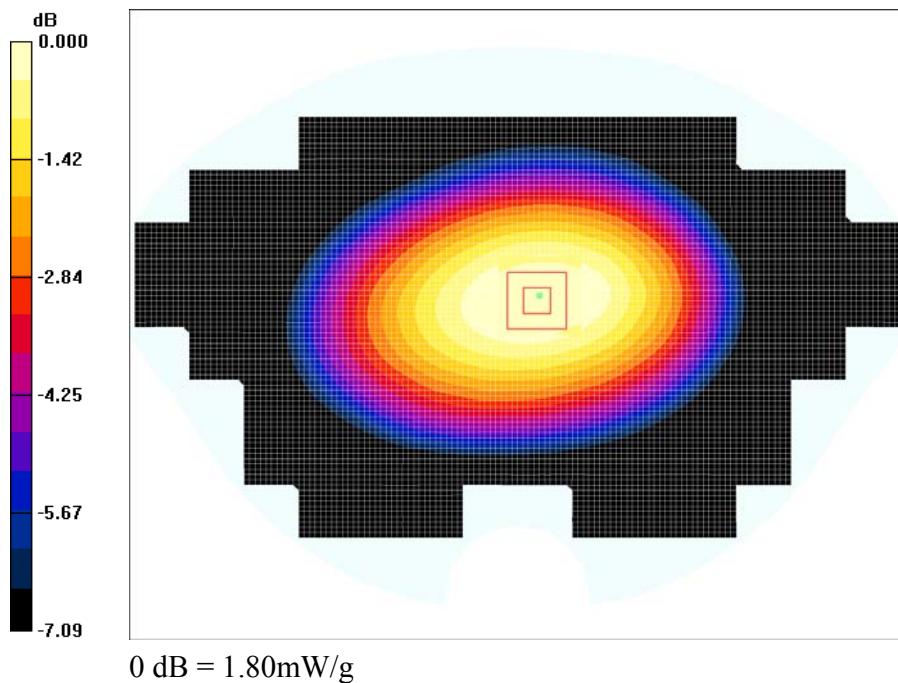
2.5 cm Face up to the Flat Phantom/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.97 mW/g**2.5 cm Face up to the Flat Phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.5 V/m; Power Drift = -0.741 dB
Peak SAR (extrapolated) = 3.34 W/kg**SAR (1 g) = 2.58 mW/g; SAR (10 g) = 1.98 mW/g**
Maximum value of SAR (measured) = 2.69 mW/g**Plot #2**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**2.5 cm Face up to the Flat Phantom (High Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-25 kHz; Frequency: 469.975 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

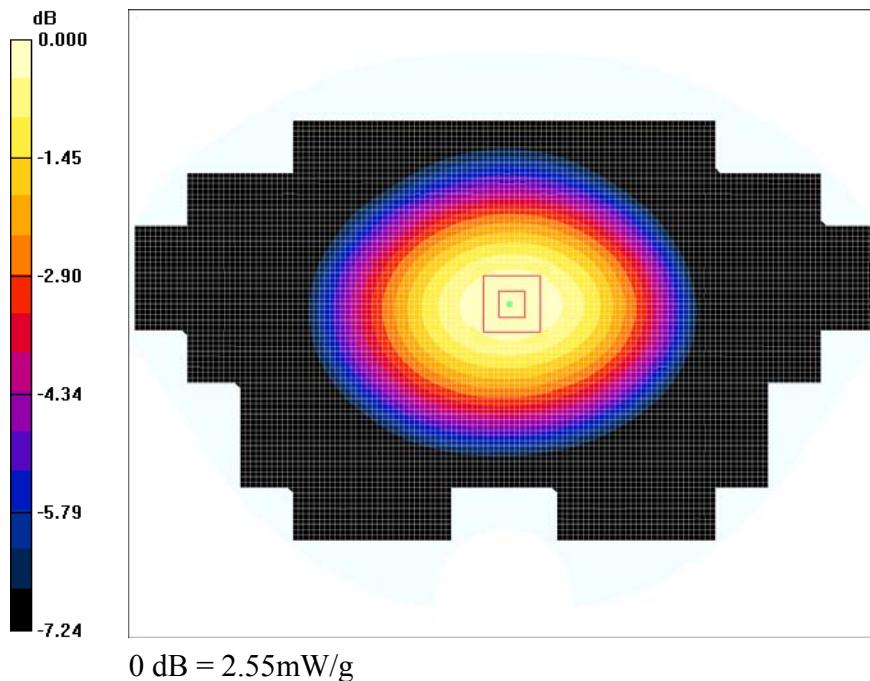
2.5 cm Face up to the Flat Phantom/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 1.88 mW/g**2.5 cm Face up to the Flat Phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 46.1 V/m; Power Drift = -0.458 dB
Peak SAR (extrapolated) = 2.25 W/kg**SAR (1 g) = 1.73 mW/g; SAR (10 g) = 1.32 mW/g**
Maximum value of SAR (measured) = 1.80 mW/g**Plot #3**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**2.5 cm Face up to the Flat Phantom (Low Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-12.5 kHz; Frequency: 400.025 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

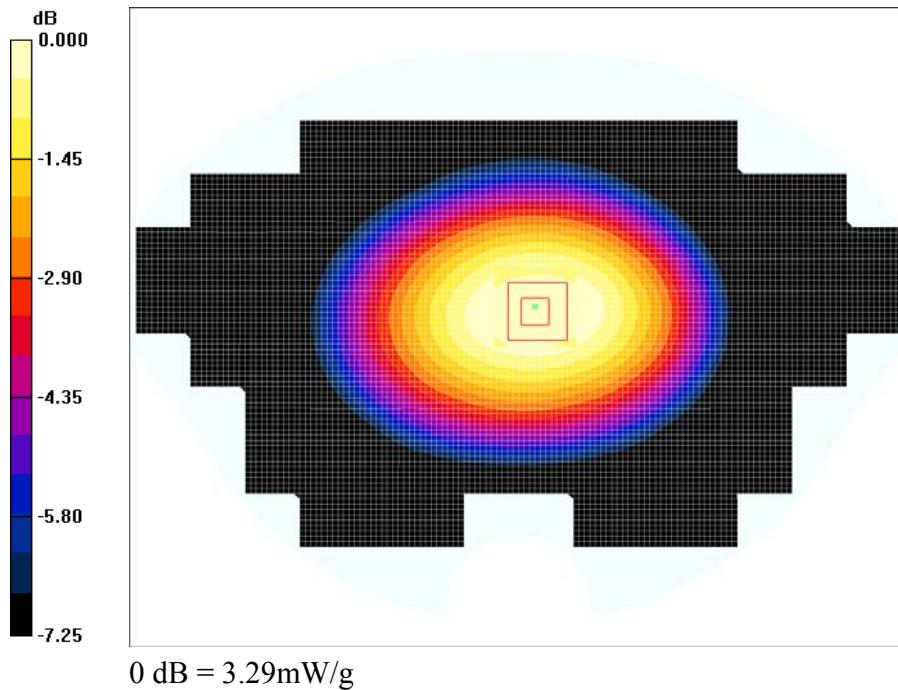
2.5 cm Face up to the Flat Phantom/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.54 mW/g**2.5 cm Face up to the Flat Phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.4 V/m; Power Drift = 0.033 dB
Peak SAR (extrapolated) = 3.16 W/kg**SAR (1 g) = 2.43 mW/g; SAR (10 g) = 1.86 mW/g**
Maximum value of SAR (measured) = 2.55 mW/g**Plot #4**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**2.5 cm Face up to the Flat Phantom (Middle Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-12.5 kHz; Frequency: 435 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

2.5 cm Face up to the Flat Phantom/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 3.49 mW/g**2.5 cm Face up to the Flat Phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.8 V/m; Power Drift = -0.658 dB
Peak SAR (extrapolated) = 4.11 W/kg**SAR (1 g) = 3.15 mW/g; SAR (10 g) = 2.4 mW/g**
Maximum value of SAR (measured) = 3.29 mW/g**Plot #5**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**2.5 cm Face up to the Flat Phantom (High Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-12.5 kHz; Frequency: 469.975 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

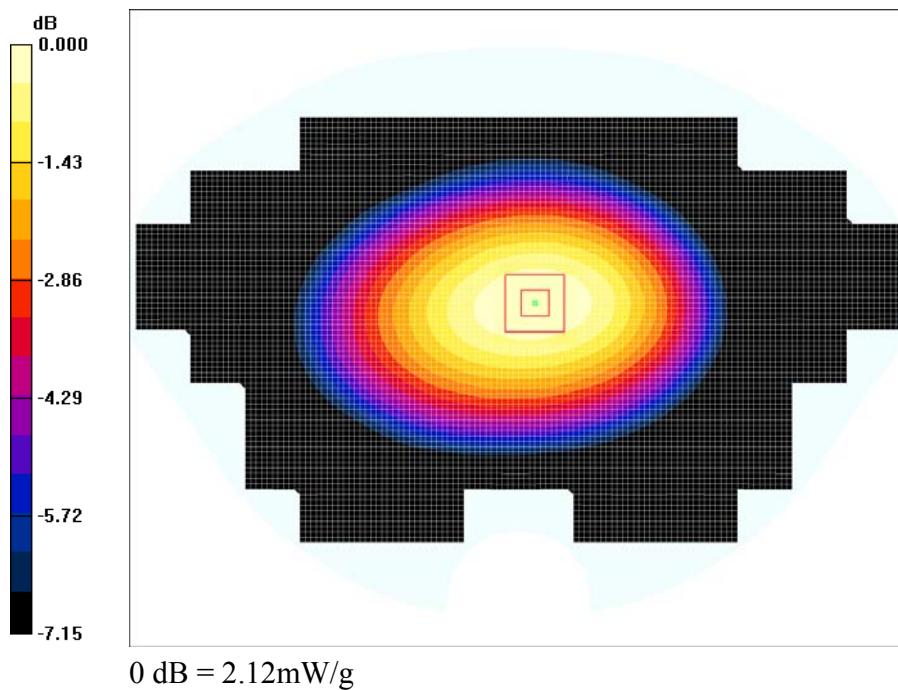
- Probe: ES3DV2 - SN3019; ConvF(6.28, 6.28, 6.28); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

2.5 cm Face up to the Flat Phantom/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.11 mW/g**2.5 cm Face up to the Flat Phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 47.7 V/m; Power Drift = 0.046 dB

Peak SAR (extrapolated) = 2.65 W/kg

SAR (1 g) = 2.02 mW/g; SAR (10 g) = 1.54 mW/g

Maximum value of SAR (measured) = 2.12 mW/g

**Plot #6**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**Back Touch to Flat Phantom with Belt Clip and Headset (Low Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-25 kHz; Frequency: 400.025 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.93, 6.93, 6.93); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

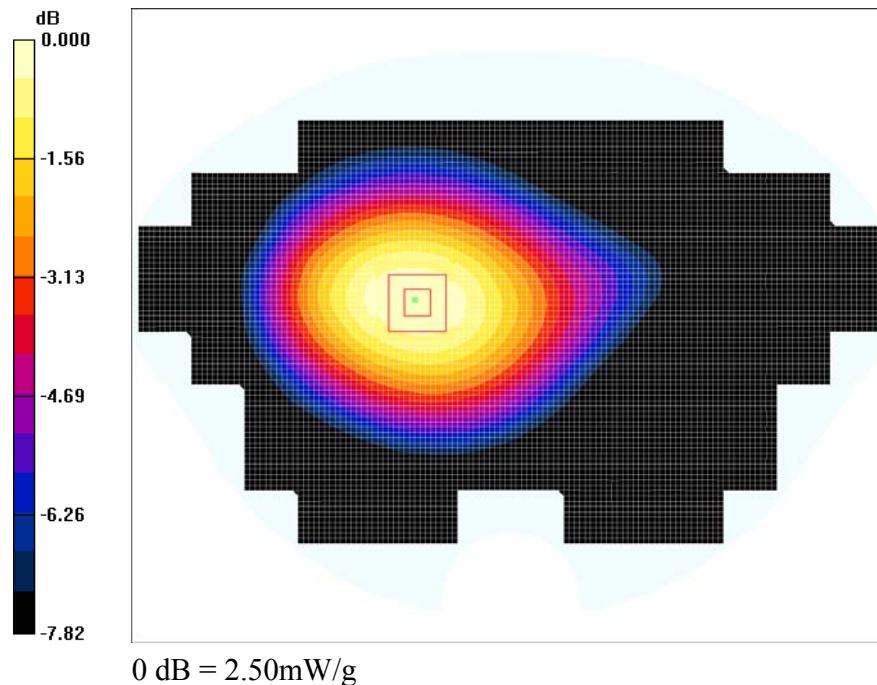
Back Touch to Flat Phantom with Belt Clip/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.53 mW/g**Back Touch to Flat Phantom with Belt Clip/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 42.4 V/m; Power Drift = -0.077 dB

Peak SAR (extrapolated) = 3.16 W/kg

SAR (1 g) = 2.38 mW/g; SAR (10 g) = 1.78 mW/g

Maximum value of SAR (measured) = 2.50 mW/g

**Plot #7**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**Back Touch to Flat Phantom with Belt Clip and Headset (Middle Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-25 kHz; Frequency: 435 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.93, 6.93, 6.93); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

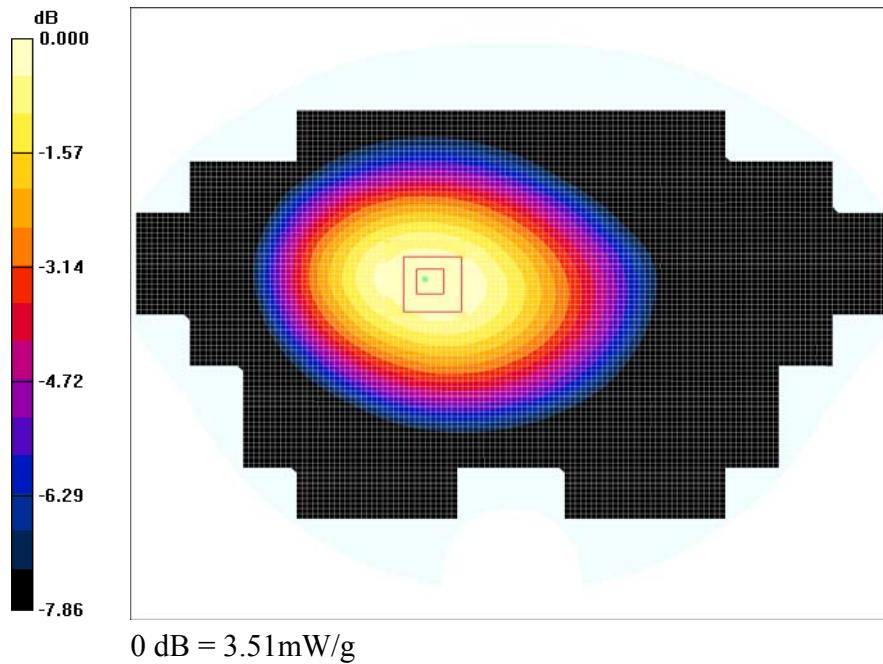
Back Touch to Flat Phantom with Belt Clip/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 3.62 mW/g**Back Touch to Flat Phantom with Belt Clip/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.5 V/m; Power Drift = -0.153 dB

Peak SAR (extrapolated) = 4.47 W/kg

SAR (1 g) = 3.36 mW/g; SAR (10 g) = 2.52 mW/g

Maximum value of SAR (measured) = 3.51 mW/g

**Plot #8**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**Back Touch to Flat Phantom with Belt Clip and Headset (High Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-25 kHz; Frequency: 469.975 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.93, 6.93, 6.93); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

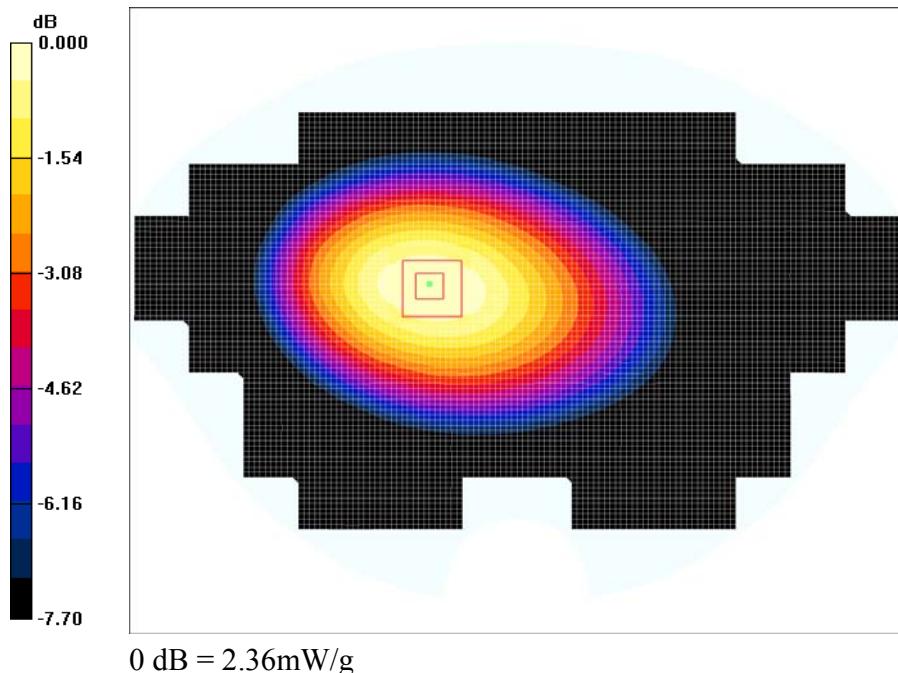
Back Touch to Flat Phantom with Belt Clip/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.38 mW/g**Back Touch to Flat Phantom with Belt Clip/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 43.9 V/m; Power Drift = 0.042 dB

Peak SAR (extrapolated) = 3.01 W/kg

SAR (1 g) = 2.25 mW/g; SAR (10 g) = 1.68 mW/g

Maximum value of SAR (measured) = 2.36 mW/g

**Plot #9**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**Back Touch to Flat Phantom with Belt Clip and Headset (Low Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-12.5 kHz; Frequency: 400.025 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.93, 6.93, 6.93); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

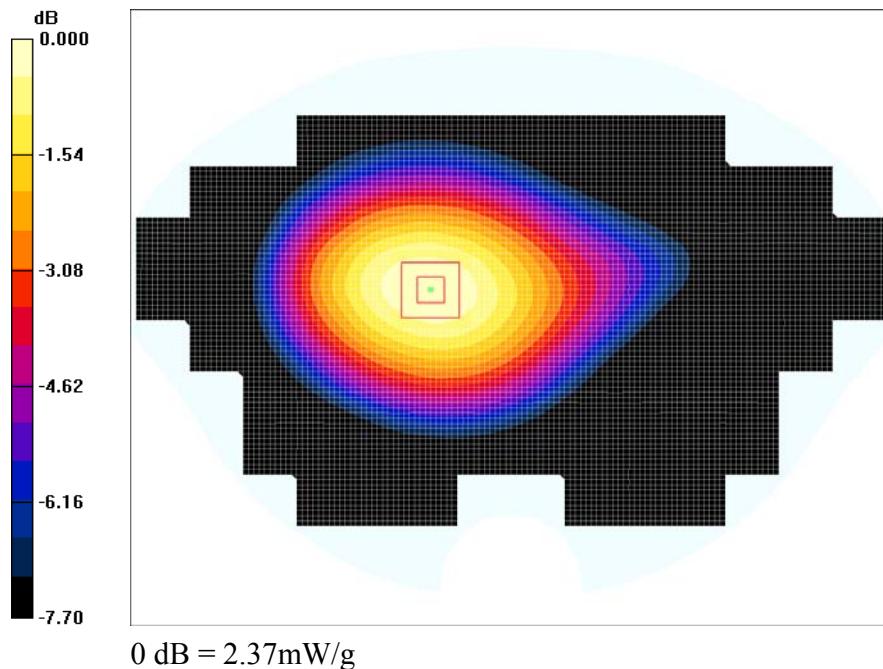
Back Touch to Flat Phantom with Belt Clip/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.36 mW/g**Back Touch to Flat Phantom with Belt Clip/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 43.0 V/m; Power Drift = 0.103 dB

Peak SAR (extrapolated) = 2.99 W/kg

SAR (1 g) = 2.26 mW/g; SAR (10 g) = 1.69 mW/g

Maximum value of SAR (measured) = 2.37 mW/g

**Plot #10**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**Back Touch to Flat Phantom with Belt Clip and Headset (Middle Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-12.5 kHz; Frequency: 435 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.93, 6.93, 6.93); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

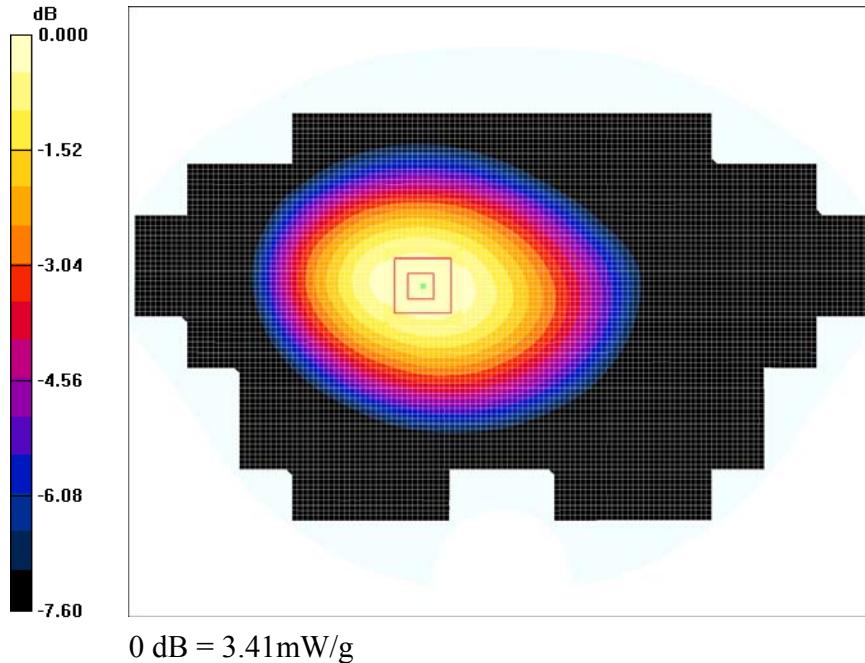
Back Touch to Flat Phantom with Belt Clip/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 3.48 mW/g**Back Touch to Flat Phantom with Belt Clip/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.1 V/m; Power Drift = -0.148 dB

Peak SAR (extrapolated) = 4.32 W/kg

SAR (1 g) = 3.26 mW/g; SAR (10 g) = 2.44 mW/g

Maximum value of SAR (measured) = 3.41 mW/g

**Plot #11**

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**Back Touch to Flat Phantom with Belt Clip and Headset (High Channel)****Weierwei Electron Science & Technology Co., Ltd.; Model: VEV-V8; S/N: 10032150043**

Communication System: UHF-12.5 kHz; Frequency: 469.975 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 450$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(6.93, 6.93, 6.93); Calibrated: 9/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 184

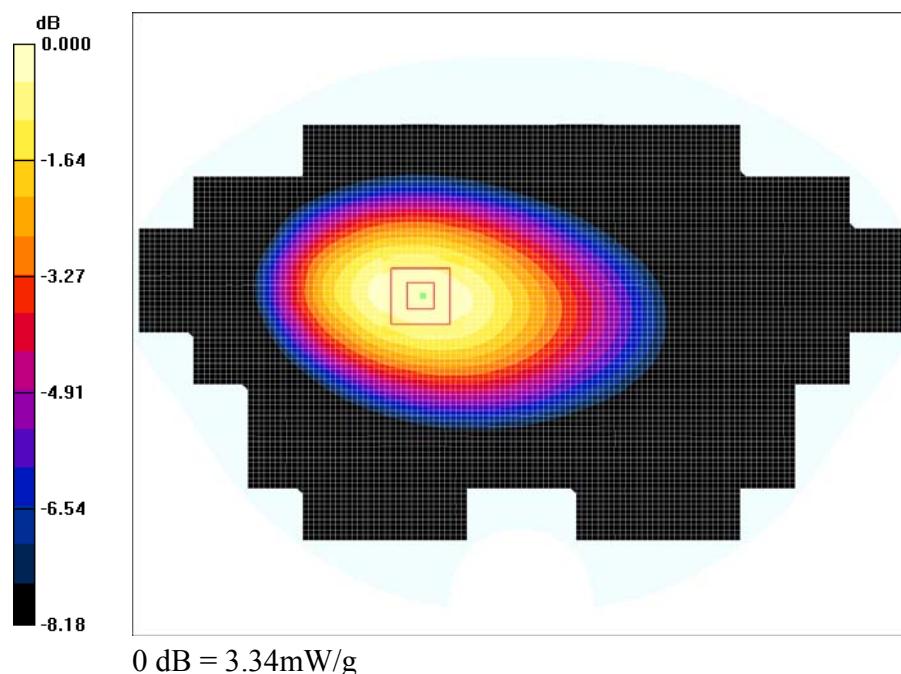
Back Touch to Flat Phantom with Belt Clip/Area Scan (81x141x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 3.38 mW/g**Back Touch to Flat Phantom with Belt Clip/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 48.2 V/m; Power Drift = -0.066 dB

Peak SAR (extrapolated) = 4.34 W/kg

SAR (1 g) = 3.17 mW/g; SAR (10 g) = 2.3 mW/g

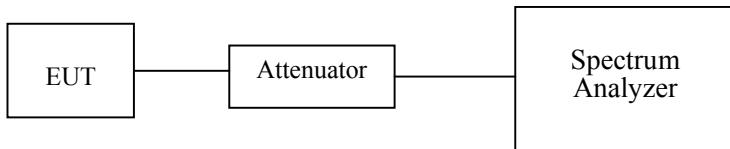
Maximum value of SAR (measured) = 3.34 mW/g

**Plot #12**

APPENDIX F – OUTPUT POWER MEASUREMENT

Test Block Diagram and Procedure

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



Test Equipment Lists and Details

Manufacturer	Description	Model Number	S/N	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-09

Test Results

Channel Spacing (kHz)	Frequency (MHz)	Measured Conducted Output Power	
		(dBm)	(Watt)
25.0	400.025	36.80	4.786
25.0	430.000	36.85	4.842
25.0	469.975	36.78	4.764
12.5	400.025	36.87	4.864
12.5	430.000	36.90	4.898
12.5	469.975	36.85	4.842

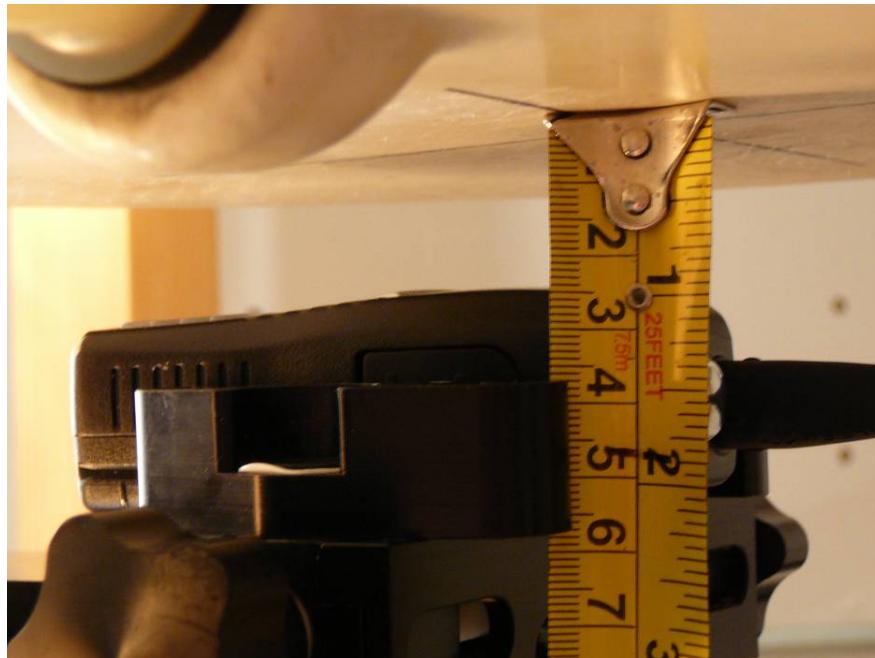
APPENDIX G – TEST SET UP PHOTOS

Body Worn - Back Touch to Flat Phantom

(With Headset and Belt Clip)



Face Held - 2.5 cm Separation to Flat Phantom



APPENDIX H– EUT PHOTOS

EUT – Front View



EUT – Back View



EUT – Back View with Clip



EUT – Battery off View



EUT – Battery View



EUT – Charger



APPENDIX I - INFORMATIVE REFERENCES

- [1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.
- [2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, O_ce of Engineering & Technology, Washington, DC, 1997.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E- eld scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.
- [4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.
- [5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM _ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The depen-dence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.
- [10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.
- [11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
- [12] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992. Dosimetric Evaluation of Sample device, month 1998 9
- [13] NIS81 NAMAS, \The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.
- [14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10.

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