Lab Code: 200167-0

Bay Area Compliance Labs.Corp.

SAR EVALUATION REPORT

For

Lisheng Electronic, Co., Ltd.

Lisheng Industry Zone, 5# Chongxiang St., Econ. & Tech. Area,

Quanzhou, Fujian, China

FCC ID: XEPLS-7500

Report Type: Original Report	**Product Type:** Two-Way Radio

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Report Number: R0906114-SAR

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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:	Portable Transceiver
Modulation Type:	FM
TX Frequency Range:	450~470 MHz
Maximum Conducted Power Tested:	35.4 dBm
Antenna Type(s) Tested:	External Antenna
Body-Worn Accessories:	Earphone and Belt Clip
Face-Head Accessories:	None
Battery Type (s) Tested:	7.4 Vdc Rechargeable Li-On Battery
Max. SAR Level(s) Measured:	Body-Worn: 2.145 W/Kg (1 g Body Tissue) Face-Held: 1.805 W/Kg (1g 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

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0906114-SAR	Original	2009-06-30

REFERENCE, STANDARDS, AND GUILDELINES

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 Lisheng Electronic Co., Ltd. product, FCC ID: XEPLS-7500 model LS-7500-UHF or the “EUT" as referred to in this report is a FM two way radio operates at UHF band.

Items	Technical Specification
Frequency Range	450~470 MHz
Modulation	FM
Conducted Power	3 Watts
Channel Spacing	25 kHz
Emission Designator	16K0F3E
Modulation Limit	±5 kHz
Operation Voltage	7.2 Vdc±20%
Antenna Gain	< 1.8 dBi
Operation Mode	Face-held Body-worn (with Earphone and Belt Clip)

**The data gathered are from a typical production sample provided by the manufacturer, serial number: R0906114-1*

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 ±0.02mm. 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 ±10%. The spherical isotropy was evaluated with the procedure and found to be better than ±0.25dB.

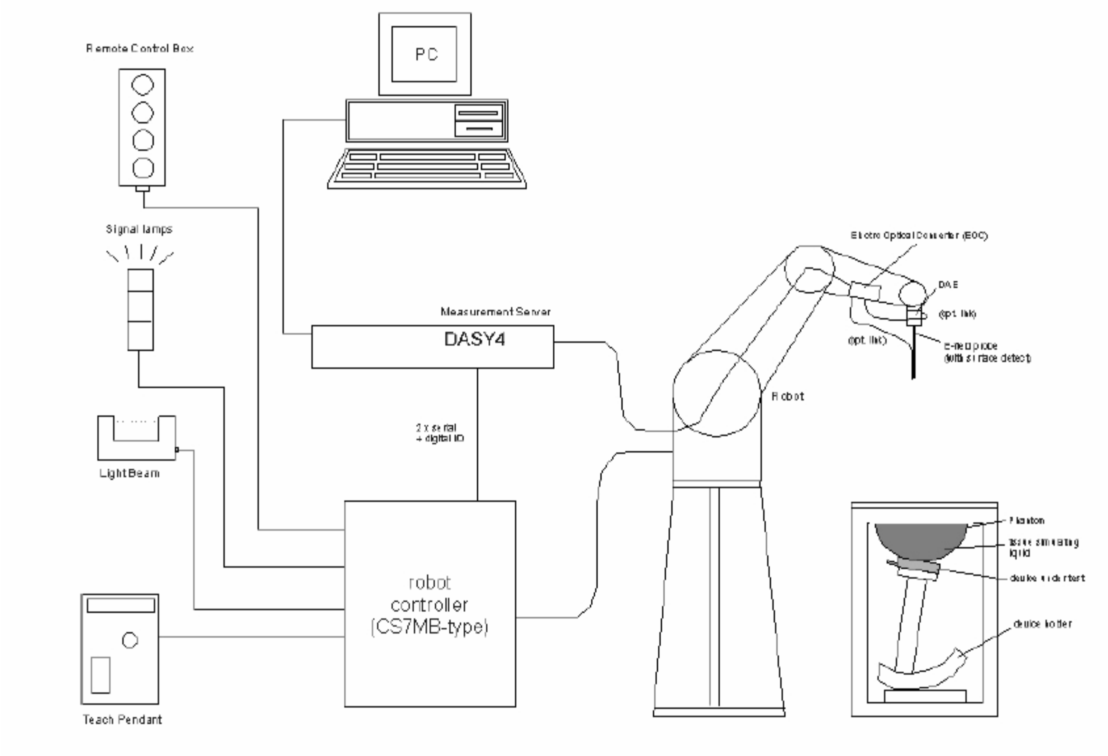
The phantom used was the Generic Twin Phantom. The ear was simulated as a spacer of 4 mm thickness between the earpiece of the phone and the tissue simulating liquid. The Tissue simulation liquid used for each test is in according with the FCC OET65 supplement C as listed below.

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.

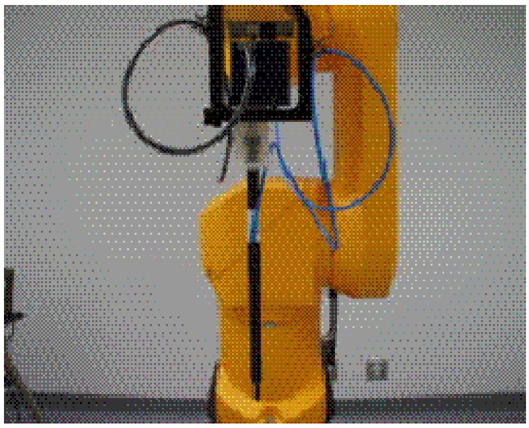
Dosimetric Probes: These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (±2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

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

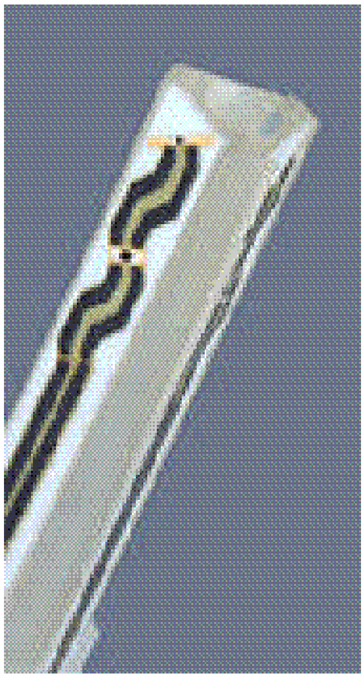
Construction Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
Calibration In air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 450 MHz, 900 MHz and
1.8 GHz (accuracy ± 8%)
Frequency 10 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 bellow 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:

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

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)
dcp_i = diode compression point (DASY parameter)

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

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

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

With Vi = compensated signal of channel i (i =x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i =x, y, z)
$\mu V/(V/m)^2$ for E-field probes
ConF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = 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/cm^3

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 lined, 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 o_-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 ±0.5mm would produce a SAR uncertainty of ±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 "=3 and loss tangent _=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	Cal. Due Date	S/N:
DASY4 Professional Dosimetric System	N/A	N/A
Robot RX60L	N/A	CS7MBSP / 467
Robot Controller	N/A	F01/5J72A1/A/01
Dell Computer Demension 3000	N/A	N/A
SPEAG EDC3	N/A	N/A
SPEAG DAE3	N/A	456
DASY4 Measurement Server	N/A	1176
SPEAG E-Field Probe ET3DV6	2009-09-23	1604
Antenna Dipole D450V2	2010-04-06	1010
SPEAG Generic Twin Phantom	N/A	N/A
450 MHz Head Liquid	Each Time	N/A
450 MHz Body Liquid	Each Time	N/A
Agilent, Spectrum Analyzer E4440A	2010-04-27	MY44303352
Microwave Amp. 8349A	N/A	2644A02662
Dielectric Probe Kit HP85070A	N/A	US99360201
Agilent, Signal Generator, 8648C	2009-09-18	3347M00143
Amplifier, ST181-20	N/A	E012-0101
Antenna, Horn SAS-200/571	2009-4-20	A052704

SAR MEASUREMENT SYSTEM VERIFICATION

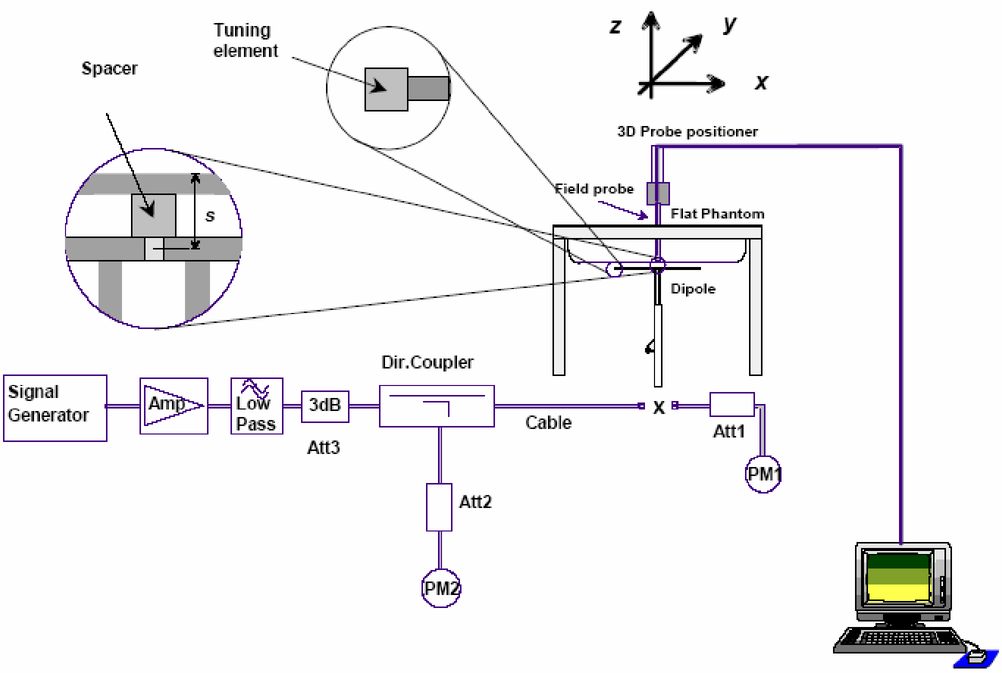
System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±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 Jimmy Nguyen from 2009-06-29 to 2009-06-30.*

Test Position	Accessory	Frequency (MHz)	Liquid Type	Phantom Type	1 g SAR (W/Kg) Value	S AR of 50% Duty Cycle (W/Kg)	FCC Limit (W/Kg)	Ref. Plot
Back Touching to Flat Phantom	Earphone and Belt clip	450	Body	Flat	3.49	1.745	8.0	1
Back Touching to Flat Phantom	Earphone and Belt clip	460	Body	Flat	3.88	1.94	8.0	2
Back Touching to Flat Phantom	Earphone and Belt clip	470	Body	Flat	4.29	2.145	8.0	3
2.5 cm to Flat Phantom	None	450	Head	Flat	2.99	1.495	8.0	4
2.5 cm to Flat Phantom	None	460	Head	Flat	3.13	1.565	8.0	5
2.5 cm to Flat Phantom	None	470	Head	Flat	3.61	1.805	8.0	6

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: **ET3-1604_Sep08**

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1604
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	September 23, 2008
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-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	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-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	

Issued: September 23, 2008

Certificate No: ET3-1604_Sep08 Page 1 of 9

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**
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
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,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., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) 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
b) 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:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,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 ≤ 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 *NORMx,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.

Certificate No: ET3-1604_Sep08 Page 2 of 9

Probe ET3DV6

SN:1604

Manufactured:	July 30, 2001
Last calibrated:	August 28, 2007
Recalibrated:	September 23, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1604

Sensitivity in Free Space[A]

NormX	**1.93** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**91** mV
NormY	**1.84** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**89** mV
NormZ	**1.89** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**90** mV

Diode Compression[B]

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	10.0	6.0
SAR_{be} [%]	With Correction Algorithm	0.8	0.3

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	10.6	6.5
SAR_{be} [%]	With Correction Algorithm	0.9	0.6

Sensor Offset

Probe Tip to Sensor Center **2.7** 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%.

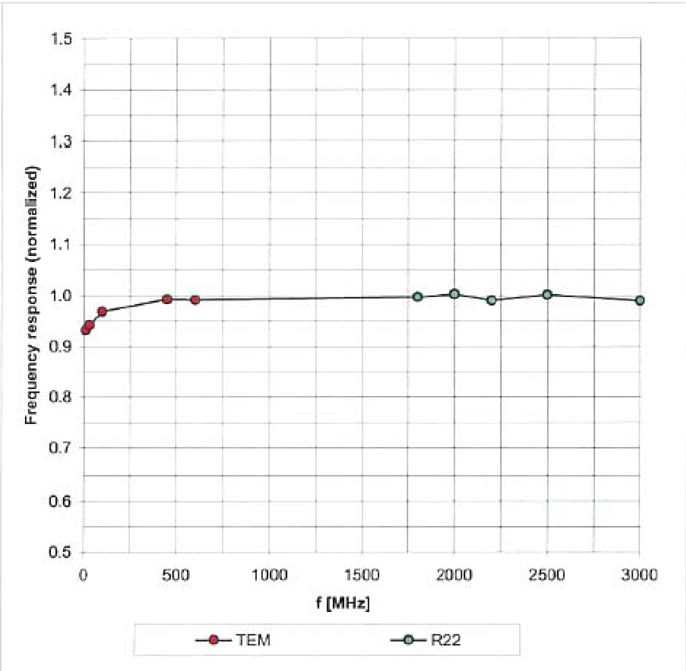
[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1604 September 23, 2008

Frequency Response of E-Field

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



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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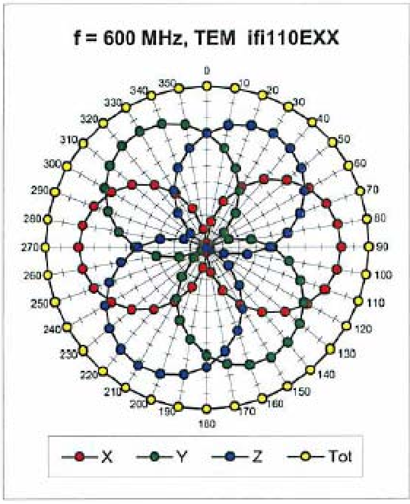
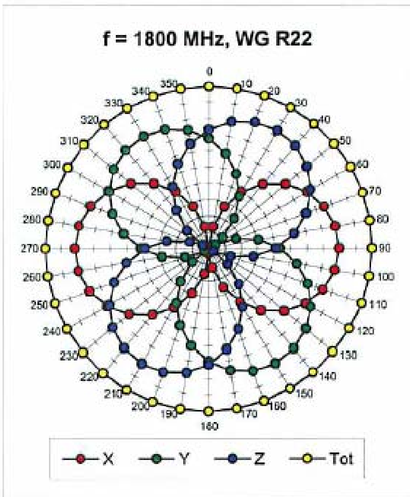
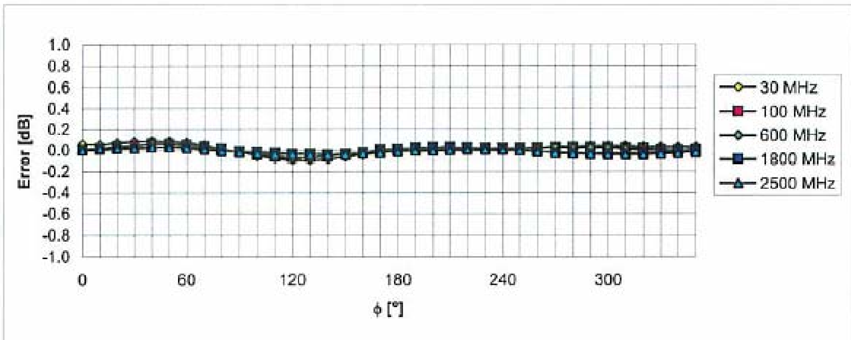
ET3DV6 SN:1604 September 23, 2008

Receiving Pattern (ϕ), $\vartheta = 0°$







Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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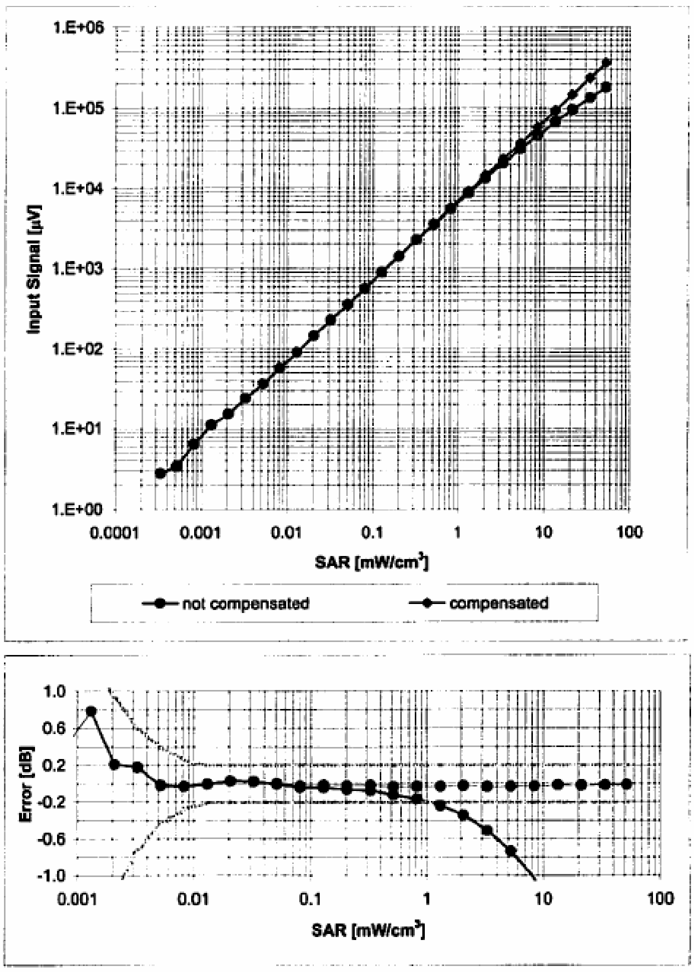
ET3DV6 SN:1604 September 23, 2008

Dynamic Range f(SAR_{head})

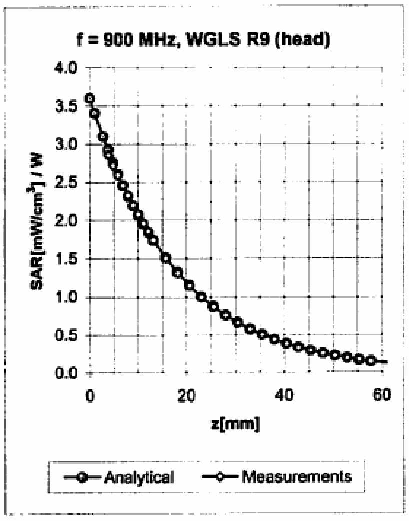
(Waveguide R22, f = 1800 MHz)

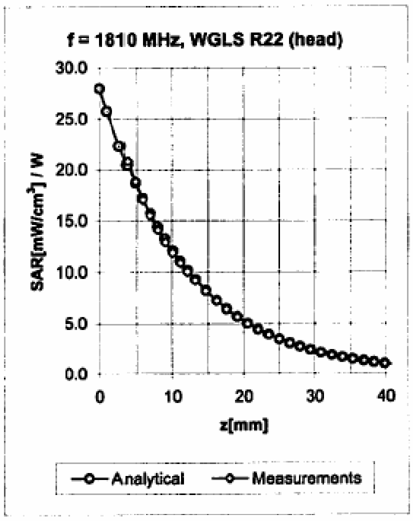


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1604 **September 23, 2008**

Conversion Factor Assessment





f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.59	2.21	6.46 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.58	2.28	6.23 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.65	2.01	5.30 ± 11.0% (k=2)
1900	± 50 / ± 101	Head	40.0 ± 5%	1.40 ± 5%	0.76	1.75	5.18 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.85	1.55	4.59 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.58	2.33	6.23 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.59	2.29	6.08 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.69	2.04	4.64 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.88	1.61	4.52 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.80	1.60	3.94 ± 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 RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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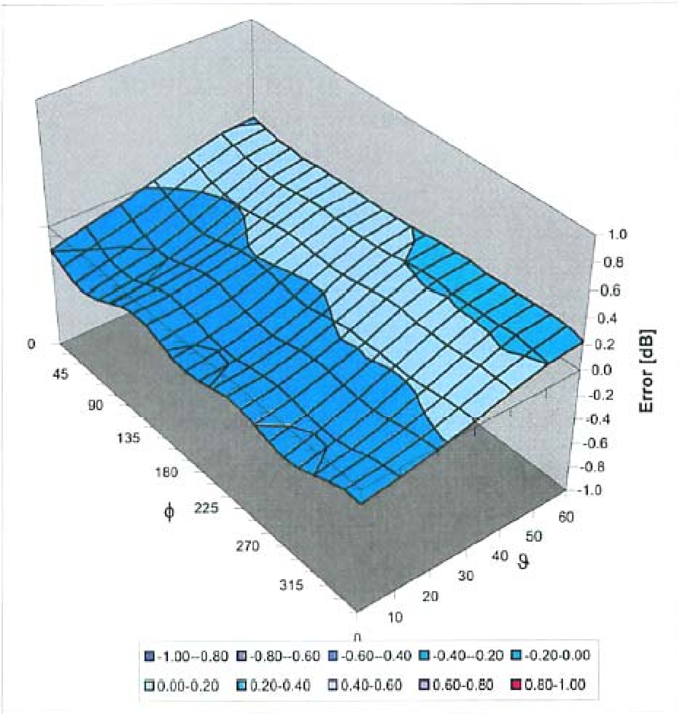
ET3DV6 SN:1604 September 23, 2008

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ET3-1604_Sep08 Page 9 of 9

APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

BACL
Bay Area Compliance Lab Corp.

Verification of Calibration Report

Report Number:	CAL 2009-04-01
Description:	Dipole Antenna
Manufacturer:	Schmid & Partner Engineering AG
Model Number:	D450V2
Serial Number:	SN: 1010
Date of Calibration:	06 April 2009

Conditions and results of calibration: See attachment

Calibrated By:	Greeman Greeman Chen	Apr/06/2009 Date
Reviewed By:	S. Lisinker Samuil Lisinker	2009-04-07 Date
Quality Assurance:	Steve Hubbard Steve Hubbard	4-7-09 Date

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Attachment

Ambient Environment of Calibration

Temperature	Relative Humidity	Pressure
19.3 ^{o} C	37 %	101.68 k Pa

Equipment List

Description	Manufacturer	Model	Serial #	Cal Date
Signal Generator	HP	8348C	3426A00417	2008-05-28
Network Analyzer	HP	8753D	3410A04346	2008-04-08
Power meter	Agilent	E4419B	MY41291511	2008-10-10
Power Sensor	Agilent	E9301A	MY41497252	2008-10-10
Reference Probe	SPEAG	ET3DV6	1604	2008-09-23

Measurement Conditions

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

Calibration Data:

SAR result with Head TSL

SAR average over 1 cm^3 (1g) of Head TSL	Condition	Result
SAR measured	387 mW input power	2.01 mW / g
SAR normalized	Normalized to 1W	5.19 mW / g
SAR for nominal Head TSL parameters	Normalized to 1W	5.21 mW / g ± 18.1% (k=2)

SAR average over 10 cm^3 (10g) of Head TSL	Condition	Result
SAR measured	387 mW input power	1.39 mW / g
SAR normalized	Normalized to 1W	3.59 mW / g
SAR for nominal Head TSL parameters	Normalized to 1W	3.50 mW / g ± 17.6% (k=2)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	45.609 Ω
Return Loss	-19.758 dB

DASY4 Validation Report for Head TSL

System Performance Test (450MHz Head)

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; σ = 0.88 mho/m; ε_r = 43.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

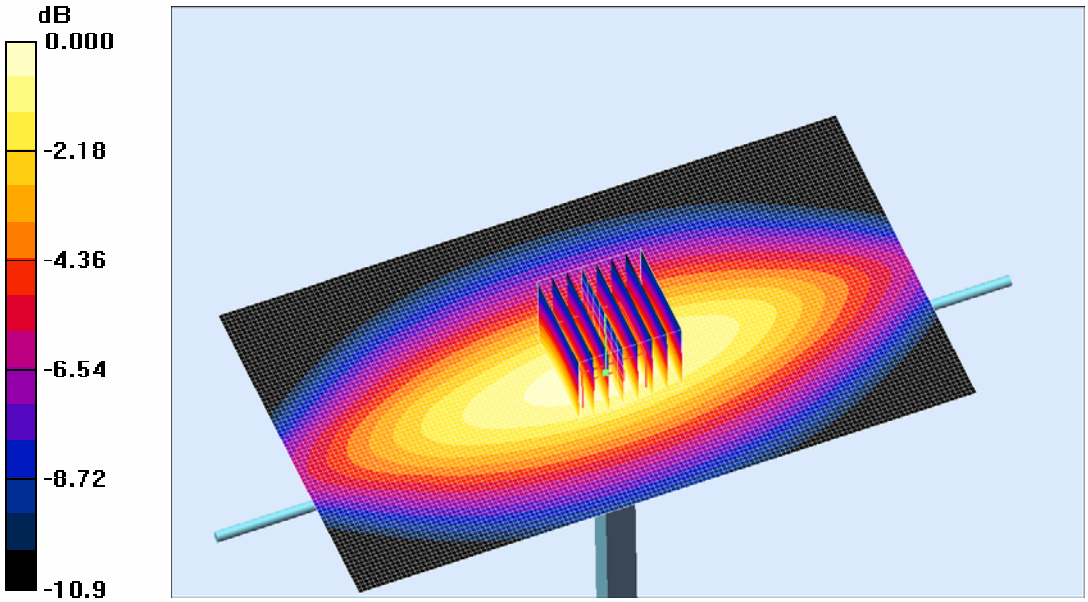
DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.31, 7.31, 7.31);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456;
- Phantom: Flat Phantom 4.4; Type: Flat Phantom 4.4; Serial
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

d =15 mm, Pin = 387mW 2/Area Scan (81x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.08 mW/g

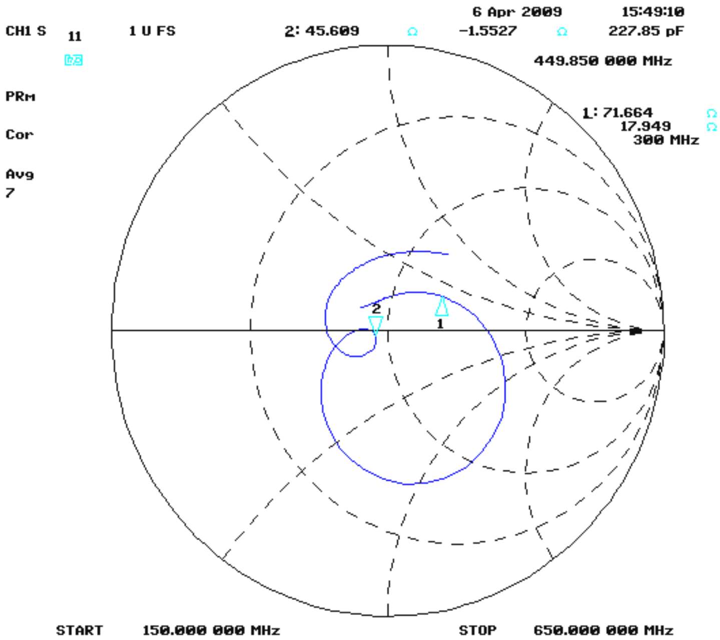
d =15 mm, Pin = 387mW 2/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.7 V/m; Power Drift = -0.150 dB
Peak SAR (extrapolated) = 2.96 W/kg

SAR (1 g) = 2.01 mW/g; SAR (10 g) = 1.39 mW/g
Maximum value of SAR (measured) = 2.14 mW/g

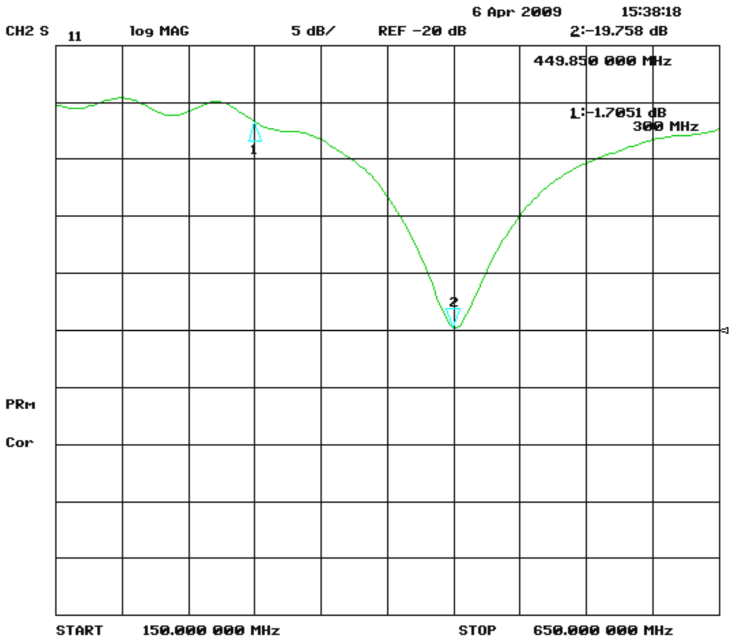


0 dB = 2.14mW/g

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 Jimmy Nguyen on 2009-06-29~2009-06-30

Simulant	Freq. [MHz]	Parameters	Liquid Temp. [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
Head	450	εr	22	43.5	43.6	0.23	±5
		σ	22	0.87	0.88	1.15	±5
		1g SAR	22	4.9	4.67	-4.69	±10

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

System Performance Test (450 MHz Head Liquid)

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; σ = 0.88 mho/m; ε_r = 43.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

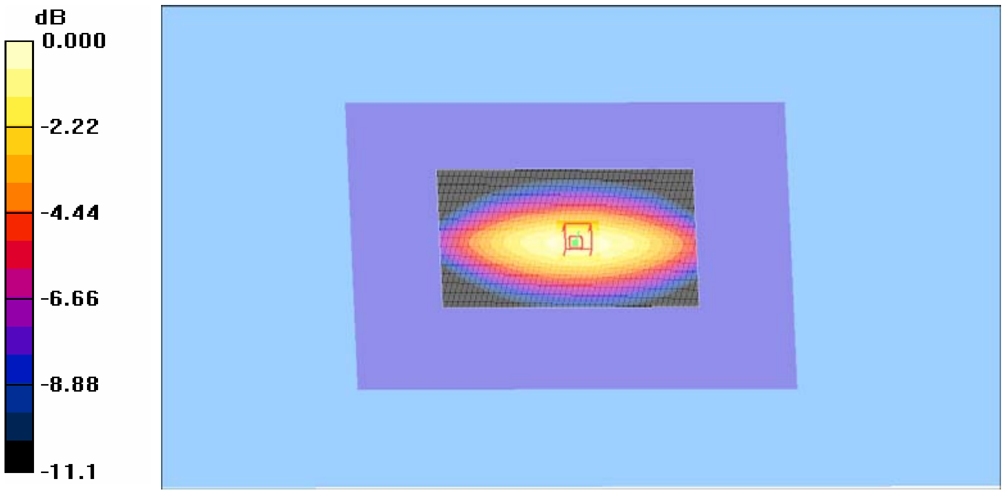
DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.31, 7.31, 7.31); Calibrated: 9/23/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: Flat Phantom 4.3; Type: Flat Phantom 4.3; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

d =15 mm, Pin = 1W/Area Scan (81x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.82 mW/g

d =15 mm, Pin = 1W/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 77.7 V/m; Power Drift = -0.108 dB
Peak SAR (extrapolated) = 6.85 W/kg

SAR (1 g) = 4.67 mW/g; SAR (10 g) = 3.21 mW/g
Maximum value of SAR (measured) = 4.97 mW/g



0 dB = 4.97 mW/g

450 MHz System Validation

APPENDIX E – EUT SCAN RESTLTS

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)
EUT Back Touch to Flat Phantom with Belt Clip and Earphone (Channel 1-450 MHz)
Lisheng Electronic Co., Ltd.; Type: Two Way Radio; Serial: R0906114-1

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.89 mho/m; ε_r = 56.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.84, 7.84, 7.84); Calibrated: 9/23/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: Flat Phantom 4.3; Type: Flat Phantom 4.3; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

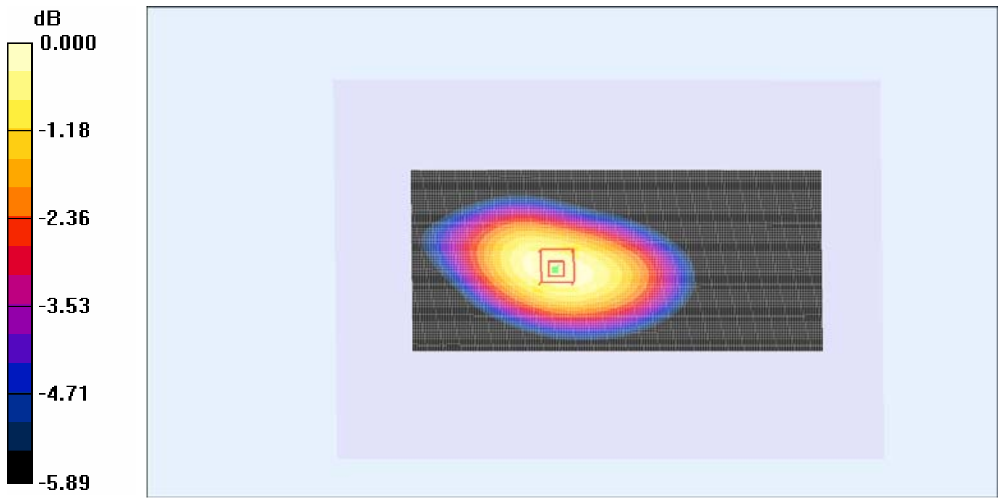
EUT Back Touch to Flat Phantom with Belt Clip and Earphone/Area Scan (81x181x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.58 mW/g

EUT Back Touch to Flat Phantom with Belt Clip and Earphone/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.3 V/m; Power Drift = -0.068 dB
Peak SAR (extrapolated) = 5.43 W/kg

SAR (1 g) = 3.49 mW/g; SAR (10 g) = 2.65 mW/g
Maximum value of SAR (measured) = 3.60 mW/g



0 dB = 3.60 mW/g

Plot # 1

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

EUT Back Touch to Flat Phantom with Belt Clip and Earphone (Channel 2-460 MHz)

Lisheng Electronic Co., Ltd.; Type: Two Way Radio; Serial: R0906114-1

Communication System: CW; Frequency: 460 MHz; Duty Cycle: 1:1
Medium parameters used: f = 460 MHz; σ = 0.92 mho/m; ε_r = 56.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.84, 7.84, 7.84); Calibrated: 9/23/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: Flat Phantom 4.3; Type: Flat Phantom 4.3; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

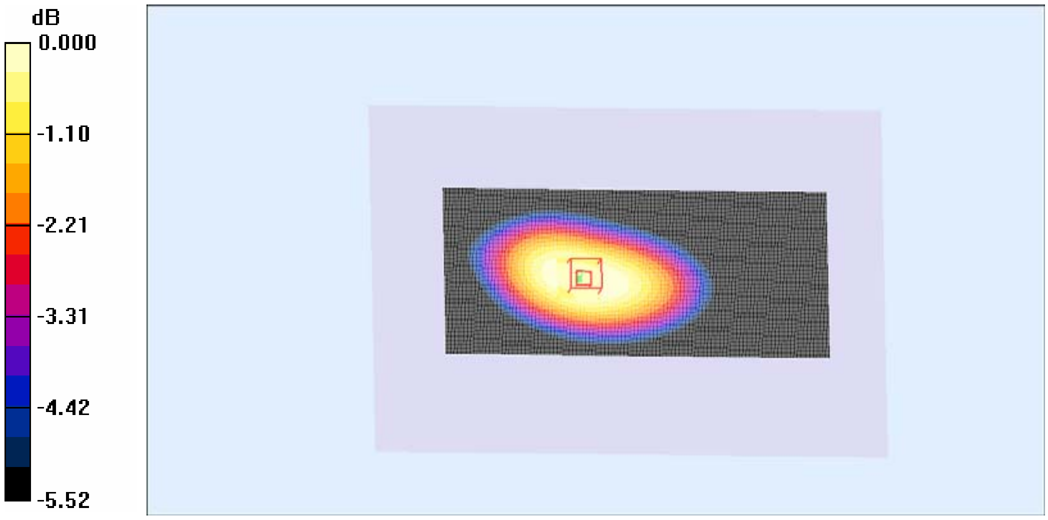
EUT Back Touch to Flat Phantom with Belt Clip and Earphone/Area Scan (81x181x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.21 mW/g

EUT Back Touch to Flat Phantom with Belt Clip and Earphone/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.2 V/m; Power Drift = -0.308 dB
Peak SAR (extrapolated) = 6.11 W/kg

SAR (1 g) = 3.88 mW/g; SAR (10 g) = 2.93 mW/g
Maximum value of SAR (measured) = 3.98 mW/g



0 dB = 3.98 mW/g

Plot # 2

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

EUT Back Touch to Flat Phantom with Belt Clip and Earphone (Channel 3-470 MHz)

Lisheng Electronic Co., Ltd.; Type: Two Way Radio; Serial: R0906114-1

Communication System: CW; Frequency: 470 MHz; Duty Cycle: 1:1
Medium parameters used: f = 470 MHz; σ = 0.94 mho/m; ε_r = 56.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.84, 7.84, 7.84); Calibrated: 9/23/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: Flat Phantom 4.3; Type: Flat Phantom 4.3; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

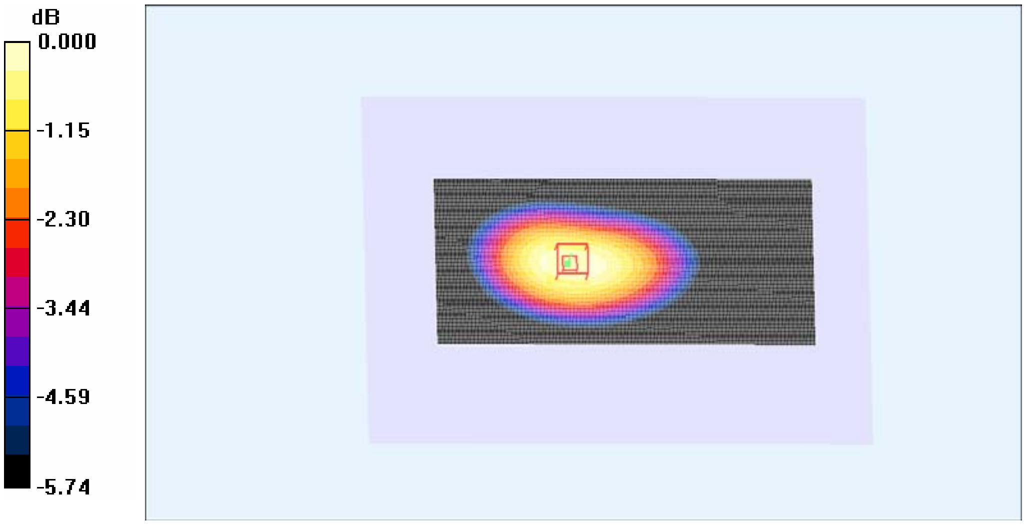
EUT Back Touch to Flat Phantom with Belt Clip and Earphone/Area Scan (81x181x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.42 mW/g

EUT Back Touch to Flat Phantom with Belt Clip and Earphone/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 64.0 V/m; Power Drift = -0.154 dB
Peak SAR (extrapolated) = 6.72 W/kg

SAR (1 g) = 4.29 mW/g; SAR (10 g) = 3.2 mW/g
Maximum value of SAR (measured) = 4.41 mW/g



0 dB = 4.41 mW/g

Plot # 3

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

Face-held 2.5 cm Separation to Flat Phantom (Channel 1-450 MHz)

Lisheng Electronic Co., Ltd.; Type: Two Way Radio; Serial: R0906114-1

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.88 mho/m; ε_r = 43.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.31, 7.31, 7.31); Calibrated: 9/23/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: Flat Phantom 4.3; Type: Flat Phantom 4.3; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

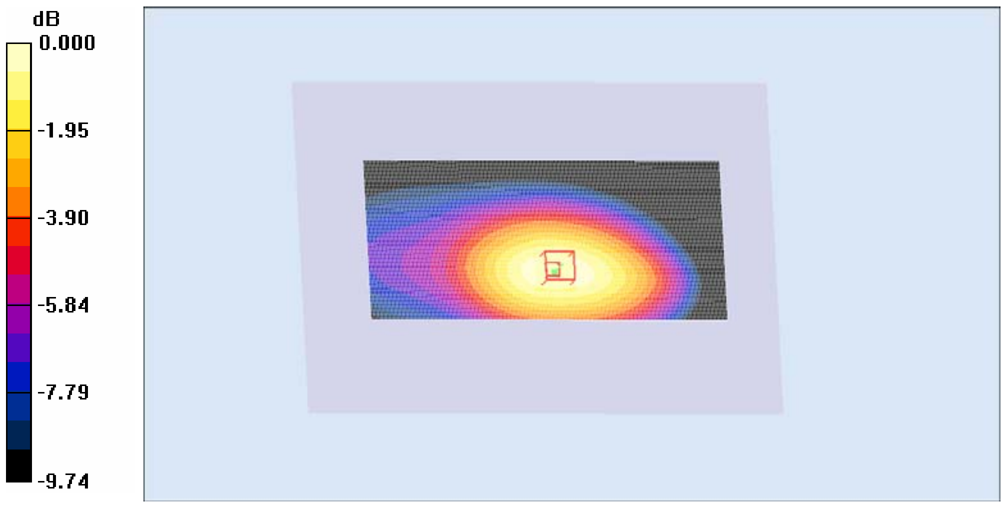
Face-Held 2.5 cm Separation to Flat Phantom/Area Scan (81x181x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.08 mW/g

Face-Held 2.5 cm Separation to Flat Phantom/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.8 V/m; Power Drift = -0.101 dB
Peak SAR (extrapolated) = 4.34 W/kg

SAR (1 g) = 2.99 mW/g; SAR (10 g) = 2.18 mW/g
Maximum value of SAR (measured) = 3.14 mW/g



0 dB = 3.14 mW/g

Plot # 4

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

Face-held 2.5cm Separation to Flat Phantom (Channel 2-460 MHz)

Lisheng Electronic Co., Ltd.; Type: Two Way Radio; Serial: R0906114-1

Communication System: CW; Frequency: 460 MHz; Duty Cycle: 1:1
Medium parameters used: f = 460 MHz; σ = 0.9 mho/m; ε_r = 43.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.31, 7.31, 7.31); Calibrated: 9/23/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: Flat Phantom 4.3; Type: Flat Phantom 4.3; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

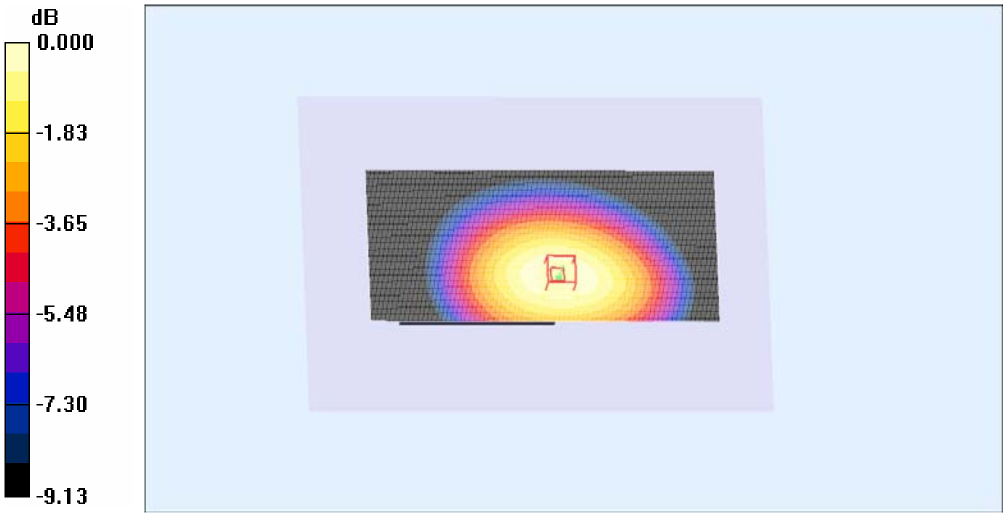
Face-Held 2.5 cm Separation to Flat Phantom/Area Scan (81x181x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.28 mW/g

Face-Held 2.5 cm Separation to Flat Phantom/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.0 V/m; Power Drift = -0.370 dB
Peak SAR (extrapolated) = 4.37 W/kg

SAR (1 g) = 3.13 mW/g; SAR (10 g) = 2.33 mW/g
Maximum value of SAR (measured) = 3.25 mW/g



0 dB = 3.25 mW/g

Plot # 5

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

Face-held 2.5cm Separation to Flat Phantom (Channel 3-470 MHz)

Lisheng Electronic Co., Ltd.; Type: Two Way Radio; Serial: R0906114-1

Communication System: CW; Frequency: 470 MHz; Duty Cycle: 1:1
Medium parameters used: f = 470 MHz; σ = 0.92 mho/m; ε_r = 43.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(7.31, 7.31, 7.31); Calibrated: 9/23/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/8/2007
- Phantom: Flat Phantom 4.3; Type: Flat Phantom 4.3; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 71; Post processing SW: SEMCAD, V1.8 Build 184

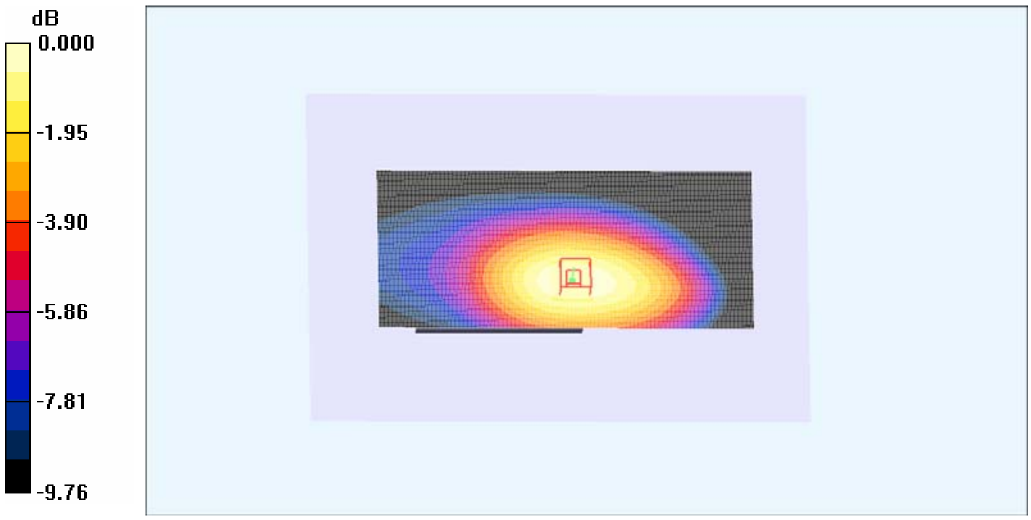
Face-Held 2.5 cm Separation to Flat Phantom/Area Scan (81x181x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.77 mW/g

Face-Held 2.5 cm Separation to Flat Phantom/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.3 V/m; Power Drift = -0.275 dB
Peak SAR (extrapolated) = 5.21 W/kg

SAR (1 g) = 3.61 mW/g; SAR (10 g) = 2.63 mW/g
Maximum value of SAR (measured) = 3.77 mW/g



0 dB = 3.77 mW/g

Plot # 6

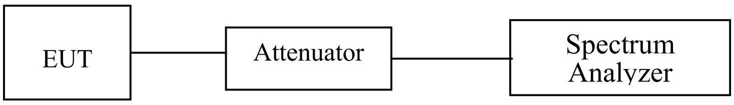
APPENDIX F – OUTPUT POWER MEASUREMENT

Applicable Standard

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

Test Procedure

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



Test Equipment Lists and Details

Manufacturer	Description	Model Number	S/N	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-04-27

Test Results

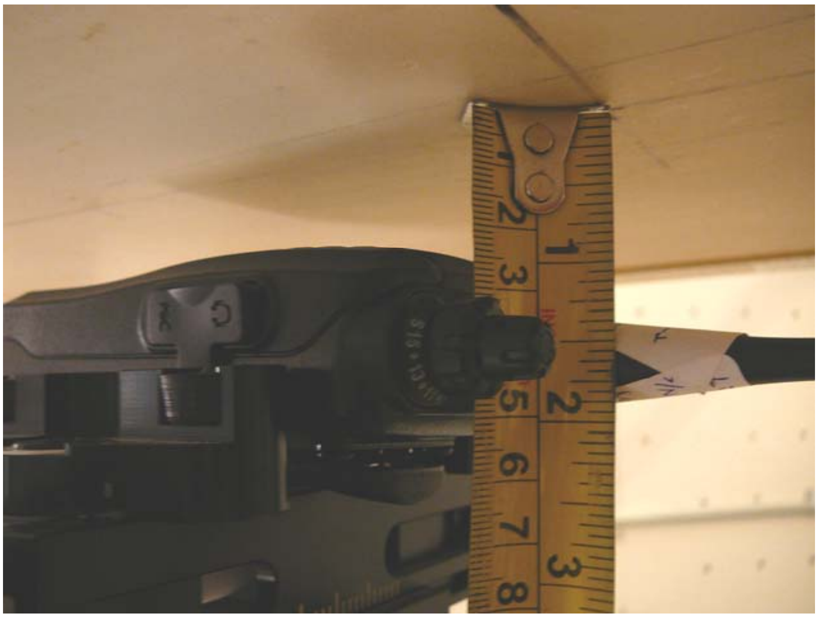
Channel Spacing (kHz)	Frequency (MHz)	Measured Conducted Output Power	
		(dBm)	(Watt)
25.0	450	35.34	3.420
25.0	460	35.38	3.451
25.0	470	35.40	3.467

APPENDIX G – TEST SET UP PHOTOS

Body Worn - Back Touching to Flat Phantom

(with Belt Clip and Earphone)

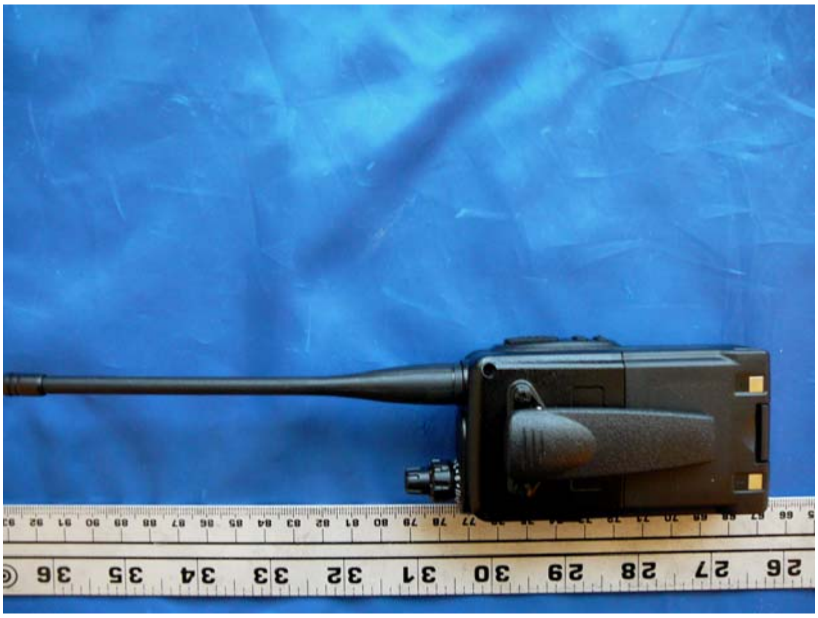
Face Held - 2.5 cm Separation to Flat Phantom



APPENDIX H– EUT PHOTOS

EUT – Front View

EUT – Rear View



EUT – Battery off View

EUT – Earphone View

EUT – Charger

APPENDIX I - INFORMATIVE REFERENCES

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