ANSI/IEEE Std. C95.1-1992
In accordance with the requirements of FCC Report and Order: ET Docket 93-62

FCC SAR TEST REPORT

For

Product Name: Tablet PC
Brand Name: N/A
Model No.: T100C
Series Model:C22L
Test Report Number:
C130711S01-SF

Issued for

EA Excelsior Computer Technology Ltd

Rm.1901B,International Culture Building, Futian Road, Futian district, Shenzhen, P.R. China

Issued by

Compliance Certification Services Inc.

Kun shan Laboratory

No.10 Weiye Rd., Innovation park, Eco&Tec,
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ACCREDITED
TESTING CERT #2541.01

Revision History

Revision	REPORT NO.	Date	Page Revised	Contents
Original	C130711S01-SF	August 15, 2013	N/A	N/A

TABLE OF CONTENTS

1. CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

Product Name:	Tablet PC
Brand Name:	N/A
Model Name.:	T100C
Series Model:	C22L
Devices supporting GPRS：	No
Device Category:	PORTABLE DEVICES
Exposure Category:	GENERAL POPULATION/UNCONTROLLED EXPOSURE
Date of Test:	August 9, 2013& August 10, 2013& August 11, 2013
Applicant:	**EA Excelsior Computer Technology Ltd** Rm.1901B,International Culture Building, Futian Road, Futian district, Shenzhen, P.R. China
Manufacturer:	**EA Excelsior Computer Technology Ltd** Rm.1901B,International Culture Building, Futian Road, Futian district, Shenzhen, P.R. China
Application Type:	Certification

APPLICABLE STANDARDS AND TEST PROCEDURES	
STANDARDS AND TEST PROCEDURES	**TEST RESULT**
KDB 865664	No non-compliance noted
Deviation from Applicable Standard	
None	

The device was tested by Compliance Certification Services Inc. in accordance with the measurement methods and procedures specified in KDB865664. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Jeff Fang
RF Manager
Compliance Certification Services Inc.

Tested by:

Luck.Fu
Test Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product Name:	Tablet PC
Brand Name:	N/A
Model Name.:	T100C
Series Model:	C22L
Model Discrepancy:	The motherboard is the same ,only different models
Peripheral devices:	Keyboard: Is only used as input device, no emission module; Don't join the SAR test evaluation.
FCC ID:	2AAIYT100C
Power reduction:	NO
DTM Description:	N/A
Device Category:	Production unit
Frequency Range:	802.11b / g: 2412 MHz ~ 2462 MHz n HT20: 2412 MHz ~ 2462 MHz n HT40: 2422 MHz ~ 2452 MHz Bluetooth: 2402 MHz ~ 2480 MHz 802.11 a/ n HT20 (5.2G): 5180 MHz ~ 2462 MHz 802.11 a/ n HT20 (5.8G):5745 MHz ~5825 MHz 80.211 n HT40(5.2G):5190 MHz ~5230 MHz 80.211 n HT40(5.8G):5755 MHz ~5815 MHz
Max. SAR（1g）:	WI-FI IEEE 802.11b:0.675 W/kg WI-FI IEEE 802.11g: 1.012 W/kg WI-FI IEEE 802.11a 5.2G:0.894 W/kg WI-FI IEEE 802.11a 5.8G:0.0.984 W/kg WI-FI IEEE 802.11n20 5.2G:1.032 W/kg WI-FI IEEE 802.11n20 5.8G:0.756 W/kg WI-FI IEEE 802.11n40 5.2G:1.119 W/kg WI-FI IEEE 802.11n40 5.8G:0.736 W/kg
Modulation Technique:	WI-FI IEEE 802.11a: OFDM WI-FI IEEE 802.11b: DSSS WI-FI IEEE 802.11g: DSSS + OFDM WI-FI IEEE 802.11n: OFDM Bluetooth: EDR (GFSK + π/4DQPSK+8DPSK) Bluetooth 4.0 LE: GFSK
Accessories:	Power supply and ADP (rating): Brand name: BSC Model name:BSC60-190250 Input:100-240Vac 50-60Hz 1.5A MAX Ouput: DC 19.0V 2.1A Battery（rating）: Capacitance:6000mAh Standard Voltage: 7.4V
Antenna Specification:	WIFI: PIFA antenna Bluetooth: PIFA antenna
Operating Mode:	Maximum continuous output

3. MAXIMUM RF OUTPUT POWER AMONG PRODUCTION UNITS

Average power(dBm)		
Average power(dBm)		
Mode	Ant1	Ant2
802.11 B	19.5	19
802.11 G	22.5	20
802.11 N(20Mhz)	22	21
802.11 N(40Mhz)	21.5	20

Average power(dBm)			
Band (Mhz)	Mode	Ant1	Ant2
5.2	802.11a 6Mhz	15.00	15.50
	802.11n(20Mhz) MCS0	15.00	15.50
	802.11n(40Mhz) MCS0	15.00	13.50
5.8	802.11a	15.50	18.00
	802.11n(20Mhz) MCS0	16.00	17.50
	802.11n(40Mhz) MCS0	16.00	18.50

4. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The 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 for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992.

5. TEST METHODOLOGY

The Specific Absorption Rate (SAR) testing specification, method and procedure for this device is in accordance with the following standards:

☒ FCC 47 CFR Part 2 (2.1093)
☒ ANSI/IEEE C95.1-1992
☒ KDB 248227 D01v01r02 SAR Measurement Procedures for 802.11 a/b/g Transmitters
☒ KDB 447498 D01v05r01 General RF Exposure Guidance
☒ KDB 648474 D04v01r01 Handset SAR
☒ KDB 865664 D01v01r01 SAR Measurement 100 MHz to 6 GHz
☒ KDB 616217 D04v01r01 SAR for laptop and tablets

6. DOSIMETRIC ASSESSMENT SETUP

These measurements were performed with the automated near-field scanning system DASY 5 from ATTENNESSA. The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than ± 0.02 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 E-field PROBE EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in [8] and found to be better than ±0.25 dB. The phantom used was the SAM Twin Phantom as described in IEE P1528

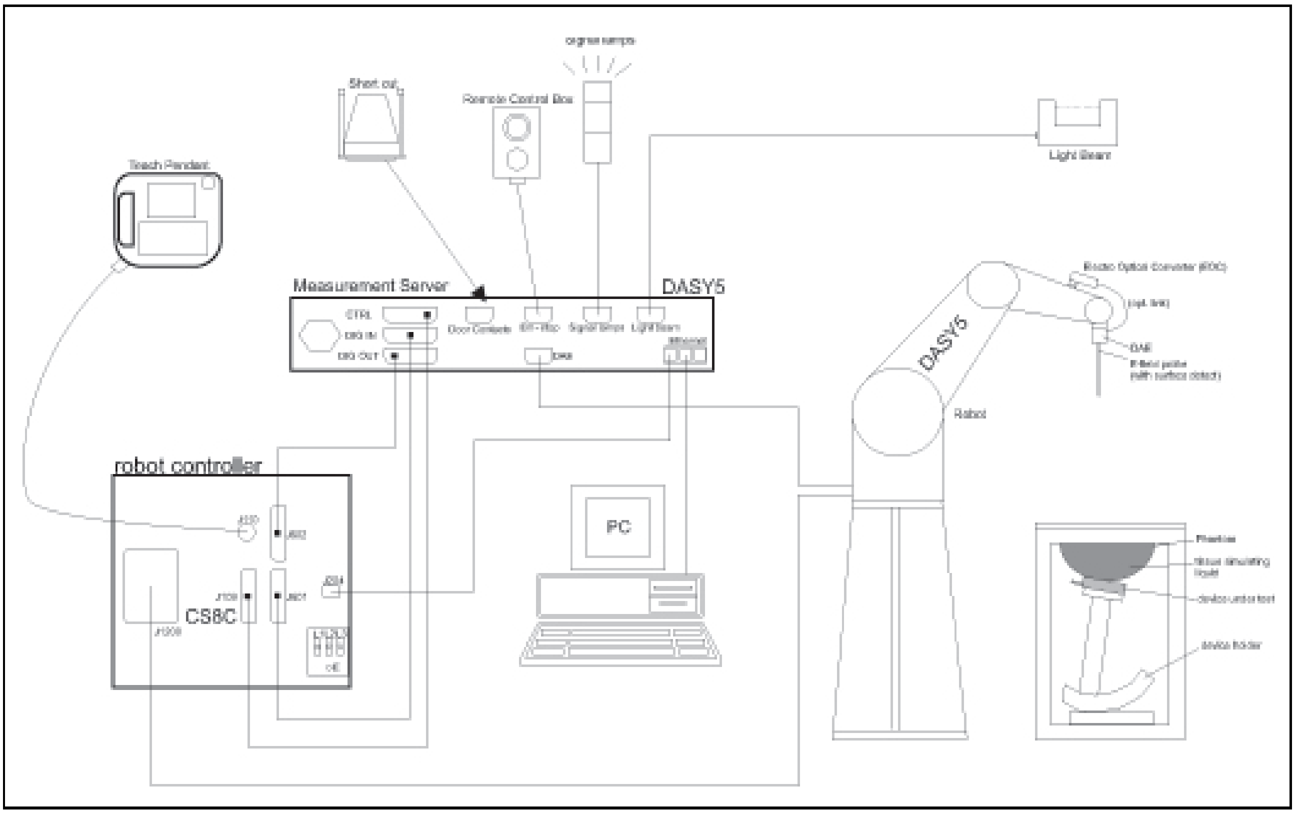
Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0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

Salt: >99% Pure Sodium Chloride Sugar: >98% Pure Sucrose
Water: De-ionized, >16 MΩ resistivity HEC: Hydroxyethyl Cellulose
DGBE: >99% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

6.1 MEASUREMENT SYSTEM DIAGRAM



The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (St¨aubli 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 7.
- DASY5 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 validating the proper functioning of the system.

6.2 SYSTEM COMPONENTS

	The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV celeron, 128MB chip-disk and 128 MB 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 DASY5 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. Calibration: No calibration required.
Data Acquisition Electronics (DAE)	
	The data acquisition electronics (DAE4) 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. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.
EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements	

Construction: Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration: Basic Broad Band Calibration in air: 10-3000 MHz.
Conversion Factors (CF) for HSL 900 and HSL 1800
CF-Calibration for other liquids and frequencies upon request.

Frequency: 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Directivity: ± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in HSL (rotation normal to probe axis)

Dynamic Range: 10 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
(noise: typically < 1 μW/g)

Dimensions: Overall length: 337 mm (Tip: 9 mm)
Tip diameter: 2.5 mm (Body: 10 mm)
Distance from probe tip to dipole centers: 1 mm

Application: High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

Interior of probe

SAM Twin Phantom

Construction:

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50360 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

Shell Thickness: 2 ±0.2 mm

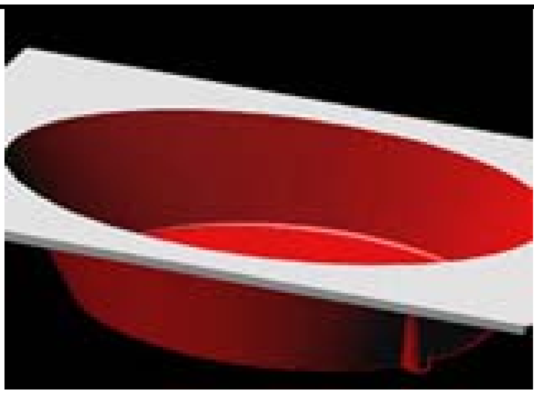
Filling Volume: Approx. 25 liters

Dimensions: Height: 850mm; Length: 1000mm; Width: 750mm

SAM Phantom (ELI4 v4.0)

Description Construction:

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4/DASY5.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles



Shell Thickness: 2.0 ± 0.2 mm (sagging: <1%)

Filling Volume: Approx. 25 liters

Dimensions: Major ellipse axis: 600 mm

Minor axis: 400 mm 500mm

Device Holder for SAM Twin Phantom

Construction: In combination with the Twin SAM Phantom, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).

System Validation Kits for SAM Twin Phantom

Construction: Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

Frequency: 900,1800,2450,5800 MHz

Return loss: > 20 dB at specified validation position

Power capability: > 100 W (f < 1GHz); > 40 W (f > 1GHz)

Dimensions:

D835V2: dipole length: 161 mm; overall height: 340 mm
D1800V2: dipole length: 72.5 mm; overall height: 300 mm
D1900V2: dipole length: 67.7 mm; overall height: 300 mm
D2450V2: dipole length: 51.5 mm; overall height: 290 mm
D5GHzV2: dipole length: 20.6 mm; overall height: 300mm

System Validation Kits for ELI4 phantom

Construction:	Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.	
Frequency:	900, 1800, 2450, 5800 MHz	
Return loss:	> 20 dB at specified validation position	
Power capability:	> 100 W (f < 1GHz); > 40 W (f > 1GHz)	
Dimensions:	D835V2: dipole length: 161 mm; overall height: 340 mm D1800V2: dipole length: 72.5 mm; overall height: 300 mm D1900V2: dipole length: 67.7 mm; overall height: 300 mm D2450V2: dipole length: 51.5 mm; overall height: 290 mm D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm	

7. EVALUATION PROCEDURES

DATA EVALUATION

The DASY 5 post processing software 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	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
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 be imported into the software from the configuration files issued for the DASY 5 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 5 parameter)
dcp_i = Diode compression point (DASY 5 parameter)

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \bullet ConvF}}$$

H-field probes:

$$H_i = \sqrt{Vi} \cdot \frac{a_{i10} + a_{i11} f + a_{i12} f^2}{f}$$

with V_i = Compensated signal of channel i (i = x, y, z)
$Norm_i$ = Sensor sensitivity of channel i (i = x, y, z)
$\mu V/(V/m)^2$ for E0field Probes
$ConvF$ = Sensitivity enhancement in solution
aij = Sensor sensitivity factors for H-field probes
f = Carrier frequency (GHz)
Ei = Electric field strength of channel i in V/m
Hi = Magnetic field strength of channel i in A/m

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.

$$SAR = E_{tot}^{2} \cdot \frac{\sigma}{\rho \cdot 1000}$$

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 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^{2}}{3770} \quad \text{or} \quad P_{pwe} = H_{tot}^{2} \cdot 37.7$$

with P_{pwe} = Equivalent power density of a plane wave in mW/cm^2
E_{tot} = total electric field strength in V/m
H_{tot} = total magnetic field strength in A/m

SAR EVALUATION PROCEDURES

The procedure for assessing the peak spatial-average SAR value consists of the following steps:

- **Power Reference Measurement**

  The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- **Area Scan**

  The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY 5 software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to 15 mm by 15 mm and can be edited by a user.

- **Zoom Scan**

  Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures 5 x 5 x 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more then one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

- **Power Drift measurement**

  The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY 5 software stop the measurements if this limit is exceeded.

- **Z-Scan**

  The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.

SPATIAL PEAK SAR EVALUATION

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g.

The DASY 5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maximum searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b exp(-\frac{z}{a}) cos(\pi \frac{z}{\lambda})$$

Since the decay of the boundary effect dominates for small probes ($a \ll \lambda$), the cos-term can be omitted. Factors *Sb* (parameter Alpha in the DASY 5 software) and *a* (parameter Delta in the DASY 5 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30_ to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY 5 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.

8. MEASUREMENT UNCERTAINTY

UNCERTAINTY BUDGE ACCORDING TO IEEE 1528-2003						
Error Description	**Uncertainty Value ±%**	**Probability distribution**	**Divisor**	**C_1 1g**	**Standard unc.(1g) ±%**	**V_1 or V_{eff}**
Measurement System						
Probe calibration	±5.5	normal	1	1	±5.5	∞
Axial isotropy of probe	±4.7	rectangular	√3	0.7	±1.9	∞
Hemispherical Isotropy of probe	±9.6	rectangular	√3	0.7	±3.9	∞
Probe linearity	±4.7	rectangular	√3	1	±2.7	∞
Detection Limit	±1.0	rectangular	√3	1	±0.6	∞
Boundary effects	±1.0	rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	normal	1	1	±0.3	∞
Response time	±0.8	rectangular	√3	1	±0.5	∞
Integration time	±2.6	rectangular	√3	1	±1.5	∞
Probe positioning	±2.9	rectangular	√3	1	±1.7	∞
Probe positioner	±0.4	rectangular	√3	1	±0.2	∞
RF ambient Noise	±3.0	rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	rectangular	√3	1	±1.7	∞
Max.SAR Eval	±1.0	rectangular	√3	1	±0.6	∞
Test Sample Related						
Device positioning	±2.9	normal	1	1	±2.9	145
Device holder uncertainty	±3.6	normal	1	1	±3.6	5
Power drift	±5.0	rectangular	√3	1	±2.9	∞
Phantom and Set up						
Phantom uncertainty	±4.0	rectangular	√3	1	±2.3	∞
Liquid conductivity(target)	±5.0	rectangular	√3	0.64	±1.8	∞
Liquid conductivity(meas.)	±2.5	rectangular	1	0.64	±1.6	∞
Liquid permittivity(target)	±5.0	rectangular	√3	0.6	±1.7	∞
Liquid permittivity(meas.)	±2.5	rectangular	1	0.6	±1.5	∞
Combined Standard Uncertainty					±10.7	387
Coverage Factor for 95%		kp=2				
Expanded Standard Uncertainty					±21.4	

Table: Worst-case uncertainty for DASY5 assessed according to IEEE1528-2003.
The budge is valid for the frequency range 300 MHz to 6G Hz and represents a worst-case analysis.

9. EXPOSURE LIMIT

(A). Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

(B). Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Note: Whole-Body SAR is averaged over the entire body, **partial-body SAR** is averaged over any 10 gram of tissue defined as a tissue volume in the shape of a cube. **SAR for hands, wrists, feet and ankles** is averaged over any 1 grams of tissue defined as a tissue volume in the shape of a cube.

Population/Uncontrolled Environments are defined as locations where there is the exposure of individuals 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).

NOTE
GENERAL POPULATION/UNCONTROLLED EXPOSURE
PARTIAL BODY LIMIT
1.6 W/kg

10. EUT ARRANGEMENT

Please refer to IEEE1528-2003 illustration below.

10.1 EUT TESTING POSITION

This EUT was tested in five different positions. They are Rear view of tablet PC, Left side, Right side, Top side , Bottom side. In these positions, the surface of EUT is touching with phantom 0 cm.

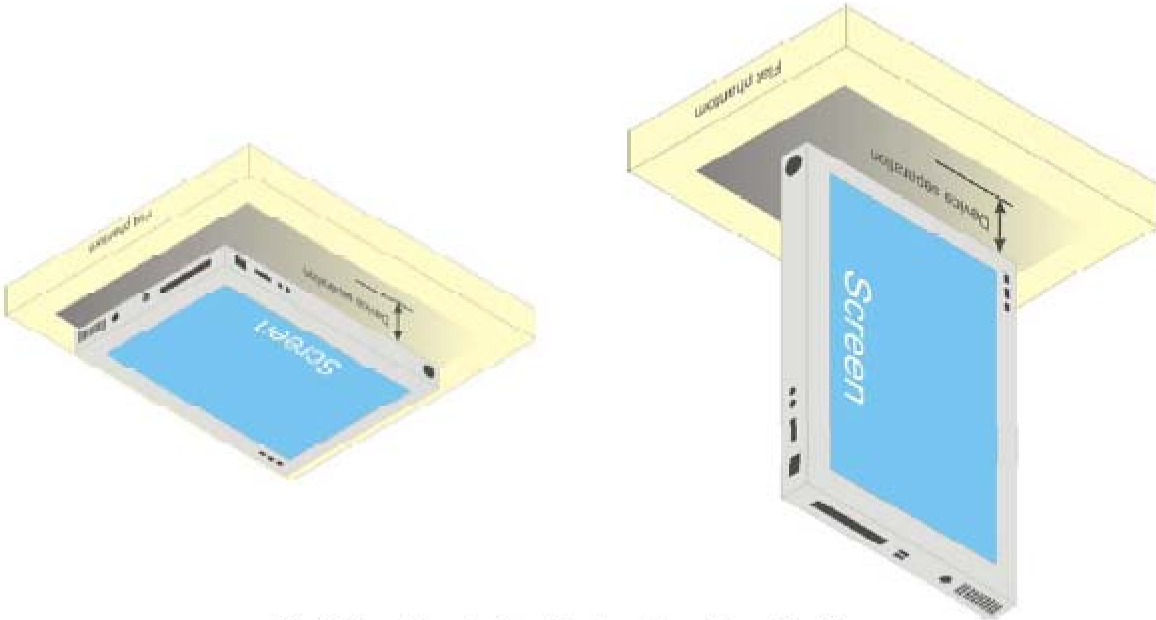


Fig 8.1 Illustration for Lap-touching Position

11. MEASUREMENT RESULTS

11.1 TEST LIQUIDS CONFIRMATION

SIMULATED TISSUE LIQUID PARAMETER CONFIRMATION

The dielectric parameters were checked prior to assessment using the HP85070C dielectric probe kit. The dielectric parameters measured are reported in each correspondent section.

IEEE SCC-34/SC-2 P1528 /KDB865664 RECOMMENDED TISSUE DIELECTRIC PARAMETERS

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

Target 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	45.3	5.27	48.2	6.00

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

11.2 LIQUID MEASUREMENT RESULTS

The following table show the measuring results for simulating liquid:

Liquid Type	Frequency	Temp. [°C]	Parameters	Target	Measured	Deviation[%]	Limited[%]	Measured Date
Body2450	2450 MHz	21.3	Permitivity	52.70	50.42	-4.32	± 5	2013-8-9
			Conductivity	1.95	2.01	3.03	± 5	
Body5200	5200 MHz	21.4	Permitivity	48.48	48.29	-0.40	± 5	2013-8-10
			Conductivity	5.29	5.36	1.34	± 5	
Body5800	5800 MHz	21.4	Permitivity	48.20	46.75	-3.01	± 5	2013-8-10
			Conductivity	6.00	6.18	3.03	± 5	
Body5200	5200 MHz	21.1	Permitivity	48.48	48.26	-0.46	± 5	2013-8-11
			Conductivity	5.29	5.39	1.89	± 5	
Body5800	5800 MHz	21.1	Permitivity	48.20	46.79	-2.92	± 5	2013-8-11
			Conductivity	6.00	6.19	3.17	± 5	

11.3 PROBE CALIBRATION PROCEDURE

For the calibration of E-field probes in lossy liquids, an electric field with an accurately known field strength must be produced within the measured liquid. For standardization purposes it would be desirable if all measurements which are necessary to assess the correct field strength would be traceable to standardized measurement procedures. In the following two different calibration techniques are summarized:

Transfer Calibration with Temperature Probes

In lossy liquids the specific absorption rate (SAR) is related both to the electric field (E) and the temperature gradient (dT/dt) in the liquid.

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

whereby σ is the conductivity, ρ the density and c the heat capacity of the liquid.

Hence, the electric field in lossy liquid can be measured indirectly by measuring the temperature gradient in the liquid. Non-disturbing temperature probes (optical probes or thermistor probes with resistive lines) with high spatial resolution (<1-2 mm) and fast reaction time (<1 s) are available and can be easily calibrated with high precision [2]. The setup and the exciting source have no influence on the calibration; only the relative positioning uncertainties of the standard temperature probe and the E-field probe to be calibrated must be considered. However, several problems limit the available accuracy of probe calibrations with temperature probes:

- The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.

- The measured volume around the temperature probe is not well defined. It is difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.

- The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures ($\sim$ 2% for c; much better for ρ) , there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed $\pm$5%.

- Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about $\pm$10% (RSS) [4]. Recently, a setup which is a combination of the waveguide techniques and the thermal measurements was presented in

[7]. The estimated uncertainty of the setup is $\pm$5% (RSS) when the same liquid is used for the calibration and for actual measurements and $\pm$7-9% (RSS) when not, which is in good agreement with the estimates given in [4].

Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids.

When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:

- The setup must enable accurate determination of the incident power.
- The accuracy of the calculated field strength will depend on the assessment of the dielectric parameters of the liquid.
- Due to the small wavelength in liquids with high permittivity, even small setups might be above the resonant cutoff frequencies. The field distribution in the setup must be carefully checked for conformity with the theoretical field distribution.

In the following section a setup which allows the analytical calculation of the SAR will be introduced.

New Waveguide Setup for Probe Calibration

Rectangular waveguides are self-contained systems. In the frequency band in which only the dominant TE_{01} mode exists, highly accurate fields can be generated for calibration purposes if reflections can be minimized or compensated for. Considerable standing waves unavoidably occur if a lossy liquid is inserted in the waveguide. However, the cross sectional field distribution which is defined only by the geometry is not modified by these standing waves, a fact which can be utilized for generating well defined fields inside lossy liquid.

Three different standard waveguides (R9, R14 and R22) with overlapping frequency ranges were realized covering the frequency range of interest, i.e., from 800 up to 2500 MHz. In each waveguide, a planar, dielectric slab (ϵ_r = 3.3) was introduced to minimize reflections (return loss $<$ -10 dB). The lossy tissue simulating liquid in which the probe had to be calibrated was

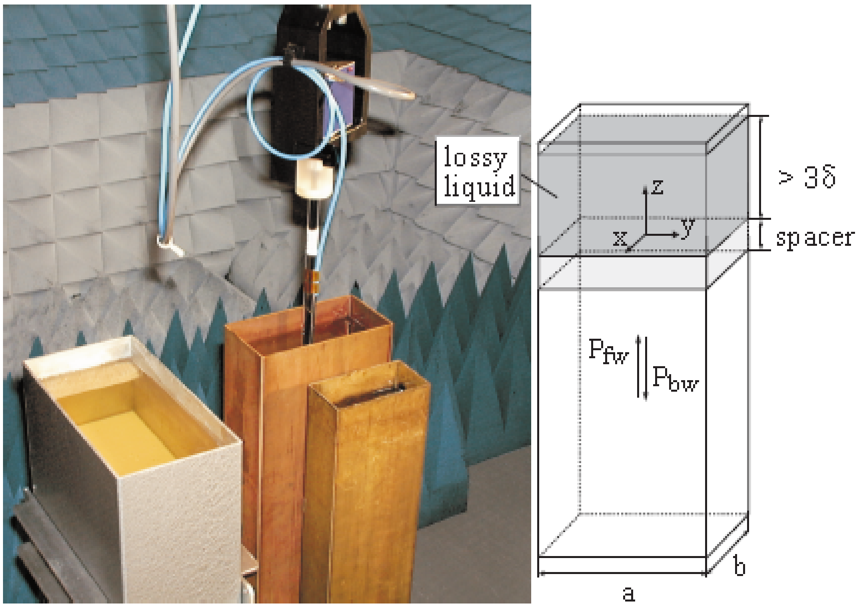


Figure 5.1: Experimental setup for assessment of the conversion factor when using a vertically rectangular waveguide.

The here presented waveguide system is a robust and easy-to-use setup enabling calibration of dosimetric E-field probes with high precision. Even more important is that the calibration of the setup can be reduced to power measurements which can be traced to a standard calibration procedure. The practical limitation given by the waveguide size to the frequency band between 800 and 2500 MHz is not severe in the context of compliance testing, since the most important operational frequencies of mobile communications systems are covered. The presented waveguide system is therefore well suited for implementation as a standard calibration technique for dosimetric probes in this frequency range. For frequencies below 800 MHz, transfer calibration with temperature probes remains the most practical way to achieve calibration with decent precision.

filled into the vertically standing waveguide. The medium depth had to be chosen such that the standing waves within the liquid were negligible, i.e., larger than three times the skin depth (< -50 dB at the interface liquid-slab). The attenuation of the waveguide adapters was determined to be 0.05 dB by the transmission method using two identical adapters. Table 5.1 gives an overview of some of the construction details.

	R9	R14	R22
WG cross section*	248 x 124	165 x 82.5	109 x 54.7
Spacer height*	50	30	25
Liquid height*	150	130	80

* all dimensions in mm

Table 5.1: Description of the waveguide systems.

With these setups, the total power absorbed by the lossy liquid can be accurately determined by measurement of the forward and reflected powers. Since all power entering the lossy liquid is absorbed by the liquid, the volume SAR can be determined as:

$$SAR^V = \frac{4\,(P_{fw} - P_{bw})}{ab\delta}\, cos^2(\pi \frac{y}{a})\, e^{(-2z/\delta)} \qquad (5.2)$$

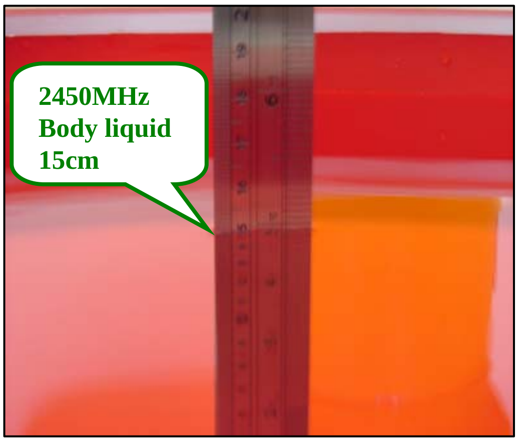
The here presented waveguide system is a robust and easy-to-use setup enabling calibration of dosimetric E-field probes with high precision. Even more important is that the calibration of the setup can be reduced to power measurements which can be traced to a standard calibration procedure. The practical limitation given by the waveguide size to the frequency band between 800 and 2500 MHz is not severe in the context of compliance testing, since the most important operational frequencies of mobile communications systems are covered. The presented waveguide system is therefore well suited for implementation as a standard calibration technique for dosimetric probes in this frequency range. For frequencies below 800 MHz, transfer calibration with temperature probes remains the most practical way to achieve calibration with decent precision.

11.4 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

SYSTEM PERFORMANCE CHECK MEASUREMENT CONDITIONS

- The measurements were performed in the flat section of the SAM twin phantom filled with head and body simulating liquid of the following parameters.
- The DASY5 system withan E-fileld probe EX3DV4 SN: 3820 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15 mm (below 1 GHz) and 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration (dx= 5 mm, dy= 5 mm, dz= 5 mm).
- Distance between probe sensors and phantom surface was set to 2 mm.
- The dipole input power was 1W±3%.
- The results are normalized to 1 W input power.



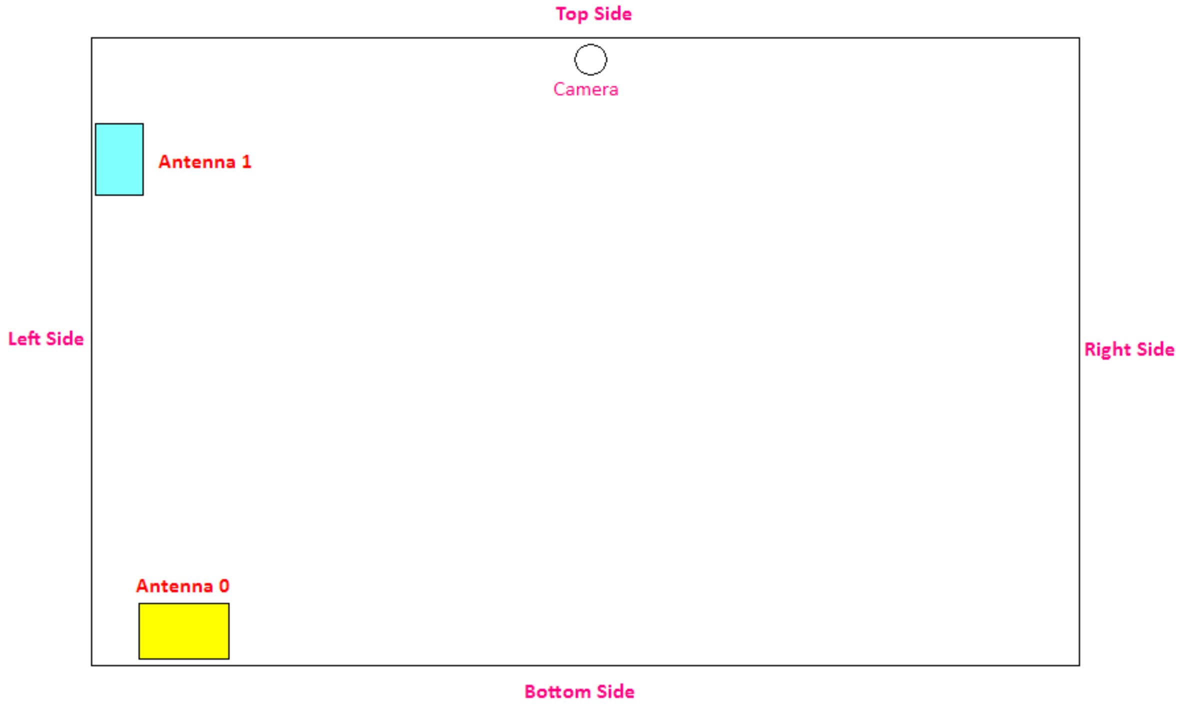
- Note: For SAR testing, less than 3G the liquid depth is 15cm shown above
- Note: For SAR testing, above than 3G the liquid depth is 10cm shown above

SYSTEM PERFORMANCE CHECK RESULTS

Ambient conduction

Liquid Type	Ambient Temp. (°C)	Liquid Temp. (°C)	Input Power (W)	Measured SAR_{1g} (W/Kg)	1W Target SAR_{1g}(W/Kg)	1W Normalized SAR_{1g}(W/Kg)	Deviation (%)	Limited (%)	Date
Body2450	22.5	21.3	0.25	13.50	51.50	54.00	4.85	± 10	2013-8-9
Body5200	22.7	21.4	0.1	7.42	74.60	74.2	-0.54	± 10	2013-8-10
Body5800	22.7	21.4	0.1	7.09	75.00	70.9	-5.47	± 10	2013-8-10
Body5200	22.3	21.1	0.1	7.31	74.60	73.1	-2.01	± 10	2013-8-11
Head5800	22.3	21.1	0.1	7.21	75.00	72.1	-3.87	± 10	2013-8-11

11.5 SAR TEST CONFIGURATIONS



Device dimensions (H x W x D): 296 x 195 x 12mm

Antennas	Wireless Interface
Antennas 0	WLAN Main antenna
Antennas 1	WLAN Aux antenna and Bluetooth Main antenna

Test Mode

WLAN	Data transmission mode(11b/g) Data transmission mode(11a /n20Mhz/n40Mhz)

Body Exposure Condition for Antenna 1

Test Configurations	Antenna-to-edge（mm）	SAR required	Note
Rear	5	Yes	
Left Side	20	Yes	
Right Side	253	No	This is not the most conservative antenna-to-user distance at edge mode
Top Side	128	No	This is not the most conservative antenna-to-user distance at edge mode
Bottom Side	3	Yes	

According to **KDB616217 D04** when the SAR Test Exclusion Threshold in KDB 447498 applies, a minimum test separation distance of 25 mm is required to determine test exclusion for the display.

Body Exposure Condition for Antenna 2

Test Configurations	Antenna-to-edge（mm）	SAR required	Note
Rear	5	Yes	
Left Side	4	Yes	
Right Side	280	No	This is not the most conservative antenna-to-user distance at edge mode
Top Side	42	No	This is not the most conservative antenna-to-user distance at edge mode
Bottom Side	128	No	This is not the most conservative antenna-to-user distance at edge mode

According to **KDB616217 D04** when the SAR Test Exclusion Threshold in KDB 447498 applies, a minimum test separation distance of 25 mm is required to determine test exclusion for the display.

11.6 EUT TUNE-UP PROCEDURES AND TEST MODE

The following procedure had been used to prepare the EUT for the SAR test.
To setup the desire channel frequency and the maximum output power.

WLAN Conducted output power(dBm):

WLAN 2.4G Band:

Mode	Band	Mhz	Channel	Default Test Channe	
				802.11b	802.11g
802.11b/g	2.4Ghz	2412	1#	√	▽
		2437	6	√	▽
		2462	11#	√	▽

Notes:
√ = "default test channels"
∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Test result:

Average power(dBm)					
Mode	CH	Fre(Mhz)	Ant1	Ant2	Total
802.11 b	1	2412	17.95	18.45	
	6	2437	18.07	17.83	
	11	2462	18.93	17.06	
802.11 g	1	2412	21.25	19.23	
	6	2437	20.97	18.57	
	11	2462	20.58	18.22	
802.11 N(20Mhz)	1	2412	21.36	19.72	23.63
	6	2437	20.38	19.03	22.77
	11	2462	20.43	19.38	22.95
802.11 N(40Mhz)	3	2422	21.05	19.33	23.28
	6	2437	20.33	18.98	22.72
	9	2452	20.31	19.22	22.81

Note:
1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR Exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate
3. Per KDB 248227 D01 v01r02, 11g, 11n-HT20 and 11n-HT40 output power is less than 1/4dB higher than 11b mode, thus the SAR can be excluded.

WLAN 5G Band:
Required Test Channels per KDB 248227 D01
Test result:

Average power(dBm)						
Band (Mhz)	Mode	CH	Fre(Mhz)	Ant1	Ant2	Total
5.2	802.11a 6Mhz	36.00	5180.00	13.35	13.56	
		40.00	5200.00	13.16	13.77	
		44.00	5220.00	14.75	14.51	
		48.00	5240.00	13.88	14.35	
	802.11n(20Mhz) MCS0	36.00	5180.00	13.53	13.84	16.70
		40.00	5200.00	13.68	14.01	16.86
		44.00	5220.00	14.26	14.97	17.64
		48.00	5240.00	13.38	14.48	16.98
	802.11n(40Mhz) MCS0	38.00	5190.00	13.27	12.61	15.96
		46.00	5230.00	14.23	12.29	16.38
5.8	802.11a	149.00	5745.00	13.85	17.33	
		153.00	5765.00	15.03	16.24	
		157.00	5785.00	14.24	17.02	
		161.00	5805.00	14.55	16.45	
		165.00	5825.00	13.57	16.82	
	802.11n(20Mhz) MCS0	149.00	5745.00	15.58	17.04	19.38
		153.00	5765.00	15.41	16.15	18.81
		157.00	5785.00	14.50	17.41	19.20
		161.00	5805.00	14.36	15.98	18.26
		165.00	5825.00	14.28	16.28	18.40
	802.11n(40Mhz) MCS0	151.00	5755.00	15.75	17.56	19.76
		159.00	5795.00	15.01	16.55	18.86

Note:
1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate.
3. Per KDB 248227 D01 v01r02, 802.11n HT20/HT40/VHT20/VHT40 output power is less than 1/4dB higher than 802.11a mode, thus the SAR can be excluded.
4. For 802.11ac SAR evaluation for each frequency band, 802.11n VHT80 will verified at the worst case found in 802.11a SAR testing.

Bluetooth Conducted output power(dBm)

Date Rate(Mbps)	Channel	Frequence	Average power(dBm)
1	0	2402 MHZ	3.54
	39	2441 MHZ	2.43
	78	2480 MHZ	2.51
2	0	2402 MHZ	0.98
	39	2441 MHZ	0.73
	78	2480 MHZ	0.81
3	0	2402 MHZ	1.01
	39	2441 MHZ	0.84
	78	2480 MHZ	0.88

Date Rate(Mbps)	Channel	Frequence	Average power(dBm)
BT 4.0 LE	0	2402MHZ	**5.21**
	19	2440MHZ	4.52
	39	2480MHZ	4.31

According to KDB447498 D01:The 1-g and 10-g SAR test exclusion thresholds fsor 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,24 where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation25
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below
- If the test separation distance (antenna-user) is < 5mm, 5mm is used for excluded SAR calculation

	Wireless Interface	Bluetooth
Tune-up Maximum power (dBm)		6
Tune-up Maximum rated power (mW)		3.98
Body	Antenna to user (mm)	5
	Frequency(GHz)	2.402
	SAR exclusion threshold	3

Per KDB 447498 D01v05r01 exclusion thresholds is 1.23< 3, RF exposure evaluation is not required.

Antenna 1

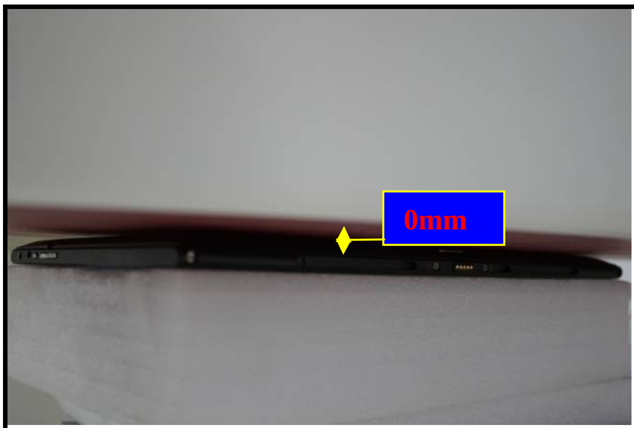
Mode	The Turn-up Maximum Power(Customer Declared)(dBm)	Range	Measured Conduct Maximum Power(dBm)
IEEE 802.11b	18.5+/-1	17.5-19.5	18.93
IEEE 802.11g	21.5+/-1	20.5-22.5	21.95
IEEE 802.11n(20M) 2.4G	21+/-1	20-22	21.36
IEEE 802.11n(40M) 2.4G	20.5+/-1	19.5-21.5	21.05
IEEE 802.11 a 5.2G	14+/-1	13-15	14.75
IEEE 802.11 a 5.8G	14.5+/-1	13.5-15.5	15.03
IEEE 802.11n(20M) 5.2G	14+/-1	13-15	14.26
IEEE 802.11n(20M) 5.8G	15+/-1	14-16	15.58
IEEE 802.11n(40M) 5.2G	14+/-1	13-15	14.23
IEEE 802.11n(40M) 5.8G	15+/-1	14-16	15.75

Antenna 2

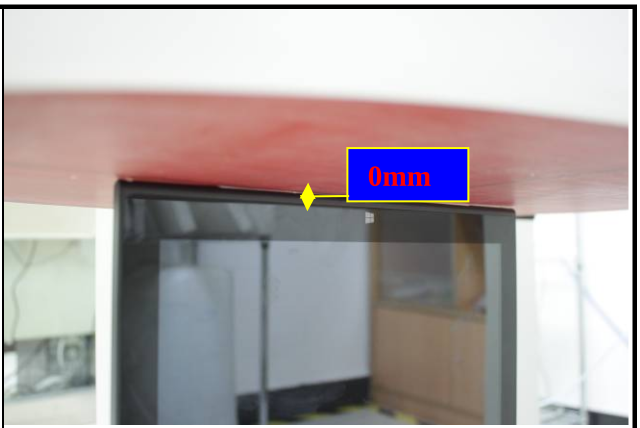
Mode	The Turn-up Maximum Power(Customer Declared)(dBm)	Range	Measured Conduct Maximum Power(dBm)
IEEE 802.11b	19+/-1	17-19	18.45
IEEE 802.11g	19+/-1	18-20	19.23
IEEE 802.11n(20M) 2.4G	20+/-1	19-21	19.72
IEEE 802.11n(40M) 2.4G	19+/-1	18-20	19.33
IEEE 802.11 a 5.2G	14.5+/-1	13.5-15.5	14.51
IEEE 802.11 a 5.8G	17+/-1	16-18	17.33
IEEE 802.11n(20M) 5.2G	14.5+/-1	13.5-15.5	14.97
IEEE 802.11n(20M) 5.8G	16.5+/-1	15.5-17.5	17.41
IEEE 802.11n(40M) 5.2G	12.5+/-1	11.5-13.5	12.61
IEEE 802.11n(40M) 5.8G	17.5+/-1	16.5-18.5	17.56
Bluetooth 1 Mbps	3+/-1	2-4	3.54
Bluetooth 2 Mbps	0.5+/-1	-0.5-1.5	0.98
Bluetooth 3 Mbps	0.5+/-1	-0.5-1.5	0.88
Bluetooth LE	5+/-1	4-6	5.21

So, they are in tune-up range and complied.

11.7 EUT SETUP PHOTOS



Body position Rear View plot 1



Body position Botttom Side plot 2

Body position Left Side plot 3

11.8 SAR MEASUREMENT RESULTS

WLAN 2.4G SAR

Antenna 1

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 2.4G	802.11b	Rear	0	11	2462	18.93	19.5	1.14	-0.16	**0.592**	**0.675**
WLAN 2.4G	802.11b	Bottom	0	11	2462	18.93	19.5	1.14	-0.15	0.371	0.423
WLAN 2.4G	802.11b	Left	0	11	2462	18.93	19.5	1.14	-0.11	0.101	0.115
WLAN 2.4G	802.11g	Rear	0	1	2412	21.25	22.5	1.334	0.01	**0.759**	**1.012**
WLAN 2.4G	802.11g	Bottom	0	1	2412	21.25	22.5	1.334	0.12	0.494	0.659
WLAN 2.4G	802.11g	Left	0	1	2412	21.25	22.5	1.334	-0.10	0.124	0.165

Antenna 2

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 2.4G	802.11b	Bottom	0	1	2412	18.45	19	1.135	0.00	**0.503**	**0.571**
WLAN 2.4G	802.11b	Left	0	1	2412	18.45	19	1.135	-0.03	0.027	0.031
WLAN 2.4G	802.11g	Bottom	0	1	2412	19.23	20	1.194	0.00	**0.657**	**0.784**
WLAN 2.4G	802.11g	Left	0	1	2412	19.23	20	1.194	0.00	0.021	0.025

WLAN 5G SAR

Antenna1

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 5.2G	802.11a	Rear	0	36	5180	13.35	15	1.462	0.00	0.094	0.137
WLAN 5.2G	802.11a	Rear	0	44	5220	14.75	15	1.059	0.00	0.193	0.204
WLAN 5.8G	802.11a	Rear	0	153	5765	15.03	15.5	1.114	0.00	0.303	0.338
WLAN 5.8G	802.11a	Rear	0	161	5805	14.55	15.5	1.245	0.00	0.234	0.291
WLAN 5.8G	802.11a	Rear	0	165	5825	13.57	15.5	1.560	0.00	0.222	0.346
WLAN 5.2G	802.11a	Bottom	0	36	5180	13.35	15	1.462	0.00	0.518	0.757
WLAN 5.2G	802.11a	Bottom	0	44	5220	14.75	15	1.059	0.00	**0.785**	**0.832**
WLAN 5.8G	802.11a	Bottom	0	153	5765	15.03	15.5	1.114	0.00	0.279	0.311
WLAN 5.8G	802.11a	Bottom	0	161	5805	14.55	15.5	1.245	0.00	0.187	0.233
WLAN 5.8G	802.11a	Bottom	0	165	5825	13.57	15.5	1.560	0.00	0.554	0.864
WLAN 5.2G	802.11a	Left	0	36	5180	13.35	15	1.462	0.00	0.17	0.249
WLAN 5.2G	802.11a	Left	0	44	5220	14.75	15	1.059	0.00	0.369	0.391
WLAN 5.8G	802.11a	Left	0	153	5765	15.03	15.5	1.114	0.00	0.638	0.711
WLAN 5.8G	802.11a	Left	0	161	5805	14.55	15.5	1.245	-0.19	0.591	0.736
WLAN 5.8G	802.11a	Left	0	165	5825	13.57	15.5	1.560	-0.16	**0.585**	**0.912**
WLAN 5.2G	802.11 n20	Rear	0	40	5200	13.68	15	1.355	0.00	0.387	0.524

WLAN 5.2G	802.11 n20	Rear	0	44	5220	14.26	15	1.186	0.00	0.479	0.568
WLAN 5.8G	802.11 n20	Rear	0	149	5745	15.58	16	1.102	0.00	0.325	0.358
WLAN 5.8G	802.11 n20	Rear	0	157	5785	14.50	16	1.413	0.00	0.267	0.377
WLAN 5.8G	802.11 n20	Rear	0	161	5805	14.36	16	1.459	0.00	0.232	0.338
WLAN 5.2G	802.11 n20	Bottom	0	40	5200	13.68	15	1.355	0.00	**0.74**	**1.003**
WLAN 5.2G	802.11 n20	Bottom	0	44	5220	14.26	15	1.186	0.00	0.785	0.931
WLAN 5.8G	802.11 n20	Bottom	0	149	5745	15.58	16	1.102	0.00	0.365	0.402
WLAN 5.8G	802.11 n20	Bottom	0	157	5785	14.50	16	1.413	0.12	0.262	0.370
WLAN 5.8G	802.11 n20	Bottom	0	161	5805	14.36	16	1.459	0.00	0.363	0.530
WLAN 5.2G	802.11 n20	Left	0	40	5200	13.68	15	1.355	0.00	0.272	0.369
WLAN 5.2G	802.11 n20	Left	0	44	5220	14.26	15	1.186	0.00	0.328	0.389
WLAN 5.8G	802.11 n20	Left	0	149	5745	15.58	16	1.102	0.00	0.6	0.661
WLAN 5.8G	802.11 n20	Left	0	157	5785	14.50	16	1.413	0.00	**0.535**	**0.756**
WLAN 5.8G	802.11 n20	Left	0	161	5805	14.36	16	1.459	0.00	0.474	0.691
WLAN 5.2G	802.11 n40	Rear	0	38	5190	13.27	15	1.489	0.00	0.288	0.429
WLAN 5.2G	802.11 n40	Rear	0	46	5230	14.23	15	1.194	0.00	0.439	0.524
WLAN 5.8G	802.11 n40	Rear	0	151	5785	15.75	16	1.059	0.00	0.21	0.222
WLAN 5.8G	802.11 n40	Rear	0	159	5805	15.01	16	1.256	0.00	0.182	0.229
WLAN 5.2G	802.11 n40	Bottom	0	38	5190	13.27	15	1.489	0.00	**0.751**	**1.119**
WLAN 5.2G	802.11 n40	Bottom	0	46	5230	14.23	15	1.194	0.00	0.768	0.917
WLAN 5.8G	802.11 n40	Bottom	0	151	5785	15.75	16	1.059	0.00	**0.695**	**0.736**
WLAN 5.8G	802.11 n40	Bottom	0	159	5805	15.01	16	1.256	0.00	0.531	0.667
WLAN 5.2G	802.11 n40	Left	0	38	5190	13.27	15	1.489	0.00	0.179	0.267
WLAN 5.2G	802.11 n40	Left	0	46	5230	14.23	15	1.194	0.00	0.292	0.349
WLAN 5.8G	802.11 n40	Left	0	151	5785	15.75	16	1.059	0.00	0.529	0.560
WLAN 5.8G	802.11 n40	Left	0	159	5805	15.01	16	1.256	0.00	0.44	0.553

Antenna2

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 5.2G	802.11a	Rear	0	40	5200	13.77	15.5	1.489	-0.19	**0.600**	**0.894**
WLAN 5.2G	802.11a	Rear	0	44	5220	14.51	15.5	1.256	0.00	0.651	0.818
WLAN 5.8G	802.11a	Rear	0	149	5765	17.33	18	1.167	-0.12	0.714	0.833
WLAN 5.8G	802.11a	Rear	0	157	5785	17.02	18	1.253	0.00	**0.785**	**0.984**
WLAN 5.8G	802.11a	Rear	0	165	5825	16.82	18	1.312	0.00	0.725	0.951
WLAN 5.2G	802.11a	Left	0	40	5200	13.77	15.5	1.489	0.00	0.354	0.527
WLAN 5.2G	802.11a	Left	0	44	5220	14.51	15.5	1.256	0.00	0.402	0.505
WLAN 5.8G	802.11a	Left	0	149	5765	17.33	18	1.167	0.00	0.712	0.831
WLAN 5.8G	802.11a	Left	0	157	5785	17.02	18	1.253	0.00	0.776	0.972
WLAN 5.8G	802.11a	Left	0	165	5825	16.82	18	1.312	0.00	0.656	0.861
WLAN 5.2G	802.11 n20	Rear	0	40	5200	14.01	15.5	1.409	0.12	**0.732**	**1.032**
WLAN 5.2G	802.11 n20	Rear	0	44	5220	14.97	15.5	1.130	0.00	0.623	0.704

WLAN 5.2G	802.11 n20	Left	0	40	5200	14.01	15.5	1.409	-0.01	0.422	0.595
WLAN 5.2G	802.11 n20	Left	0	44	5220	14.97	15.5	1.130	0.16	0.721	0.815

WLAN 2.4G SAR Antenna1+Antenna2

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 2.4G	802.11n20	Rear	0	1	2412	21.36	22	1.159	-0.03	0.235	0.272
						19.72	21	1.343	-0.03	0.731	0.982

WLAN 5 G SAR Antenna1+Antenna2

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 5.2G	802.11n20	Rear	0	44	5220	14.26	15	1.186	-0.14	0.194	0.230
						14.97	15.5	1.130	-0.14	0.703	0.794
WLAN 5.8G	802.11n20	Rear	0	149	5745	14.23	15	1.194	0.00	0.142	0.170
						17.04	17.5	1.112	0.00	0.738	0.820

Summary of Highest SAR Values

Antenna1

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 2.4G	802.11b	Rear	0	11	2462	18.93	19.5	1.14	-0.16	0.592	0.675
WLAN 2.4G	802.11g	Rear	0	1	2412	21.25	22.5	1.334	0.01	0.759	1.012
WLAN 5.2G	802.11a	Bottom	0	44	5220	14.75	15	1.059	0.00	0.785	0.832
WLAN 5.8G	802.11a	Left	0	165	5825	13.57	15.5	1.560	-0.16	0.585	0.912
WLAN 5.2G	802.11 n20	Bottom	0	40	5200	13.68	15	1.355	0.00	0.74	1.003
WLAN 5.8G	802.11 n20	Left	0	157	5785	14.50	16	1.413	0.00	0.535	0.756
WLAN 5.2G	802.11 n40	Bottom	0	38	5190	13.27	15	1.489	0.00	0.751	1.119
WLAN 5.8G	802.11 n40	Bottom	0	151	5785	15.75	16	1.059	0.00	0.695	0.736

Antenna2

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Turn-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
WLAN 2.4G	802.11b	Bottom	0	1	2412	18.45	19	1.135	0.00	0.503	0.571
WLAN 2.4G	802.11g	Bottom	0	1	2412	19.23	20	1.194	0.00	0.657	0.784
WLAN 5.2G	802.11a	Rear	0	40	5200	13.77	15.5	1.489	-0.19	0.600	0.894
WLAN 5.8G	802.11a	Rear	0	157	5785	17.02	18	1.253	0.00	0.785	0.984
WLAN 5.2G	802.11 n20	Rear	0	40	5200	14.01	15.5	1.409	0.12	0.732	1.032

11.9 SAR TABLET PC MULTI XMITER ASSESSMENT

	Position	Applicable Combination
Simultaneous Transmission	Body	WWAN (data) + BT

Note:

1. The reported SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01v05, simultaneous transmission SAR is compliant if,
   1) Scalar SAR summation < 1.6W/kg.
   2) SPLSR = (SAR1 + SAR2)1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan
   If SPLSR ≤ 0.04, simultaneously transmission SAR is compliant
   3) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg
3. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r01 based on the formula below.
   (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)/x] W/kg for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
   0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

	Max power	Body (5mm distance)
Estimated SAR	6 dBm	0.164W/kg

3. SUM ∑SAR_{1g} of Body-worn

Bluetooth and Antenna1 2.4G 802.11b

Position	WLAN 2.4G W/kg	Bluetooth	**802.11b** + Bluetooth W/kg
Rear	0.675	0.164	0.839

Bluetooth and Antenna1 2.4G 802.11g

Position	WLAN 2.4G W/kg	Bluetooth	**802.11b** + Bluetooth W/kg
Rear	1.012	0.164	1.176

Bluetooth and Antenna1 5.2G 802.11a

Position	WLAN 2.4G W/kg	Bluetooth	**802.11a** + Bluetooth W/kg
Bottom	0.832	0.164	0.996

Bluetooth and Antenna1 5.8G 802.11a

Position	WLAN 2.4G W/kg	Bluetooth	**802.11a** + Bluetooth W/kg
Left	0.912	0.164	1.076

Bluetooth and Antenna1 5.2G 802.11n20

Position	WLAN 2.4G W/kg	Bluetooth	**802.11 n20** + Bluetooth W/kg
Bottom	1.003	0.164	1.167

Bluetooth and Antenna1 5.8G 802.11n20

Position	WLAN 2.4G W/kg	Bluetooth	**802.11n20** + Bluetooth W/kg
Left	0.756	0.164	0.920

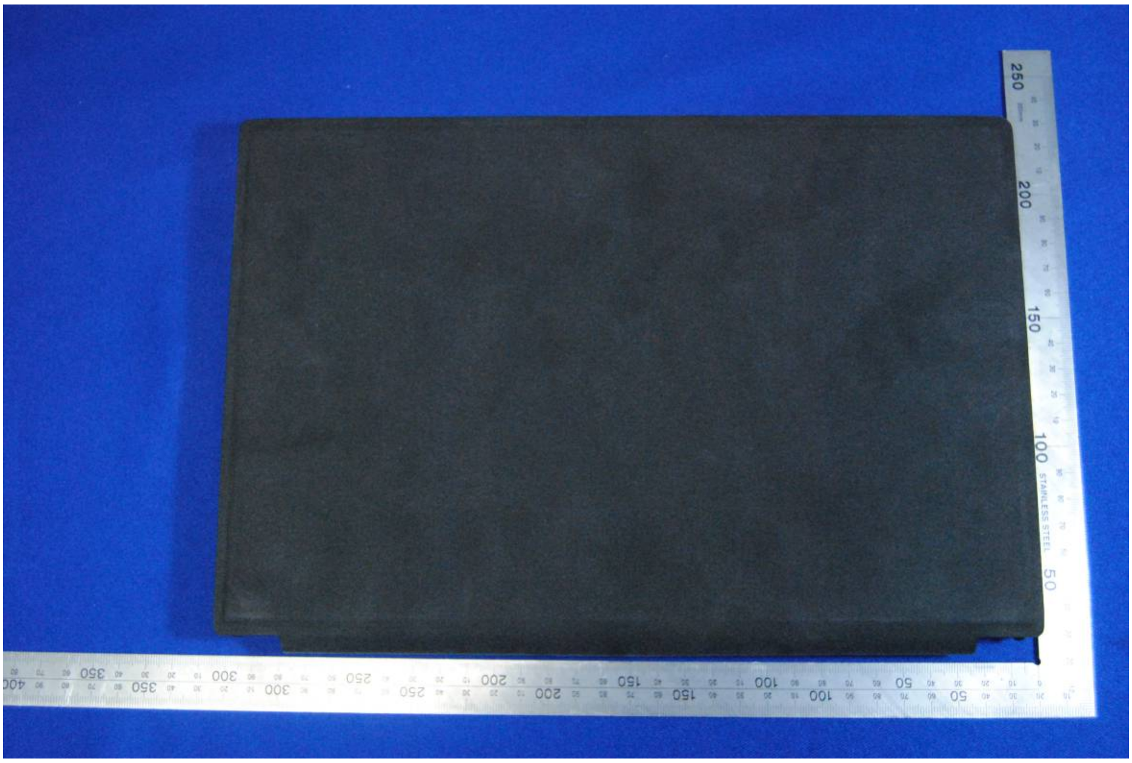
Bluetooth and Antenna1 5.2G 802.11n40

Position	WLAN 2.4G W/kg	Bluetooth	**802.11n40** + Bluetooth W/kg
Bottom	1.119	0.164	1.283

Bluetooth and Antenna1 5.8G 802.11n40

Position	WLAN 2.4G W/kg	Bluetooth	**802.11n40** + Bluetooth W/kg
Bottom	0.736	0.164	0.900

12. EUT PHOTO



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F1
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F11
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PrtScr SysRq
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Del
Backspace
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STAINLESS STEEL

中国制造
MADE IN CHINA

13. EQUIPMENT LIST & CALIBRATION STATUS

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Calibration	Calibration Due
P C	HP	Core(rm)3.16G	CZCO48171H	N/A	N/A
Signal Generator	Agilent	E8257C	MY43321570	05/13/2012	05/12/2013
S-Parameter Network Analyzer	Agilent	E5071B	MY42301382	03/11/2013	03/10/2014
Wireless Communication Test Set	R&S	CMU200	SN:109525	01/23/2013	01/22/2014
Power Meter	Agilent	E4416A	QB41292714	03/16/2013	03/15/2014
Peak & Average sensor	Agilent	E9327A	CF0001	03/16/2013	03/15/2014
E-field PROBE	SPEAG	EX3DV4	3820	12/10/2012	12/09/2013
DAE	SPEAG	DEA4	679	01/16/2013	01/15/2014
DIPOLE 835MHZ ANTENNA	SPEAG	D835V2	4d092	06/17/2013	06/16/2014
DIPOLE 1900MHZ ANTENNA	SPEAG	D1900V2	5d142	06/10/2013	06/09/2014
DIPOLE 2450MHZ ANTENNA	SPEAG	D2450V2	869	06/11/2013	06/10/2014
DIPOLE 5GHZ ANTENNA	SPEAG	D5GHzV2	1095	05/31/2013	05/30/2014
DUMMY PROBE	SPEAG	DP_2	SPDP2001AA	N/A	N/A
SAM PHANTOM (ELI4 v4.0)	SPEAG	QDOVA001BB	1102	N/A	N/A
Twin SAM Phantom	SPEAG	QD000P40CD	1609	N/A	N/A
ROBOT	SPEAG	TX60	F10/5E6AA1/A101	N/A	N/A
ROBOT KRC	SPEAG	CS8C	F10/5E6AA1/C101	N/A	N/A
LIQUID CALIBRATION KIT	ANTENNESSA	41/05 OCP9	00425167	N/A	N/A

14. FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ No.10, Weiye Rd., Innovation Park, Eco & Tec. Development Part, Kunshan City, Jiangsu Province, China.

15. REFERENCES

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16. ATTACHMENTS

Exhibit	Content
1	System Performance Check Plots
2	Dipole calibration report D2450V2 SN: 869
3	Dipole calibration report D5GHzV2-SN:1095
4	Probe calibration report EX3DV4 SN3820
5	DAE calibration report DEA4 SD000D04BJ SN:679
6	SAR Test Plots

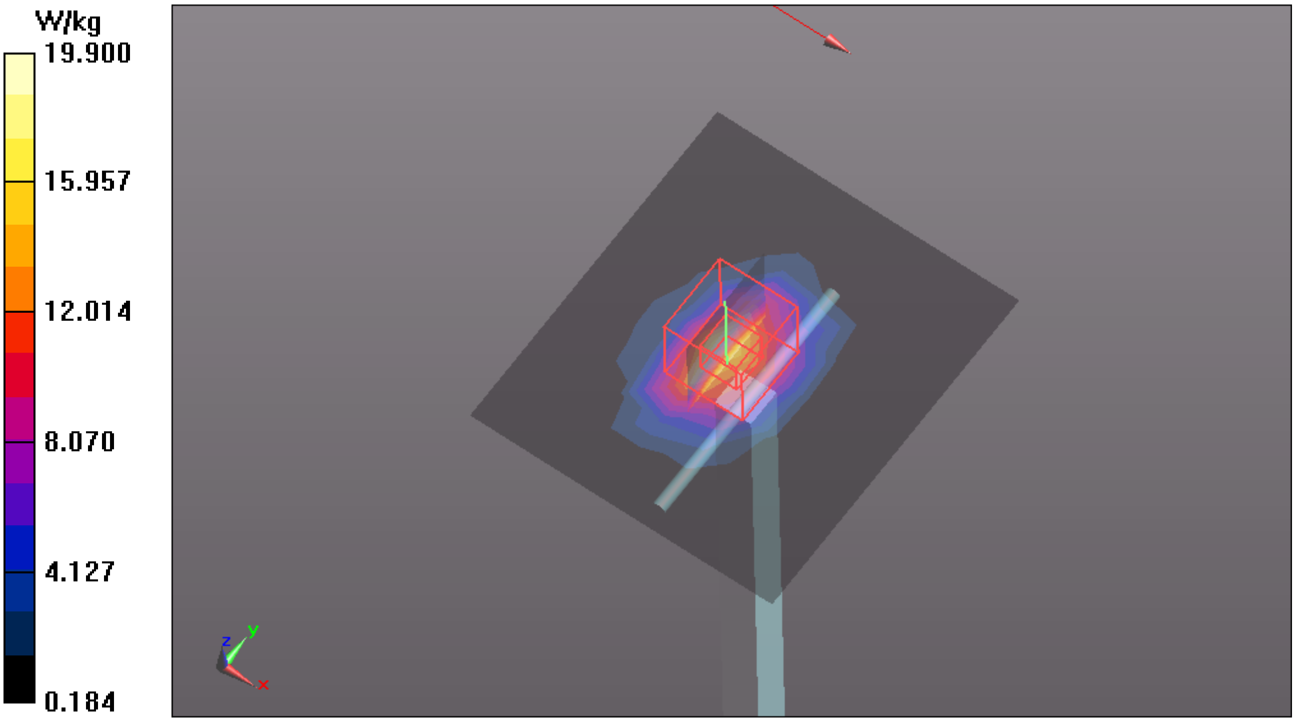
APPENDIX A: PLOTS OF PERFORMANCE CHECK

The plots are showing as followings.

Test Laboratory: Compliance Certification Services Inc. Date: 8/9/2013
SystemPerformanceCheck-Body D2450_2013.08.09
DUT: Dipole 2450 MHz D2450V2; Type: D24500V2; Serial: 869
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.009 S/m; ε_r = 50.424; ρ = 1000 kg/m^3
Room Ambient Temperature: 22.5°C; Liquid Temperature: 21.3°C
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3820; ConvF(6.84, 6.84, 6.84); Calibrated: 12/10/2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 1/16/2013
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1102
- DASY52 52.8.5(1059);
- SEMCAD X Version 14.6.8 (7028)

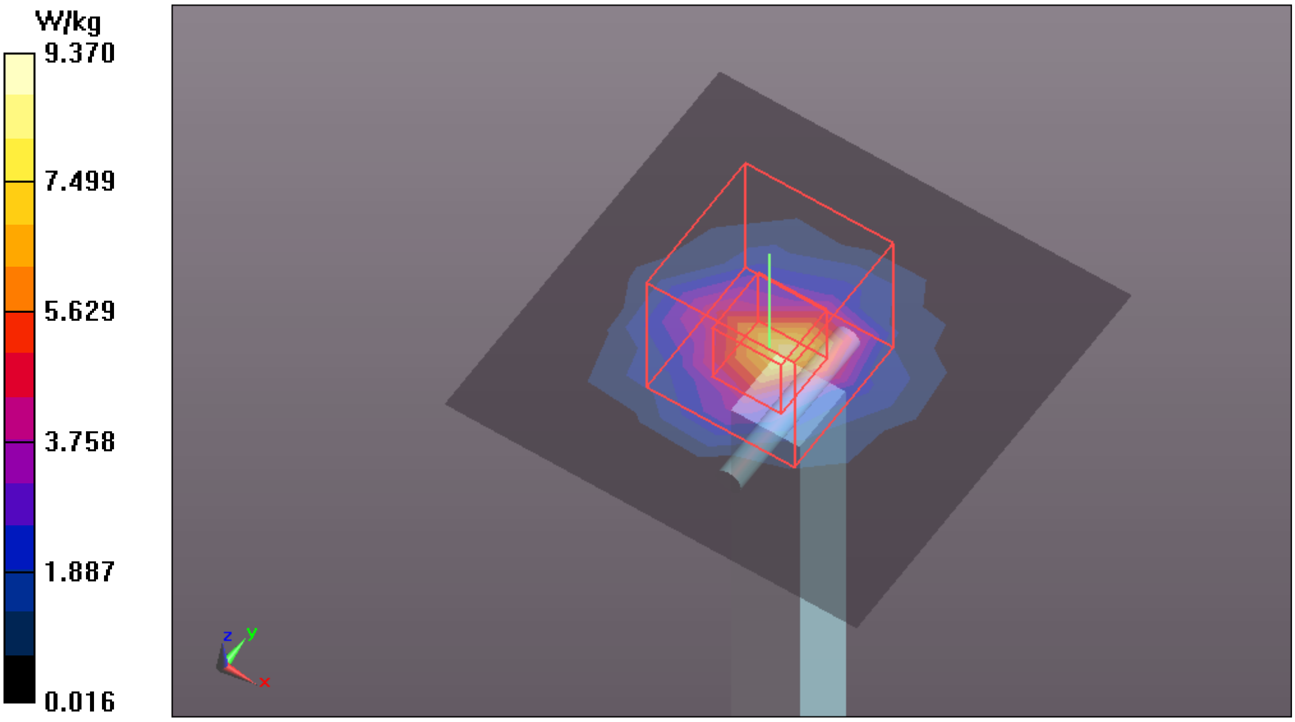
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 17.5 W/kg
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.160 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 26.3 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.52 W/kg
Maximum value of SAR (measured) = 19.9 W/kg



Test Laboratory: Compliance Certification Services Inc. Date: 8/102013
System check_ MSL5200
DUT: Dipole 5GHz ; Type: D5GHz V2; Serial: 1004
Communication System: CW; Communication System Band: D5GHz; Frequency: 5200 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5200 MHz; σ = 5.361 S/m; ε_r = 48.286; ρ = 1000 kg/m^3
Room Ambient Temperature: 22.7°C; Liquid Temperature: 21.4°C
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.23, 4.23, 4.23); Calibrated: 12/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 1/16/2013
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1102
- DASY52 52.8.5(1059);
- SEMCAD X Version 14.6.8 (7028)

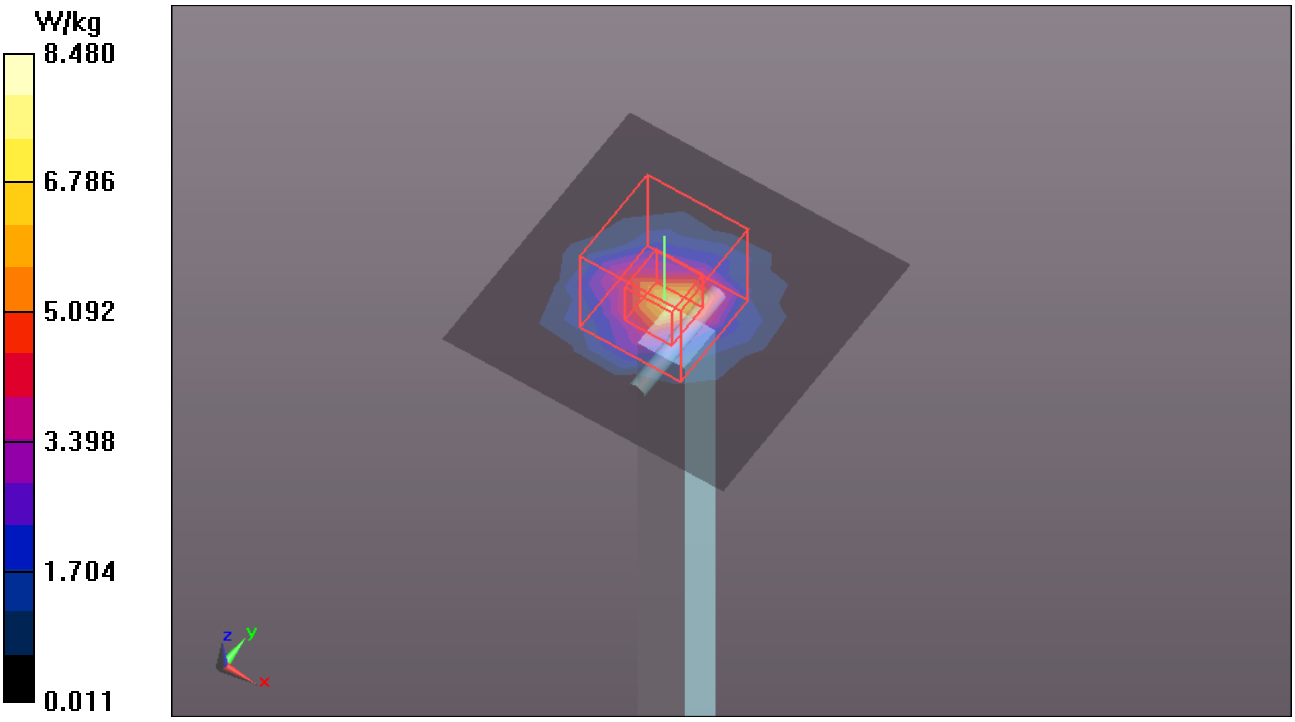
Configuration/Pin=100mW,d=10mm/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 8.71 W/kg
Configuration/Pin=100mW,d=10mm/Zoom Scan (7x7x15)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 41.827 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 24.2 W/kg
SAR(1 g) = 7.42 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 9.37 W/kg



Test Laboratory: Compliance Certification Services Inc. Date: 8/102013
System check_ MSL5800
DUT: Dipole 5GHz ; Type: D5GHz V2; Serial: 1004
Communication System: CW; Communication System Band: D5GHz; Frequency: 5800 MHz;Duty Cycle: 1:1 Medium parameters used (interpolated): f = 5800 MHz; σ = 6.182 S/m; ε_r = 46.751; ρ = 1000 kg/m^3
Room Ambient Temperature: 22.7°C; Liquid Temperature: 21.4°C
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3820; ConvF(3.83, 3.83, 3.83); Calibrated: 12/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 1/16/2013
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1102
- DASY52 52.8.5(1059);
- SEMCAD X Version 14.6.8 (7028)

Configuration/Pin=100mW,d=10mm/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 7.96 W/kg
Configuration/Pin=100mW,d=10mm/Zoom Scan (7x7x15)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 37.332 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 25.5 W/kg
SAR(1 g) = 7.09 W/kg; SAR(10 g) = 2.06 W/kg
Maximum value of SAR (measured) = 8.48 W/kg



Test Laboratory: Compliance Certification Services Inc. Date: 8/11/2013

System check_ MSL5200

DUT: Dipole 5GHz ; Type: D5GHz V2; Serial: 1095

Communication System: CW; Communication System Band: D5GHz; Frequency: 5200 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5200 MHz; σ = 5.39 S/m; ε_r = 48.256; ρ = 1000 kg/m^3

Room Ambient Temperature: 22.3°C; Liquid Temperature: 21.1°C

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.23, 4.23, 4.23); Calibrated: 12/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 1/16/2013
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1102
- DASY52 52.8.5(1059);
- SEMCAD X Version 14.6.8 (7028)

Configuration/Pin=100mW,d=10mm/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 7.63 W/kg

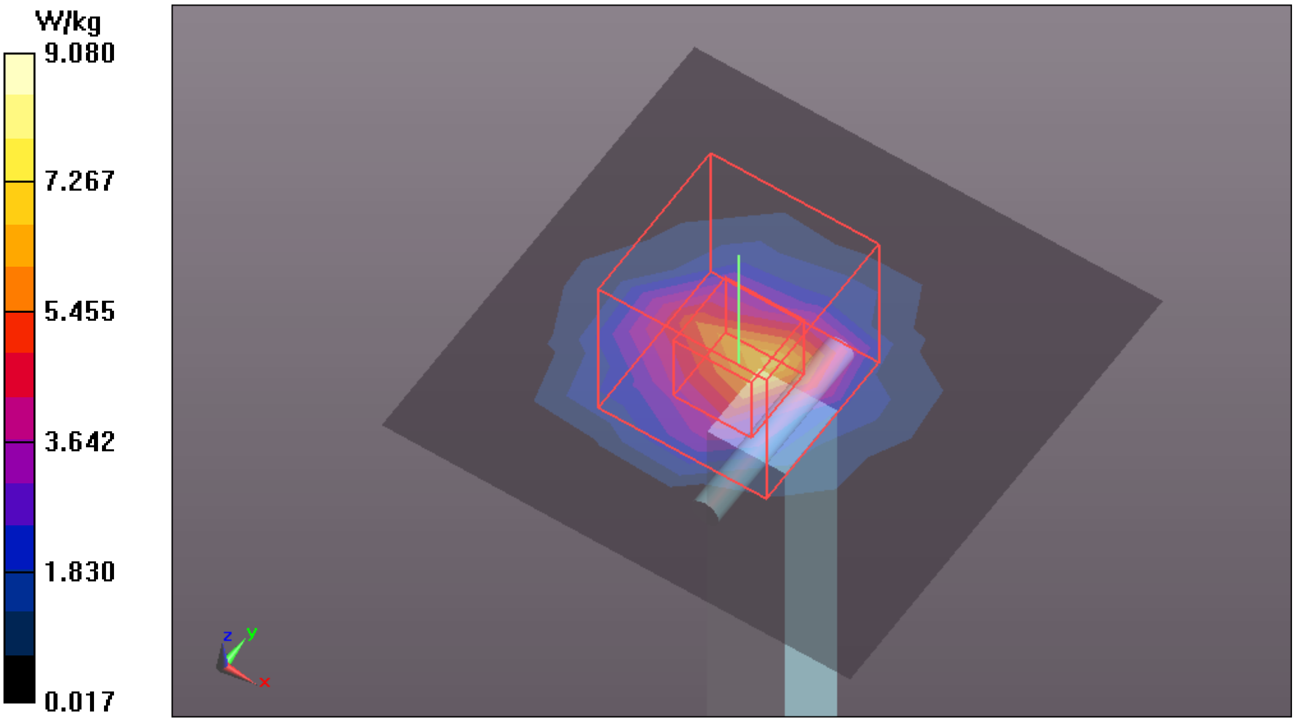
Configuration/Pin=100mW,d=10mm/Zoom Scan (7x7x15)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 39.106 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 23.8 W/kg

SAR(1 g) = 7.31 W/kg; SAR(10 g) = 2.15 W/kg

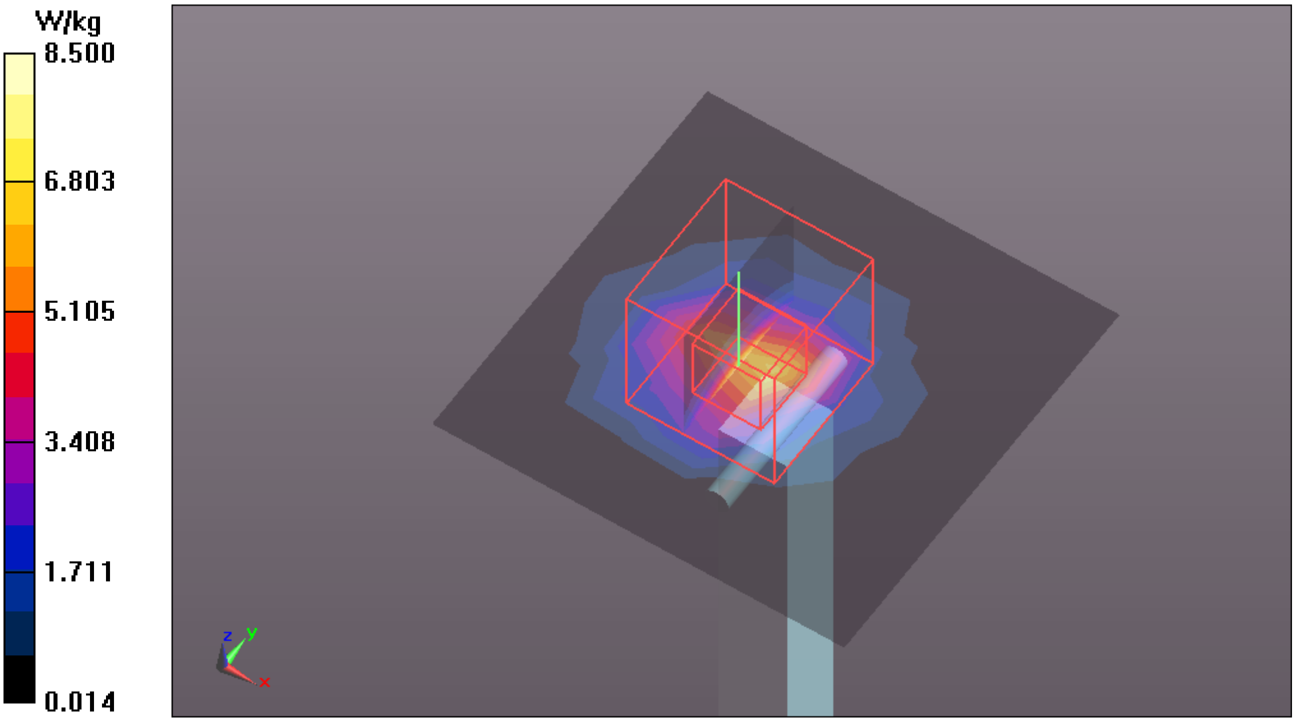
Maximum value of SAR (measured) = 9.08 W/kg



Test Laboratory: Compliance Certification Services Inc. Date: 8/11/2013
System check_ MSL5800
DUT: Dipole 5GHz ; Type: D5GHz V2; Serial: 1095
Communication System: CW; Communication System Band: D5GHz; Frequency: 5800 MHz;Duty Cycle: 1:1 Medium parameters used (interpolated): f = 5800 MHz; σ = 6.19 S/m; ε_r = 46.791; ρ = 1000 kg/m^3
Room Ambient Temperature: 22.3°C; Liquid Temperature: 21.1°C
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3820; ConvF(3.83, 3.83, 3.83); Calibrated: 12/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 1/16/2013
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: 1102
- DASY52 52.8.5(1059);
- SEMCAD X Version 14.6.8 (7028)

Configuration/Pin=100mW,d=10mm/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 7.09 W/kg
Configuration/Pin=100mW,d=10mm/Zoom Scan (7x7x15)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 35.165 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 7.21 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 8.50 W/kg



APPENDIX B: DASY CALIBRATION CERTIFICATE

The DASY Calibration Certificates are showing as followings .

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

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C Service suisse d'étalonnage
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 Auden

Certificate No: D2450V2-869_Jun13

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 869
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	June 11, 2013

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 EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 11, 2013

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

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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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.9 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.1 Ω + 5.5 jΩ
Return Loss	- 23.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.4 Ω + 6.6 jΩ
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 18, 2010

DASY5 Validation Report for Head TSL

Date: 11.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

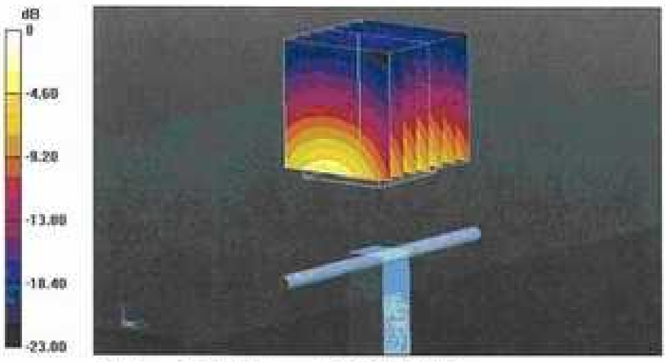
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 869

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

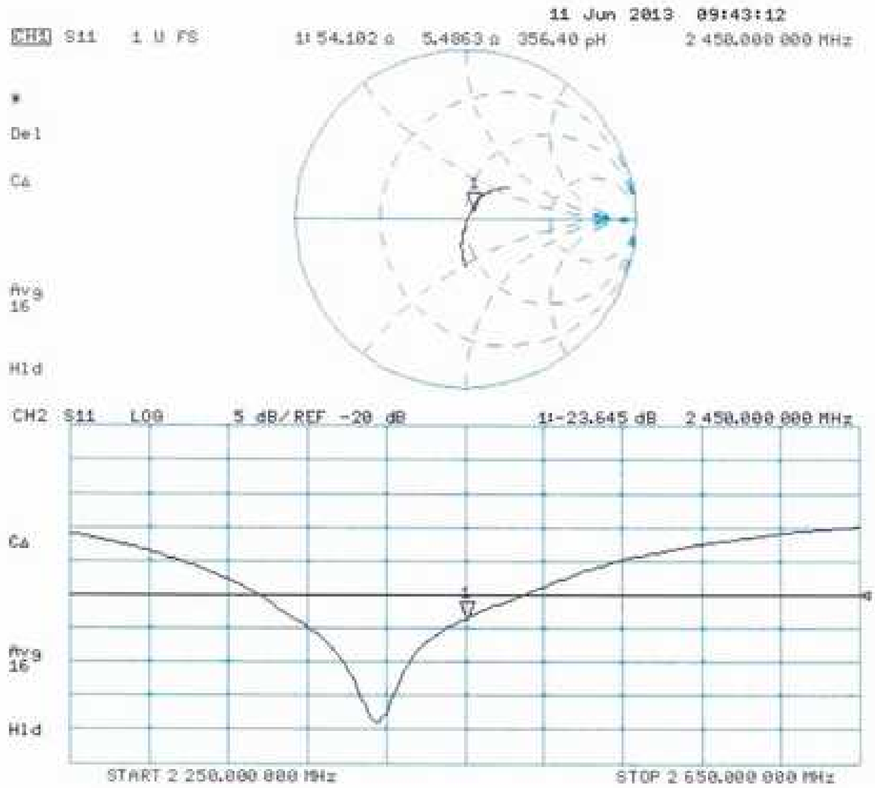
- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.432 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 28.1 W/kg
SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.3 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



0 dB = 17.1 W/kg = 12.33 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

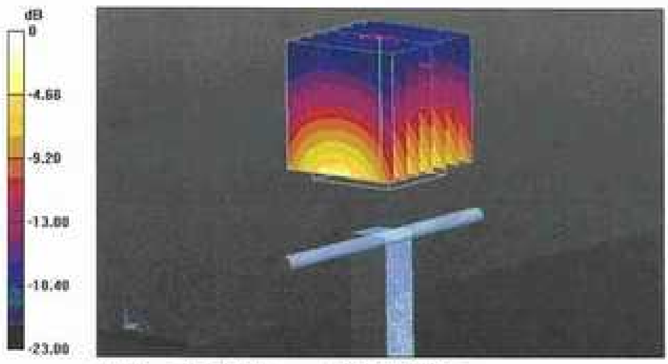
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 869

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

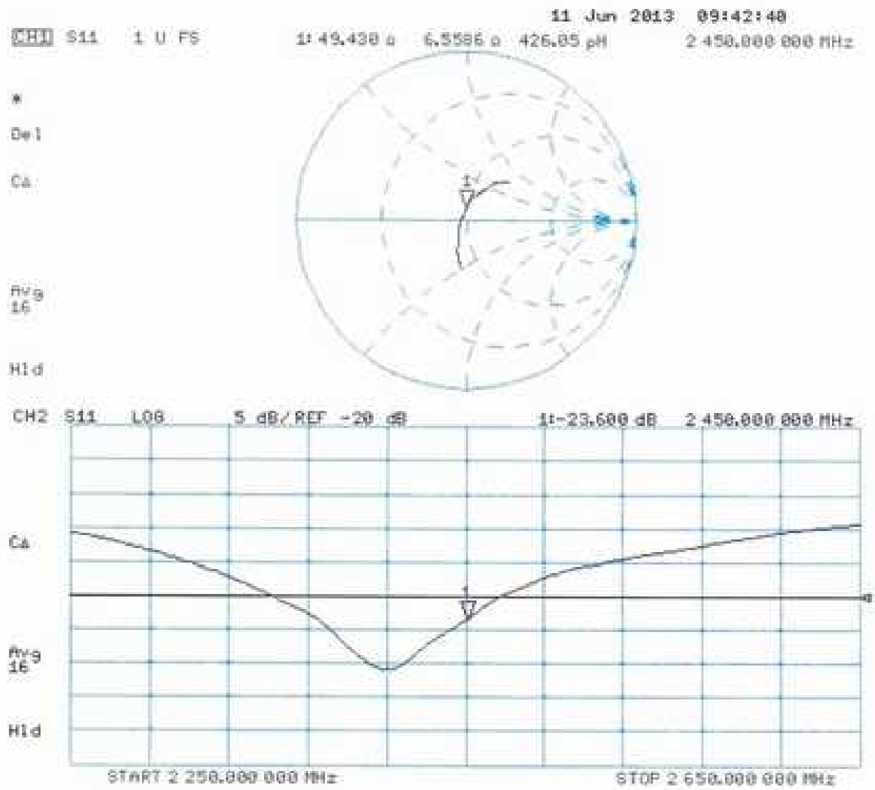
- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.432 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 27.6 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.09 W/kg
Maximum value of SAR (measured) = 17.3 W/kg



0 dB = 17.3 W/kg = 12.38 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client CCS-CN (Auden)

Certificate No: D5GHzV2-1095_May13

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1095
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	May 31, 2013

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 EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe EX3DV4	SN: 3503	28-Dec-12 (No. EX3-3503_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 31, 2013

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
b) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.5 ± 6 %	4.50 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.94 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.3 ± 6 %	4.60 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.1 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.1 ± 6 %	4.79 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.0 ± 6 %	4.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.7 ± 6 %	5.11 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.86 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.6 ± 6 %	5.41 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.4 ± 6 %	5.53 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.1 ± 6 %	5.80 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.89 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.19 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.0 ± 6 %	5.80 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.76 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.6 ± 6 %	6.24 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.7 W/kg ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.2 Ω - 6.4 jΩ
Return Loss	- 23.9 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.2 Ω - 3.3 jΩ
Return Loss	- 29.6 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	53.2 Ω - 2.2 jΩ
Return Loss	- 28.5 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	56.0 Ω - 1.1 jΩ
Return Loss	- 24.8 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.4 Ω - 2.8 jΩ
Return Loss	- 24.8 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	50.7 Ω - 5.3 jΩ
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	50.8 Ω - 1.5 jΩ
Return Loss	- 35.5 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	53.8 Ω - 1.2 jΩ
Return Loss	- 28.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.2 Ω + 1.1 jΩ
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.6 Ω + 0.3 jΩ
Return Loss	- 25.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.208 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 24, 2010

DASY5 Validation Report for Head TSL

Date: 30.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1095

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.5 S/m; ε_r = 36.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.6 S/m; ε_r = 36.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.79 S/m; ε_r = 36.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.89 S/m; ε_r = 36; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.11 S/m; ε_r = 35.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(5.1, 5.1, 5.1); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.76, 4.76, 4.76); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

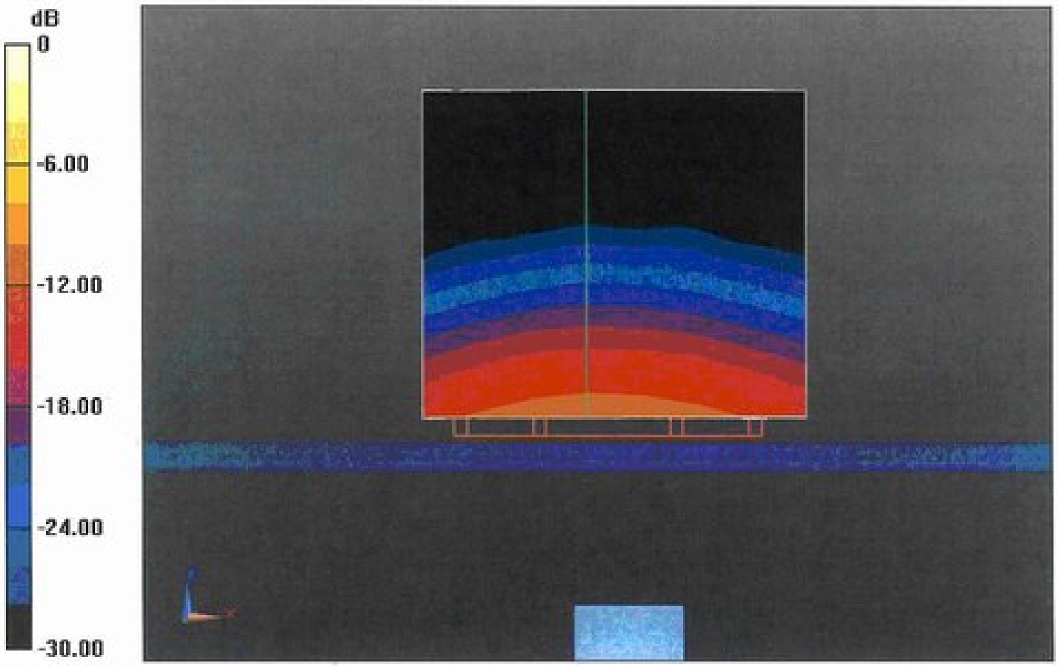
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.153 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 29.3 W/kg
SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.27 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.596 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.2 W/kg
SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.37 W/kg
Maximum value of SAR (measured) = 19.3 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.084 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 33.1 W/kg
SAR(1 g) = 8.42 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 20.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.341 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.34 W/kg
Maximum value of SAR (measured) = 19.9 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.473 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 32.8 W/kg
SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg

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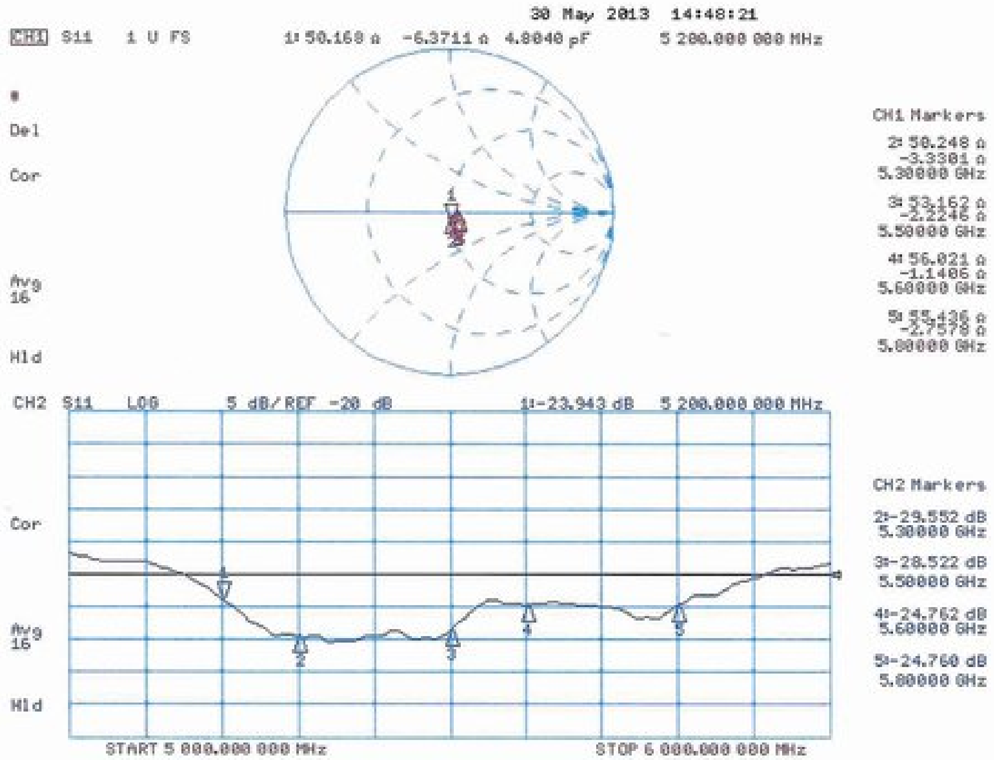
Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 31.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1095

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.41 S/m; ε_r = 49.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.53 S/m; ε_r = 49.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.8 S/m; ε_r = 49.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.8 S/m; ε_r = 49; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.24 S/m; ε_r = 48.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.67, 4.67, 4.67); Calibrated: 28.12.2012, ConvF(4.43, 4.43, 4.43); Calibrated: 28.12.2012, ConvF(4.22, 4.22, 4.22); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

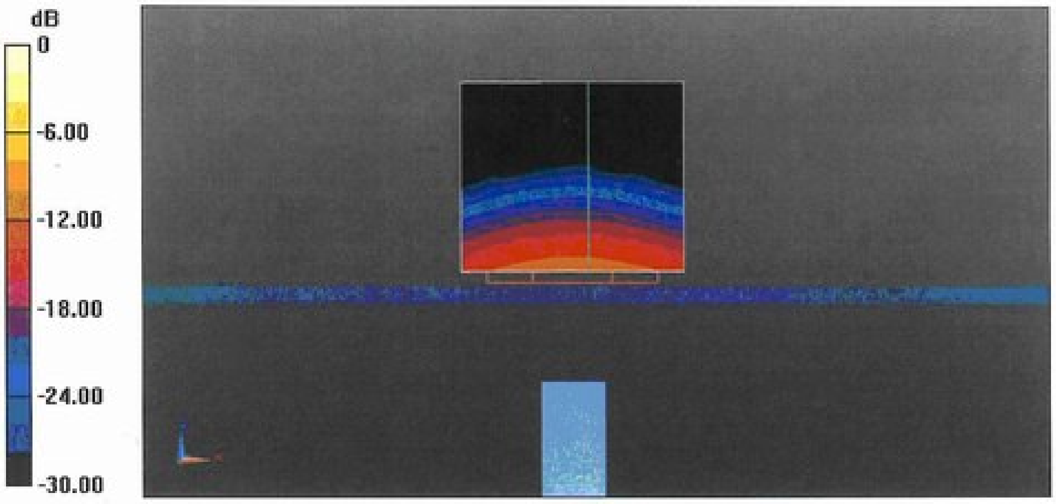
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.744 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 29.0 W/kg
SAR(1 g) = 7.44 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.0 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.871 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 30.4 W/kg
SAR(1 g) = 7.58 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 17.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.666 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 33.6 W/kg
SAR(1 g) = 7.89 W/kg; SAR(10 g) = 2.19 W/kg
Maximum value of SAR (measured) = 18.7 W/kg

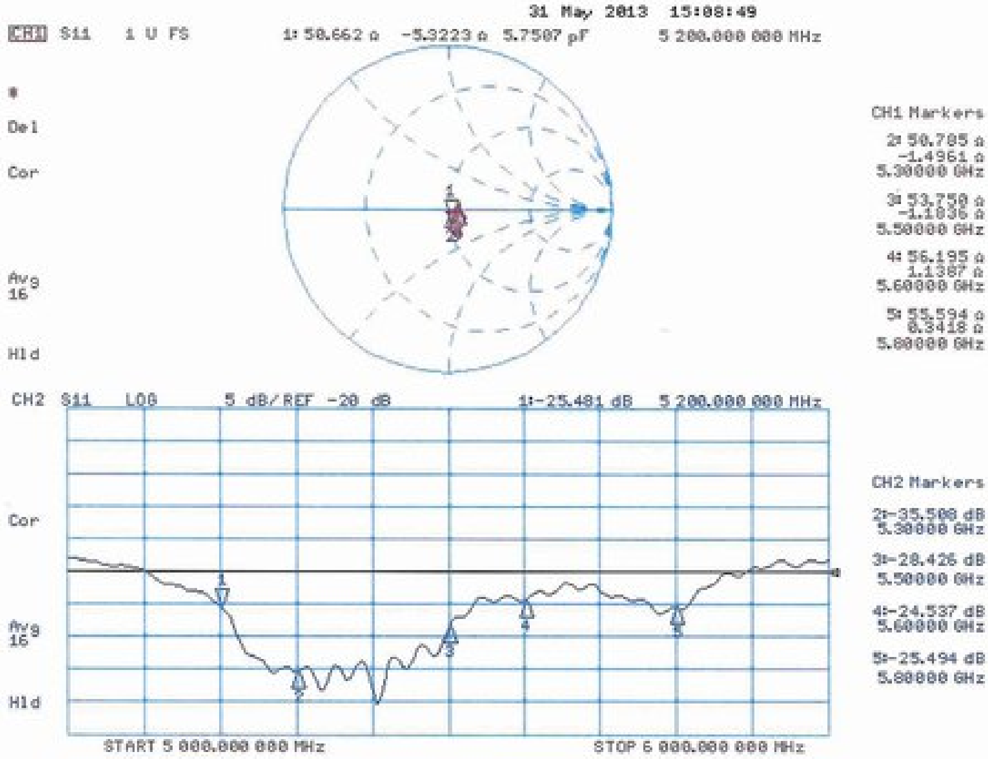
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.108 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 34.2 W/kg
SAR(1 g) = 7.76 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.451 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 34.6 W/kg
SAR(1 g) = 7.47 W/kg; SAR(10 g) = 2.06 W/kg
Maximum value of SAR (measured) = 18.2 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 108**

Client **Auden**

Certificate No: **EX3-3820_Dec12**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3820

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: December 10, 2012

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 11, 2012

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

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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
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
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 affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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.

Probe EX3DV4

SN:3820

Manufactured: September 2, 2011
Calibrated: December 10, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.44	0.35	0.44	± 10.1 %
DCP (mV)[B]	99.1	100.3	99.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.0	0.0	1.0	149.3	±3.0 %
			Y	0.0	0.0	1.0	179.2	
			Z	0.0	0.0	1.0	147.4	

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	41.5	0.90	9.19	9.19	9.19	0.80	0.66	± 12.0 %
1750	40.1	1.37	7.81	7.81	7.81	0.49	0.77	± 12.0 %
1900	40.0	1.40	7.51	7.51	7.51	0.46	0.78	± 12.0 %
2100	39.8	1.49	7.64	7.64	7.64	0.42	0.81	± 12.0 %
2450	39.2	1.80	6.74	6.74	6.74	0.37	0.89	± 12.0 %
5200	36.0	4.66	5.01	5.01	5.01	0.45	1.80	± 13.1 %
5300	35.9	4.76	4.76	4.76	4.76	0.45	1.80	± 13.1 %
5500	35.6	4.96	4.58	4.58	4.58	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.31	4.31	4.31	0.50	1.80	± 13.1 %
5800	35.3	5.27	4.52	4.52	4.52	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	55.2	0.97	9.07	9.07	9.07	0.32	1.10	± 12.0 %
1750	53.4	1.49	7.60	7.60	7.60	0.37	0.91	± 12.0 %
1900	53.3	1.52	7.30	7.30	7.30	0.26	1.19	± 12.0 %
2100	53.2	1.62	7.56	7.56	7.56	0.25	1.17	± 12.0 %
2450	52.7	1.95	6.84	6.84	6.84	0.80	0.61	± 12.0 %
5200	49.0	5.30	4.23	4.23	4.23	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.95	3.95	3.95	0.55	1.90	± 13.1 %
5500	48.6	5.65	3.63	3.63	3.63	0.60	1.90	± 13.1 %
5600	48.5	5.77	3.39	3.39	3.39	0.65	1.90	± 13.1 %
5800	48.2	6.00	3.83	3.83	3.83	0.60	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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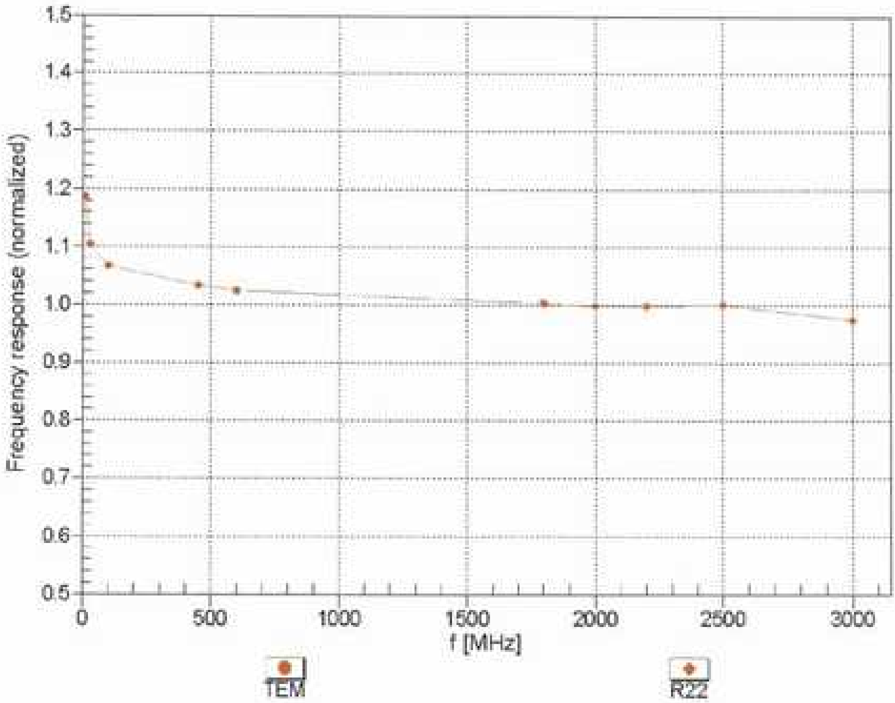
Frequency Response of E-Field

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

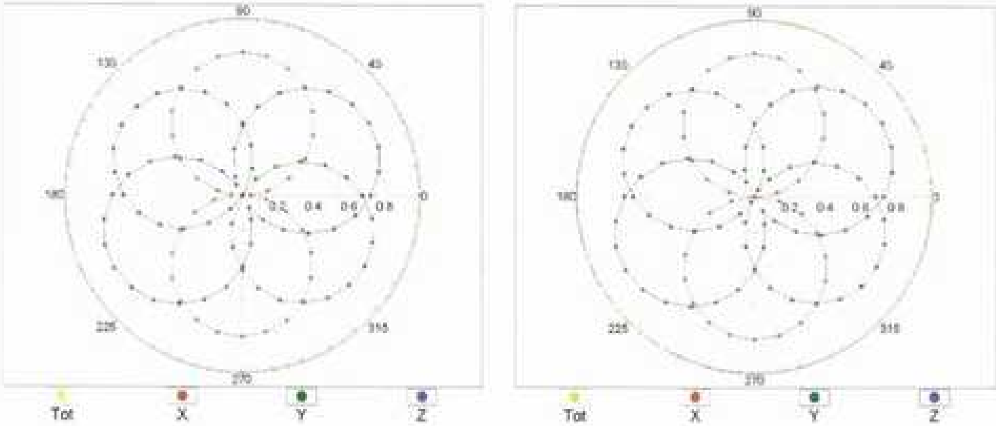


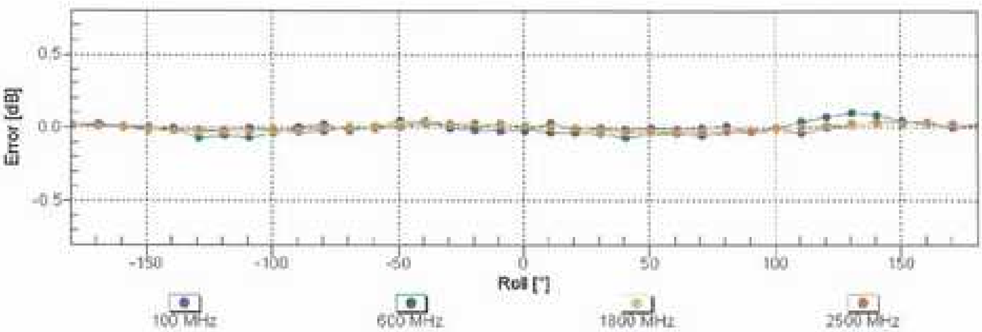
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM

f=1800 MHz,R22





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

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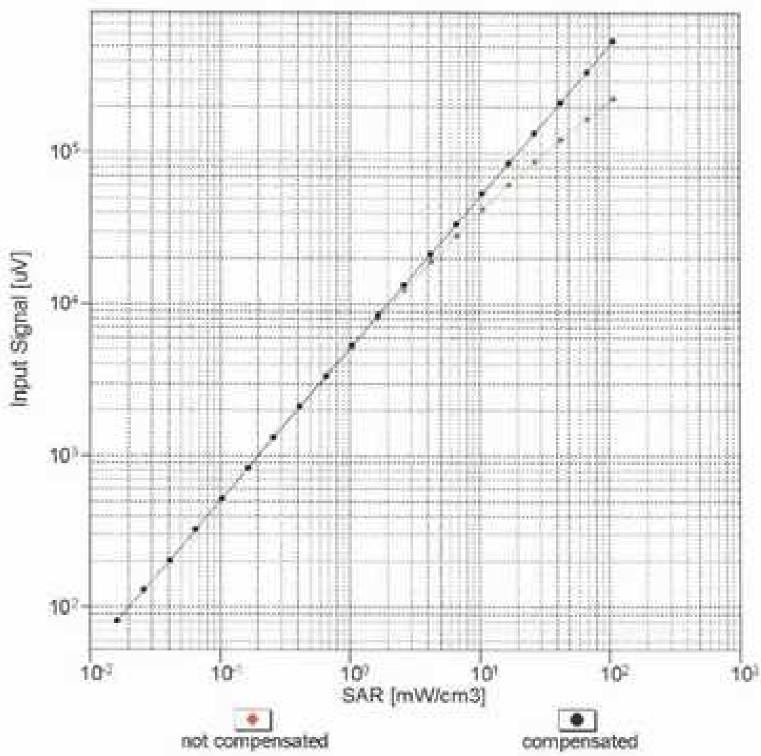
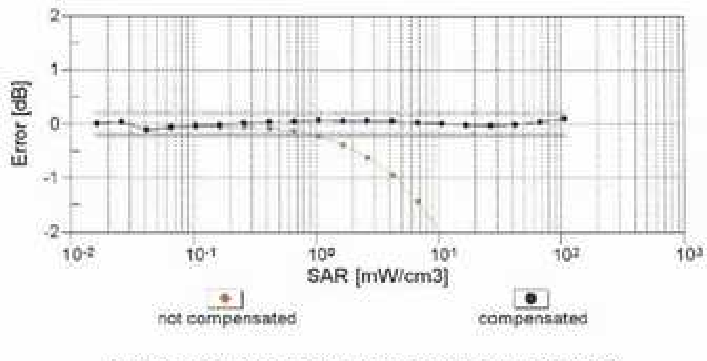
Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)





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

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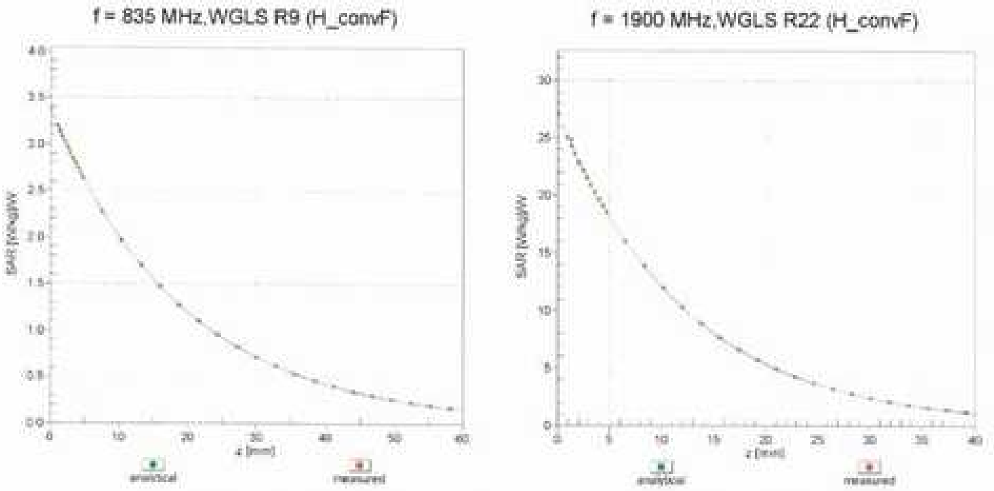
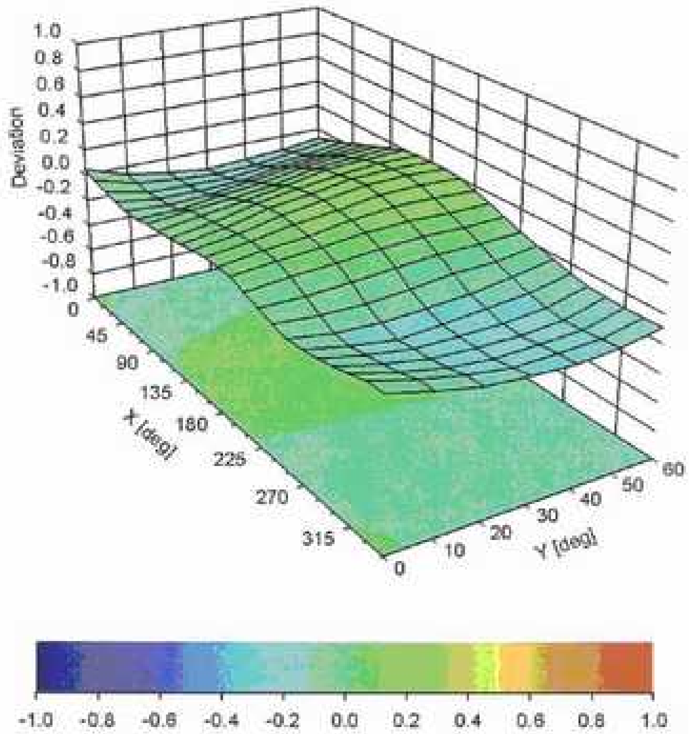
Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-69.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

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s p e a g

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IMPORTANT NOTICE

USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:
To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

Schmid & Partner Engineering

TN_BR040315AD DAE4.doc 11.12.2009

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Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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 Auden

Certificate No: DAE4-679_Jan13

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BJ - SN: 679

Calibration procedure(s): QA CAL-06.v25
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: January 16, 2013

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
Keithley Multimeter Type 2001	SN: 0810278	02-Oct-12 (No:12728)	Oct-13
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-13 (in house check)	In house check: Jan-14
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-13 (in house check)	In house check: Jan-14

	Name	Function	Signature
Calibrated by:	R.Mayoraz	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: January 16, 2013

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

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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
    - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
    - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
    - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
    - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
    - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
    - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
    - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
    - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
    - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.425 ± 0.02% (k=2)	404.872 ± 0.02% (k=2)	404.978 ± 0.02% (k=2)
Low Range	3.96758 ± 1.55% (k=2)	3.95353 ± 1.55% (k=2)	3.96036 ± 1.55% (k=2)

Connector Angle

Connector Angle to be used in DASY system	292.5 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199996.90	1.82	0.00
Channel X	+ Input	20003.25	2.75	0.01
Channel X	- Input	-19997.65	3.00	-0.02
Channel Y	+ Input	199995.27	0.36	0.00
Channel Y	+ Input	19997.98	-2.40	-0.01
Channel Y	- Input	-19998.66	2.23	-0.01
Channel Z	+ Input	199995.51	0.20	0.00
Channel Z	+ Input	19999.37	-1.05	-0.01
Channel Z	- Input	-20001.82	-1.00	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.84	0.06	0.00
Channel X	+ Input	201.69	0.45	0.22
Channel X	- Input	-198.75	-0.06	0.03
Channel Y	+ Input	2000.76	0.12	0.01
Channel Y	+ Input	200.78	-0.37	-0.18
Channel Y	- Input	-199.31	-0.51	0.26
Channel Z	+ Input	2000.82	0.07	0.00
Channel Z	+ Input	199.77	-1.35	-0.67
Channel Z	- Input	-199.88	-1.08	0.54

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	2.86	1.90
	- 200	-0.18	-1.41
Channel Y	200	5.64	5.17
	- 200	-5.57	-5.74
Channel Z	200	-4.33	-4.54
	- 200	1.84	1.84

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-0.69	-2.35
Channel Y	200	7.98	-	-0.18
Channel Z	200	7.21	6.87	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16168	16568
Channel Y	15450	16137
Channel Z	16062	16148

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.17	-0.91	1.33	0.45
Channel Y	0.26	-1.24	2.10	0.66
Channel Z	-1.53	-4.10	0.30	0.60

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

APPENDIX C: PLOTS OF SAR TEST RESULT

The plots are showing in the file named Appendix C Plots of SAR Test Result

END REPORT