SAR TEST REPORT

for

Philips Electronics Hong Kong Ltd.

GoGear Connect, WiFi MP3 Player

Model Number	Brand Name
SA3CNTxxyz/**	PHILIPS

Test Model: SA3CNT16K/37, SA3CNT16S/37
SA3CNT16K/17, SA3CNT16S/17

FCC ID: BOUSA3CNT16K

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Deutscher Akkreditierungs Rat
DAR
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SAR TEST REPORT

Applicant : Philips Electronics Hong Kong Ltd.

Manufacturer : Keen High Technologies Ltd.

EUT Description : GoGear Connect, WiFi MP3 Player

FCC ID : BOUSA3CNT16K

(A) Model No.& Brand Name

Model Number	Brand Name
SA3CNTxxyz/**	PHILIPS

(B) Test Model : SA3CNT16K/37, SA3CNT16S/37
SA3CNT16K/17, SA3CNT16S/17

(B) Serial NO. : N/A

(C) Test Voltage : DC 3.7V From Battery

Measurement Standard Used:

OET Bulletin 65 Supplement C: Additional Information for Evaluating Compliance of Mobile And Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65.
KDB 248227: SAR Measurement Procedures for 802.11a/b/g Transmitters
KDB 447498: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

The device described above is tested by Audix Technology (Shenzhen) Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Audix Technology (Shenzhen) Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. This report contains data that are not covered by the NVLAP accreditation. Also, this report shows that the EUT is technically compliant with the OET 65 Supplement C, KDB 248227 and KDB 447498 requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shenzhen) Co., Ltd.

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Date of Test : Sep.16~26, 2011 Report of date: Sep.27, 2011

Prepared by : Sala Yang / Supervisor

Reviewer by : Sunny Lu / Supervisor

信華科技（深圳）有限公司
Audix Technology (Shenzhen) Co., Ltd.
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Signature:

Approved & Authorized Signer : Ken Lu / Manager

1. SUMMARY OF RESULTS

1.1. Test Results

Test Position	Channel	Results		Power Drift (±0.2 dB)	Limit	
		1g Average	10g Average		1g (1.6W/Kg)	10g (2.0W/Kg)
Back Side	CH1	/	/	/	/	/
	CH6	0.642	0.250	0.16	PASS	PASS
	CH11	/	/	/	/	/
Right Side	CH1	/	/	/	/	/
	CH6	0.045	0.026	0.12	PASS	PASS
	CH11	/	/	/	/	/
Left Side	CH1	/	/	/	/	/
	CH6	0.117	0.051	0.18	PASS	PASS
	CH11	/	/	/	/	/
Top Side	CH1	/	/	/	/	/
	CH6	0.528	0.226	0.14	PASS	PASS
	CH11	/	/	/	/	/
Front Side	CH1	/	/	/	/	/
	CH4	0.270	0.142	0.13	PASS	PASS
	CH7	/	/	/	/	/

Note: 1. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (<0.8 W/Kg) lower than the SAR limit, testing at the high and low channels is optional.

2. Upper and lower frequencies were measured at the worst case.

3. KDB 248227- SAR is not required for 802.11g/n channels when the maximum average output power is less than ¼ dB higher than measured on the corresponding 802.11b channels.

Test Information

The device is tested under full battery.
A special test software was used to control EUT work in Continuous TX mode (100% duty cycle), and select test channel, wireless mode and data rate.

Tested mode, channel, and data rate information			
Mode	data rate (Mpbs)(see Note)	Channel	Frequency (MHz)
IEEE 802.11b	11	Low :CH1	2412
	11	Middle: CH6	2437
	11	High: CH11	2462
IEEE 802.11g	54	Low :CH1	2412
	54	Middle: CH6	2437
	54	High: CH11	2462
IEEE 802.11n HT20	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11n HT40	13.5	Low :CH1	2422
	13.5	Middle: CH4	2437
	13.5	High: CH7	2452
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description : GoGear Connect, WiFi MP3 Player

Model Number

Model Number	Brand Name
SA3CNTxxyz/**	PHILIPS

Test Model

SA3CNT16K/37, SA3CNT16S/37
SA3CNT16K/17, SA3CNT16S/17

The EUT have four main model numbers, The between difference is colour only, all the other things are the same like PCB layout, circuit and RF module.

GoGear "Connect", WiFi MP3 Player with model SA3CNTxxyz/** consist of the various stroke versions which are identical in electrical, mechanical and physical construction. The last two charters "y" and "z" representative of the following differences. The "y" denoted can be A-W consist of the different cabinet coulour only. The "z" denoted can be A-X or blank consist of the various accessories by-packed and/or packaging used.
Stroke number representative of the country of destination are differences /**

/07	denoted sales for Cabada only. Ordinary product packaging in D-box type.
/17	denote sales for U.S.A only. Ordinary product packaging in D-box type.
/37	denote sales for U.S.A and Canada. Ordinary product packaging in D-box type.

Memory Size	8GB :	SA3CNTxxyz/**, "xx" denoted the flash memory size as 8GB.
Memory Size	16GB :	SA3CNTxxyz/**, "xx" denoted the flash memory size as 16GB.
Memory Size	32GB:	SA3CNTxxyz/**, "xx" denoted the flash memory size as 32GB.

Applicant : Philips Electronics Hong Kong Ltd.
5/F.,Philips Electronics Building No.5 Science Park East Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong

Manufacturer : Keen High Technologies Ltd.
Ze Da Li Industrial Zone, Jian-An 1 Road, New-High Technologies Area, Tang Wei, Fuyong, Bao-An, Shenzhen

Operation Frequency	:	WIFI: IEEE 802.11b: 2412MHz—2462MHz IEEE 802.11g: 2412MHz—2462MHz IEEE802.11n HT20: 2412MHz—2462MHz IEEE802.11n HT40: 2422MHz—2452MHz Bluetooth: 2402MHz -2480MHz
FCC ID	:	BOUSA3CNT08K
Exposure Category	:	Uncontrolled Exposure Environment
Battery Type Tested	:	Internal rechargeable battery 1100mA, Li-ion polymer
Antenna	:	IFA, 1.5dBi PK gain
Channel Number	:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7Channels Bluetooth: 79Channels
Modulation Technology	:	WIFI: IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20,HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) Bluetooth: GFSK, π/4 DQPSK, 8-DPSK
Product Dimensions	:	112mm (L)*59mm (W)*11mm (H)
USB Cable	:	Shielded, Detachable, 0.8m(Bonded one ferrite core)
Earphone	:	Manufacturer: Philips Model: AY3840 Cable: Detachable,1.0m
Date of Test	:	Sep.16, 2011
Date of Receipt	:	Aug.02, 2011
Sample Type	:	Prototype production

Note: (1) This Portable wireless equipment has been measured in all cases, requested by the relevant standards. The results of this reports are below limits specified in the relevant standards. The device contains WiFi module and BT module and can transmit sumultaneous.

Note: (2) This EUT have four main model numbers, the difference is the colour only, all the other things like PCB Layout, circuit, RF module are the same.

According to exploratory testing, the test result of the SA3CNT16K/37 which be showed in test report is worst.

Note: (3)According to exploratory testing, the result of the SA3CNT16K/37 which be showed in test report is worst.

2.2. Block Diagram of connection between EUT and simulators

EUT

(EUT: GoGear Connect, WiFi MP3 Player)

2.3. Test Equipment

Item	Equipment	Manufacturer	Model No.	S/N	Last Cal Date	Cal. Interval
1.	SAR Test System	Speag	DASY5 TX60L SAR	N/A	June.04,11	1 Year
2.	Wireless Communication Test Set	Agilent	E5515C	GB44300243	May.08, 11	1Year
3.	Power Meter	Anritsu	ML2487A	6K00002472	May.08, 11	1 Year
4.	Power Sensor	Anritsu	MA2491A	032516	May.08, 11	1 Year
5	Signal Generator	Marconi	2031B	119606/058	May.08, 11	1 Year
6	Amplifier	Milmega	AS0206-50	1036253	NCR	N/A
7.	Dipole Antenna	Speag	D900V2	1d088	Mar.23,11	1 Year
8.	Dipole Antenna	Speag	D1800V2	2d186	Mar.22,11	1 Year
9.	Dipole Antenna	Speag	D2000V2	1055	Mar.24,11	1 Year
10	Dipole Antenna	Speag	D2450V2	862	Mar.22,11	1 Year
11	Dipole Antenna	Speag	D5GHzV2	1102	Mar.14,11	1 Year
12.	Attenuator	Agilent	8491A 3dB	MY39262001	May.08, 11	1 Year
13	Attenuator	Agilent	8491A 10dB	MY39264375	May.08, 11	1 Year
14.	DAE	Speag	DAE4	899	Mar.18,11	1 Year
15.	E-Field Probe	Speag	ES3DV3	3139	Mar.23,11	1 Year
16.	E-Field Probe	Speag	EX3DV4	3767	Mar.21,11	1Year

2.4. Measurement Uncertainty

Test Item	Uncertainty
Uncertainty for SAR test	1g: 21.14
	10g: 20.64
Uncertainty for test site temperature and humidity	0.6℃
	3%

2.5. Laboratory Environment

Temperature	Min:20℃,Max.25℃
Relative humidity	Min. = 30%, Max. = 70%
Note: Ambient noise is checked and found very low and in compliance with requirement of standards.	

3. MEASURE PROCEDURES

3.1. General description of test procedures

For the 802.11b/g SAR body tests, a communication link is set up with the test mode software for WIFI mode test. The Absolute Radiofrequency Channel Number (ARFCN) is allocated to 1,6 and 11 respectively in the case of 2450 MHz. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate. Testing at higher data rates is not required when the maximum average output power is less than 0.25dB higher than those measured at the lowest data rate.

802.11b/g operating modes are tested independently according to the service requirements in each frequency band.802.11b/g modes are tested on channels1,6,11;however,if output power reduction is necessary for channels 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels must be tested instead.

SAR is not required for 802.11g channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels. When the maximum average output channel in each frequency band is not included in the “default test channels”, the maximum channel should be tested instead of an adjacent “default test channels”, these are referred to as the “required test channels” and are illustrated in table 1.

Then The Absolute Radiofrequency Channel Number (ARFCN) is firstly allocated to 2437 respectively in the case of 802.11b/g.

Mode	GHz	Channel	Turbo Channel	“Default Test Channels” 15.247	
				802.11b	802.11g
802.11b/g	2.412	1#		√	*
	2.437	6	6	√	*
	2.462	11#		√	*

Table 1

Note: #= when output power is reduced for channel 1 and /or 11to meet restricted band requirements the highest out put channels closet to each of these channels should be tested.
√= ” default test channels”
* = possible 802.11g channels with maximum average output 0.25dB>=the “default test channels”

3.2. Position of module in Portable devices

The EUT is tested at the following 5 test positions:

(1) Test Position 1: The back side of the EUT towards and directed tightly to touch the bottom of the flat phantom.

(2) Test Position 2: The rignt side of the EUT towards and directed tightly to touch the bottom of the flat phantom.

(3) Test Position 3: The left side of the EUT towards and directed tightly to touch the bottom of the flat phantom. The corresponding edge is further to he user.

(4) Test Position 4: The top side of the EUT towards and directed tightly to touch the bottom of the flat phantom.

(5) Test Position 5: The front side of the EUT towards and directed tightly to touch the bottom of the flat phantom.

(6) Test Position 6: The bottom side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (This is not the most conservative antenna - to - user distance at edge mode. According to KDB 447498 4) ii) (2) –SAR is required only the edge with the most conservative exposure conditions)

4. SAR MEASUREMENTS SYSTEM

4.1. SAR Measurement Set-up

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

(1) A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
(2) A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage It issue simulating liquid. The probe is equipped with an optical surface detector system.
(3) A data acquisition electronic (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.
(4) A unit to operate the optical surface detector which is connected to the EOC.
(5) The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
(6) The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.
(7) DASY5 software and SEMCAD data evaluation software.
(8) Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
(9) The generic twin phantom enabling the testing of left-hand and right-hand usage.
(10) The device holder for handheld mobile phones.
(11) Tissue simulating liquid mixed according to the given recipes.
(12) System validation dipoles allowing to validate the proper functioning of the system.

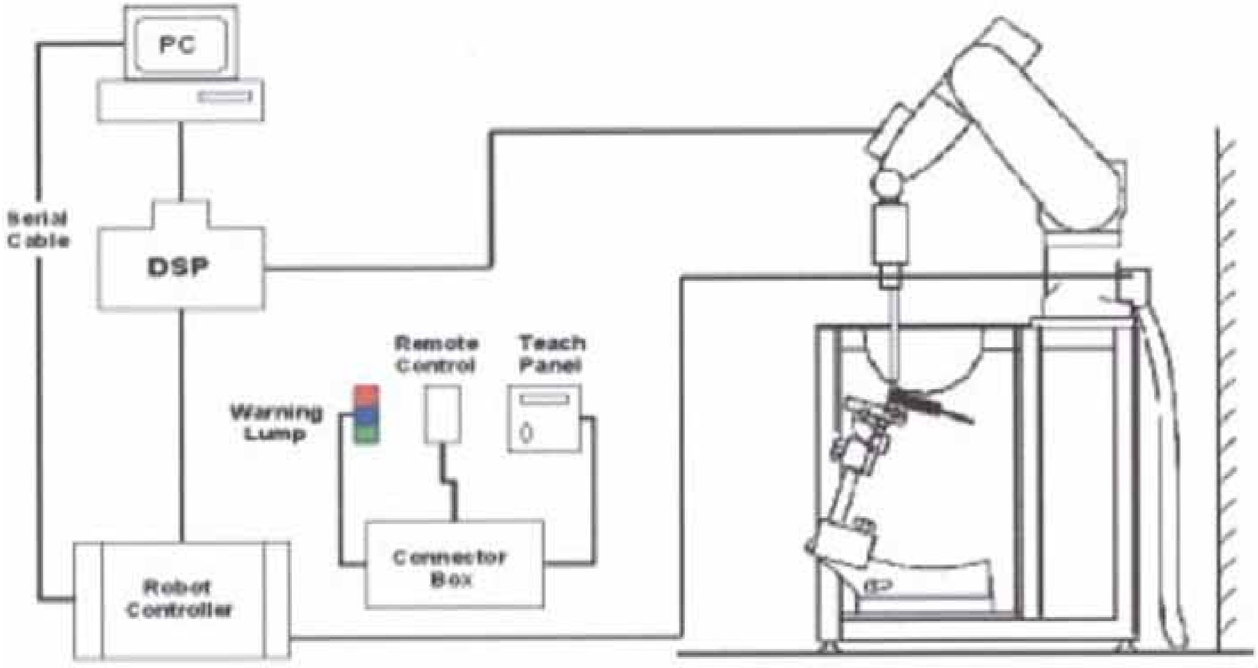
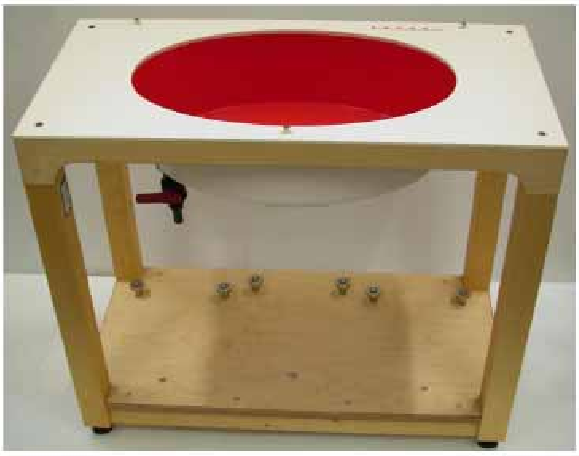


Figure 1 SAR Lab Test Measurement Set-up

4.2. ELI4 Phantom

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquide.



A cover prevents evaporation of the liquid. Reference markings on the phantom al-low installation of the complete setup, including all predefined phantom positions and measurement grids, by teach three points

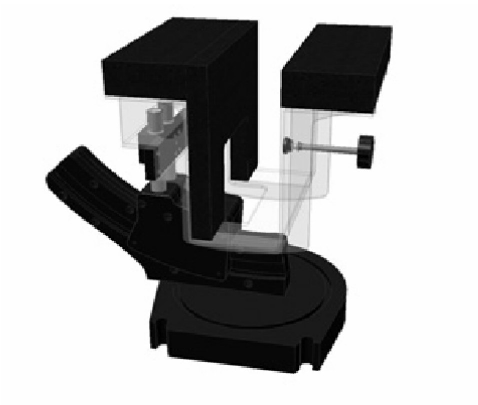
Shell Thickness 2±0.2cm
Filling Volume Approx. 30 liters
Dimensions 190*600*400 (H*L*W)

4.3. ES3DV3 Isotropic E-Field Probe for Dosimetric Measurements

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

Calibration	ISO/IEC 17025 calibration service available.
Frequency	10MHz to 4GHz Linearity:0.2dB (30MHz to 4GHz)
Directivity	±0.2dB in HSL (rotation around probe axis) ±0.3dB in tissue material (rotation normal to probe axis)
Dynamic Range	5uW/g to ＞ 100 mW/g; Linearity: 0.2dB
Dimensions	Overall length: 337 mm (Tip:20 mm) Tip diameter: 3.9mm (Body:12mm) Distance from probe tip to dipole centers: 2.0mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

4.4. Laptop Extension Kit to Mounting Device



In October 2007, SPEAG released a simple but effective extension for our Mounting Device that facilitates the testing of larger devices according o IEC 62209-2 (e.g., laptops, cameras, etc).
The extension is light weight and made of POM, acrylic glass and foam. It fits easily on the Upper part of the Mounting Device in place of the phone positioned. The extension is fully Compatible with the Twin-SAM and ELI phantoms.

4.5. E-field Probe Calibration

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

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

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

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
ΔT = Temperature increase due to RF exposure.

Or

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

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/m3).

4.6. Scanning procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The ”reference“ and ”drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure.The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The ”surface check“ measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles.

The difference between the optical surface detection and the actual surface depends on the Probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

4.6.1. Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.

After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

4.6.2. Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

4.6.3. Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 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 maxima 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 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 Zoom 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 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

5. TISSUE SIMULATING LIQUIDS

For the measurement of the field distribution inside the SAM phantom with DASY5, the phantom must be filled with around 25 liters of homogeneous tissue simulating liquid.

The following ingredients for tissue simulating liquid are used:

Water: deionized water, resistivity ≥16MΩ - as basis for the liquid
Sugar: refined sugar in crystals, as available in food shops-to reduce relative permittivity
Salt: pure NaCl-to increase conductivity
Cellulose: Hydroxyethyl-cellulose medium viscosity(75-125mPa.s, 2% in water, 20℃)，CAS#54290-to increase viscosity and to keep sugar in solution.
Preservative: Preventol D-7 Bayer
Deithlenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS#112-34-5-to reduce relative permittivity.

Ingredient	MSL 2450MHz
Water	698.3 ml
DGMBE	301.7 ml
Total Amount	1 L
Dielectric Parameters at 22℃	F=2450MHz ε =52.5±5% σ =2.00±10% S/m

Table: Ingredient for Tissue Simulating Liquid

6. DATA STORAGE AND EVALUATION

6.1. Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for thedata evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

6.2. Data Evaluation by SEMCAD

The SEMCAD 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	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	
	- Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter 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:

$$Vi = Ui + Ui2 \cdot c\,f \,/\, d\,c\,pi$$

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

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

cf = crest factor of exciting field (DASY parameter)

dcpi = diode compression point (DASY parameter)

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

E-field probes: ***Ei = (Vi / Normi · ConvF)1/2***

H-field probes: ***Hi = (Vi)1/2 · (ai0 + ai1 f + ai2f2) / f***

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

Normi = sensor sensitivity of channel i (i = x, y, z)

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):

Etot = (Ex2+ EY2+ Ez2)1/2

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

SAR = (Etot2·   ) / (· 1000)

with

SAR = local specific absorption rate in mW/g

Etot = total field strength in V/m

= conductivity in [mho/m] or [Siemens/m]

= equivalent tissue density in g/cm3

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 to be a free space field.

Ppwe = *Etot2 / 3770* or ***Ppwe = Htot2 · 37.7***

with ***Ppwe*** = equivalent power density of a plane wave in mW/cm2

Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

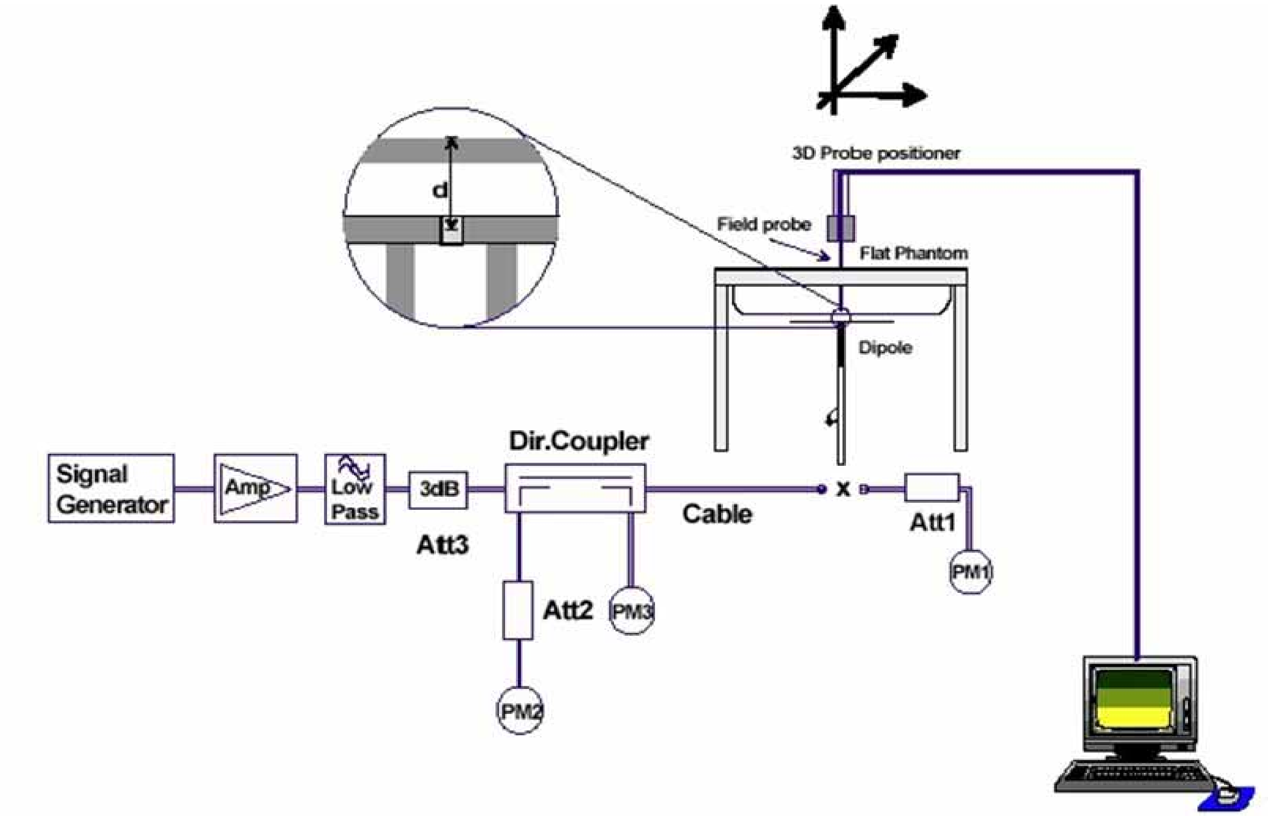
7. SYSTEM CHECK

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were

measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the Table 6.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



System Check Set-up

7.1. Table----System Check for Body Tissue simulating liquid

Frequency	Description	SAR(W/kg)		Dielectric Parameters		Temp
		1g	10g	εr	σ(s/m)	℃
2450MHz	Recommended value ±10% window	5.97 5.37 — 6.57	13 11.7 — 14.3	51.8	2.01	/
	Measurement value 2011-09-16	6.43	13.8	52.33	1.95	22.9
2450MHz	Recommended value ±10% window	5.97 5.37 — 6.57	13 11.7 — 14.3	51.8	2.01	/
	Measurement value 2011-09-26	6.40	13.6	52.30	1.94	22.6

Note: Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

7.2. Dielectric Performance for Body Tissue simulating liquid

Frequency	Description	Dielectric Parameters		Temp
		εr	σ(s/m)	℃
2450MHz	Target value ±5% window	52.7 50.07-55.34	1.95 1.85-2.05	/
	Measurement value 2011-09-16	52.33	1.95	22.5
2450MHz	Target value ±5% window	52.7 50.07-55.34	1.95 1.85-2.05	/
	Measurement value 2011-09-26	52.30	1.94	22.1

Liquid depth in the flat phantom (2450MHz, 15.2 depth)

8. CONDUCTED POWER RESULTS

Test Mode	Channel (MHz)	Before the test Average（dBm）	After the test Average（dBm）
11b	CH1	12.55	12.61
	CH6	12.45	12.44
	CH11	10.93	10.95
11g	CH1	10.87	10.94
	CH6	11.02	11.04
	CH11	11.03	11.01
11nHT20	CH1	10.09	10.12
	CH6	11.03	11.01
	CH11	10.51	10.54
11nHT40	CH1	10.92	10.93
	CH4	10.78	10.80
	CH7	10.53	10.52

Table 8.1 Conducted average power for WIFI

Note: KDB 248227-SAR is not required for 802.11g/n channels when the maximum average Output power is less than ¼ dB higher than measured on the corresponding 802.11b channels.

Test Mode	Channel (MHz)	Before the test Average（dBm）	After the test Average（dBm）
8DPSK	2402	-2.35	-2.32
	2441	-2.59	-2.58
	2480	-3.29	-3.27
GFSK	2402	-3.86	-3.83
	2441	-4.10	-4.05
	2480	-5.17	-5.21

Table 8.2 Conducted average power for Bluetooth

Note: The device contains BT module and WIFI module and they can not transmit simultaneous with the identical antenna. The max conducted average power is -2.35 dBm which is lower than 60/f, so the SAR evaluation in BT mode is not required.

ANNEX A: System Check Results

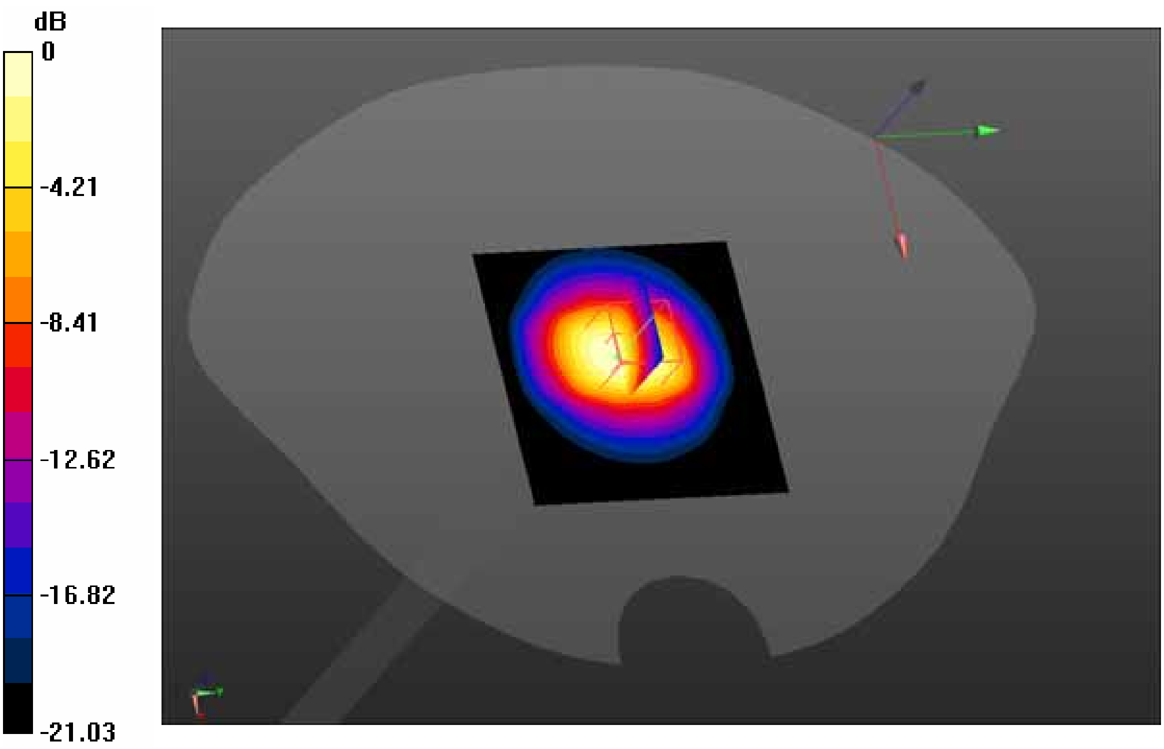
Date: 09/16/2011 Time: 9:15:34 AM

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 3139
Communication System: CW; Communication System Band: D2450 (2450.0 MHz);
Frequency: 2450 MHz; Communication System PAR: 0 dB; Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 52.33; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3139; ConvF(4, 4, 4); Calibrated: 23/03/2011
- Electronics: DAE4 Sn899; Calibrated: 18/03/2011
- Phantom: SAM1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=xx mW, dist=3.0mm (ES-Probe)/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 17.500 mW/g

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=xx mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.979 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 28.643 W/kg
SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.43 mW/g
Maximum value of SAR (measured) = 15.735 mW/g



0 dB = 15.740mW/g

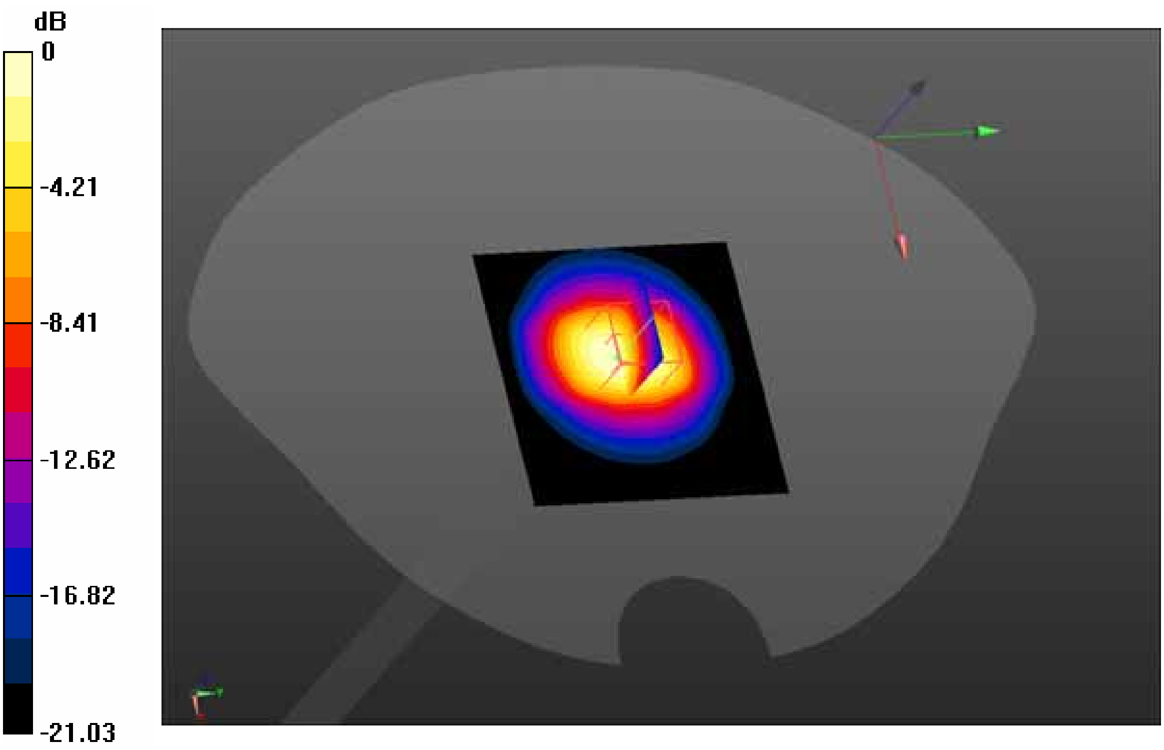
Date: 09/16/2011 Time: 11:25:34 AM

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 3139
Communication System: CW; Communication System Band: D2450 (2450.0 MHz);
Frequency: 2450 MHz; Communication System PAR: 0 dB; Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 52.33; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3139; ConvF(4, 4, 4); Calibrated: 23/03/2011
- Electronics: DAE4 Sn899; Calibrated: 18/03/2011
- Phantom: SAM1; Type: SAM; Serial: TP-1543
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=xx mW, dist=3.0mm (ES-Probe)/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 17.496 mW/g

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=xx mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.972 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 28.639 W/kg
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.40 mW/g
Maximum value of SAR (measured) = 15.732 mW/g



0 dB = 15.730mW/g

ANNEX B: Graph Results

Back Side

Date: 09/26/2011 Time: 15:43:17AM

DUT: GoGear Connect, WiFi MP3 Player M/N: SA3CNT16K/37

Communication System: IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz

Medium parameters used (interpolated): f = 2437 MHz; σ = 2.013 mho/m; ε_r = 50.739; ρ = 1000 kg/m^3; PAR: 0 dB; Crest factor: 1

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3139; ConvF(4, 4, 4); Calibrated: 23/03/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn899; Calibrated: 18/03/2011
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Configuration/Body/Area Scan (111x51x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.636 mW/g

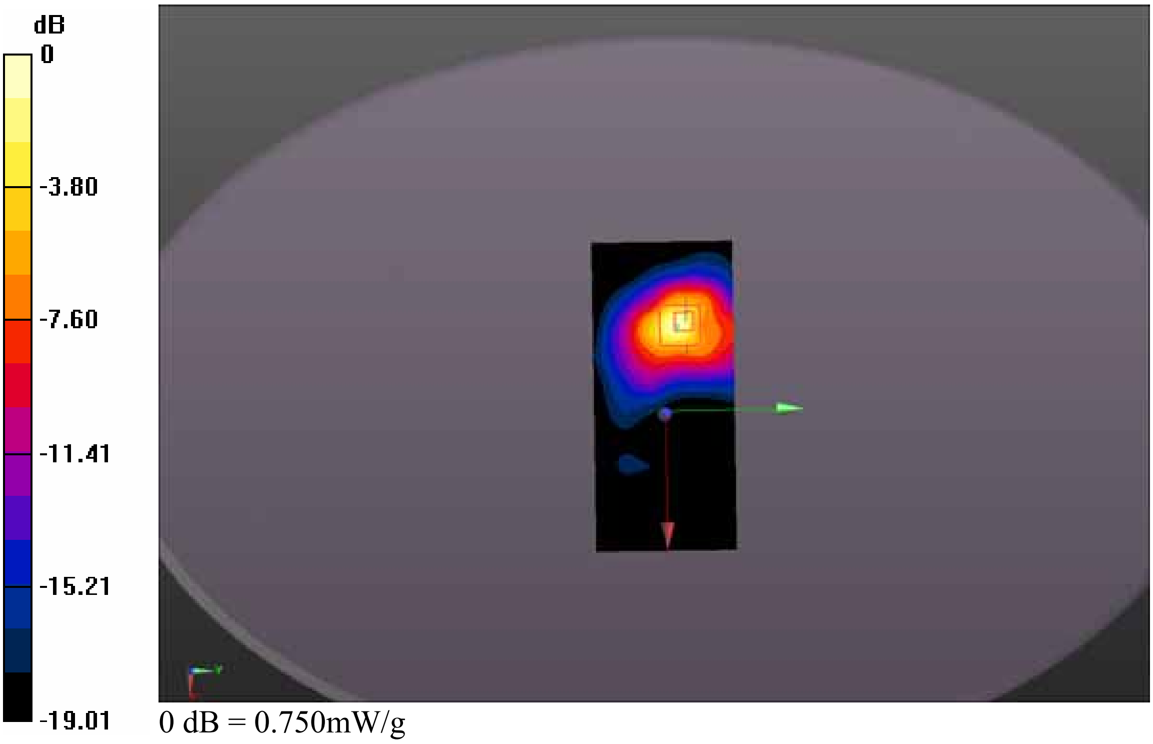
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.986 V/m; Power Drift = 0.13 dB

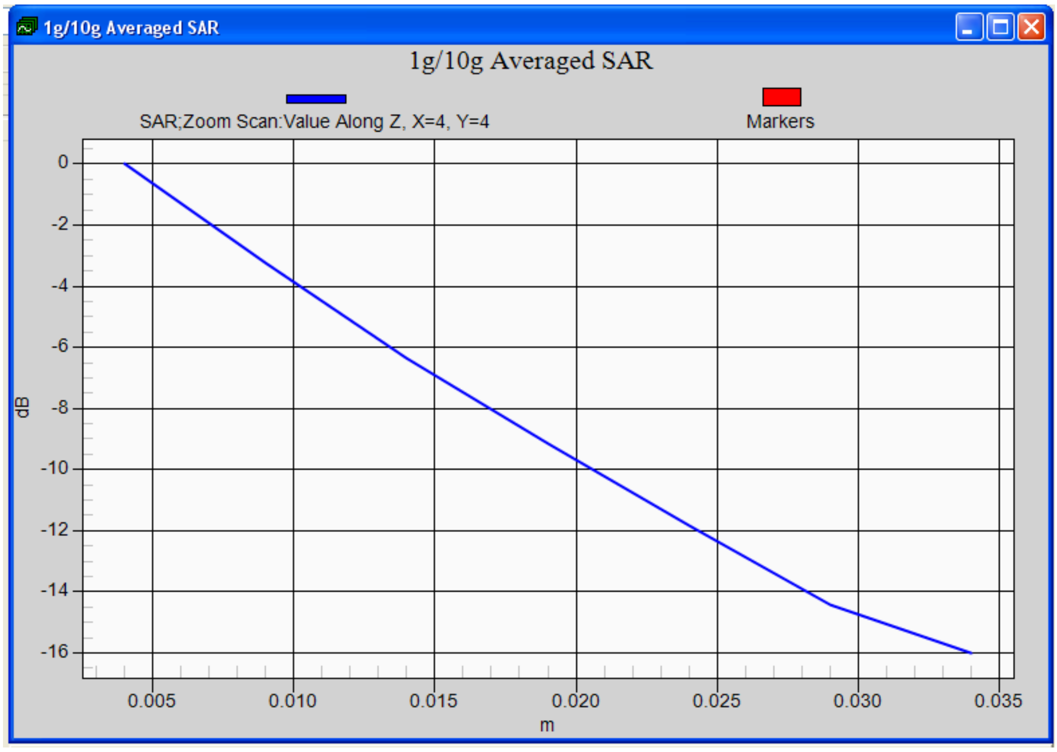
Peak SAR (extrapolated) = 1.601 W/kg

SAR(1 g) = 0.642 mW/g; SAR(10 g) = 0.250 mW/g

Maximum value of SAR (measured) = 0.755 mW/g



0 dB = 0.750mW/g


1g/10g Averaged SAR
1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=4, Y=4
Markers
dB
0
-2
-4
-6
-8
-10
-12
-14
-16
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

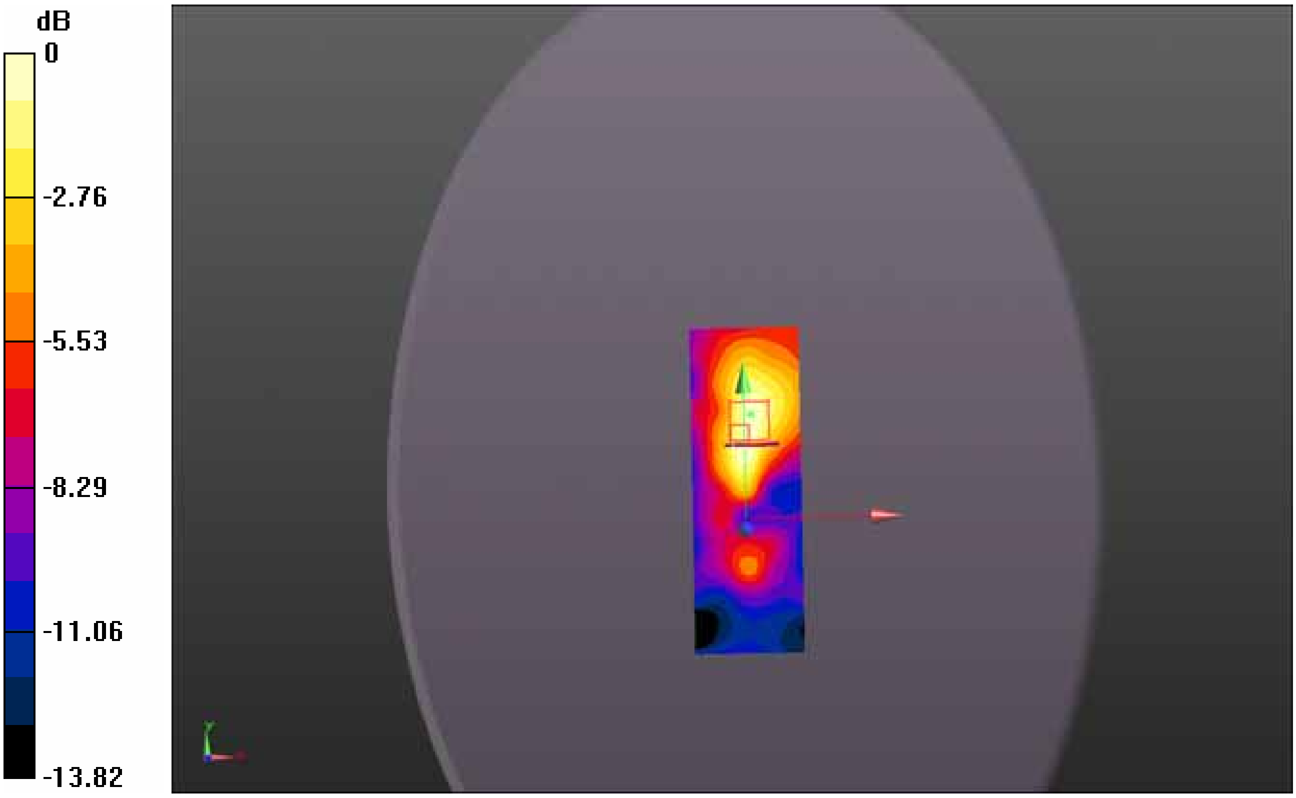
Right Side

Date: 09/16/2011 Time: 13:20:35 AM
DUT: GoGear Connect, WiFi MP3 Player M/N: SA3CNT16K/37
Communication System: IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz
Medium parameters used (interpolated): f = 2437 MHz; σ = 2.013 mho/m; ε_r = 50.739; ρ = 1000 kg/m^3; PAR: 0 dB; Crest factor: 1
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

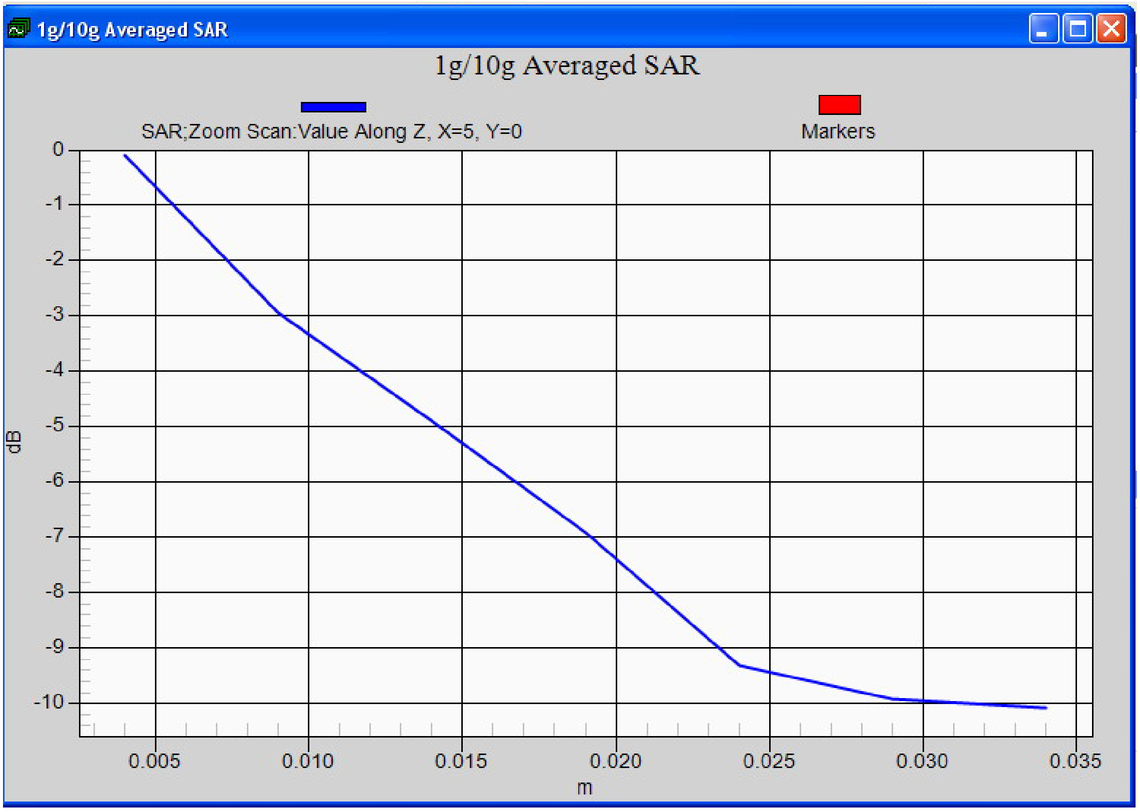
- Probe: ES3DV3 - SN3139; ConvF(4, 4, 4); Calibrated: 23/03/2011
- Electronics: DAE4 Sn899; Calibrated: 18/03/2011
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: TP-1543

Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)
Configuration/Body/Area Scan (41x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.048 mW/g
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.378 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.096 W/kg
SAR(1 g) = 0.045 mW/g; SAR(10 g) = 0.026 mW/g

Maximum value of SAR (measured) = 0.049 mW/g



0 dB = 0.050mW/g


1g/10g Averaged SAR
1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=5, Y=0
Markers
dB
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Left Side

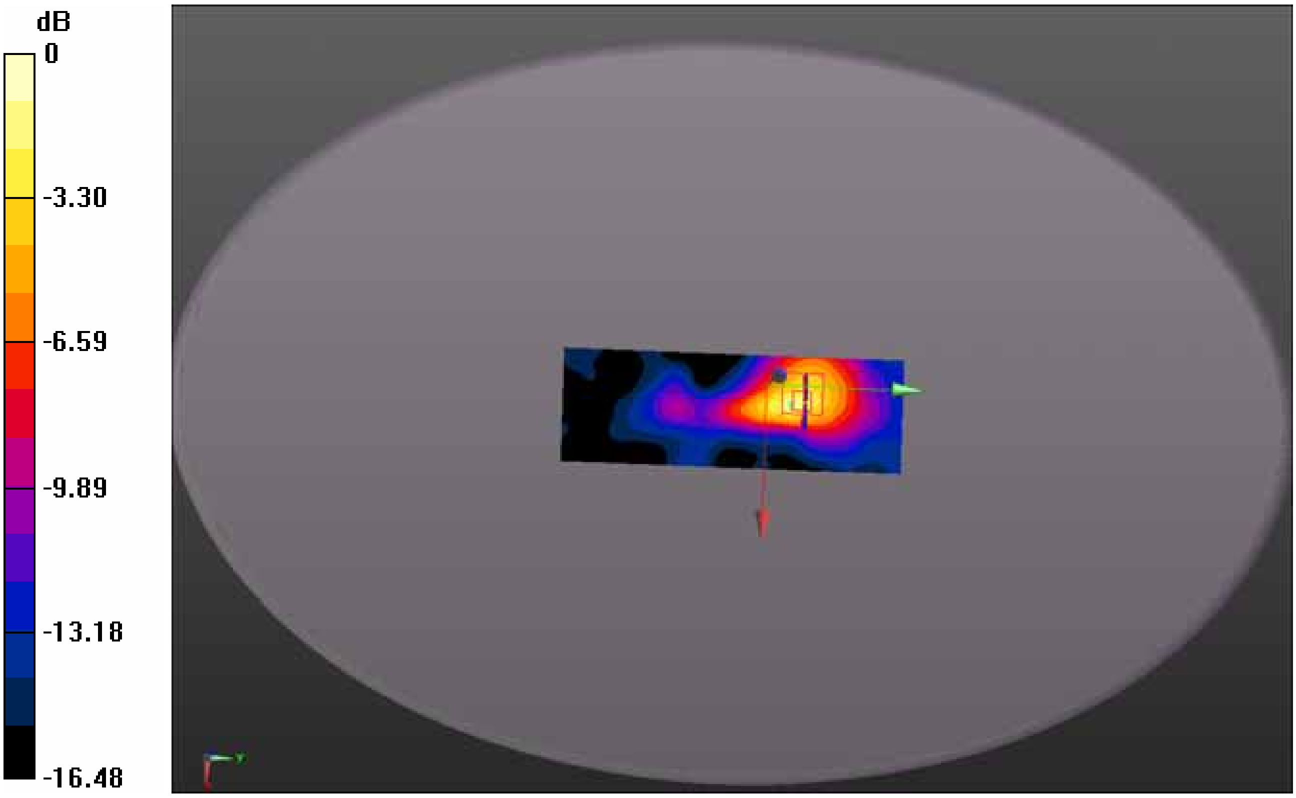
Date: 09/16/2011 Time: 13:56:13 AM

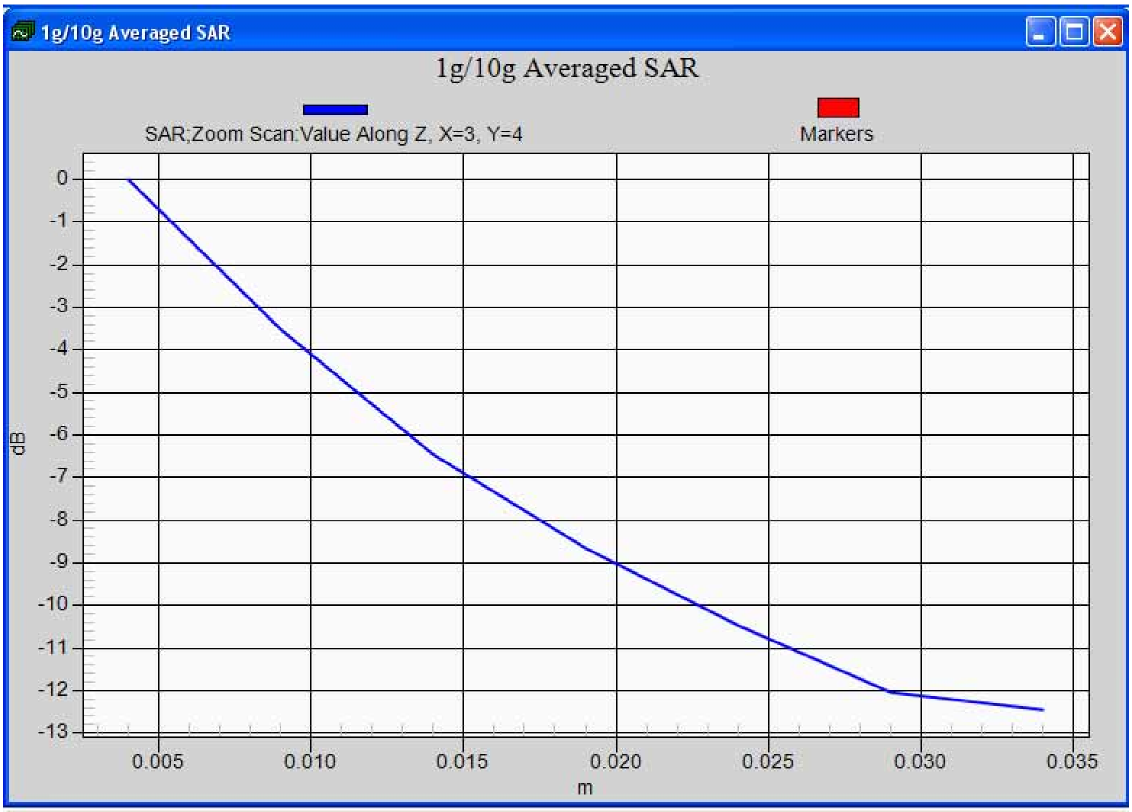
DUT: GoGear Connect, WiFi MP3 Player M/N: SA3CNT16K/37

Communication System: IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz
Medium parameters used (interpolated): f = 2437 MHz; σ = 2.013 mho/m; ε_r = 50.739; ρ = 1000 kg/m^3; PAR: 0 dB; Crest factor: 1
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3139; ConvF(4, 4, 4); Calibrated: 23/03/2011
- Electronics: DAE4 Sn899; Calibrated: 18/03/2011
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: TP-1543
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Configuration/Body_Front Side/Area Scan (91x51x1): Measurement grid: dx=15mm, dy=15mm.
Maximum value of SAR (interpolated) = 0.090 mW/g
Configuration/Body_Front Side/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.755 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.277 W/kg
SAR(1 g) = 0.117 mW/g; SAR(10 g) = 0.051 mW/g
Maximum value of SAR (measured) = 0.144 mW/g




1g/10g Averaged SAR
1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=3, Y=4
Markers
dB
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

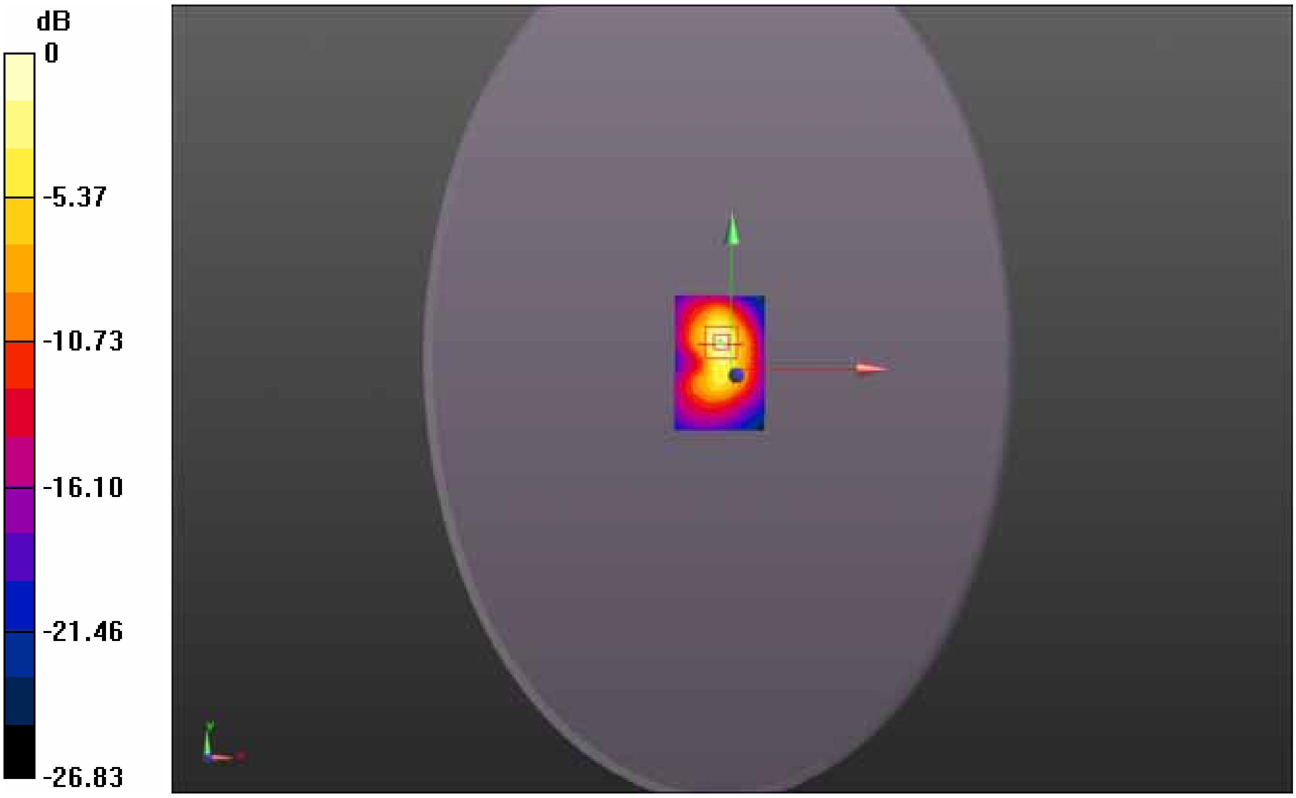
Top Side

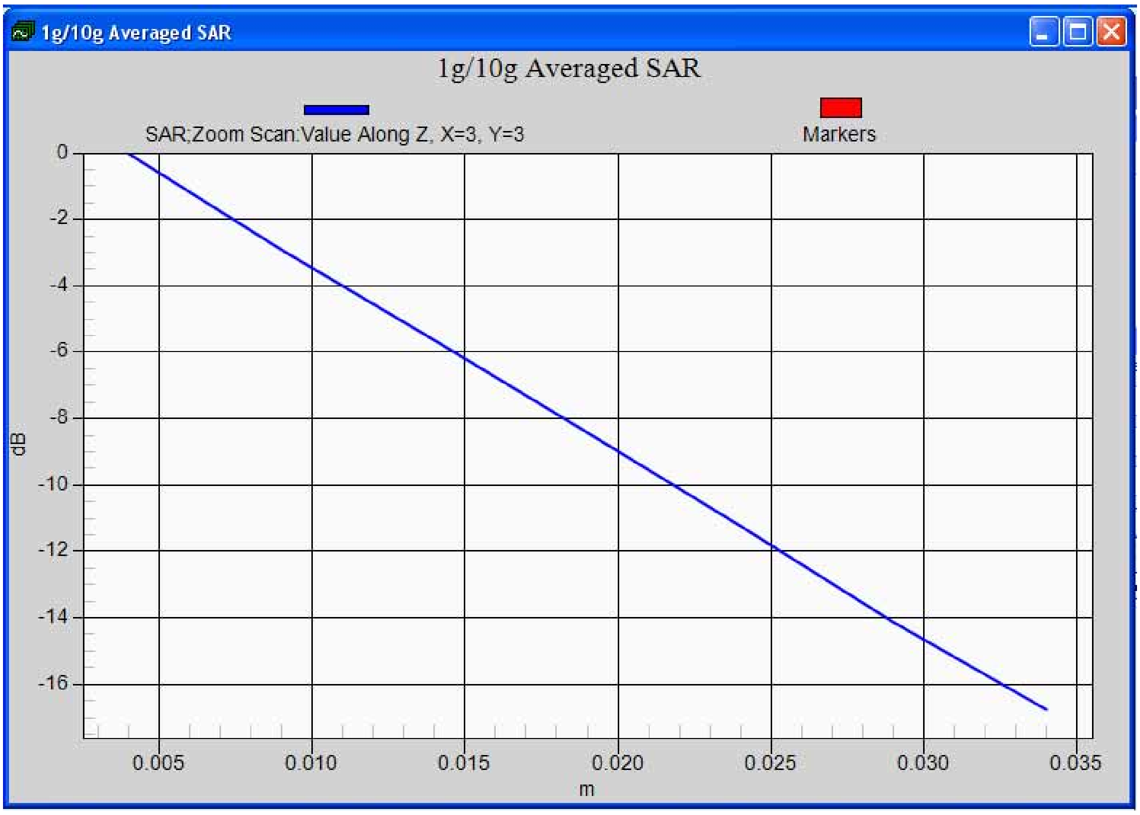
Date: 09/16/2011 Time: 14:31:20 AM

DUT: GoGear Connect, WiFi MP3 Player M/N: SA3CNT16K/37
Communication System: IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz
Medium parameters used (interpolated): f = 2437 MHz; $\sigma = 2.013$ mho/m; $\varepsilon_r = 50.739$; $\rho = 1000$ kg/m^3; PAR: 0 dB; Crest factor: 1
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3139; ConvF(4, 4, 4); Calibrated: 23/03/2011
- Electronics: DAE4 Sn899; Calibrated: 18/03/2011
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: TP-1543
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Configuration/Body/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.614 mW/g
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.584 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 1.134 W/kg
SAR(1 g) = 0.528 mW/g; SAR(10 g) = 0.226 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.619 mW/g




1g/10g Averaged SAR
1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=3, Y=3
Markers
0
-2
-4
-6
-8
-10
-12
-14
-16
dB
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Front Side

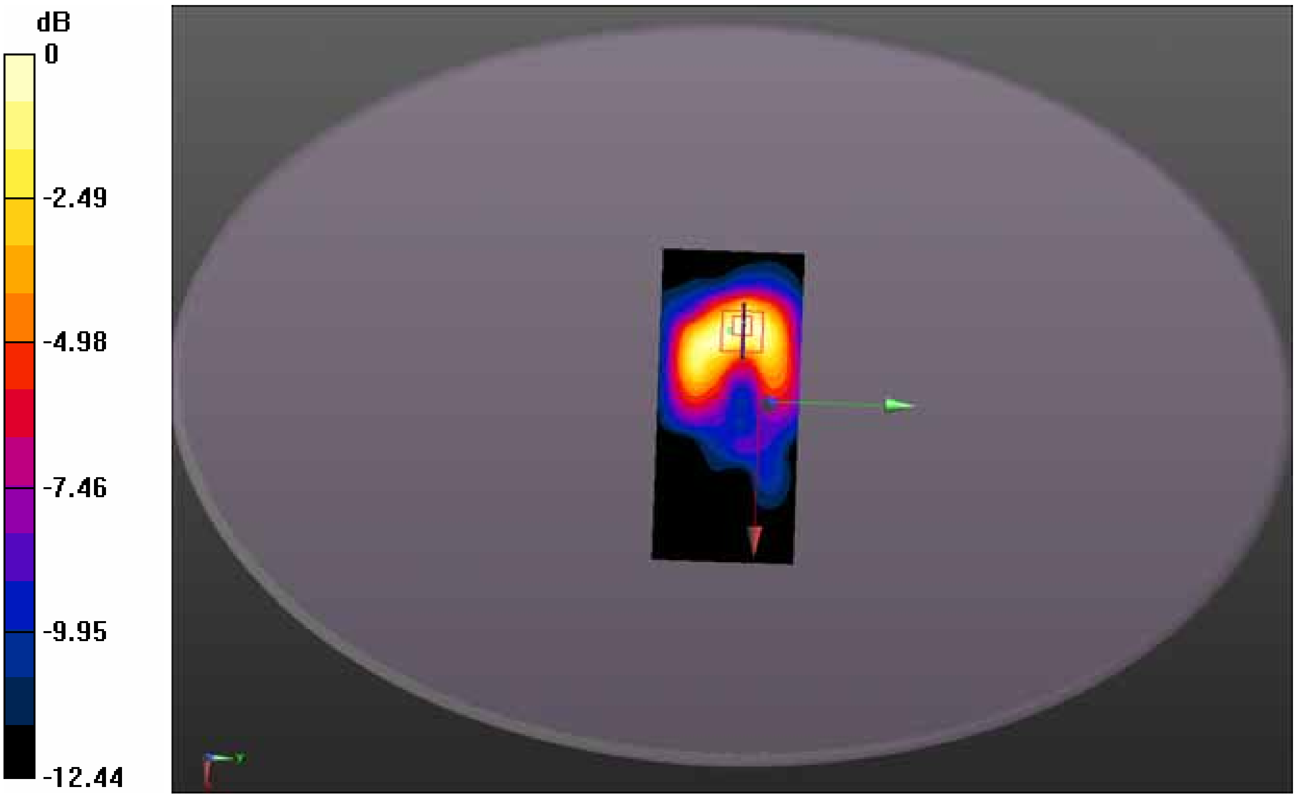
Date: 09/16/2011 Time: 15:40:15 AM

DUT: GoGear Connect, WiFi MP3 Player M/N: SA3CNT16K/37

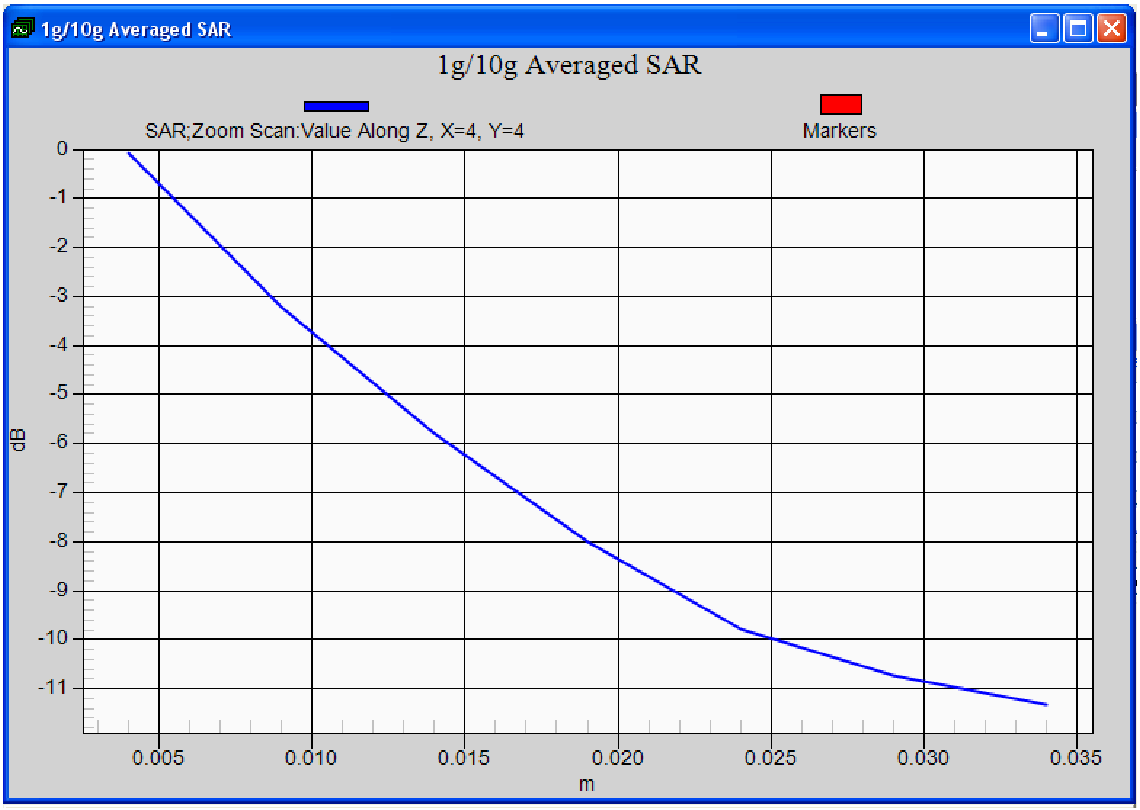
Communication System: IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz
Medium parameters used (interpolated): f = 2437 MHz; σ = 2.013 mho/m; ε_r = 50.739; ρ = 1000 kg/m^3; PAR: 0 dB; Crest factor: 1
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3139; ConvF(4, 4, 4); Calibrated: 23/03/2011
- Electronics: DAE4 Sn899; Calibrated: 18/03/2011
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: TP-1543
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Configuration/Body/Area Scan (111x51x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.277 mW/g
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.292 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.612 W/kg
SAR(1 g) = 0.270 mW/g; SAR(10 g) = 0.142 mW/g
Maximum value of SAR (measured) = 0.295 mW/g



0 dB = 0.300mW/g


1g/10g Averaged SAR
1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=4, Y=4
Markers
dB
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

ANNEX C: Calibration Certificate

Dipole Calibration Certificate:

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

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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
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.

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
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	38.7 ± 6 %	1.72 mho/m ± 6 %
Head TSL temperature during test	(21.3 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 mW / g
SAR normalized	normalized to 1W	52.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**53.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.12 mW / g
SAR normalized	normalized to 1W	24.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 mW /g ± 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	51.5 ± 6 %	1.92 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 mW / g
SAR normalized	normalized to 1W	51.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.86 mW / g
SAR normalized	normalized to 1W	23.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.4 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.6 Ω + 3.6 jΩ
Return Loss	- 25.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.3 Ω + 4.9 jΩ
Return Loss	- 26.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 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.
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	April 23, 2010

DASY5 Validation Report for Head TSL

Date/Time: 22.03.2011 14:07:14

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:862

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 2450 MHz; $\sigma = 1.72$ mho/m; $\varepsilon_r = 38.8$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

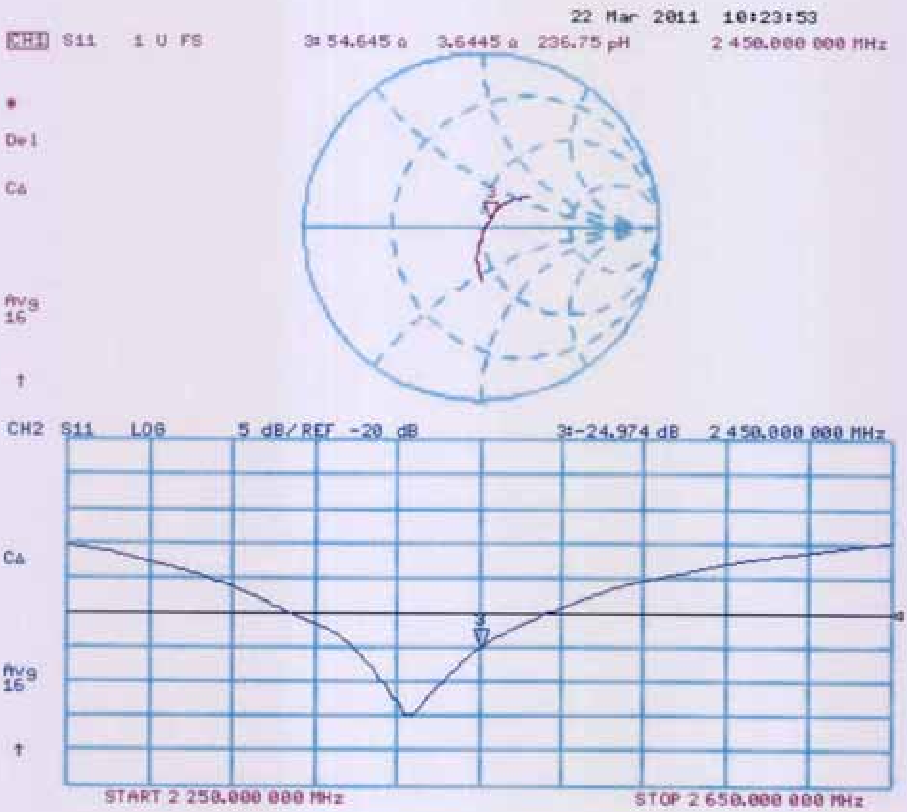
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.7 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 26.808 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.12 mW/g
Maximum value of SAR (measured) = 16.641 mW/g

0 dB = 16.640mW/g

Certificate No: D2450V2-862_Mar11 Page 6 of 9

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 21.03.2011 14:22:38

Test Laboratory: SPEAG, Zurich, Switzerland

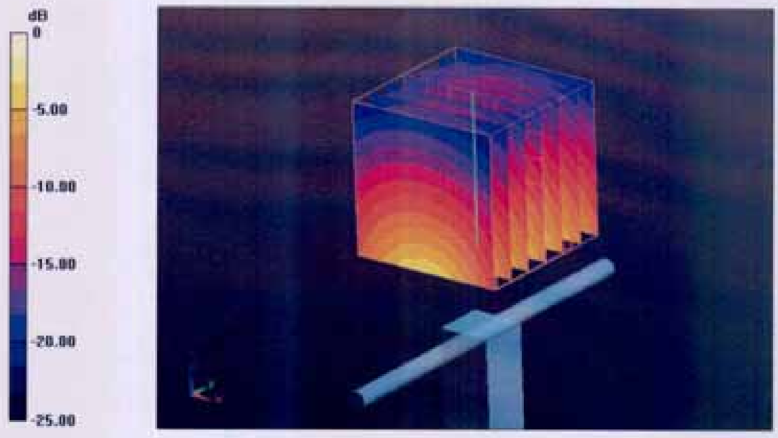
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:862

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.92 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

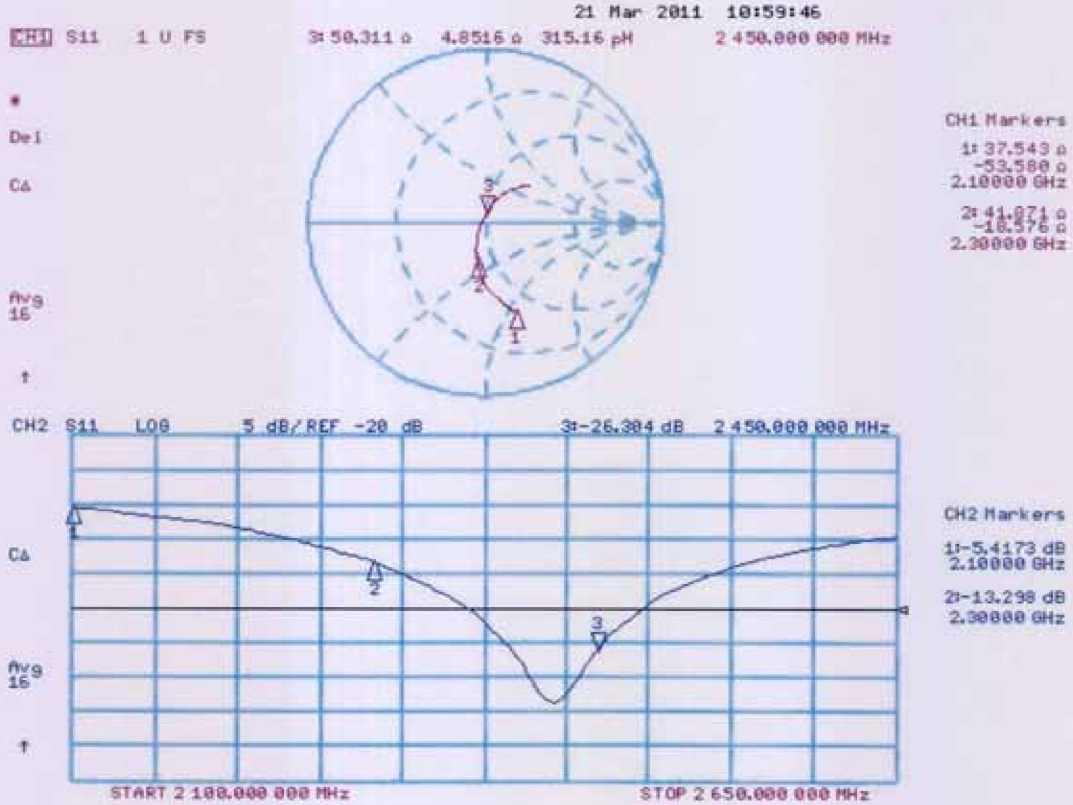
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.402 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 27.156 W/kg
SAR(1 g) = 12.8 mW/g; SAR(10 g) = 5.86 mW/g
Maximum value of SAR (measured) = 16.826 mW/g



0 dB = 16.830mW/g

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client **Audix (Auden)**

Certificate No: D2450V2-862_Mar11

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 862
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	March 22, 2011

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 23, 2011

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E-field Probes Calibration Certificate:

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Accreditation No.: SCS 108

Client **Audix (Auden)**

Certificate No: ES3-3139_Mar11

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3139
Calibration procedure(s)	QA CAL-01.v7, QA CAL-23.v4, QA CAL-25.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	March 23, 2011

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	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 25, 2011

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Certificate No: ES3-3139_Mar11 Page 1 of 11

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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* are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- *VR:* VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- *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 ES3DV3

SN:3139

Manufactured: February 12, 2007
Calibrated: March 23, 2011

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3139

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.31	1.35	1.38	± 10.1 %
DCP (mV)[B]	104.0	99.4	101.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	119.4	±2.5 %
			Y	0.00	0.00	1.00	114.8	
			Z	0.00	0.00	1.00	121.6	

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: ES3DV3 - SN:3139

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	5.87	5.87	5.87	0.99	1.09	± 12.0 %
900	41.5	0.97	5.79	5.79	5.79	0.99	1.10	± 12.0 %
1810	40.0	1.40	4.94	4.94	4.94	0.99	1.13	± 12.0 %
2000	40.0	1.40	4.85	4.85	4.85	0.99	1.11	± 12.0 %

[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: ES3DV3- SN:3139

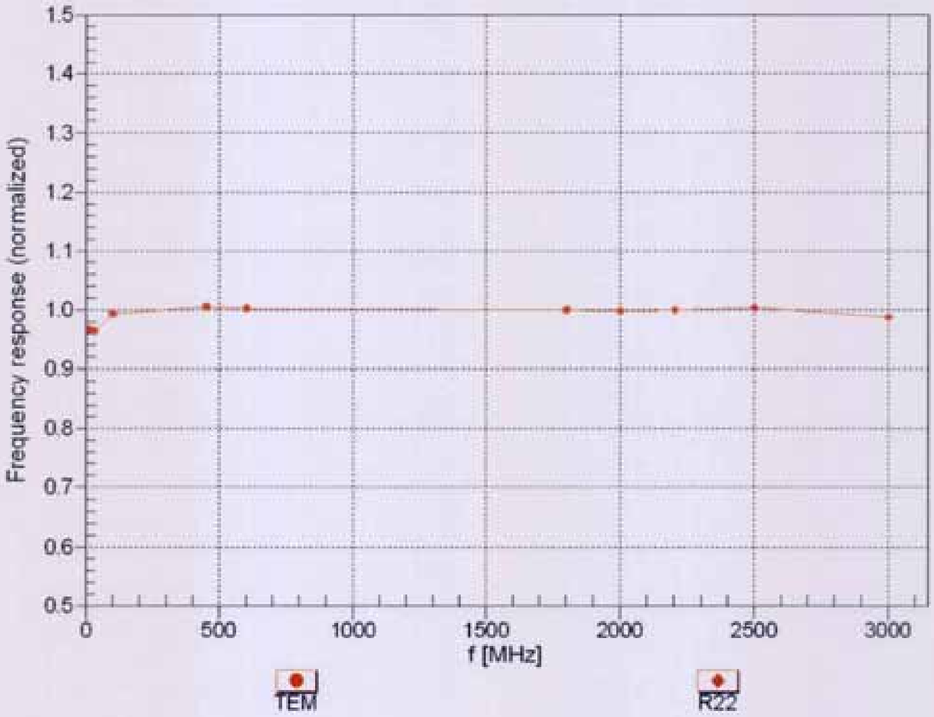
Calibration Parameter Determined in Body Tissue Simulating Media

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	5.83	5.83	5.83	0.99	1.17	± 12.0 %
900	55.0	1.05	5.76	5.76	5.76	0.99	1.15	± 12.0 %
1810	53.3	1.52	4.61	4.61	4.61	0.93	1.23	± 12.0 %
2000	53.3	1.52	4.45	4.45	4.45	0.80	1.28	± 12.0 %
2450	52.7	1.95	4.00	4.00	4.00	0.99	1.04	± 12.0 %

[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.

Frequency Response of E-Field

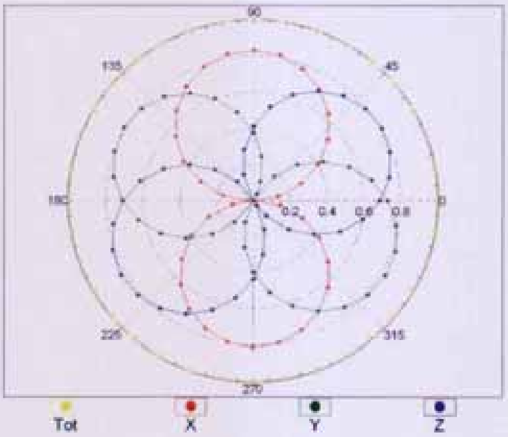
(TEM-Cell:ifi110 EXX, Waveguide: R22)



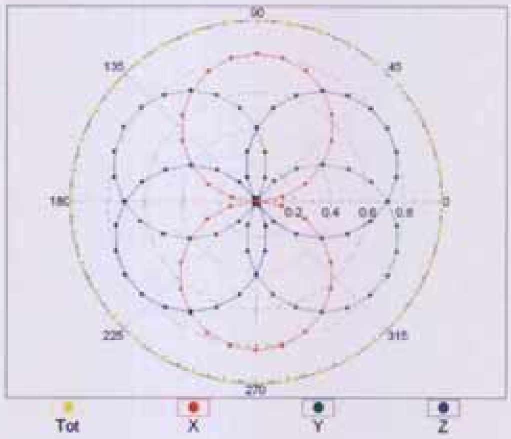
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

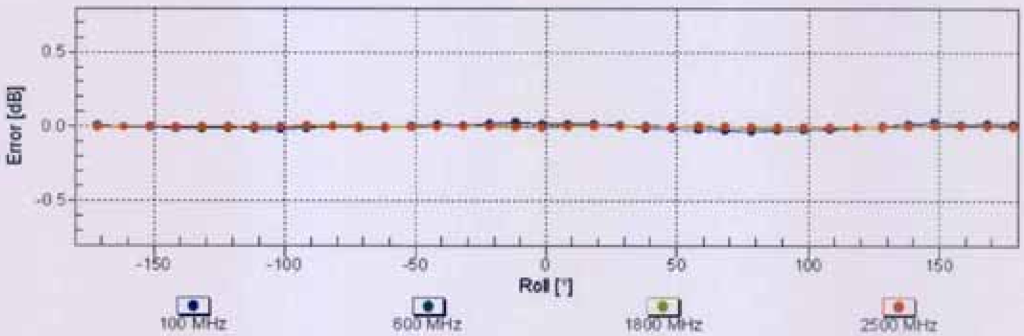
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

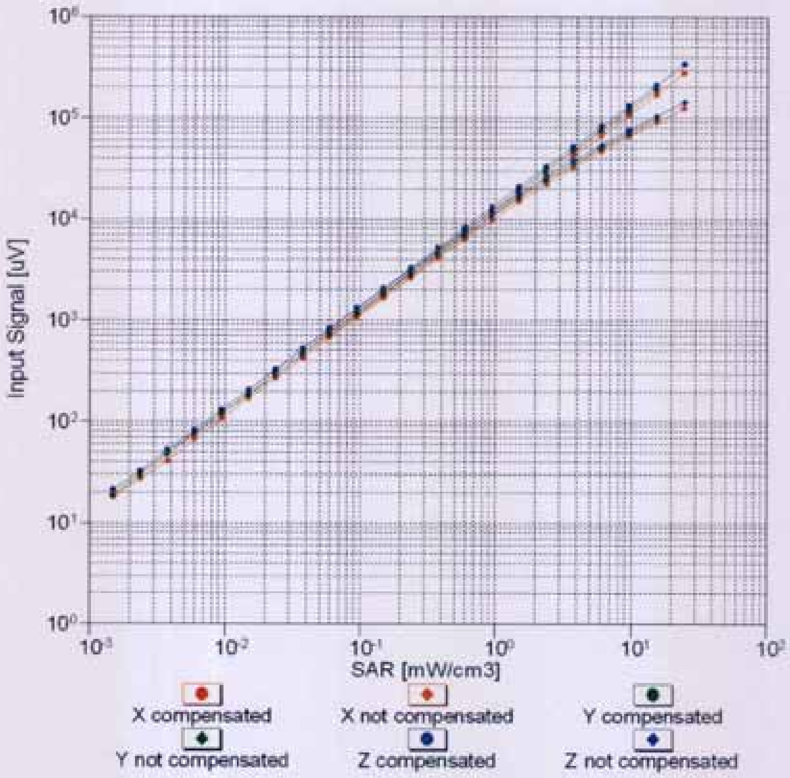


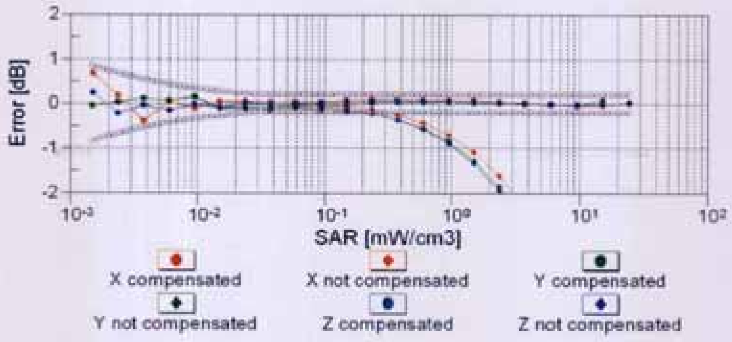


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f = 900 MHz)

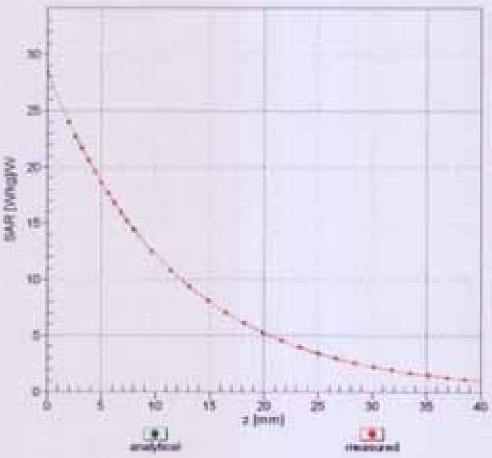




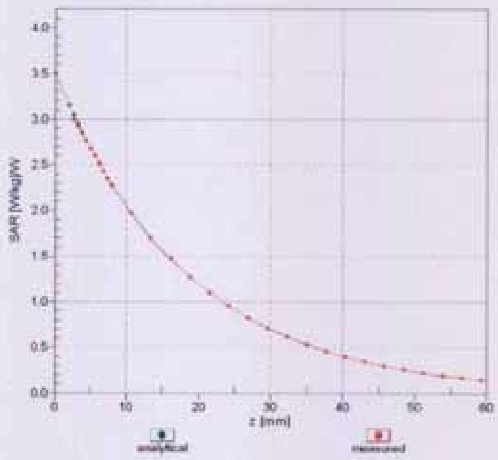
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 2000 MHz,WGLS R22 (H_convF)

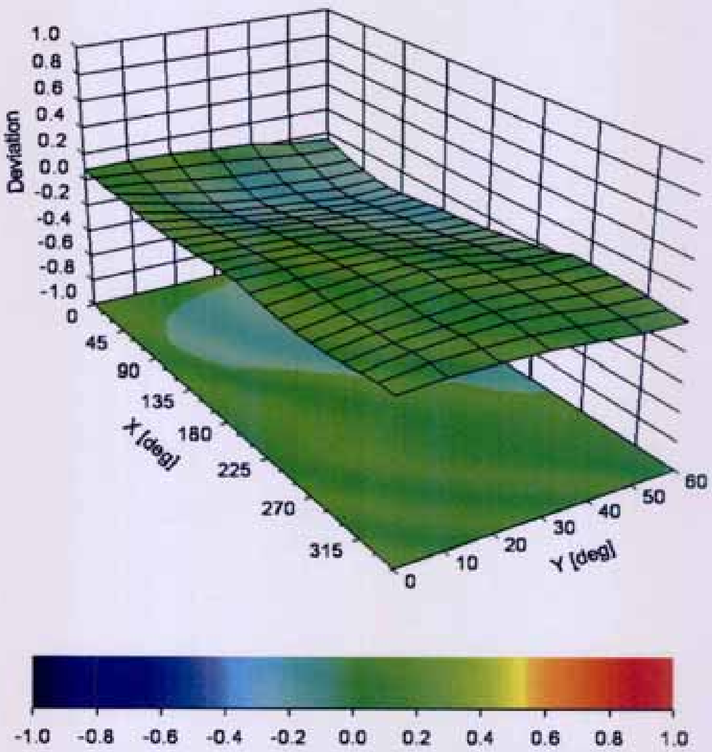


f = 900 MHz,WGLS R9 (M_convF)



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: ES3DV3 - SN:3139

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

DAE Calibration Certificate:

Schmid & Partner Engineering AG

s p e a g

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info@speag.com, http://www.speag.com

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.

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TN_BR040315AD DAE4.doc 11.12.2009

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Accreditation No.: SCS 108

Client **Audix (Auden)**

Certificate No: DAE4-899_Mar11

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 899
Calibration procedure(s)	QA CAL-06.v22 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	March 18, 2011

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	28-Sep-10 (No:10376)	Sep-11
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	07-Jun-10 (in house check)	In house check: Jun-11

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	[signature]
Approved by:	Fin Bomholt	R&D Director	i.V. [signature]

Issued: March 18, 2011

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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	402.471 ± 0.1% (k=2)	403.052 ± 0.1% (k=2)	403.039 ± 0.1% (k=2)
Low Range	3.98081 ± 0.7% (k=2)	3.95588 ± 0.7% (k=2)	3.98377 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	348.5 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200005.3	-3.18	-0.00
Channel X	+ Input	19999.58	0.28	0.00
Channel X	- Input	-19998.40	1.80	-0.01
Channel Y	+ Input	199993.2	-4.06	-0.00
Channel Y	+ Input	20000.38	0.08	0.00
Channel Y	- Input	-20001.20	-0.80	0.00
Channel Z	+ Input	199994.6	-1.77	-0.00
Channel Z	+ Input	19998.79	-1.71	-0.01
Channel Z	- Input	-20001.20	-1.00	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.3	0.36	0.02
Channel X	+ Input	199.90	-0.10	-0.05
Channel X	- Input	-200.05	-0.05	0.03
Channel Y	+ Input	2000.6	0.40	0.02
Channel Y	+ Input	198.61	-1.29	-0.65
Channel Y	- Input	-200.62	-0.62	0.31
Channel Z	+ Input	2000.2	0.07	0.00
Channel Z	+ Input	198.61	-1.29	-0.65
Channel Z	- Input	-200.71	-0.81	0.41

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	8.14	7.31
	- 200	-6.04	-7.82
Channel Y	200	12.77	13.21
	- 200	-14.98	-14.77
Channel Z	200	-7.28	-7.24
	- 200	5.94	5.68

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	-	4.08	-0.12
Channel Y	200	3.16	-	5.26
Channel Z	200	1.92	-0.07	-

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	16020	17047
Channel Y	15654	13539
Channel Z	15817	15639

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	-0.25	-1.34	1.03	0.47
Channel Y	-0.29	-0.95	0.53	0.36
Channel Z	-0.68	-1.67	0.05	0.36

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