



Variant FCC SAR Test Report

APPLICANT : Hewlett Packard Company
EQUIPMENT : HP iPAQ KB1
BRAND NAME : HP
MODEL NAME : HSTNH-P21C
FCC ID : B94HHP21C
STANDARD : FCC 47 CFR Part 2 (2.1093)
IEEE C95.1-1999
IEEE 1528-2003
FCC OET Bulletin 65 Supplement C (Edition 01-01)

This is a variant report which is only valid combined with the original report. The product was received on Aug. 10, 2009 and completely tested on Aug. 13, 2009. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Roy Wu / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) were found during testing for **Hewlett Packard Company HP iPAQ KB1 HP HSTNH-P21C**, which are as follows (with expanded uncertainty 21.8 % for 300 MHz to 3 GHz).

Band	Position	SAR_{1g} (W/kg)
WCDMA Band V	Head	0.706
	Body	0.625

They are in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1999, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement C (Edition 01-01).



2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No. : SAR01-HY

2.2 Applicant

Company Name	Hewlett Packard Company
Address	3000 Hanover Street, Palo Alto, CA 94304

2.3 Manufacturer

Company Name	Pegatron Corporation
Address	5F., No. 76, Ligong St., Beitou Dist., Taipei City 112, Taiwan (R.O.C.)

2.4 Application Details

Date of Receipt of Application	Aug. 10, 2009
Date of Start during the Test	Aug. 12, 2009
Date of End during the Test	Aug. 13, 2009



3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type	HP iPAQ KB1
Brand Name	HP
Model Name	HSTNH-P21C
FCC ID	B94HHP21C
Tx Frequency	GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz WCDMA Band V : 824 MHz ~ 849 MHz WCDMA Band II : 1850 MHz ~ 1910 MHz
Rx Frequency	GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz WCDMA Band V : 869 MHz ~ 894 MHz WCDMA Band II : 1930 MHz ~ 1990 MHz
Maximum Output Power to Antenna	WCDMA Band V : 23.85 dBm
Antenna Type	Fixed Internal Antenna
HW Version	DVT2
SW Version	Obsidian_0.30.88.03
Type of Modulation	GSM / GPRS : GMSK EDGE : 8PSK WCDMA : QPSK HSDPA : QPSK / 16QAM
DUT Stage	Identical Prototype

List of Accessory:

Specification of Accessory		
AC Adapter 1	Manufacturer	Flextronics
	Brand Name	HP
	Part Number	538745-001
	Power Rating	I/P:100-240Vac, 50-60Hz, 200mA; O/P: 5Vdc, 1A
AC Adapter 2	Manufacturer	Phihong
	Brand Name	HP
	Model Name	PSAA05A-050 (for US) PSAA05N-050 (for Argentina)
	Power Rating	I/P:100-240Vac, 50-60Hz, 200mA; O/P: 5Vdc, 1A
	AC Power Cord Type	1.8 meter shielded cable without ferrite core
Battery 1	Brand Name	HP
	Model Name	HSTNH-T21C-H
	Power Rating	3.7Vdc, 11.3Wh
	Type	Li-ion
Battery 2	Brand Name	HP
	Model Name	HSTNH-T21C-S
	Power Rating	3.7Vdc, 5.7Wh
	Type	Li-ion
Earphone	Brand Name	foster
	Model Name	492854
	Signal Line Type	1.3 meter non-shielded cable without ferrite core
USB Cable	Brand Name	Foxconn
	Model Name	486113-001
	Signal Line Type	1.2 meter shielded cable without ferrite core
LCD Panel	Brand Name	Samsung Mobile Display
	Model Name	AMS250CU01

Remark:

1. The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. PSAA05A-050 and PSAA05N-050 have the same circuit design. The difference between these models is plug, only PSAA05A-050 (for US) was used for the test.

3.2 Product Photos

Please refer to Appendix D.



3.3 Applied Standards

The Specific Absorption Rate (SAR) testing specification, method and procedure for this HP iPAQ KB1 is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- IEEE C95.1-1999
- IEEE 1528-2003
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- FCC KDB 648474 D01 v01r05
- FCC KDB 941225 D01 v02

3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

3.5 Test Conditions

3.5.1 Ambient Condition

Ambient Temperature	20 to 24 °C
Humidity	< 60 %

3.5.2 Test Configuration

The device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

For WWAN SAR testing, the DUT is in WCDMA link mode and its crest factor is 1.

4. Specific Absorption Rate (SAR)

4.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

4.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$\text{SAR} = C \left(\frac{\delta T}{\delta t} \right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

5. SAR Measurement System

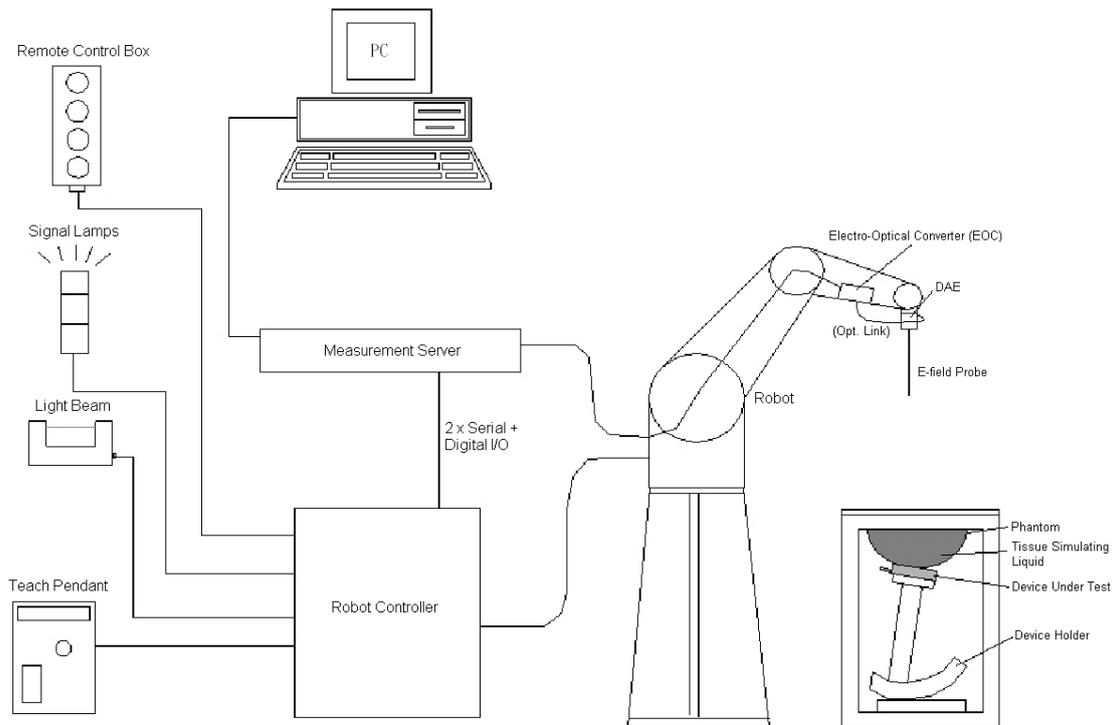


Fig 5.1 SPEAG DASY4 or DASY5 System Configurations

The DASY4 or DASY5 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (ECO) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY4 or DASY5 software
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Some of the components are described in details in the following sub-sections.

5.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG). The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

5.1.1 E-Field Probe Specification

<ET3DV6>

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 μ W/g to 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm



Fig 5.2 Photo of ET3DV6

<EX3DV3 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm



Fig 5.3 Photo of EX3DV3

5.1.2 E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

5.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) 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 input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Fig 5.4 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



Fig 5.5 Photo of DASY4



Fig 5.6 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128 MB), RAM (DASY4: 64 MB, DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.



Fig 5.7 Photo of Server for DASY4



Fig 5.8 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	 <p>Fig 5.9 Photo of SAM Phantom</p>
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI4 Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	 <p>Fig 5.10 Photo of ELI4 Phantom</p>
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI4 phantom is intended 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 standard and all known tissue simulating liquids.

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

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

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

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



Fig 5.11 Device Holder

<Laptop Extension Kit>

The extension is lightweight 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 SAM Twin and ELI phantoms.

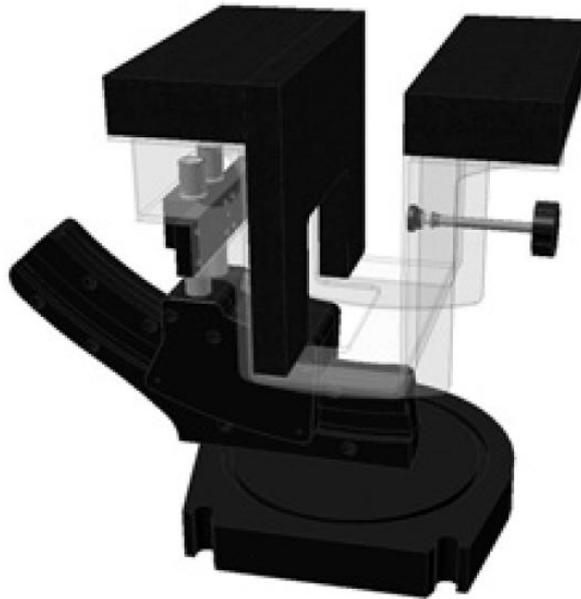


Fig 5.12 **Laptop Extension Kit**



5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing 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 erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

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

5.7.2 Data Evaluation

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

Probe parameters :	- Sensitivity	Norm _i , a ₁₀ , a ₁₁ , a ₁₂
	- 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 they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

The formula for each channel can be given as :

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

with V_i = compensated signal of channel i, (i = x, y, z)
 U_i = input signal of channel i, (i = x, y, z)
 cf = crest factor of exciting field (DASY parameter)
 dcp_i = diode compression point (DASY parameter)

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

$$\text{E-field Probes : } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

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

with V_i = compensated signal of channel i, (i = x, y, z)
 Norm_i = sensor sensitivity of channel i, (i = x, y, z), $\mu\text{V}/(\text{V/m})^2$ for E-field Probes
 ConvF = sensitivity enhancement in solution
 a_{ij} = sensor sensitivity factors for H-field probes
 f = carrier frequency [GHz]
 E_i = electric field strength of channel i in V/m
 H_i = magnetic field strength of channel i in A/m

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

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

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

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

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 set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.



5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Filed Probe	ET3DV6	1787	May 26, 2009	May 25, 2010
SPEAG	Dosimetric E-Filed Probe	ET3DV6	1788	Sep. 23, 2008	Sep. 22, 2009
SPEAG	Dosimetric E-Filed Probe	EX3DV3	3514	Jan. 21, 2009	Jan. 20, 2010
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 17, 2008	Mar. 16, 2010
SPEAG	900MHz System Validation Kit	D900V2	190	Jul. 21, 2009	Jul. 20, 2011
SPEAG	1800MHz System Validation Kit	D1800V2	2d076	Jul. 20, 2009	Jul. 19, 2011
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Mar. 28, 2008	Mar. 27, 2010
SPEAG	2000MHz System Validation Kit	D2000V2	1010	Sep. 17, 2008	Sep. 16, 2010
SPEAG	2300MHz System Validation Kit	D2300V2	1006	Sep. 12, 2007	Sep. 11, 2009
SPEAG	2450MHz System Validation Kit	D2450V2	736	Jul. 20, 2009	Jul. 19, 2011
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Sep. 12, 2007	Sep. 11, 2009
SPEAG	3500MHz System Validation Kit	D3500V2	1014	Sep. 19, 2007	Sep. 18, 2009
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Jan. 24, 2008	Jan. 23, 2010
SPEAG	Data Acquisition Electronics	DAE3	577	Nov. 12, 2008	Nov. 11, 2009
SPEAG	Data Acquisition Electronics	DAE4	778	Sep. 22, 2008	Sep. 21, 2009
SPEAG	Data Acquisition Electronics	DAE4	679	Jun. 23, 2009	Jun. 22, 2010
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1303	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1383	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1446	NCR	NCR
SPEAG	SAM Phantom	QD 000 P40 C	TP-1477	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 001 BB	1026	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 001 BA	1029	NCR	NCR
Agilent	PNA Series Network Analyzer	E8358A	US40260131	Apr. 17, 2009	Apr. 16, 2010
Agilent	Wireless Communication Test Set	E5515C	MY48360820	Dec. 15, 2008	Dec. 14, 2009
R&S	Universal Radio Communication Tester	CMU200	105934	Nov. 11, 2008	Nov. 10, 2009
Agilent	Dielectric Probe Kit	85070D	US01440205	NCR	NCR
Agilent	Dual Directional Coupler	778D	50422	NCR	NCR
AR	Power Amplifier	5S1G4M2	0328767	NCR	NCR
R&S	Power Meter	NRVD	101394	Oct. 20, 2008	Oct. 19, 2009
R&S	Power Sensor	NRV-Z1	100130	Oct. 20, 2008	Oct. 19, 2009
R&S	Spectrum Analyzer	FSP7	101131	Mar. 12, 2009	Mar. 11, 2010

Table 5.1 Test Equipment List

Note: The calibration certificate of DASY can be referred to appendix C of this report.

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.2.

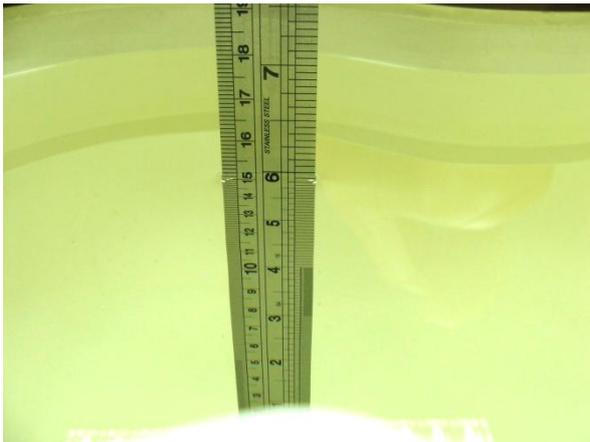


Fig 6.1 Photo of Liquid Height for Head SAR



Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Head								
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

Table 6.1 Recipes of Tissue Simulating Liquid



The following table gives the targets for tissue simulating liquid.

Frequency (MHz)	Liquid Type	Conductivity (σ)	$\pm 5\%$ Range	Permittivity (ϵ_r)	$\pm 5\%$ Range
835	Head	0.90	0.86 ~ 0.95	41.5	39.4 ~ 43.6
900	Head	0.97	0.92 ~ 1.02	41.5	39.4 ~ 43.6
1800, 1900, 2000	Head	1.40	1.33 ~ 1.47	40.0	38.0 ~ 42.0
2450	Head	1.80	1.71 ~ 1.89	39.2	37.2 ~ 41.2
835	Body	0.97	0.92 ~ 1.02	55.2	52.4 ~ 58.0
900	Body	1.05	1.00 ~ 1.10	55.0	52.3 ~ 57.8
1800, 1900, 2000	Body	1.52	1.44 ~ 1.60	53.3	50.6 ~ 56.0
2450	Body	1.95	1.85 ~ 2.05	52.7	50.1 ~ 55.3

Table 6.2 Targets of Tissue Simulating Liquid

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Liquid Type	Temperature ($^{\circ}\text{C}$)	Conductivity (σ)	Permittivity (ϵ_r)	Measurement Date
835	Head	21.6	0.9	40	Aug. 13, 2009
835	Body	21.3	0.979	52.7	Aug. 13, 2009

Table 6.3 Measuring Results for Simulating Liquid

7. Uncertainty Assessment

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience and knowledge of the behavior and properties of relevant materials and instruments, manufacture’s specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 7.1

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor ^(a)	1/k ^(b)	1/√3	1/√6	1/√2

- (a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity
- (b) κ is the coverage factor

Table 7.1 Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual “root-sum-squares” (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is showed in Table 7.2.



Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)
Measurement System					
Probe Calibration	5.9	Normal	1	1	± 5.9 %
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	± 0.6 %
Linearity	4.7	Rectangular	√3	1	± 2.7 %
System Detection Limits	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 %
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	± 0.2 %
Probe Positioning	2.9	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 %
Device Holder	3.6	Normal	1	1	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	± 2.9 %
Phantom and Setup					
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	Normal	1	0.64	± 1.6 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	± 1.5 %
Combined Standard Uncertainty					± 10.9 %
Coverage Factor for 95 %					K = 2
Expanded Uncertainty					± 21.8 %

Table 7.2 Uncertainty Budget of DASY for frequency range 300 MHz to 3 GHz

8. SAR Measurement Evaluation

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

8.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

8.2 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

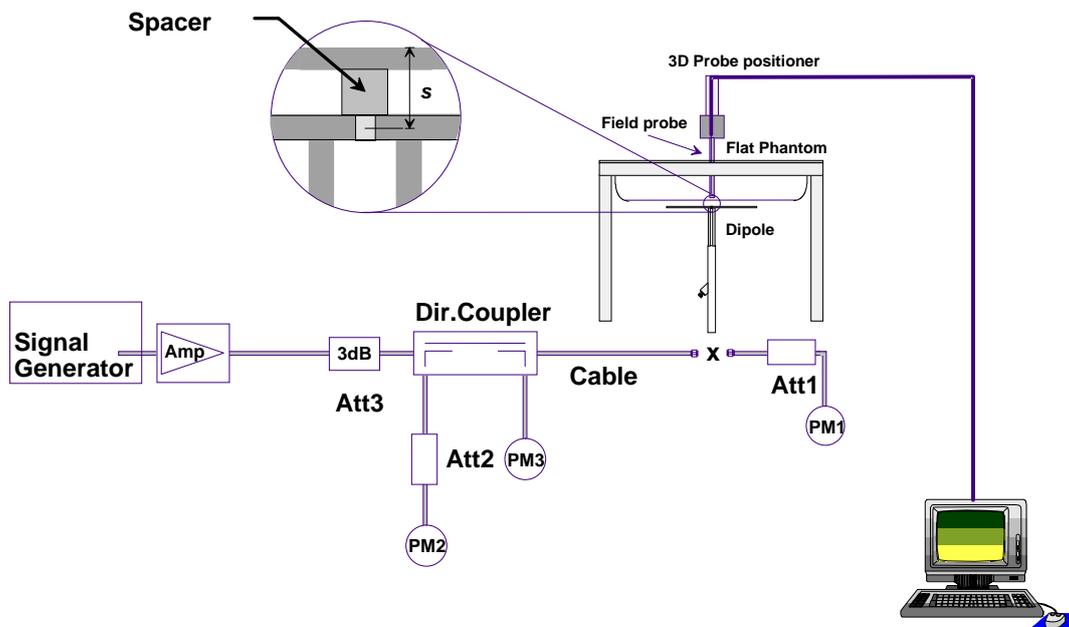


Fig 8.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

The output power on dipole port must be calibrated to 20 dBm (100 mW) before dipole is connected.

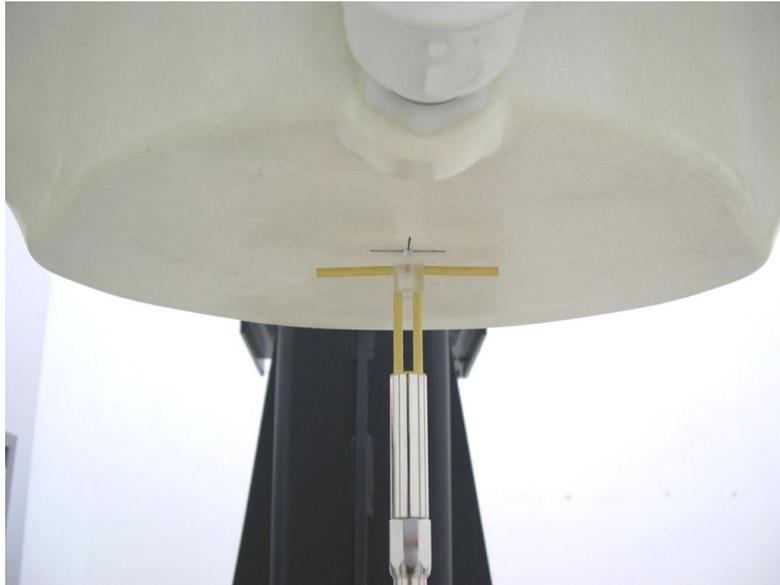


Fig 8.2 Photo of Dipole Setup

8.3 Validation Results

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Table 8.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to appendix A of this report.

Measurement Date	Frequency (MHz)	Targeted SAR _{1g} (W/kg)	Measured SAR _{1g} (W/kg)	Deviation (%)
Aug. 13, 2009	835	9.52	9.61	0.95

Table 8.1 Target and Measurement SAR after Normalized

9. DUT Testing Position

This DUT was tested in two different positions. They are left cheek and bottom of the DUT with phantom 1.5 cm gap as illustrated below:

1. Define two imaginary lines on the handset

- (a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.
- (b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
- (c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

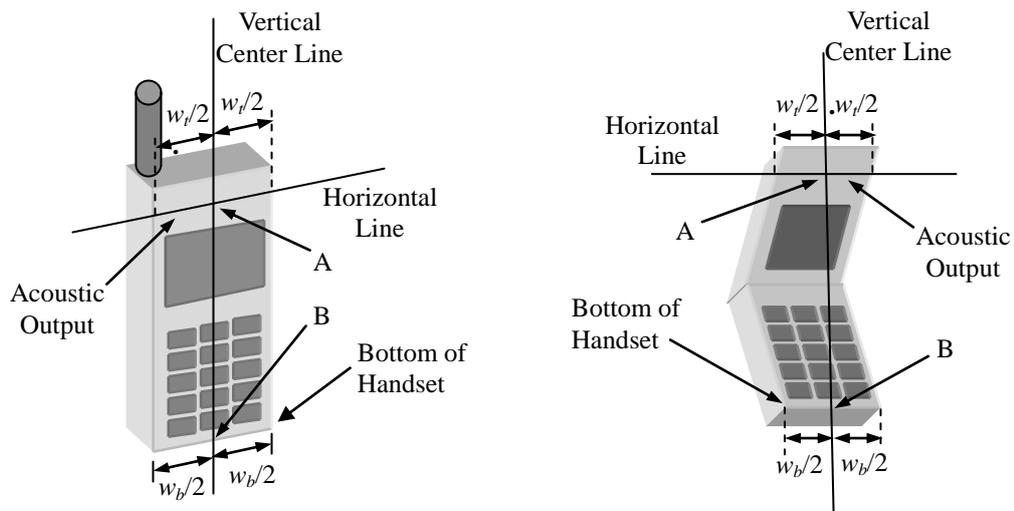


Fig 9.1 Illustration for Handset Vertical and Horizontal Reference Lines

2. Cheek Position

- (a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- (b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig. 9.2).

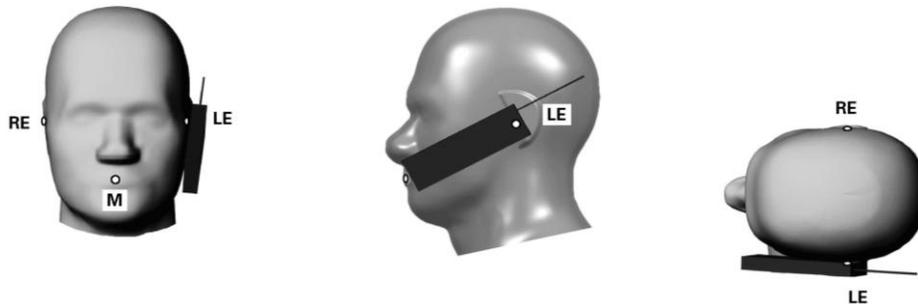


Fig 9.2 Illustration for Cheek Position

3. Body Worn Position

- (a) To position the device parallel to the phantom surface with keypad down.
- (b) To adjust the device parallel to the flat phantom.
- (c) To adjust the distance between the device surface and the flat phantom to 1.5 cm.

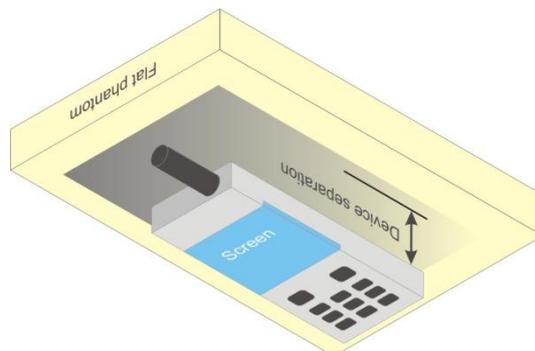


Fig 9.3 Illustration for Body Worn Position



4. DUT Setup Photos

Please refer to Appendix E for the test setup photos.



10. Measurement Procedures

The measurement procedures are as follows:

- (a) For WWAN function, link DUT with base station emulator in worst channel
- (b) Set base station emulator to allow DUT to radiate maximum output power
- (c) Measure output power through RF cable and power meter
- (d) Place the DUT in the positions described in the last section
- (e) Set scan area, grid size and other setting on the DASY software
- (f) Taking data for the worst channel

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

10.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g



10.2 Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

10.3 SAR Averaged Methods

In DASy, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

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. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.



11. SAR Test Results

11.1 Conducted Power (Unit: dBm)

Band	WCDMA Band V		
Channel	4132	4132	4132
Frequency (MHz)	826.4	826.4	826.4
RMC 12.2K	23.75	23.85	23.57

11.2 Test Records for Head SAR Test

Plot No.	Band	Mode	Test Position	Channel	Battery	SAR _{1g} (W/kg)
#02	WCDMA Band V	RMC12.2K	Left Cheek	4233	2	0.706

11.3 Test Records for Body SAR Test

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Battery	SAR _{1g} (W/kg)
#01	WCDMA Band V	RMC12.2K	Bottom	1.5	4233	2	0.625

Test Engineer : Tang Liu



12. References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] IEEE Std. C95.1-1999, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", 1999
- [3] IEEE Std. 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- [4] FCC OET Bulletin 65 (Edition 97-01) Supplement C (Edition 01-01), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", June 2001
- [5] SPEAG DASY System Handbook
- [6] FCC KDB 248227 D01 v01r02, "SAR Measurement Procedures for 802.11 a/b/g Transmitters", May 2007
- [7] FCC KDB 447498 D01 v03r03, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", January 2009
- [8] FCC KDB 447498 D02 v01, "SAR Measurement Procedures for USB Dongle Transmitters", December 2008
- [9] FCC KDB 616217 D01 v01, "SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens", December 2007
- [10] FCC KDB 648474 D01 v01r05, "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas", September 2008
- [11] FCC KDB 941225 D01 v02, "SAR Measurement Procedures for 3G Devices – CDMA 2000 / Ev-Do / WCDMA / HSDPA / HSPA", October 2007
- [12] FCC KDB 941225 D03 v01, "Recommended SAR Test Reduction Procedures for GSM / GPRS / EDGE", December 2008



Appendix A. Plots of System Performance Check

The plots are shown as follows.



Appendix B. Plots of SAR Measurement

The plots are shown as follows.



Appendix C. DASYS Calibration Certificate

The DASYS calibration certificates are shown as follows.



Appendix G. Hardware Release Notes

Hardware Release Notes

Hewlett Packard

Codename: Obsidian

EVT2 to DVT2 build

<July 20, 2009>

Note: This Hardware Release Note Template is not providing a mandatory format for release notes. Vendors are free to use whatever format they fill is suitable for their release notes. However, in any case all the information requested in this document shall appear as well in the vendor's release notes.

1. Purpose

The purpose of this document is to outline the HW changes from EVT2 to DVT2. It includes the reason for change and solution implemented in each phase of development build phase.

2. Electrical Changes from EVT2 to DVT2

Electrical Changes
For Halogen-free request 1. Change CON1401, CON1901, D1401, D2004, D801, D802, D2001, D2003, D2005, D2101, U1802 and U1803 to Halogen-free component.
To improve the Headset mode sending Distortion 1. Change C708 to NM (no mount).
To improve the Headset mode sending Distortion 1. Change C1838 from 0.1uF/6.3V(0201) to 0 ohm 2. Change R1834 from 0 ohm(0201) to 0.1uF/6.3V(0201) 3. Change C1839 from NM to 0 ohm(0201) 4. Change R1826 from 0 ohm(0201) to NM 5. Change C1842 from 0 ohm(0201) to 0.1uF/6.3V(0201)
To improve the luminance of EL lamp 1. Change R2043 to 150ohm
To improve the RF D-sense performance. 1. Change the L1401 from BLM15BA100SN1D to BLM15BA220SN1D 2. Change RP1401 to 0201 10K Ohm (R1412/R1414/R1415/R1419) 3. Add 0402 0 Ohm(R1421~R1425) at SD IF
To fix the LCM Flicker issue 1. Change the C1628/C1629/C1630 from 0603 4.7uF to 0805 10uF 2. Change the C1610/C1612 from 0402 1uF to 0603 4.7uF 3. Change the L1601/L1603 from 6.8uH to 4.7uH
To ensure the working stability of U1803 1. Add R1817 to ensure the voltage level of GPIO85.
To find tune the saturation point of light sensor 1. Change R1404 from 1M to 300K
To improve the efficiency of status LED 1. Change R2005 to 300Ohm, R2026 to 120Ohm
To ensure the USB_VBUS don't damage capacitor 1. Change C802 from 0402/6.3V to 0603/10V
Can differentiate the HW version between EVT2 and DVT2 1. Change R1003 to 845K



RF

No store for WALSIN 0 ohm Jumper

1. Change R1505 and R1514 from WALSIN/WR04X000PTL to TA-I/RM04JTN0
(DVT1 0ohms-> DNT2 0 ohms)

Modified WCMA BC1 current consumption

1. Change C2715 => MURATA/LQW15AN10NH00
(DVT1 N.M.-> DNT2 10nH)
2. Change C2712 => 1A20-01PC600
(DVT1 33pF -> DNT2 3.6pF)

Modified WCMA BC5 current consumption

1. Change C2810 => MURATA/LQW15AN5N6C10D
(DVT1 8.2nH -> DNT2 5.6nH)
2. Change C2806 => 11G23207R074360 MLCC TAIYO/UMK105CH070DW-F
(DVT1 10pF -> DNT2 7pF)



Obsidian_SW_Release_Notice_V0 30 75 03P

Enable feature FEATURE_MMGSDDI_MCC_VERIFICATION again, this feature will automatically detect and sets NV_GPRS_ANITE_GCF_I (947) to 1 for a "Test SIM" and 0 for a commercial SIM. Some NV items' setting will be ignored if a Test SIM is inserted, hard code will be used, like scan time
Report 0x380 to FTM application if NV_BAND_PREF_I is 0x180, to fix FTM Radio Access Technology and Band Selection display blank issue

Obsidian_SW_Release_Notice_V0.21.59.03

[OB864]
1. Revert luxiao's change in sdmemory driver.
2. Try to fix the issue caused by SD initialization issue when resuming from suspend.
[TD864] don't register sdbus driver as power-managed devices
[SAP]ObsidianTD2458. Recommit SAP pin issue.
1. When TAI get PinstatusCb() from modem, it will change the phone ready state immediately.
2. In sap profile, when SAP disconnect, delay 5s and then open the phone.
Change FOTA server time out registry key setting from default 7 Days to 1 Hour
[USSD] Obsidian TD1647. Add code to parse an USSD cause value and translate to unsupported command.
[OB1139]UIM_USIM_MBDN is not read and go into default, so that SendRefreshCompleted(TRUE) not called
[Wifi] fix Obsidian TD 2172: WI-FI connecton is turned off after turning off power and then on in Phone and BT connection off state.
Enable USB2PC
[OB2470]Fix the issue that BT icon will disapeared when WiFi button is pressed.
[AT&T UE]Add some png files for some folder
show nothing on shudown aniscreen title bar
[ModemLink]Fixed Macro ATT_SPECIFIC define issue.
Disable VCP for charging timeout function.
Fix sometimes the touch will lose function issue after the call in very tricky condition.(20090610)
Rootcause: the GPIOIst thread and Sensor service is not sync during the phone call state change
revert Group tag index fix for SIM Manager according to the disscussion with BLStream. Now group tag index will start from 1
remove EF_GAS/EF_AAS checking before reading/writing group/ANR tag
fix a memory leak issue
TD1318,2126 - Possible workaround for Aircomm testing where CMU unable to read 1900 power class of the device.
[Application] BLStream Update 6/10's drop
disable Adaptxt
[Westtek]Update to 5.3.1142
remove adaptxt from CTO, otherwise the CTO would not be installed successful.

Obsidian_SW_Release_Notice_V0.21.60.03

HP_IzbLimit NITZ handler under CM_SS_EVENT_SRV_CHANGED evnet condition
[AMSS][Phonebook]Fix TD1823- Error Handler of SIM Reading
[audio][TD1772]Remove some video type file from ringtone support list.
[HP Theme]Update to 1.3.0.11
[FLO DRM]Add FLO DRM for AT&T
[ObTD#1844]Clean boot will reset RTC to 2009/01/01 12:00PM
[OB2695]: Disable auto-close-camera-when-inactive function to avoid OB2695 issue.



[LockScreen]Add this cab for test
[SAP] Revert commit 3733. Need further study.
close media player when shut down
[OB2326][New Fn Feature] Support FN key for multi key press function. Fix TD#2326 (0615)
[HP Theme]Currently we need add this jpg because it seems Theme monitor dll is not workable.
[OB2126] - Removing workaround and adding actual fix for PowerClass 1900 bug in Aircomm testing. Qualcomm has accepted HP solution and they will release it later date.

Obsidian_SW_Release_Notice_V0.21.63.03

FTM - Fixing up Obsidian TD 2311 and 2165 to display GSM 2/3 screen and Call drop list.
[AT&T]Update AT&T Music icon and IM icon
Update code base to Qualcomm SBA526005
But I did not include NV and RIL/TAI related code change in SBA526005, the reason is there is a big change in NV and RIL/TAI, most of fix in RIL/TAI is double fix with our code base and there is no any open bugs in our database related to those changes so far.
This merge will not impact the check in of r3909, r3910, r3913, r3916 of main trunk
We will review the remaining changes and update code later to align with Qualcomm code base for any of potential risk and next merge.
revert Qualcomm SBA526005 BT registry change to previously version, because driver engineer told me the change is useless and will have big side effect. We will continue to check with Qualcomm
[APPS]Update HP_DataConnect_XML_v1.75ppc_IPAQ.
According to Marketing requirements, change all occurrences of "Mobile Phone" in network connection names to "iPAQ"
[NV] Change comments only
Remove the USB Mass Storage support from platforms
Change the device string from "HP iPAQ USB Device" to "HP iPAQ USB".

Obsidian_SW_Release_Notice_V0.21.65.03

[MusicID2]Update to 1.1.0.0 version
[AT&T Update]Add AT&T Update application
[Pocket Express]Update to 4.70.32 LR
[audio]add headset irq as wakeup source
update memory layout. this change has been verified in both retail build and ship build.
[OB2430, OB2448, OB 2837] Fix display issue.
merge ril devel branch, update to 5.2.6005
[OB2246][SR00166171]1.time.c: add some debug message for tracing the time information when issue happens.
2.time_tod.c: add a potential fix for time
[OB 2710]Add space after "Master reset done.", change "software" to "softwares" and change "Click Start" to "Click Start" in CustEngnScr1_0409.html.
[Modem Link]Change device name to HP iPAQ USB Modem
[Application]Update to BLStream 6/22 drop.
[APPS]Update SJWC_201106_20090622_OBS
[Java] Modify Java UAProfile
[FLO DRM]Merge Sly registry to obsidian for some related issues
show complete aniscreen



[OB1831] Make a workaround for [Defect #512 - GSM-BTR-1-1830] TU fails to receive Push SI message with blank fields.
Correct POP3 port to 110
[OB2469]: DUT would auto reboot when suspend/resume repeatedly.
[Java] Change default connection profile name to "iPAQ WAP" first, before Stephan release new xml drop; in future, Stephan will set corresponding value in xml files
Fix an error, the range of bank3 should be 69-94
[RIL] Increase Packet count function's performance
[APPS]Update Arcsoft MMS_Dshow_Camera_Streaming Player
Change transport type from 1 (IMAP4) to 0 (POP3) for earthlink and BellSouth by ATT specification
Obsidian_SW_Release_Notice_V0.21.67.03
TD 2811 - Added missing case for Registration Denied during PIN1 locking.
[AT&T Update]Update to 1.0.0.2
merge code for DVT HW
[Lockscreen]Remove Lockscreen.cab
[BT][OPP/FTP] fix Obsidian TD1790 [Defect #488 - GSM-BTR-1-1992] Bluetooth: when a BT transaction such as OPP or FTP, there is no user confirmation present
root cause: MSFT UI don't match the requirement.
fix: make a shadow to add a confirm UI.
[BT][OPP/FTP] fix message error
[AT&T UE]1,Modify the name of the folder from "Microsoft Service" to "Microsoft Services"; 2,Remove the Microsoft My phone cpl from the setting directory
revert SD driver to to r3183
merge change for Obsidian DVT build
[jIM Plug in]Update the jIM plug from Chris to solve Camera LTK rotation issue
[Modem] Workaround to avoid "can't attach to EDGE" issue because MMR_CELL_SERVICE_IND event is lost, and mm_serving_plmn.egprs_supported is not set to 0
Bug fixed for the GPIO key function abnormal
FN/SHIFT/SYM key not work after resume device
SEND/END key could not wake up device.
Copied the MS sample code for USB Mass storage class function driver and modified for our use.
1. Added a thread to call SystemIdleTimerReset every 30 seconds, if the USB Mass Storage Class driver is in use and the USB cable is connected. So when USB Mass Storage is being used by PC user, the device will not suspend.
2. Allow the device to show up in PC side even when there is no SD card in the slot. However, on PC side, it will prompt you to insert card if you try to open that device.
[jIM]Add CIRType registry to TD2830
[Application]Update to BLStream's 6/24 drop
[User Agent] Change User Agent "HP-KB1" to "HP_KB1" based on Bryan's confirm
[BT][OPP/FTP]set the confirm UI timeout from 5s to 10s
[AT&T UE]1, Change the MusicID from binary to stub; 2, Change the name of link file: "JETCET PRINT.Ink" to "Jet Cet Print.Ink", "MusicID 2.Ink" to "Music ID.Ink".
[Battery]Revert 3895 commit, enable charging over temperature notification



[OB2895]Fix the TD 2895
[HP Theme]Update HP Theme to 1.3.0.12
speedup anisreen when startup
[AT&T UE]Change the "ShopApplication.Ink" to "Shop Applications.Ink"
[AT&T Certificate]Follow the document 13340_36.pdf to add certificates for AT&T
Obsidian_SW_Release_Notice_V0.30.69.03
Update the driver date and version in USB Modem INFO, for WHQL test requirement.
Factory BootStrap
Temp solution for Display DIM issue.
[FLO DRM]Revert to 1.0-20081217-0039 because 1.0-20090625-0146 does not work normally.
[audio]acoustic parameters update to V13B
[keyboard]Revert to previously version to lower the risk of the side effect of new code
Obsidian_SW_Release_Notice_V0.30.71.03
[Application]Update to BLStream 6/29's drop
[BT][OPP/FTP] fix Obsidian TD1790 [Defect #488 - GSM-BTR-1-1992]
Bluetooth: when a BT transaction such as OPP or FTP there is no user confirmation present
root cause: There is %5 failure that cannot pop up msg box when user send multi vcard to DUT at the same time and choice "NO" or timeout.
reason: there is no enough time to destroy msg box, which cause the new msg box cannot be created if DUT receive mult vcard at the same time. so we delay 50ms if we don't receive this OPP.
[USB]Remove it for side effect for the J/K and receiver sensitivity performance
[Modem] Disable Fatal Err Message in ship ROM, give modem a chance to try if error can be recover, and try if QXDM log will not be broken by FATAL Error. it will not affect exception FATAL ERR function
Obsidian_SW_Release_Notice_V0.30.80.03
fix HPQ 817 - [6.5] - ATT Power Up / Down Animation Performance
Change the position of ADC Calibration related items in NV table and also update sensor driver for BT cases
[Music]Use small size Confess to Impress.wma(2M) to replace the Familiar Places.wma(8M) for saving flash
TD 1272 - Wrong RSSI indicator count..Changed preferred method for RSSI display to use raw dBm value from RIL to allow 1-1 match to ATT requirement.
[HP Theme]Update BLStream's STK Titanium plug in
Change the charging current, by EE's requirement.
[audio]codec tx gain 0xca62 to 0x1a00
Obsidian_SW_Release_Notice_V0.30.82.03
[Sensor] Update to 20090707_Sensor.rar:
1. Bug fixed for TD#3036
- Config GPIO 76 to input/pull-down in suspend mode.
- Turn off VREG_WLAN in suspend mode
- control MPP17 in order to save power.



Fix the bug that some sd card have special partition table
[Keypad] Update to 20090707_keypad driver;
1. Bug fixed for the GPIO keys function abnormal.
2. Implement the multi key press with CAP key.
[Sprite Backup][TD3098]Use right registry for pbf file to fix TD3098
[APPS]Add Arcsoft localization resources(0416, 0C0A)
[Audio]modify notification in call setting registry setting
Try to fix the TD bug 2355 : USB can not be recognized if device is rebooted automatically with USB connected.
add notification when clean bootup
[audio]acoustic parameters update to V15
[LockScreen]Use Microsoft new lockscreen cab for wipe issue in retail build
Revert to old version for cleartype issue
Obsidian_SW_Release_Notice_V0.30.84.03
[jIM]Update to 2.0.0.B69
Update to BLStream 7/13's drop
[cvc]update to 2.5.3-907131
change clean boot message "clean boot" to "Factory Restore is Done"
[HP Theme]Update to 1.3.0.21
[Notification] 1, set "Play Sound" to ON under Sounds & Notifications – SMS/MMS/Email;
2. Disable all pop up notifications under Sounds & Notifications (Notifications tab)
Obsidian_SW_Release_Notice_V0.30.85.03
[APPS]Update localization resources for Westtek
[OB TD3215]Use sign fakecpl.cpl to avoid the pop up issue
[FactoryRestore]Fix the loc issue for FactoryRestore
[java]update to 2.0.1.1.08
Fix GPIO key related bugs.
1. Hardware key can not work after HOME key down without key up message.
2. Send windows virtual key by sending VK_LWIN directly not by customized VK code.
[OB3065]Override IDS_DENIED="No service" to "SOS call only"
[AT&T UE][OB TD 3222]Change the order for some directories
[LockScreen]Update the cab per Microsoft requirement for Wipe issue.
[APPS]Update localization for Arcsoft Camera
[DataConnect XML]Update to DataConnect XML 1.76
[Charging]Change the timeout from 1 hour to 3 hours for CC charging period.
[OB TD 3226]Disables WMP RAM caching
Obsidian_SW_Release_Notice_V0.30.87.03
[jIM]Update to 2.0.0.B70
ODM_SIMLOCK_DATA_LEN==512 bytes only can store 13 plmns, change to 1000 in order to meet new PRD 14 plmns



[Audio]modify power up control
[bug:Unknown window on front of today screen]Remove WS_POPUP and try if this bug is fixed.
Change WiFi Button Behavior to consistence with the definition of PRD
[BT][HCI] add a workaround for passing BQP testing(PTS V3.200)
[Obsidian TD3088] [Defect #939 - GSM-BTR-1-0736] EONS: Fail: TU Constantly Displays "AT&T MicroCell" Even when registered to 3G Micro Network
[BT][BPP/BIP] remove BPP and BIP profiles
[Audio]add Qualcomm workaround solution for obsidian TD3063 keep sample rate 48K in voice call
[Application]Update to BLStream 7/20 drop.
[TD3345]Increase Obsidian font size by one notch higher per AT&T and HP marketing requirement
Obsidian_SW_Release_Notice_V0.30.88.03
[Audio]eliminate the pop noise when device sleep then wake up
[USBFN]Try to fix the TD bug 3351 : When disable "Use USB Charging" than insert USB cable,battery still charging.
[TWC]Update to new version
[StarWars]Update to 1.1.7.5
[Reminder][TD:3344]Per Marketing requirement, set the "repeat" box of reminder default to enable
[AT&T UE]Fix Jetcet Print icon display issue.
[HP Theme]Update STK and CB 's latest cpr
[ATTWifi][TD:3363]Replace the icon per AT&T LE ROM requirement.(This icon is 90*90 size, actually we need 45*45 for better effect.)
[Audio]fix headset key irq bug when sleep and wakeup
[VoiceCommander]We don't need this item because Obsidian dose not have a dedicated key for the VoiceCommander.
[BT][SAP] modify for passing BQB test case: TC_SERVER_RPS_BV_01_I, disable this workaround when SAP connected.
[TD3360][AT&T CDR-CON-3074] device requirement - CLIR (calling line identification restriction) control through ATD command does not work.Added parser for #31#,*31#,*82,*67.
[BSP] Update BSP version to 5.2.6008
[TD1831] [Defect #512 - GSM-BTR-1-1830] TU fails to receive Push SI message with blank fields. Make a workaround to handle the case that the SI-ID flag is present even if its contents is NULL.
[java]update it to 2.0.1.1.09
[audio]modify headset mic gain as device mic gain setting in 3pole headset MMA mode
[09platform][Obsidian][Keypad] Update to 20090722_Keypad.rar
1. Bug Fix for TD#3348
2. Remove APP5 key for Camera function, call CreateProcess() directly in keypad driver.
[09platform][Obsidian][Backlight/Sensor/Display] Update to 20090722_DisplayBacklightSensor.rar
1. Bug Fix for TD#3208, 3216
[Obsidian] Fix Backlight issue



Appendix H. Original Report

Please refer to Sporton Report Number FA961307A as below.

System Check_Body_835MHz_090813

DUT: Dipole 835 MHz

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL_850_090813 Medium parameters used: $f = 835$ MHz; $\sigma = 0.979$ mho/m; $\epsilon_r = 52.7$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 ; Liquid Temperature : 21.3

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(6.34, 6.34, 6.34); Calibrated: 2008/9/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2009/6/23
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Pin=100mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.04 mW/g

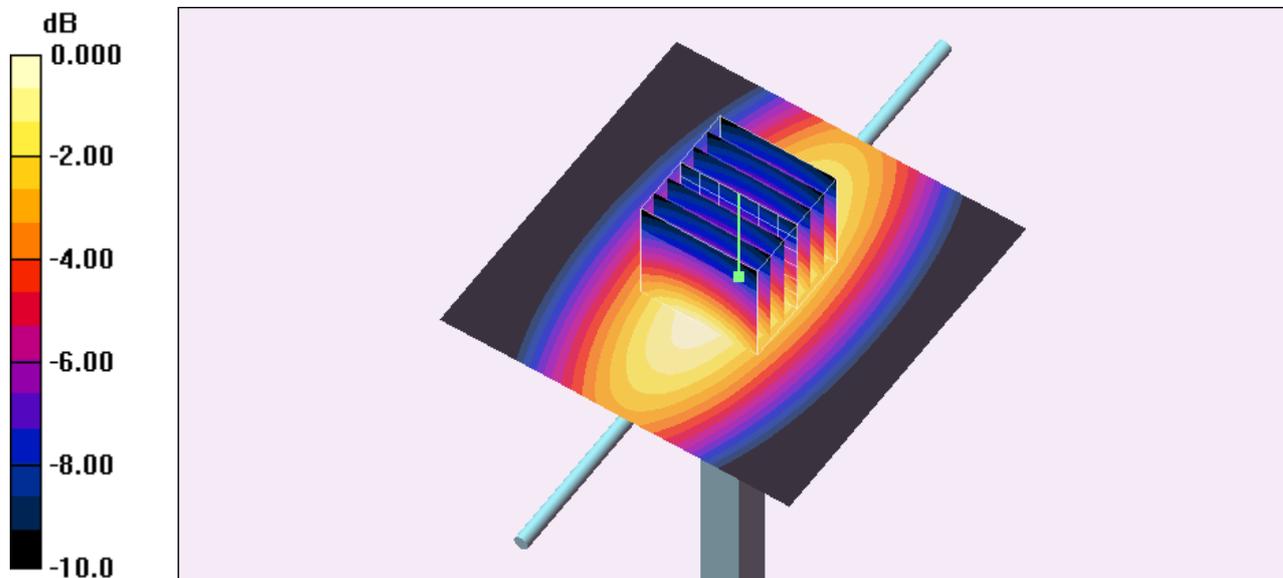
Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 34.3 V/m; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 1.31 W/kg

SAR(1 g) = 0.961 mW/g; SAR(10 g) = 0.642 mW/g

Maximum value of SAR (measured) = 1.04 mW/g



0 dB = 1.04mW/g

#02 WCDMA V_RMC12.2k_Left Cheek_Ch4233_Battery2

DUT: 961307-04

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: HSL_850_090813 Medium parameters used: $f = 847$ MHz; $\sigma = 0.911$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.6 ; Liquid Temperature : 21.6

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(6.55, 6.55, 6.55); Calibrated: 2008/9/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2009/6/23
- Phantom: SAM-Left; Type: QD 000 P40 C; Serial: TP-1477
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch4233/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

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

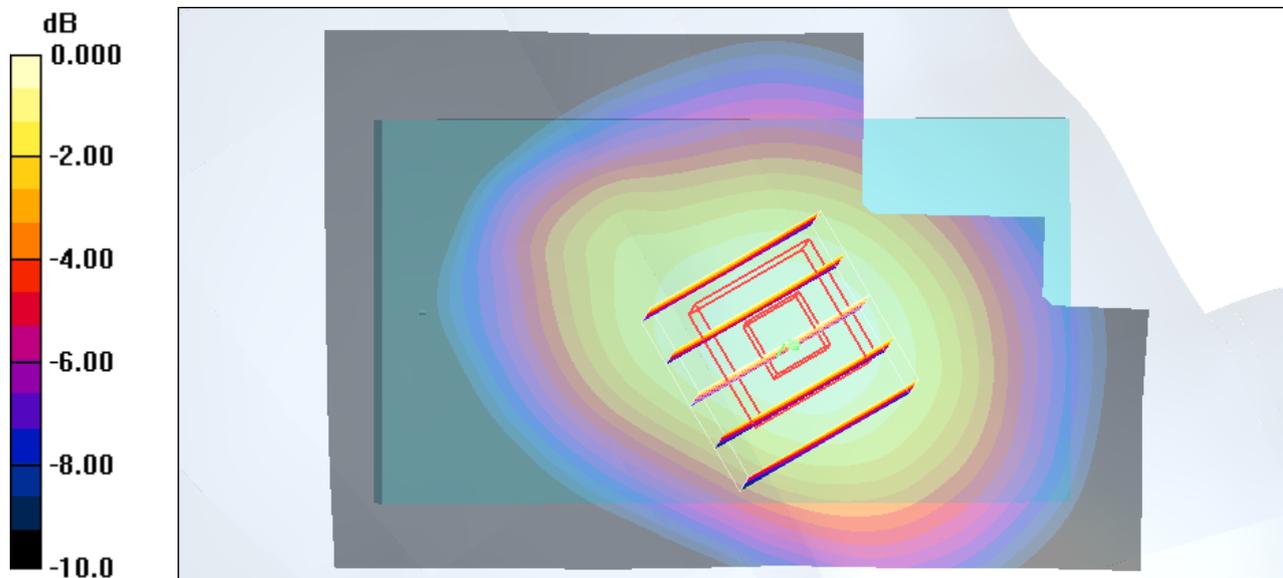
Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.1 V/m; Power Drift = -0.113 dB

Peak SAR (extrapolated) = 0.806 W/kg

SAR(1 g) = 0.706 mW/g; SAR(10 g) = 0.540 mW/g

Maximum value of SAR (measured) = 0.738 mW/g



0 dB = 0.738mW/g

#01 WCDMA V_RMC12.2K_Bottom_1.5cm_Ch4233_Battery2

DUT: 961307-04

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: MSL_850_090813 Medium parameters used: $f = 847$ MHz; $\sigma = 0.991$ mho/m; $\epsilon_r = 52.5$; $\rho =$

1000 kg/m³

Ambient Temperature : 22.3 ; Liquid Temperature : 21.5

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(6.34, 6.34, 6.34); Calibrated: 2008/9/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2009/6/23
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch4233/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.653 mW/g

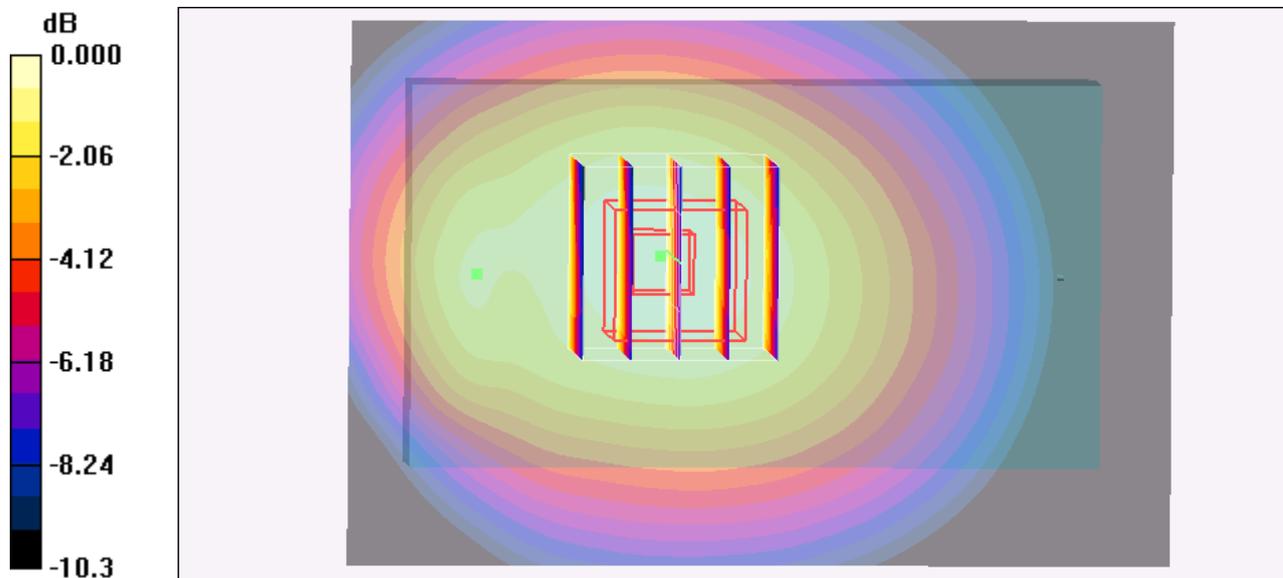
Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.21 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 0.765 W/kg

SAR(1 g) = 0.625 mW/g; SAR(10 g) = 0.455 mW/g

Maximum value of SAR (measured) = 0.662 mW/g



0 dB = 0.662mW/g



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



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

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

Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: D835V2-499_Mar08

CALIBRATION CERTIFICATE form containing fields for Object, Calibration procedure(s), Calibration date, Condition of the calibrated item, and tables for Primary and Secondary Standards.

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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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:

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

- DASY4 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	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.5 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 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	2.29 mW / g
SAR normalized	normalized to 1W	9.16 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.16 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.50 mW / g
SAR normalized	normalized to 1W	6.00 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.00 mW / g ± 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.0 ± 6 %	1.00 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	2.46 mW / g
SAR normalized	normalized to 1W	9.84 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	9.52 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.63 mW / g
SAR normalized	normalized to 1W	6.52 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	6.37 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9 Ω - 2.3 j Ω
Return Loss	- 26.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω - 3.3 j Ω
Return Loss	- 29.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.392 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	July 10, 2003

DASY4 Validation Report for Head TSL

Date/Time: 17.03.2008 11:32:45

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL 900 MHz;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.9$ mho/m; $\epsilon_r = 41.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(6.09, 6.09, 6.09); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 03.09.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:

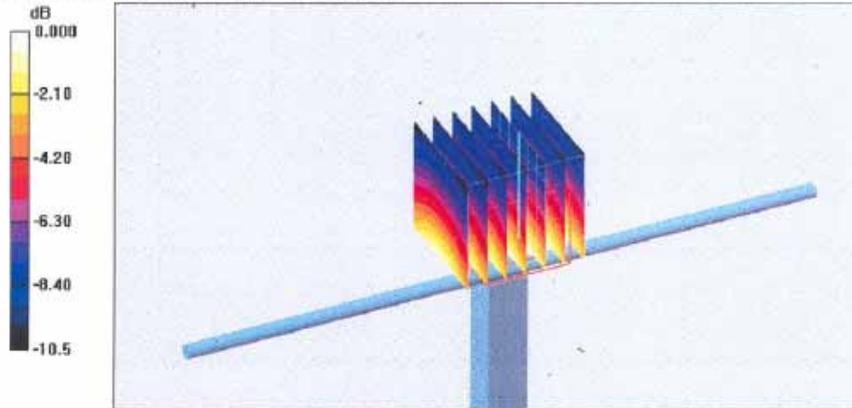
Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 54.9 V/m; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 3.34 W/kg

SAR(1 g) = 2.29 mW/g; SAR(10 g) = 1.5 mW/g

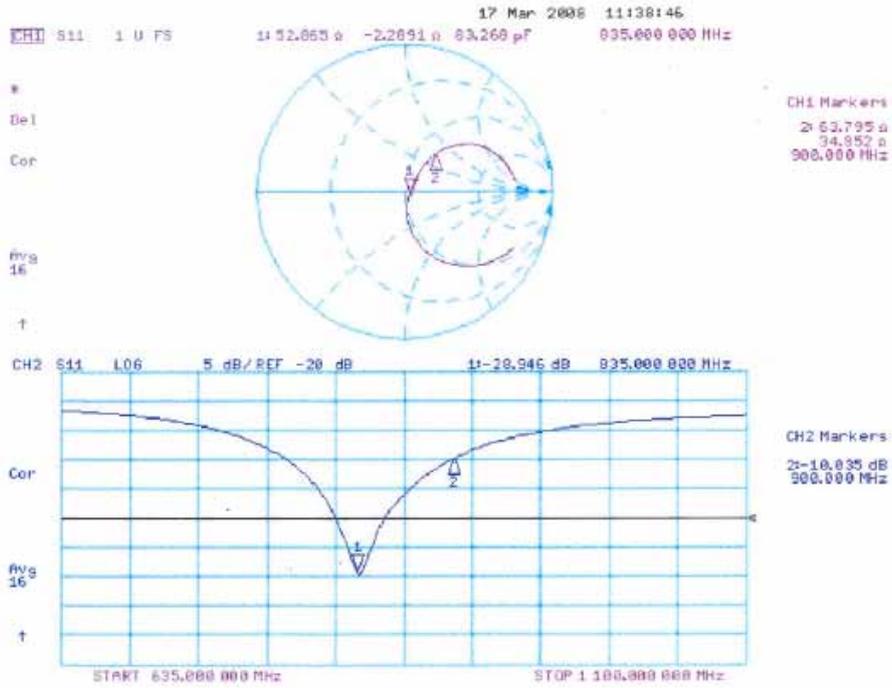
Maximum value of SAR (measured) = 2.58 mW/g



0 dB = 2.58mW/g



Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 10.03.2008 12:48:36

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL900;

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.85, 5.85, 5.85); Calibrated: 01.03.2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 03.09.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0:

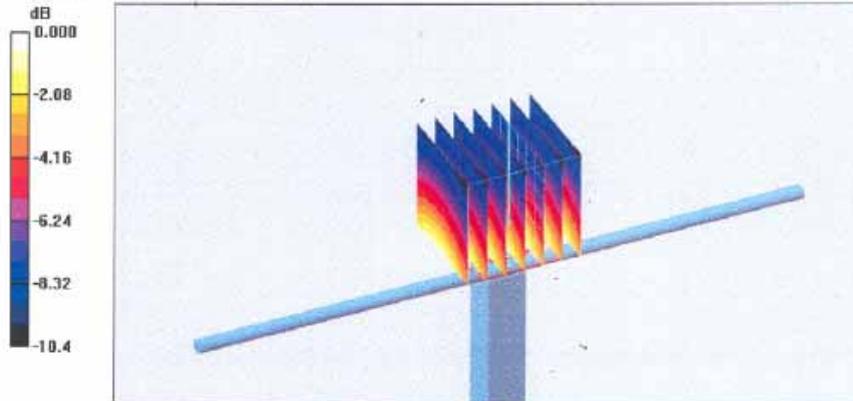
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.8 V/m; Power Drift = 0.036 dB

Peak SAR (extrapolated) = 3.59 W/kg

SAR(1 g) = 2.46 mW/g; SAR(10 g) = 1.63 mW/g

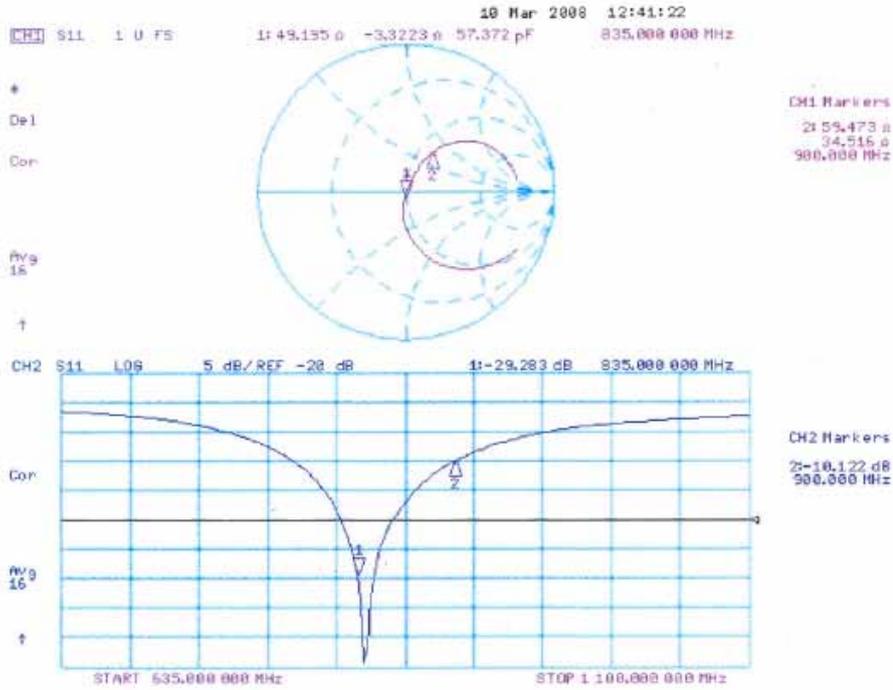
Maximum value of SAR (measured) = 2.64 mW/g



0 dB = 2.64mW/g



Impedance Measurement Plot for Body TSL





Calibration Certificate of DASY

Calibration Laboratory of
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Accreditation No.: **SCS 108**

Client **Sporton (Auden)**

Certificate No: **ET3-1788_Sep08**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1788**

Calibration procedure(s) **QA CAL-01.v6 and QA CAL-23.v3
 Calibration procedure for dosimetric E-field probes**

Calibration date: **September 23, 2008**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

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

Issued: September 24, 2008

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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



ET3DV6 SN:1788

September 23, 2008

Probe ET3DV6

SN:1788

Manufactured:	May 28, 2003
Last calibrated:	September 26, 2007
Recalibrated:	September 23, 2008

Calibrated for DASYS Systems

(Note: non-compatible with DASYS2 system!)



ET3DV6 SN:1788

September 23, 2008

DASY - Parameters of Probe: ET3DV6 SN:1788

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.73 ± 10.1%	μV/(V/m) ²	DCP X	95 mV
NormY	1.59 ± 10.1%	μV/(V/m) ²	DCP Y	98 mV
NormZ	1.72 ± 10.1%	μV/(V/m) ²	DCP Z	91 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	10.6	6.8
SAR _{be} [%]	With Correction Algorithm	0.8	0.3

TSL 1750 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	8.8	4.9
SAR _{be} [%]	With Correction Algorithm	0.7	0.6

Sensor Offset

Probe Tip to Sensor Center 2.7 mm

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

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

^B Numerical linearization parameter: uncertainty not required.

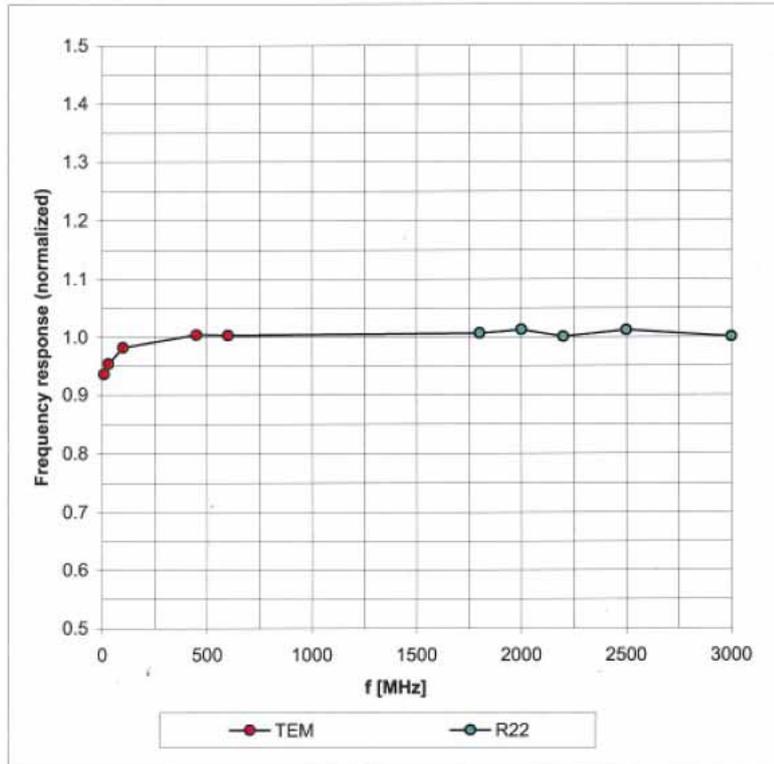


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Frequency Response of E-Field

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



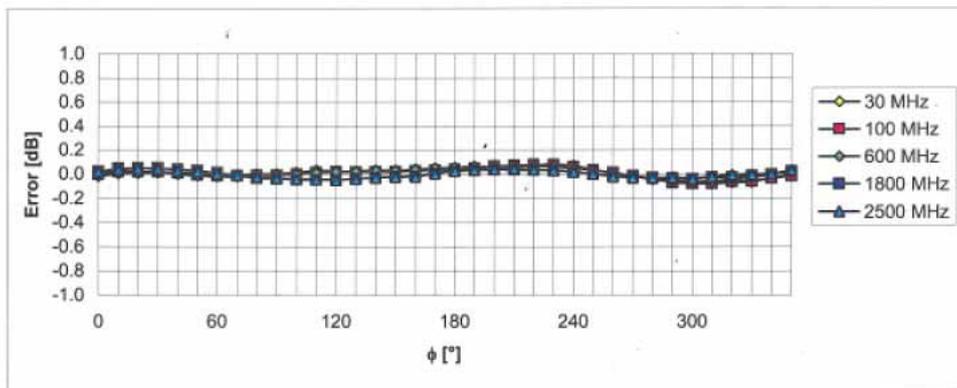
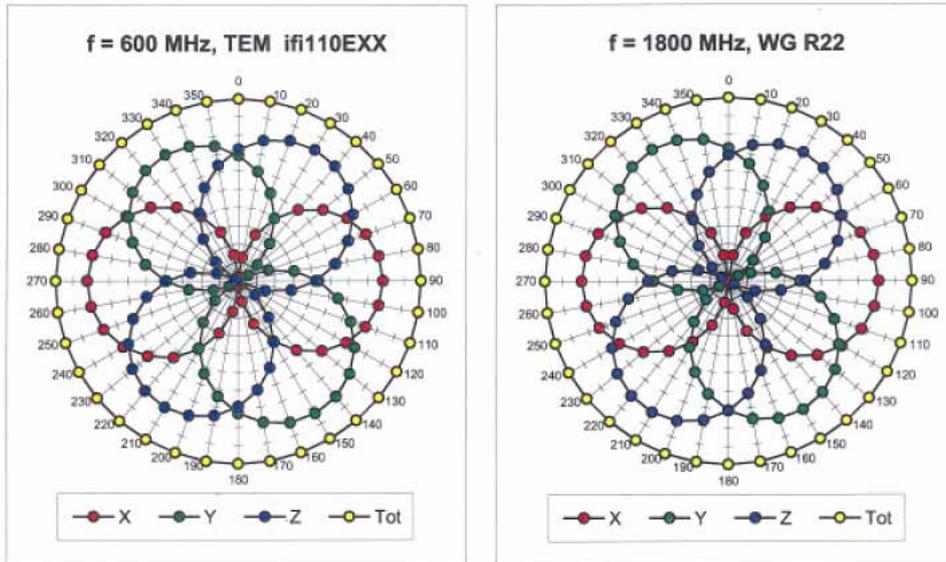
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)



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Receiving Pattern (ϕ), $\vartheta = 0^\circ$



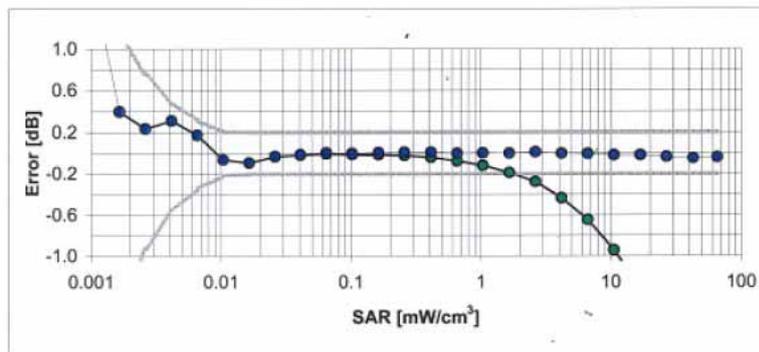
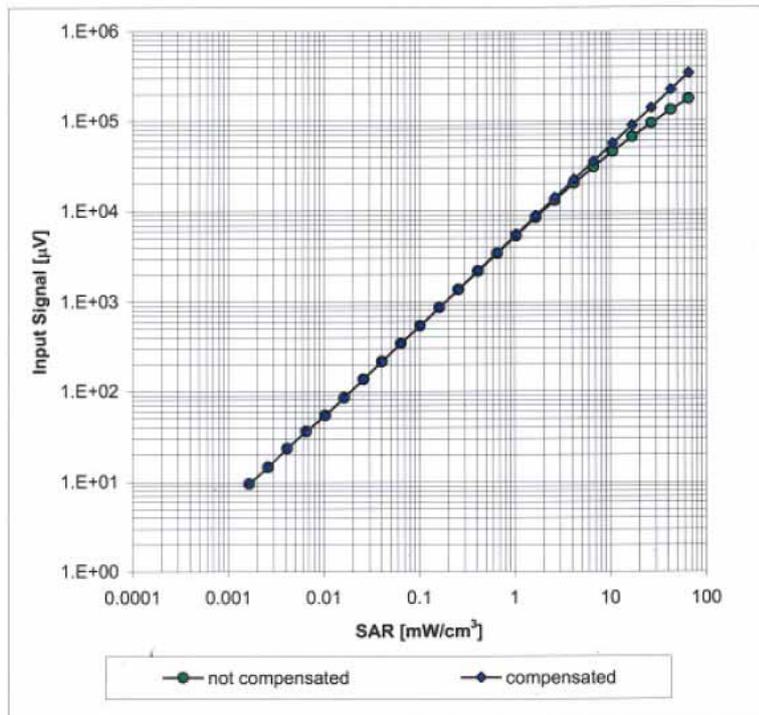
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)



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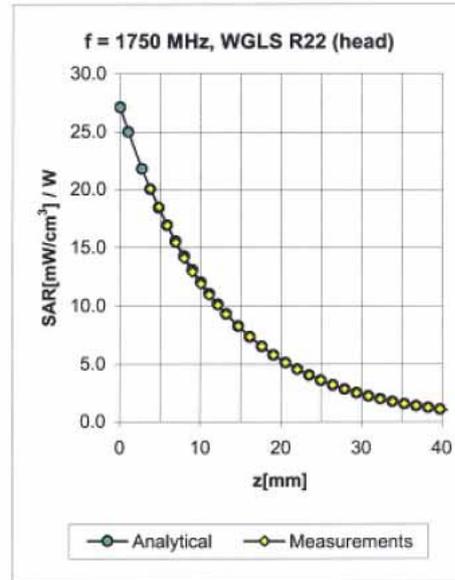
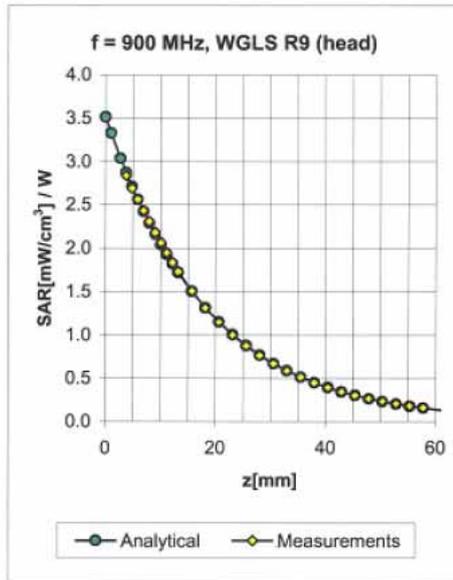
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Dynamic Range f(SAR_{head}) (Waveguide R22, f = 1800 MHz)



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

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.44	2.65	6.55 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.68	1.98	5.59 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.75	1.75	5.13 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.80	1.45	4.68 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.50	2.48	6.34 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.63	2.33	4.87 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.74	1.99	4.73 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.94	1.75	3.98 ± 11.0% (k=2)

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

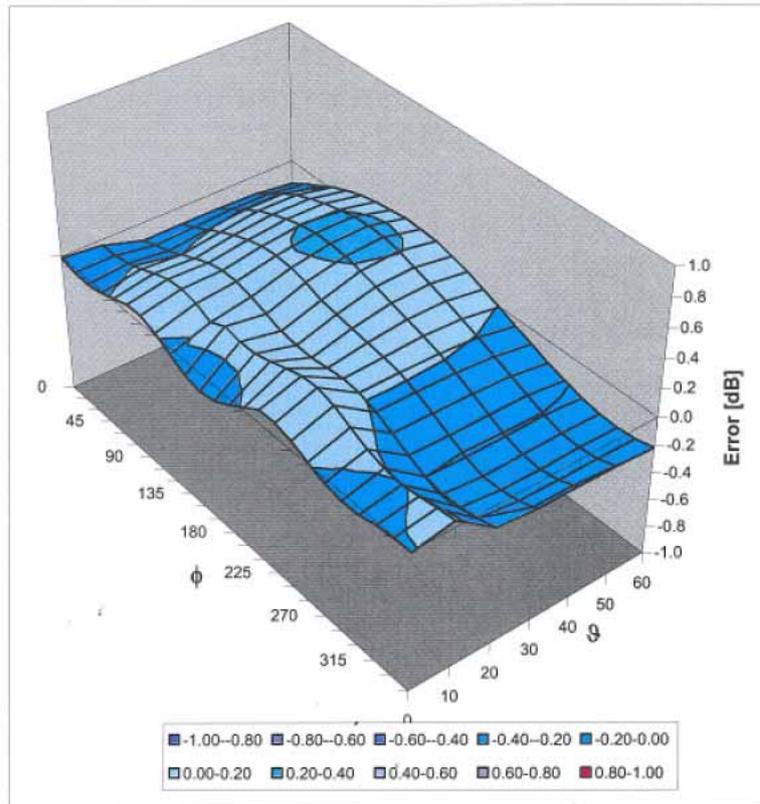


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Deviation from Isotropy in HSL

Error (ϕ, θ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)



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



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

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

Accreditation No.: SCS 108

Client Auden

Certificate No: DAE4-679_Jun09

CALIBRATION CERTIFICATE
Object: DAE4 - SD 000 D04 BJ - SN: 679
Calibration procedure(s): QA CAL-06.v12
Calibration date: June 23, 2009
Condition of the calibrated item: In Tolerance
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
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 table with columns: ID #, Cal Date (Certificate No.), Scheduled Calibration
Secondary Standards table with columns: ID #, Check Date (in house), Scheduled Check
Calibrated by: Eric Hainfeld, Technician
Approved by: Fin Bomholt, R&D Director
Signature and Issued: June 23, 2009



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



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C Servizio svizzero di taratura
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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

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:* 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 = 6.1 μ V , 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	404.503 \pm 0.1% (k=2)	404.926 \pm 0.1% (k=2)	405.103 \pm 0.1% (k=2)
Low Range	3.98274 \pm 0.7% (k=2)	3.92959 \pm 0.7% (k=2)	3.98854 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	316 $^{\circ}$ \pm 1 $^{\circ}$
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Appendix

1. DC Voltage Linearity

High Range	Input (μV)	Reading (μV)	Error (%)
Channel X + Input	200000	199999.9	0.00
Channel X + Input	20000	20004.11	0.02
Channel X - Input	20000	-20002.63	0.01
Channel Y + Input	200000	200000	0.00
Channel Y + Input	20000	20003.98	0.02
Channel Y - Input	20000	-20001.91	0.01
Channel Z + Input	200000	199999.9	0.00
Channel Z + Input	20000	20001.57	0.01
Channel Z - Input	20000	-20004.84	0.02

Low Range	Input (μV)	Reading (μV)	Error (%)
Channel X + Input	2000	2000.1	0.00
Channel X + Input	200	200.27	0.13
Channel X - Input	200	-200.34	0.17
Channel Y + Input	2000	2000.1	0.00
Channel Y + Input	200	199.56	-0.22
Channel Y - Input	200	-200.06	0.03
Channel Z + Input	2000	1999.9	0.00
Channel Z + Input	200	199.18	-0.41
Channel Z - Input	200	-201.05	0.53

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	2.30	1.94
	-200	-1.31	-2.38
Channel Y	200	6.13	4.89
	-200	-6.12	-6.48
Channel Z	200	-4.86	-5.43
	-200	2.27	3.92

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	-	1.95	-0.44
Channel Y	200	1.03	-	3.64
Channel Z	200	-1.59	0.33	-



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	16178	16934
Channel Y	15450	15973
Channel Z	16051	16646

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	-2.20	1.69	0.48
Channel Y	-1.14	-3.43	1.00	0.63
Channel Z	-0.55	-1.73	1.00	0.44

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MΩ)	Measuring (MΩ)
Channel X	0.2000	200.8
Channel Y	0.2000	199.3
Channel Z	0.1999	198.3

8. Low Battery Alarm Voltage (verified during pre test)

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

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Appendix F. FCC 3G SAR Measurement Procedures

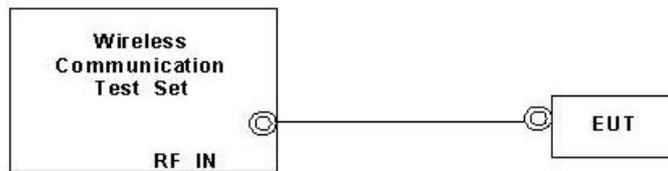
Conducted Output Power:

The EUT was tested according to the requirements of the FCC 3G procedures and the TS 34.121. The EUT's WCDMA and HSDPA function is Release 5 version supporting HSDPA Category 8. A detailed analysis of the output power for WCDMA mode is provided in the tables below.

WCDMA SAR Test mode - Conducted Power				
Mode	Setup	Cell band (850)		
		CH4132	CH4182	CH4233
		826.4 (MHz)	836.4 (MHz)	846.6 (MHz)
R99 - WCDMA	RMC 12.2Kbps	23.75	23.85	23.57

WCDMA Setup Configuration:

- a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting
 - i. Data rates: Varied from RMC 12.2Kbps
 - ii. RMC Test Loop = Loop Mode 1
 - iii. Power Ctrl Mode = All Up bits
- d. The transmitted maximum output power was recorded.



Setup Configuration

Reference:

- [1] 941225 D01 SAR test for 3G devices v02, SAR Measurement Procedures for 3G Devices CDMA 2000/Ev-Do/WCDMA/HSDPA/HSPA Oct. 2007 Laboratory Division Office of Engineering and Technology Federal Communications Commission
- [2.] TS 34.121 Universal Mobile Telecommunications System (UMTS); Terminal Conformance Specification, Radio Transmission and Reception (FDD)
- [3.] HSUPA Measurement Guide with 8960 V7.5.0 Release 7 (2007-06) Ver.: v.02.18