5 Measurement Uncertainty

5.1 Measurement Uncertainty I (According to IEEE 1528)

DASY4 Uncertainty Budget
According to IEEE 1528 [2]

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

5.2 Measurement Uncertainty II (According to IEC 62209)

DASY4 Uncertainty Budget
According to IEC 62209 [3]

Error Description	Uncertainty value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±5.9 %	N	1	1	1	±5.9 %	±5.9 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	0.7	0.7	±1.9 %	±1.9 %	∞
Spherical Isotropy	±9.6 %	R	$\sqrt{3}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
Detection Limits	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %	∞
Perturbation of the Environment	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner Mech. Restr.	±0.4 %	R	$\sqrt{3}$	1	1	±0.2 %	±0.2 %	∞
Probe Positioning	±2.9 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Post-Processing	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Test Sample Related								
Test Sample Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9,%	145
Device Holder Uncertainty	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Drift of Output Power	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %	∞
Phantom and Setup								
Phantom Uncertainty	±4.0 %	R	$\sqrt{3}$	1	1	±2.3 %	±2.3 %	∞
Liquid Conductivity (target)	±5.0 %	R	$\sqrt{3}$	0.7	0.5	±2.0 %	±1.4 %	∞
Liquid Conductivity (meas.)	±4.3 %	R	$\sqrt{3}$	0.7	0.5	±1.7,%	±1.2 %	∞
Liquid Permittivity (target)	±5.0 %	R	$\sqrt{3}$	0.6	0.5	±1.7 %	±1.4 %	∞
Liquid Permittivity (meas.)	±4.3 %	R	$\sqrt{3}$	0.6	0.5	±1.5 %	±1.2 %	∞
Combined Std. Uncertainty						±10.5 %	±10.2 %	330
Expanded Uncertainty						**±21.0 %**	**±20.5 %**	

6 References

1. [ANSI/IEEE C95.1-1992]

Safety Levels with Respect to Human Exposure to Radio Frrequency Electromagnetic Fields, 3 kHz to 300 GHz. The Institute of Electrical and Electronics Engineers, Inc. (IEEE), 1992.

2. [ANSI/IEEE C95.3-1992]

Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave". The Institute of Electrical and Electronics Engineers, Inc. (IEEE), 1992.

3. [FCC Report and Order 96-326]

Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, 1996.

4. [FCC OET Bulletin 65]

Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET Bulletin 65 Edition 97-01, August 1997. Federal Communications Commission (FCC), Office of Engineering & Technology. (OET)

5. [FCC OET Bulletin 65 Supplement C]

Additional Information for Evaluating Compliance of Mobile and Portable Device with FCC Limits for Human Exposure to Radiofrequency Emissions. Supplement C (Edition 01-01) to OET Bulletin 65, June 2001. Federal Communications Commission (FCC), Office of Engineering & Technology. (OET)

6. [DASY 4]

Schmid & Partner Engineering AG: DASY 4 Manual, September 2005.

7. [IEEE 1528-2003]

IEEE Std 1528-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wirless Communications Devices: Measurement Techniques. 1528-2003, 19th December, 2003, The Institute of Electrical and Electronics Engineers, Inc. (IEEE).

8. [RSS-102, Issue 2]

Radio Standards Specification 102, Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) sets out the requirements and measurement techniques used to evaluate radio frequency (RF) exposure compliance of radiocommunication apparatus designed to be used within the vicinity of the human body. November, 2005. Industry Canada.

9. [Health Canada Safety Code 6]

Canada's Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz (99-EHD-237)

7 Annex：Test Results of DASY4 (Refer to ANNEX)

ANNEX
Index of Annex

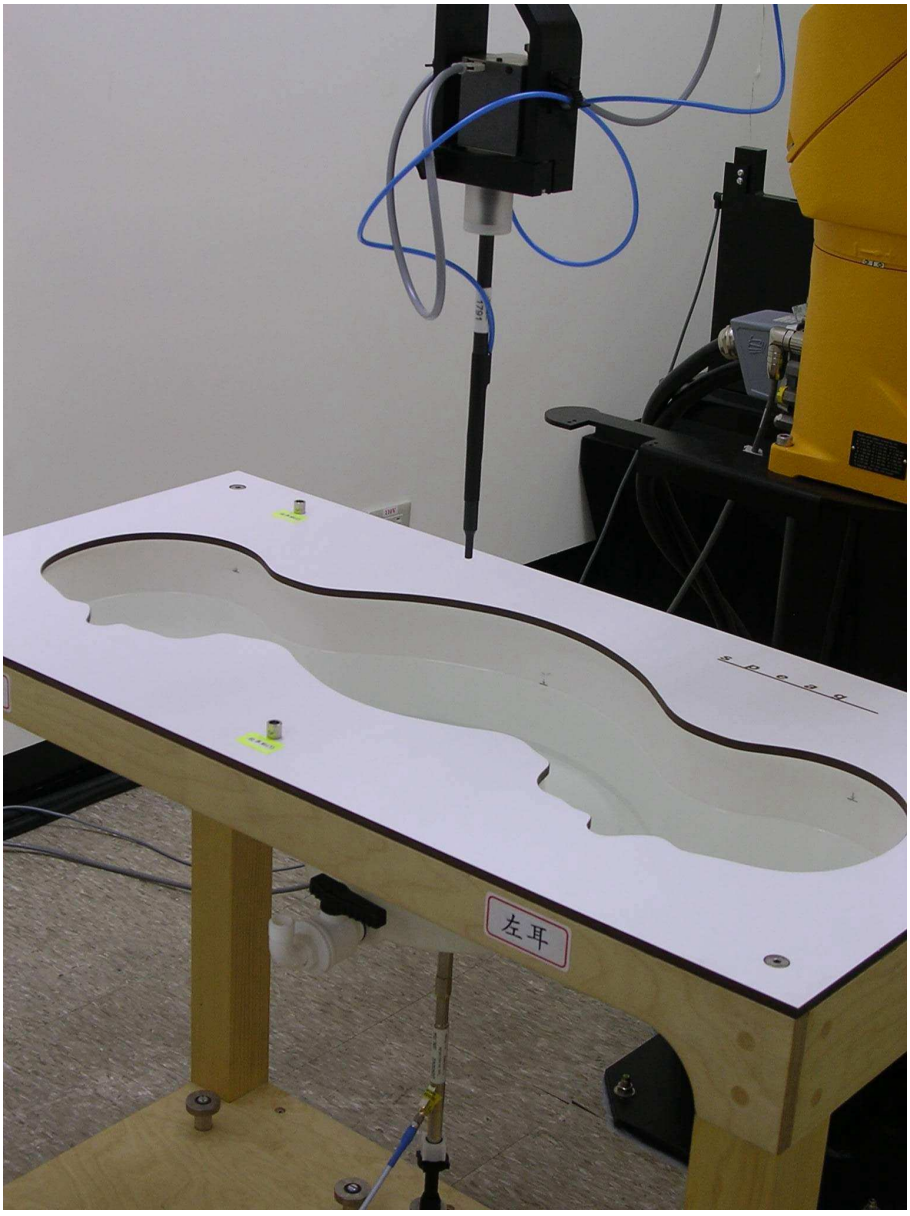
ANNEX A: EXTERNAL CONSTRUCTION PHOTOS OF EUT

	
Top end of EUT	**Bottom end of EUT**
	
EUT Battery Compartment	**NiMH Batteries**

ANNEX B: SAR RESULTS

System Performance Check

Head



Date/Time: 2/13/2007 9:44:02 AM

Test Laboratory: Electronics Testing Center, Taiwan

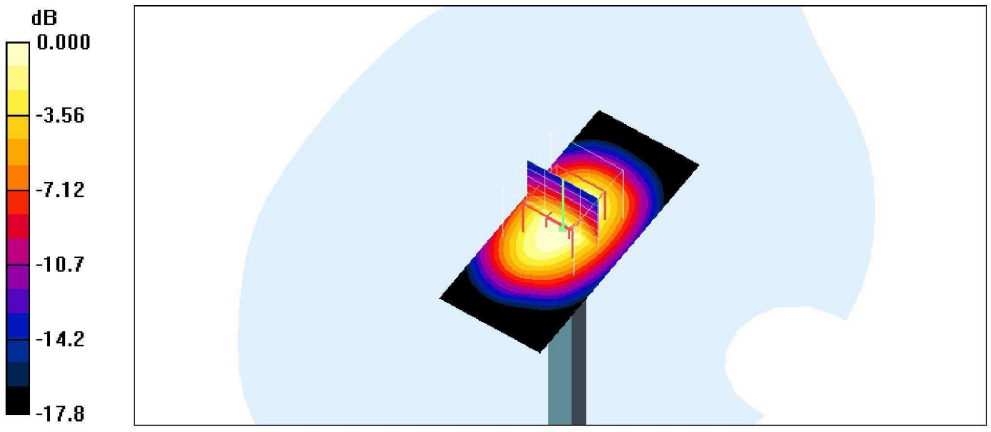
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:xxx

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 38.7; ρ = 1000 kg/m^3
Air temperature: 24 degC; Liquid temperature: 21.2 degC;
Phantom section: Flat Section

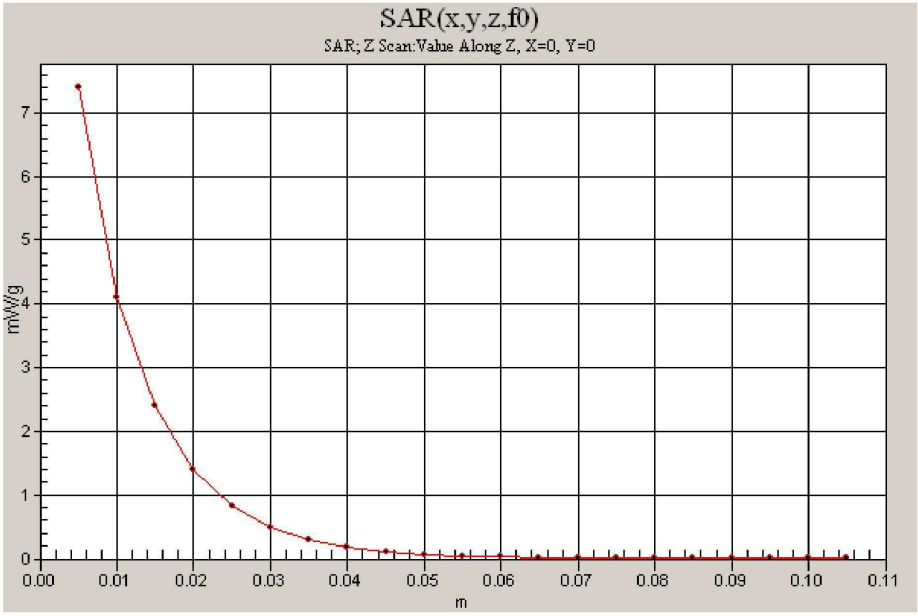
DASY4 Configuration:
- Probe: ET3DV6 - SN1791; ConvF(5, 5, 5); Calibrated: 9/19/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn629;
- Phantom: SAM 12-2; Type: SAM4.0; Serial: TP-1347
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

SPC/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.6 mW/g

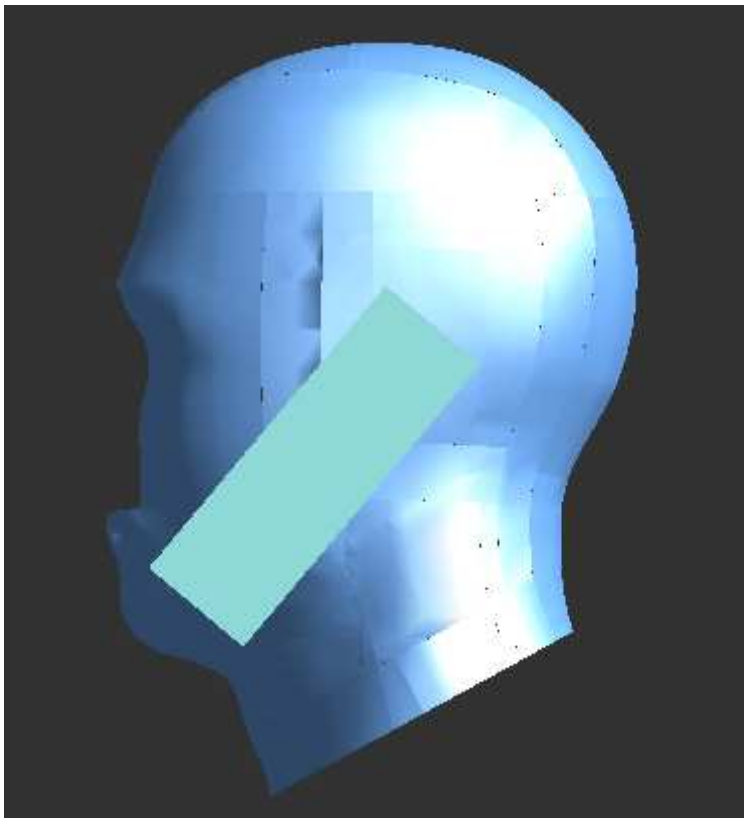
SPC/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 90.2 V/m; Power Drift = 0.003 dB
Peak SAR (extrapolated) = 15.4 W/kg
SAR(1 g) = 9.24 mW/g; SAR(10 g) = 4.92 mW/g
Maximum value of SAR (measured) = 10.4 mW/g



0 dB = 10.4mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11

Left Head



Left Cheek

Date/Time: 2/13/2007 1:16:53 PM

Test Laboratory: Electronics Testing Center, Taiwan

DUT: DECT Philips; Type: PP; Serial: 27909XXX-X

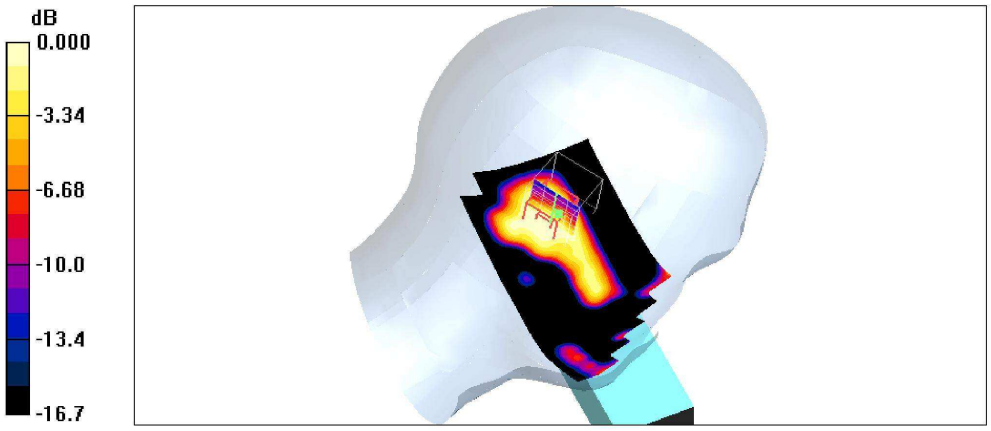
Communication System: US DECT-1900; Frequency: 1925 MHz;Duty Cycle: 1:24
Medium parameters used: f = 1925 MHz; σ = 1.44 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3
Air temperature: 26 degC; Liquid temperature: 21.3 degC;
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1791; ConvF(5, 5, 5); Calibrated: 9/19/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn629;
- Phantom: SAM 12-2; Type: SAM4.0; Serial: TP-1347
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

LC-MID/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.03 V/m; Power Drift = 0.199 dB
Peak SAR (extrapolated) = 0.016 W/kg
SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00634 mW/g

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.
Maximum value of SAR (measured) = 0.012 mW/g

LC-MID/Area Scan (61x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.019 mW/g



0 dB = 0.012mW/g