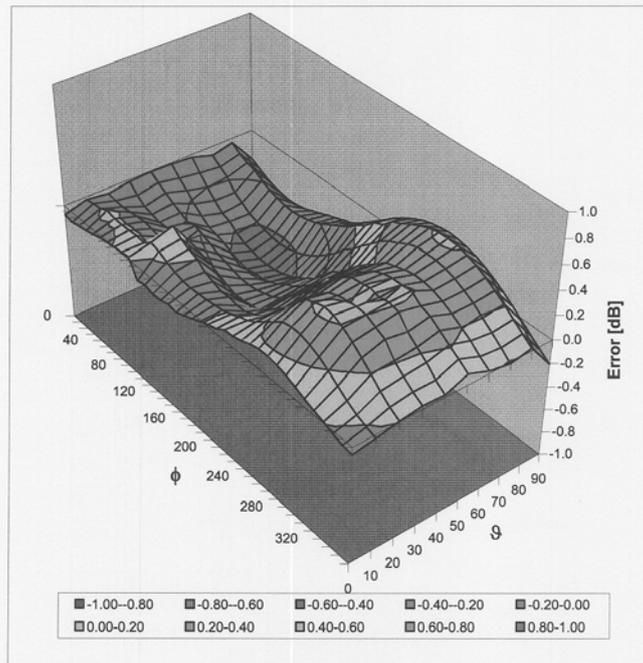


H3DV6 SN:6076

August 22, 2008

### Deviation from Isotropy in Air Error ( $\phi, \vartheta$ ), $f = 900$ MHz



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

Certificate No: H3-6076\_Aug08

Page 9 of 9

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## 16. Uncertainty Analysis

HAC-Extension Setup Performance Test Using SPEAG Calibration Dipoles							
Error Description	Uncertainty value	Prob. Dist.	Div.	$(c_1)$ E	$(c_2)$ H	Std. Unc. E	Std. Unc. H
<b>Measurement System</b>							
Probe Calibration	±5.1%	N	1	1	1	±5.1%	±5.1%
Axial Isotropy	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%
Sensor Displacement	±16.5%	R	$\sqrt{3}$	1	0.145	±9.5%	±1.4%
Boundary Effects	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%
Scaling to Peak Envelope Power	±0%	R	$\sqrt{3}$	1	1	±0%	±0%
System Detection Limit	±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%	R	$\sqrt{3}$	1	1	±0%	±0%
Integration Time	±0%	R	$\sqrt{3}$	1	1	±0%	±0%
RF Ambient Conditions	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%
RF Reflections	±6.0%	R	$\sqrt{3}$	1	1	±3.5%	±3.5%
Probe Positioner	±1.2%	R	$\sqrt{3}$	1	0.67	±0.7%	±0.5%
Probe Positioning	±4.7%	R	$\sqrt{3}$	1	0.67	±2.7%	±1.8%
Extrap. and Interpolation	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%
<b>Dipole Related</b>							
Distance Dipole Scanning Plane	±5.2%	R	$\sqrt{3}$	1	0.3	±3.0%	±0.9%
Input power	±4.7%	N	1	1	1	±4.7%	±4.7%
Combined Std. Uncertainty						±13.7%	±9.3%
<b>Expanded Std. Uncertainty on Power</b>						<b>±27.4%</b>	<b>±18.6%</b>
<b>Expanded Std. Uncertainty on Field</b>						<b>±13.7%</b>	<b>±9.3%</b>

Table 28.1: Uncertainty budget for HAC setup performance test. The budget is valid for the frequency range 800 MHz - 3 GHz and represents a worst-case analysis with respect to power uncertainty of the field. Some of the parameters are dependent on the user situations and need adjustment according to the actual laboratory conditions.

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# 17. System Validation from Original equipment supplier

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



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

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

Accreditation No.: SCS 108

Client **ADT (Auden)**

Certificate No: **CD835V3-1041\_May08**

## CALIBRATION CERTIFICATE

Object: **CD835V3 - SN: 1041**

Calibration procedure(s): **QA CAL-20.v4  
Calibration procedure for dipoles in air**

Calibration date: **May 14, 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).  
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Probe ER3DV6	SN: 2336	31-Dec-07 (No. ER3-2336_Dec07)	Dec-08
Probe H3DV6	SN: 6065	31-Dec-07 (No. H3-6065_Dec07)	Dec-08
DAE4	SN: 781	2-Oct-07 (No. DAE4-781_Oct07)	Oct-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-4419B	GB42420191	11-May-05 (in house check Oct -07)	In house check: Nov-08
Power sensor HP 8482A	US37295597	11-May-05 (in house check Oct -07)	In house check: Nov-08
Power sensor HP 8482H	3318A09450	08-Jan-02 (in house check Oct -07)	In house check: Nov-08
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Nov-09
RF generator E4433B	MY 41310391	22-Nov-04 (in house check Oct-07)	In house check: Nov-09

Calibrated by: **Mike Meili** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Fin Bornholt** (Name), **Technical Director** (Function), *[Signature]* (Signature)

Issued: May 19, 2008

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

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### 3.3.2 DASY4 H-field result

Date/Time: 13.05.2008 12:52:58

Test Laboratory: SPEAG Lab 2

**DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1041**

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

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: RF Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6065; Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

**H Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1):**

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

Maximum value of peak Total field = 0.456 A/m

Probe Modulation Factor = 1.00

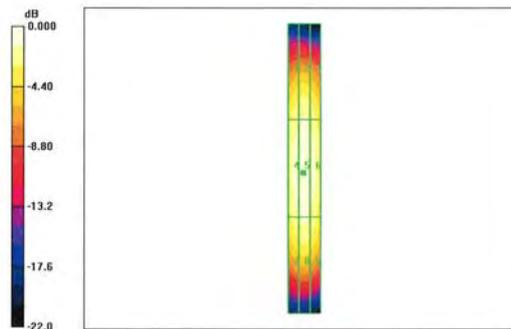
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.485 A/m; Power Drift = -0.025 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 0.381 M4	Grid 2 0.399 M4	Grid 3 0.374 M4
Grid 4 0.434 M4	Grid 5 0.456 M4	Grid 6 0.427 M4
Grid 7 0.385 M4	Grid 8 0.404 M4	Grid 9 0.378 M4



0 dB = 0.456A/m

### 3.3.3 DASY4 E-field result

Date/Time: 14.05.2008 11:32:24

Test Laboratory: SPEAG Lab 2

**DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1041**

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

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: E Dipole Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

**E Scan - Sensor Center 10mm above CD835 Dipole/Hearing Aid Compatibility Test (41x361x1):**

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

Maximum value of peak Total field = 164.3 V/m

Probe Modulation Factor = 1.00

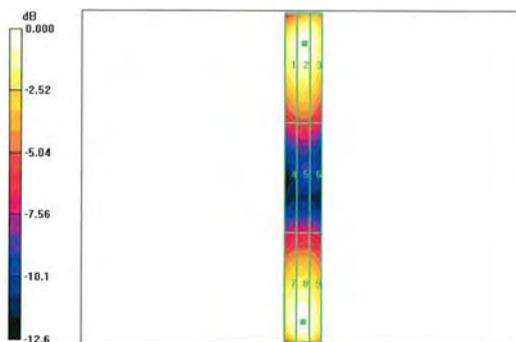
Device Reference Point: 0.000, 0.000, 354.7 mm

Reference Value = 105.9 V/m; Power Drift = -0.005 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 155.7 M4	Grid 2 160.9 M4	Grid 3 157.3 M4
Grid 4 85.3 M4	Grid 5 88.0 M4	Grid 6 85.7 M4
Grid 7 157.9 M4	Grid 8 164.3 M4	Grid 9 159.0 M4



0 dB = 164.3V/m

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



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

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

Accreditation No.: **SCS 108**

Client **ADT (Auden)**

Certificate No: **CD1880V3-1032\_Jul08**

## CALIBRATION CERTIFICATE

Object **CD1880V3 - SN: 1032**

Calibration procedure(s) **QA CAL-20.v4  
Calibration procedure for dipoles in air**

Calibration date: **July 16, 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).  
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Probe ER3DV6	SN: 2336	31-Dec-07 (No. ER3-2336_Dec07)	Dec-08
Probe H3DV6	SN: 6065	31-Dec-07 (No. H3-6065_Dec07)	Dec-08
DAE4	SN: 781	2-Oct-07 (No. DAE4-781_Oct07)	Oct-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-4419B	GB42420191	11-May-05 (in house check Oct-07)	In house check: Oct-08
Power sensor HP 8482A	US37295597	11-May-05 (in house check Oct-07)	In house check: Oct-08
Power sensor HP 8482H	3318A09450	08-Jan-02 (in house check Oct-07)	In house check: Oct-08
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-09

Calibrated by:	Name	Function	Signature
	Claudio Leubler	Laboratory Technician	
Approved by:	Fin Bornholt	Technical Director	

Issued: July 23, 2008

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Certificate No: CD1880V3-1032\_Jul08

Page 1 of 6

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## DASY4 H-Field Result

Date/Time: 15.07.2008 15:18:40

Test Laboratory: SPEAG Lab 2

**DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1032**  
 Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>  
 Phantom section: RF Section  
 Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: H3DV6 - SN6065; Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

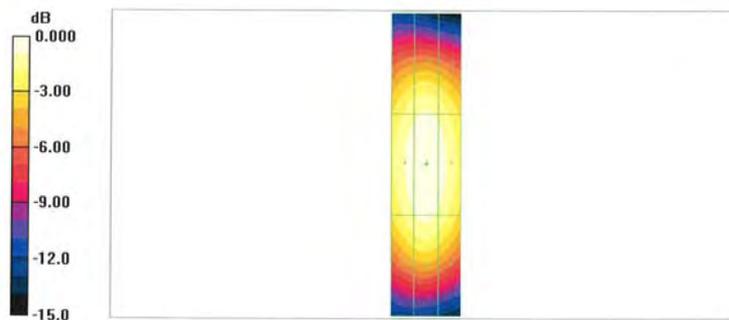
### H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility

#### Test (41x181x1):

Measurement grid: dx=5mm, dy=5mm  
 Maximum value of peak Total field = 0.467 A/m  
 Probe Modulation Factor = 1.00  
 Device Reference Point: 0.000, 0.000, -6.30 mm  
 Reference Value = 0.494 A/m; Power Drift = 0.014 dB  
**Hearing Aid Near-Field Category: M2 (AWF 0 dB)**

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
0.406	0.425	0.404
M2	M2	M2
Grid 4	Grid 5	Grid 6
0.447	0.467	0.444
M2	M2	M2
Grid 7	Grid 8	Grid 9
0.411	0.431	0.407
M2	M2	M2



0 dB = 0.467A/m

### 3.3.2 DASY4 E-Field Result

Date/Time: 16.07.2008 16:52:14

Test Laboratory: SPEAG Lab 2

**DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1032**

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: RF Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

**E Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility**

**Test (41x181x1):**

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

Maximum value of peak Total field = 141.8 V/m

Probe Modulation Factor = 1.00

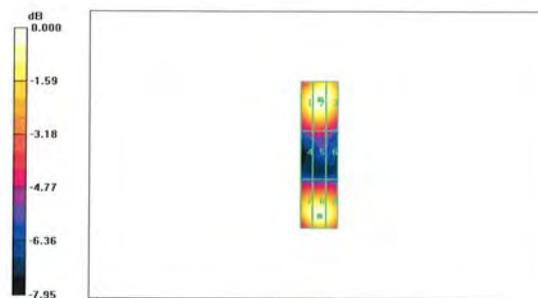
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 153.3 V/m; Power Drift = 0.022 dB

**Hearing Aid Near-Field Category: M2 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 136.3 M2	Grid 2 141.8 M2	Grid 3 139.6 M2
Grid 4 86.2 M3	Grid 5 88.6 M3	Grid 6 85.6 M3
Grid 7 134.4 M2	Grid 8 140.0 M2	Grid 9 136.7 M2



0 dB = 141.8V/m

Certificate No: CD1880V3-1032\_Jul08

Page 6 of 6

## End of 1<sup>st</sup> part of report

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