

P29 H_Field CDMA2000 BC0_RC3+SO55_Full_Ch777_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC0; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch777/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.056 A/m

Probe Modulation Factor = 1.02

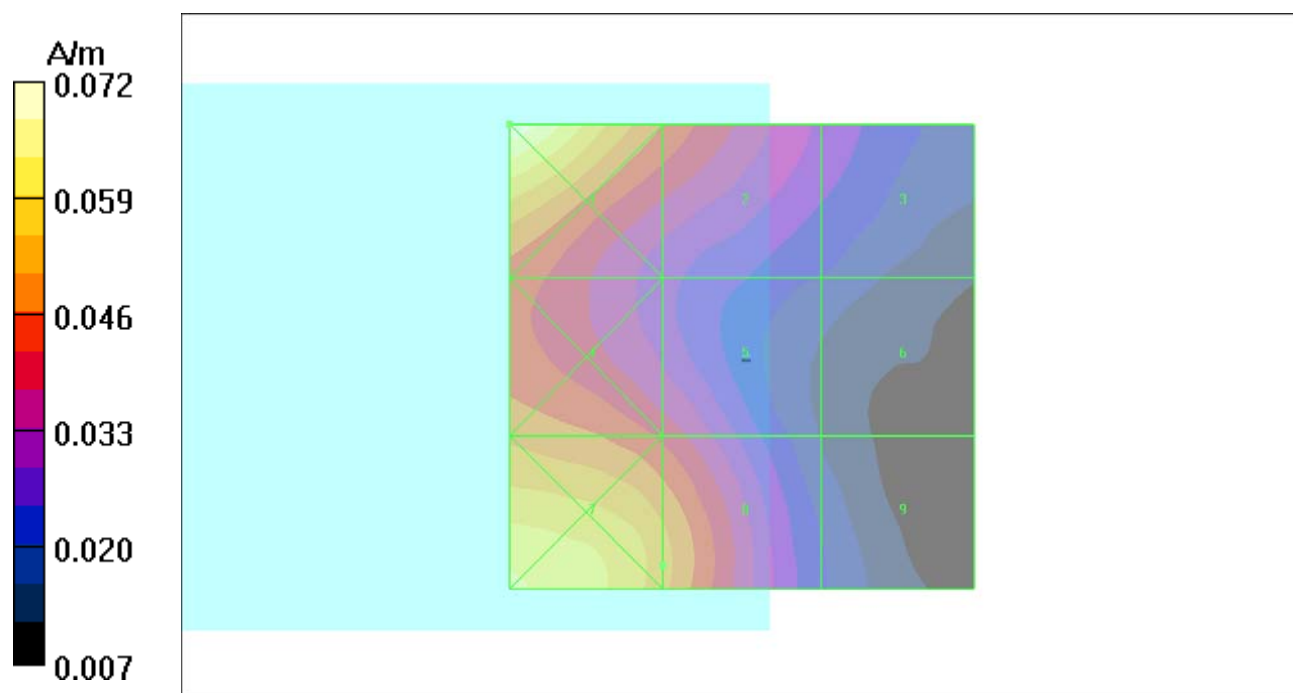
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.027 A/m; Power Drift = 0.166 dB

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

" Peak H-field in A/m

Grid 1 0.072 M4	Grid 2 0.047 M4	Grid 3 0.029 M4
Grid 4 0.055 M4	Grid 5 0.044 M4	Grid 6 0.020 M4
Grid 7 0.071 M4	Grid 8 0.056 M4	Grid 9 0.024 M4



P30 H_Field CDMA2000 BC0_RC3+SO55_Full_Ch1013_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC0; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1013/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.070 A/m

Probe Modulation Factor = 1.02

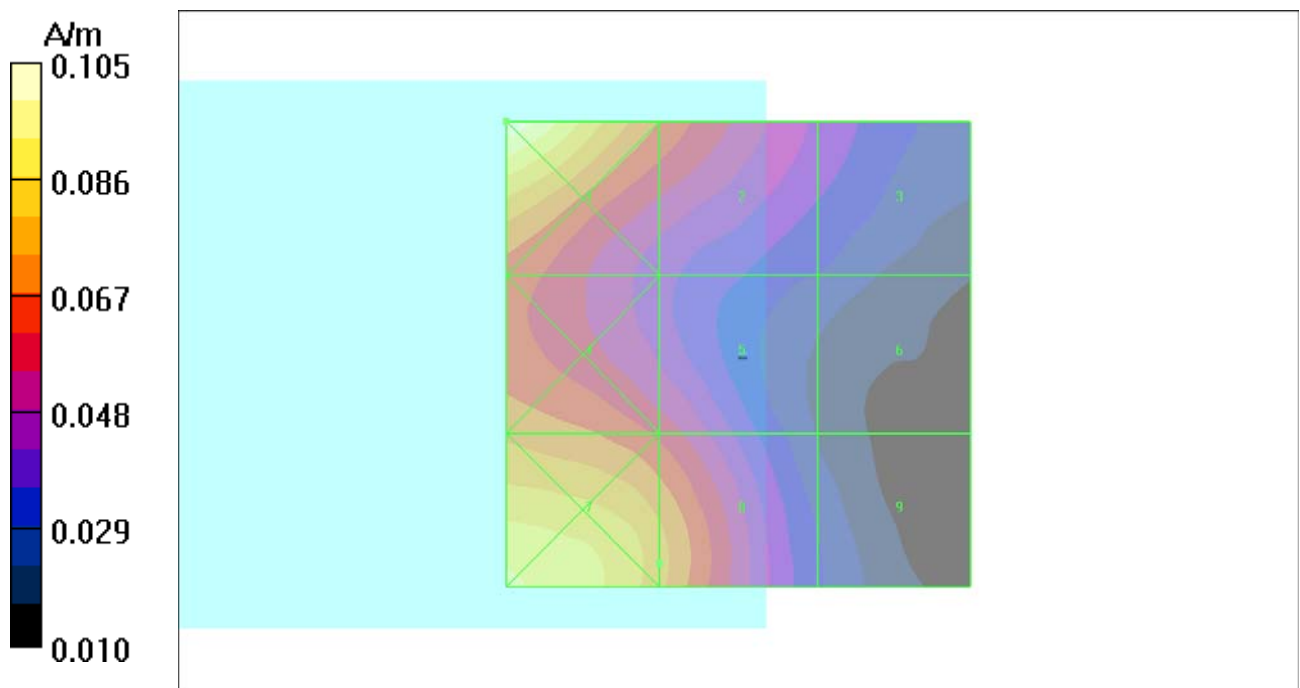
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.038 A/m; Power Drift = -0.371 dB

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

Peak H-field in A/m

Grid 1 0.105 M4	Grid 2 0.069 M4	Grid 3 0.041 M4
Grid 4 0.067 M4	Grid 5 0.055 M4	Grid 6 0.029 M4
Grid 7 0.085 M4	Grid 8 0.070 M4	Grid 9 0.029 M4



P31 H_Field CDMA2000 BC1_RC3+SO55_Full_Ch600_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC1; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch600/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.113 A/m

Probe Modulation Factor = 1.02

Device Reference Point: 0.000, 0.000, -6.30 mm

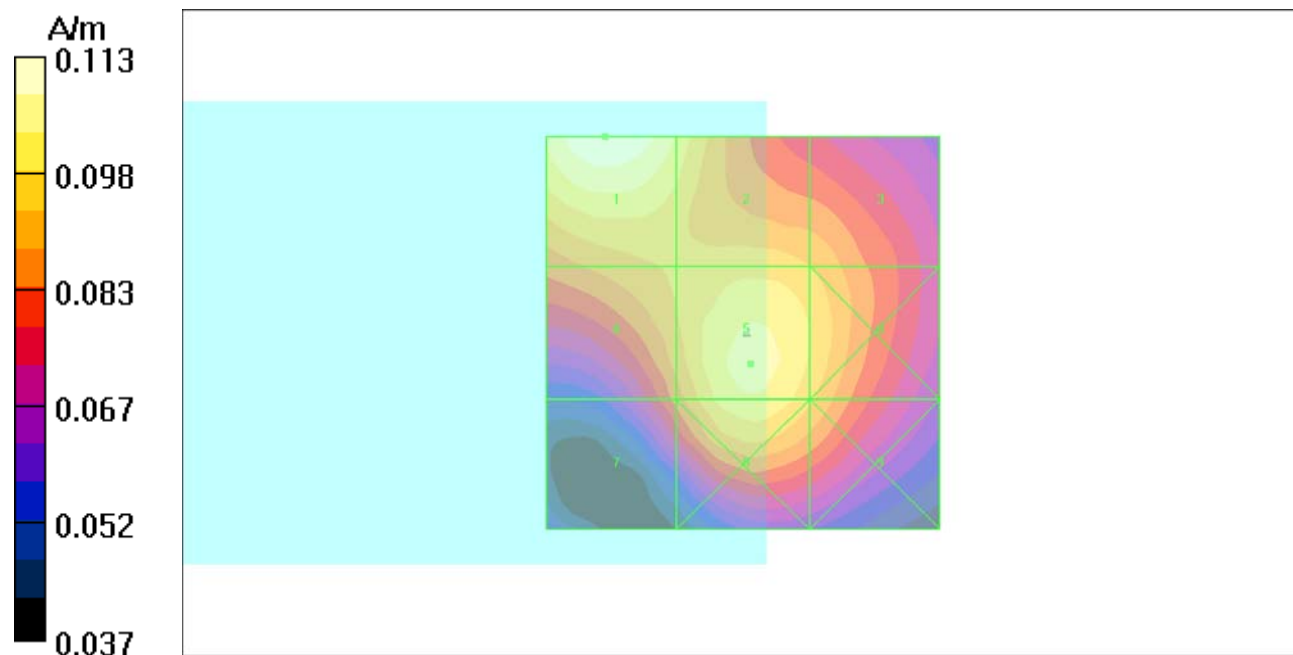
Reference Value = 0.150 A/m; Power Drift = -0.038 dB

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

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Peak H-field in A/m

Grid 1 0.113 M4	Grid 2 0.103 M4	Grid 3 0.093 M4
Grid 4 0.093 M4	Grid 5 0.105 M4	Grid 6 0.098 M4
Grid 7 0.085 M4	Grid 8 0.102 M4	Grid 9 0.094 M4



P32 H_Field CDMA2000 BC1_RC3+SO55_Full_Ch25_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC1; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch25/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.106 A/m

Probe Modulation Factor = 1.02

Device Reference Point: 0.000, 0.000, -6.30 mm

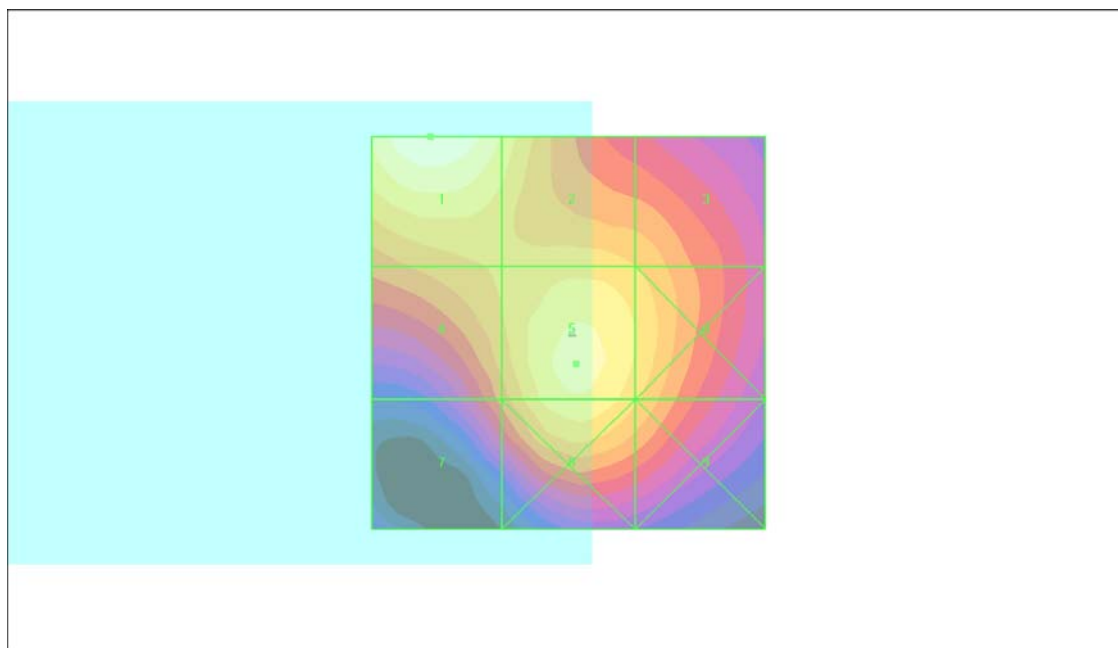
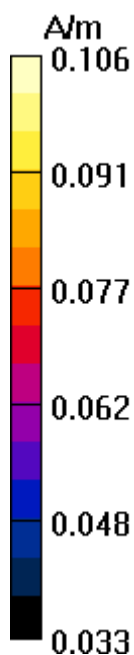
Reference Value = 0.141 A/m; Power Drift = -0.022 dB

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

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Peak H-field in A/m

Grid 1 0.106 M4	Grid 2 0.095 M4	Grid 3 0.087 M4
Grid 4 0.082 M4	Grid 5 0.097 M4	Grid 6 0.091 M4
Grid 7 0.074 M4	Grid 8 0.094 M4	Grid 9 0.087 M4



P33 H_Field CDMA2000 BC1_RC3+SO55_Full_Ch1175_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC1; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1175/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.094 A/m

Probe Modulation Factor = 1.02

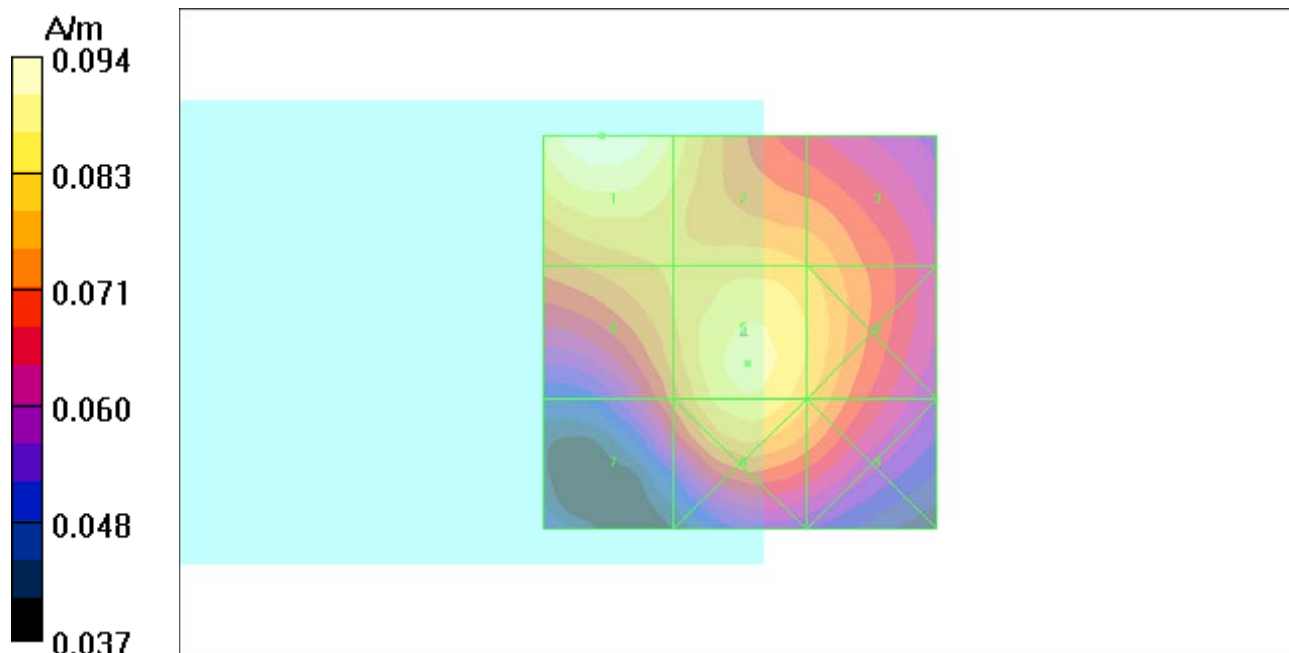
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.131 A/m; Power Drift = -0.065 dB

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

" Peak H-field in A/m
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Grid 1 0.094 M4	Grid 2 0.088 M4	Grid 3 0.081 M4
Grid 4 0.085 M4	Grid 5 0.093 M4	Grid 6 0.086 M4
Grid 7 0.078 M4	Grid 8 0.091 M4	Grid 9 0.083 M4



P34 H_Field CDMA2000 BC1_RC3+SO55_Full_Ch600_Battery2

DUT: 120508C07

Communication System: CDMA2000 BC1; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch600/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.112 A/m

Probe Modulation Factor = 1.02

Device Reference Point: 0.000, 0.000, -6.30 mm

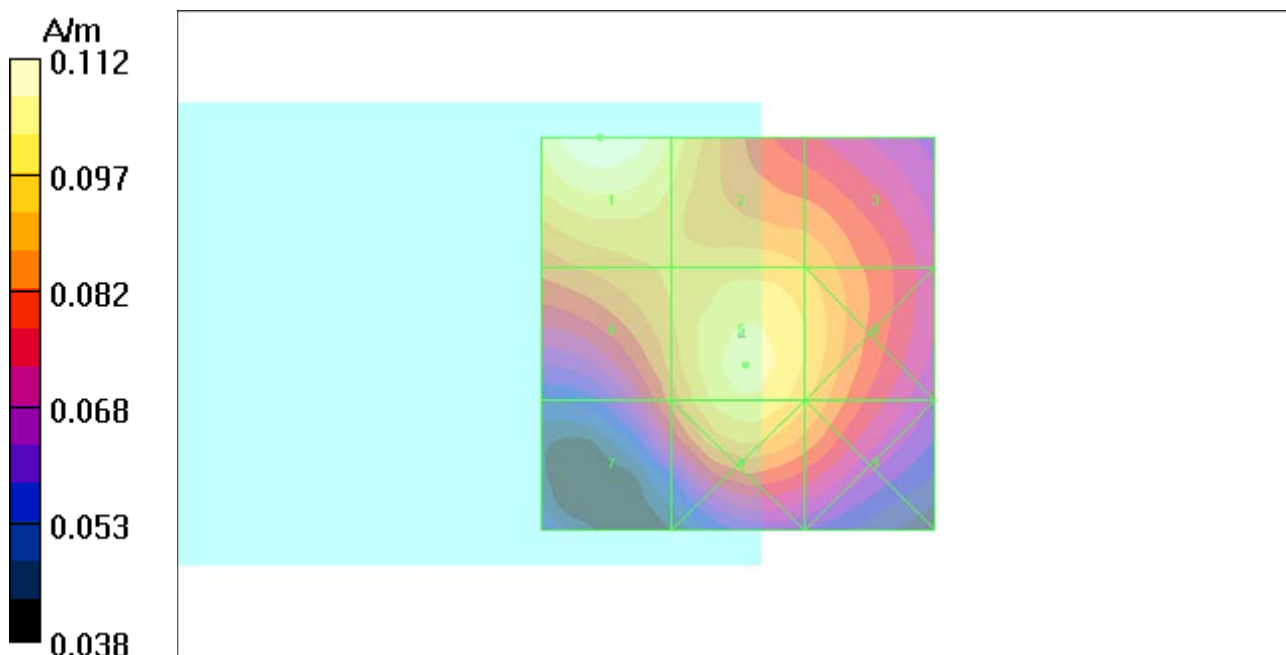
Reference Value = 0.148 A/m; Power Drift = -0.063 dB

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

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Peak H-field in A/m

Grid 1 0.112 M4	Grid 2 0.102 M4	Grid 3 0.092 M4
Grid 4 0.094 M4	Grid 5 0.104 M4	Grid 6 0.098 M4
Grid 7 0.086 M4	Grid 8 0.101 M4	Grid 9 0.093 M4



P35 H_Field CDMA2000 BC15_RC3+SO55_Full_Ch25_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC15; Frequency: 1711.25 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch25/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.100 A/m

Probe Modulation Factor = 1.02

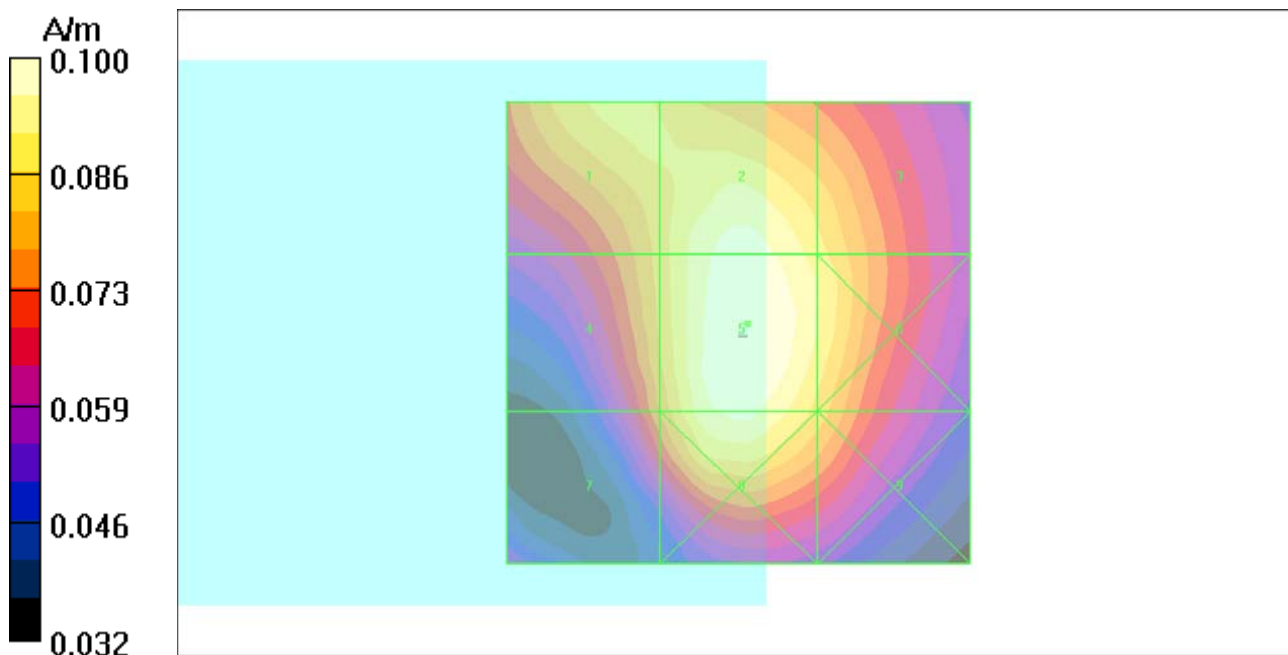
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.147 A/m; Power Drift = -0.019 dB

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

Peak H-field in A/m

Grid 1 0.086 M4	Grid 2 0.095 M4	Grid 3 0.085 M4
Grid 4 0.085 M4	Grid 5 0.100 M4	Grid 6 0.086 M4
Grid 7 0.078 M4	Grid 8 0.094 M4	Grid 9 0.079 M4



P36 H_Field CDMA2000 BC15_RC3+SO55_Full_Ch425_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC15; Frequency: 1731.25 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch425/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.087 A/m

Probe Modulation Factor = 1.02

Device Reference Point: 0.000, 0.000, -6.30 mm

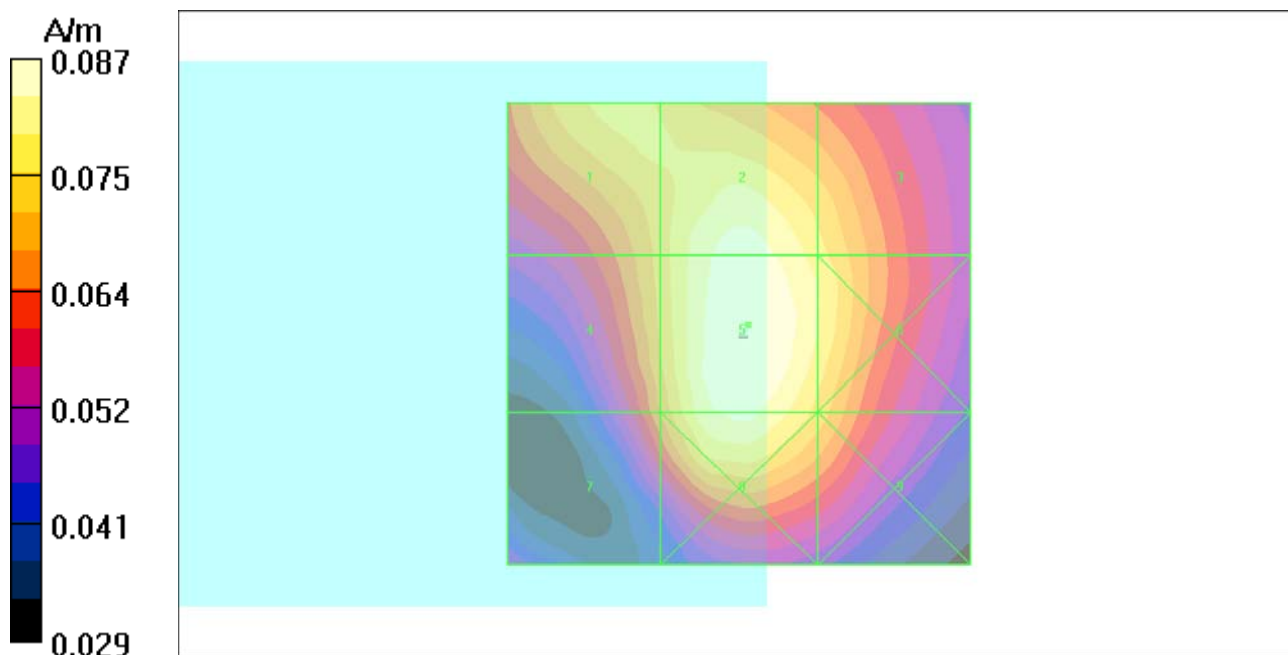
Reference Value = 0.129 A/m; Power Drift = 0.012 dB

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

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Peak H-field in A/m

Grid 1 0.080 M4	Grid 2 0.084 M4	Grid 3 0.078 M4
Grid 4 0.073 M4	Grid 5 0.087 M4	Grid 6 0.079 M4
Grid 7 0.067 M4	Grid 8 0.083 M4	Grid 9 0.073 M4



P37 H_Field CDMA2000 BC15_RC3+SO55_Full_Ch875_Battery1

DUT: 120508C07

Communication System: CDMA2000 BC15; Frequency: 1753.75 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch875/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.084 A/m

Probe Modulation Factor = 1.02

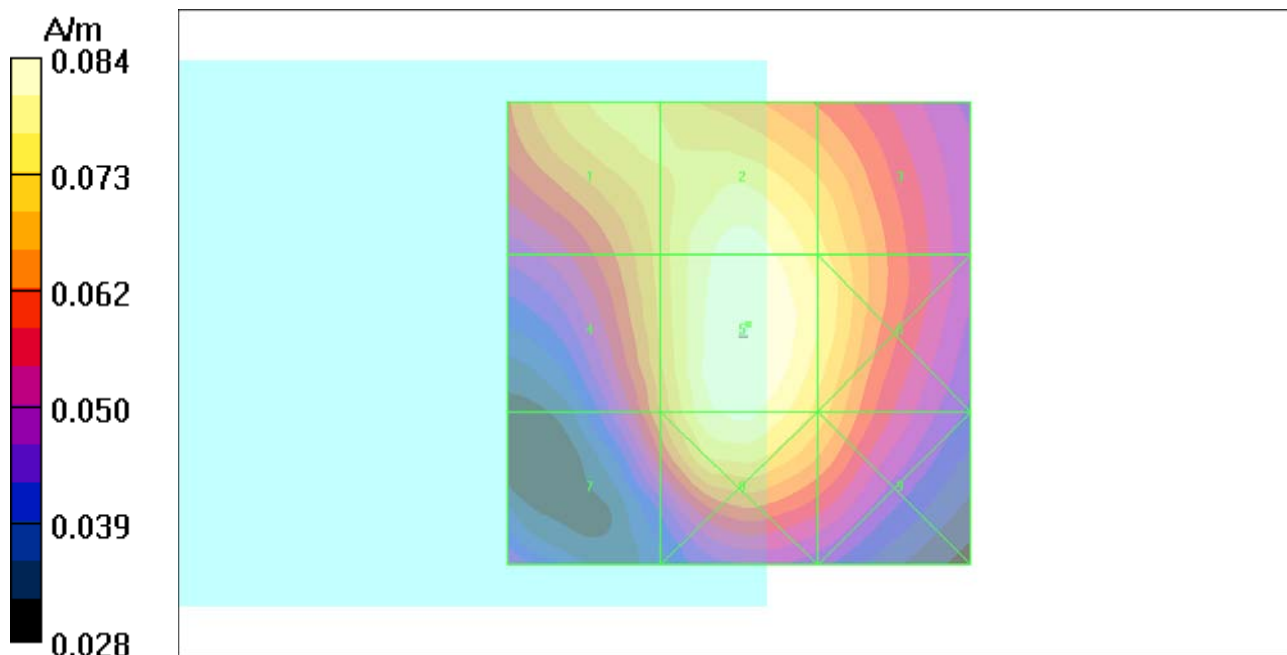
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.123 A/m; Power Drift = -0.006 dB

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

Peak H-field in A/m

Grid 1 0.080 M4	Grid 2 0.081 M4	Grid 3 0.077 M4
Grid 4 0.069 M4	Grid 5 0.084 M4	Grid 6 0.079 M4
Grid 7 0.062 M4	Grid 8 0.079 M4	Grid 9 0.072 M4



P38 H_Field CDMA2000 BC15_RC3+SO55_Full_Ch25_Battery2

DUT: 120508C07

Communication System: CDMA2000 BC15; Frequency: 1711.25 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 21.8 °C

DASY4 Configuration:

- Probe: H3DV6 - SN6274; ; Calibrated: 2012/02/17
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch25/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.098 A/m

Probe Modulation Factor = 1.02

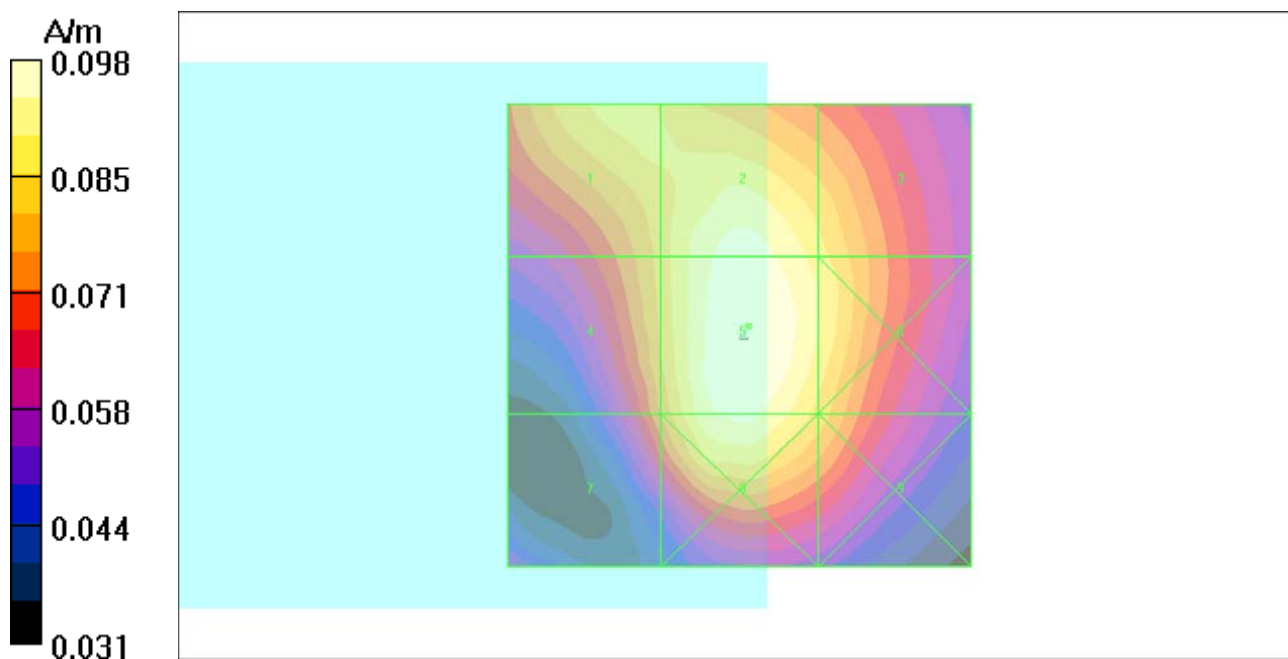
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.145 A/m; Power Drift = -0.081 dB

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

Peak H-field in A/m

Grid 1 0.086 M4	Grid 2 0.096 M4	Grid 3 0.087 M4
Grid 4 0.082 M4	Grid 5 0.098 M4	Grid 6 0.089 M4
Grid 7 0.076 M4	Grid 8 0.095 M4	Grid 9 0.083 M4





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **B.V. ADT (Auden)**

Certificate No: **CD835V3-1041_Mar12**

CALIBRATION CERTIFICATE

Object **CD835V3 - SN: 1041**

Calibration procedure(s) **QA CAL-20.v6
Calibration procedure for dipoles in air**

Calibration date: **March 19, 2012**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ 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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Probe ER3DV6	SN: 2336	29-Dec-11 (No. ER3-2336_Dec11)	Dec-12
Probe H3DV6	SN: 6065	29-Dec-11 (No. H3-6065_Dec11)	Dec-12
DAE4	SN: 781	20-Apr-11 (No. DAE4-781_Apr11)	Apr-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-11)	In house check: Oct-13

Calibrated by: **Claudio Leubler** Name: Claudio Leubler Function: Laboratory Technician

Signature

Approved by: **Fin Bomholt** Name: Fin Bomholt R&D Director

Issued: March 20, 2012

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



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**

References

- [1] ANSI-C63.19-2007
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- *Coordinate System:* y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the top edge of the dipole arms.
- *Measurement Conditions:* Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- *Antenna Positioning:* The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- *Feed Point Impedance and Return Loss:* These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminated by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- *E-field distribution:* E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (in z) above the top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, 10mm above the dipole surface.
- *H-field distribution:* H-field is measured with an isotropic H-field probe with 100mW forward power to the antenna feed point, in the x-y-plane. The scan area and sensor distance is equivalent to the E-field scan. The maximum of the field is available at the center (subgrid 5) above the feed point. The H-field value stated as calibration value represents the maximum of the interpolated H-field, 10mm above the dipole surface at the feed point.

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	10mm	
Scan resolution	dx, dy = 5 mm	
Frequency	835 MHz \pm 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 835 MHz

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW input power	0.455 A / m \pm 8.2 % (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	163.6 V / m
Maximum measured above low end	100 mW input power	159.3 V / m
Averaged maximum above arm	100 mW input power	161.5 V / m \pm 12.8 % (k=2)

Appendix

Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	15.7 dB	42.5 Ω - 13.5 j Ω
835 MHz	28.7 dB	48.0 Ω + 3.0 j Ω
900 MHz	16.6 dB	57.5 Ω - 14.1 j Ω
950 MHz	17.3 dB	45.3 Ω + 12.2 j Ω
960 MHz	13.0 dB	56.0 Ω + 23.6 j Ω

3.2 Antenna Design and Handling

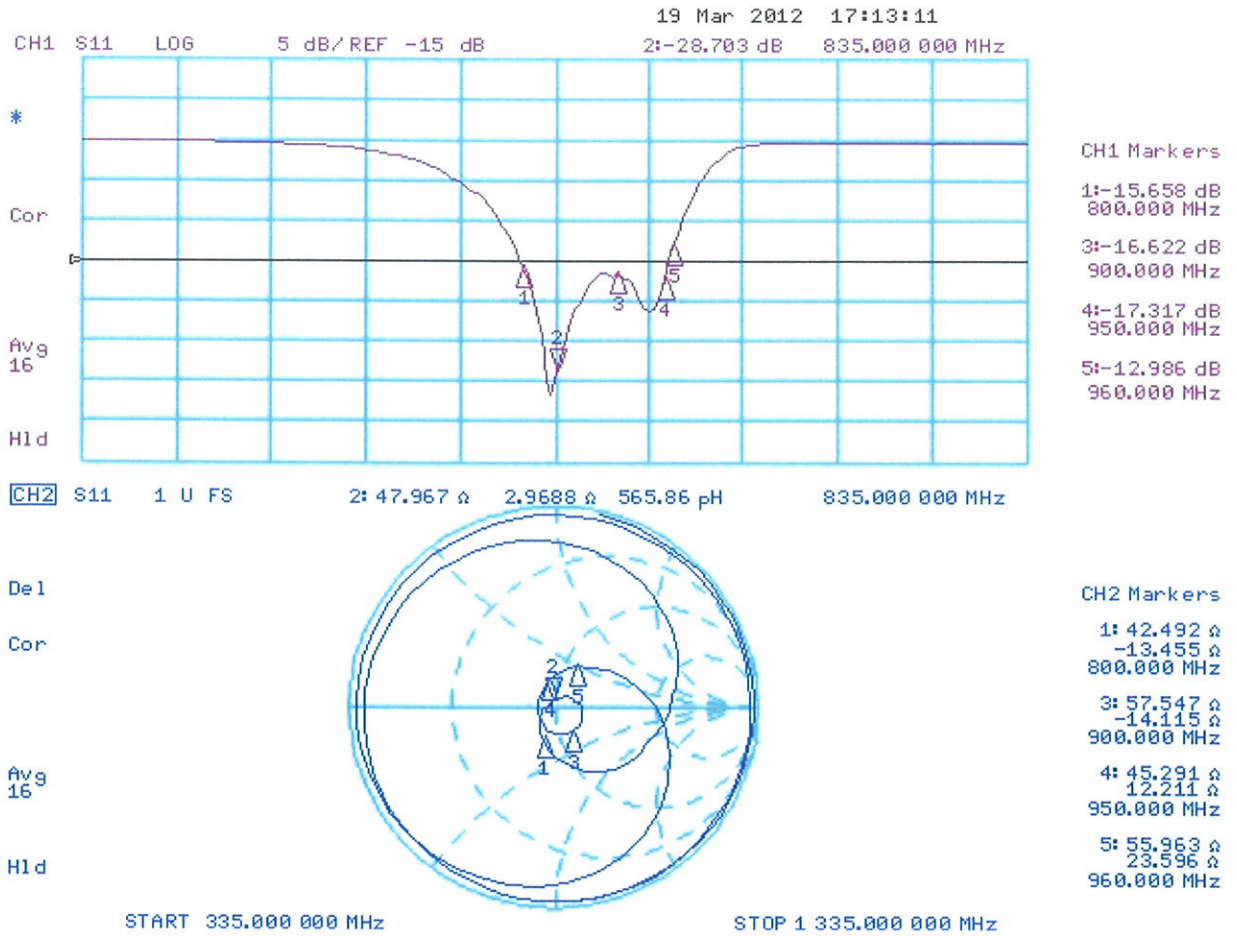
The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Impedance Measurement Plot



DASY5 H-field Result

Date: 19.03.2012

Test Laboratory: SPEAG Lab2

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1041

Communication System: CW; Frequency: 835 MHz
 Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³
 Phantom section: RF Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

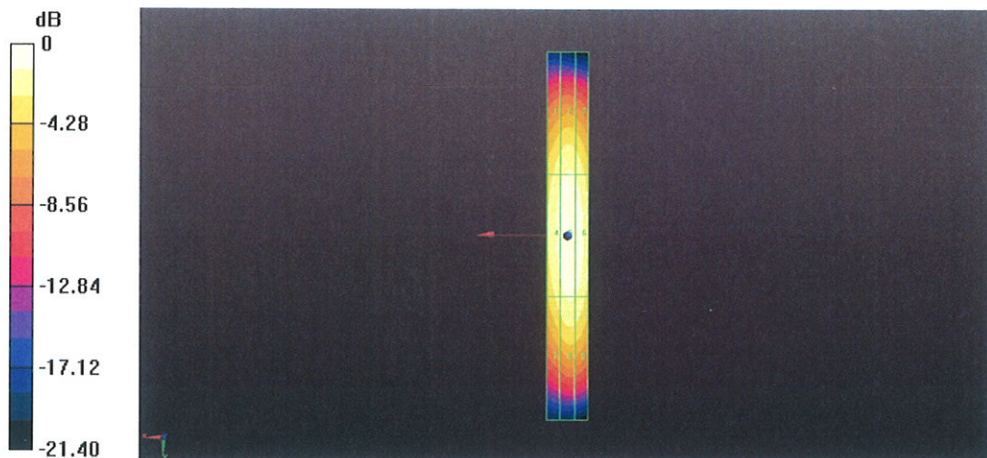
- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

Dipole H-Field measurement @ 835MHz/H-Scan - 835MHz d=10mm/Hearing Aid Compatibility Test (41x361x1):

Measurement grid: dx=5mm, dy=5mm
 Device Reference Point: 0, 0, -6.3 mm
 Reference Value = 0.48 V/m; Power Drift = -0.00 dB
 PMR not calibrated. PMF = 1.000 is applied.
 H-field emissions = 0.46 A/m
Near-field category: M4 (AWF 0 dB)

PMF scaled H-field

Grid 1 M4 0.37 A/m	Grid 2 M4 0.40 A/m	Grid 3 M4 0.39 A/m
Grid 4 M4 0.42 A/m	Grid 5 M4 0.46 A/m	Grid 6 M4 0.44 A/m
Grid 7 M4 0.36 A/m	Grid 8 M4 0.40 A/m	Grid 9 M4 0.39 A/m



0 dB = 0.46A/m = -6.74 dB A/m

DASY5 E-field Result

Date: 19.03.2012

Test Laboratory: SPEAG Lab2

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1041

Communication System: CW; Frequency: 835 MHz
 Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³
 Phantom section: RF Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

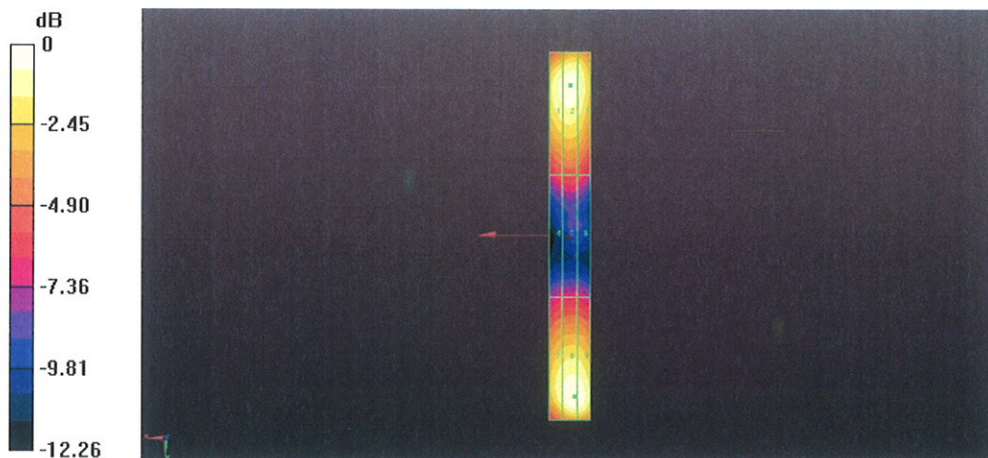
- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

Dipole E-Field measurement @ 835MHz/E-Scan - 835MHz d=10mm/Hearing Aid Compatibility Test (41x361x1):

Measurement grid: dx=5mm, dy=5mm
 Device Reference Point: 0, 0, -6.3 mm
 Reference Value = 106.2 V/m; Power Drift = 0.00 dB
 PMR not calibrated. PMF = 1.000 is applied.
 E-field emissions = 163.6 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 M4 155.3 V/m	Grid 2 M4 159.3 V/m	Grid 3 M4 154.2 V/m
Grid 4 M4 84.98 V/m	Grid 5 M4 87.25 V/m	Grid 6 M4 85.11 V/m
Grid 7 M4 150.4 V/m	Grid 8 M4 163.6 V/m	Grid 9 M4 163.2 V/m



0 dB = 163.6V/m = 44.28 dB V/m



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Accreditation No.: **SCS 108**

Client **B.V. ADT (Auden)**

Certificate No: **CD1880V3-1032_Apr12**

CALIBRATION CERTIFICATE

Object **CD1880V3 - SN: 1032**

Calibration procedure(s) **QA CAL-20.v6
 Calibration procedure for dipoles in air**

Calibration date: **April 26, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Probe ER3DV6	SN: 2336	29-Dec-11 (No. ER3-2336_Dec11)	Dec-12
Probe H3DV6	SN: 6065	29-Dec-11 (No. H3-6065_Dec11)	Dec-12
DAE4	SN: 781	25-Apr-12 (No. DAE4-781_Apr12)	Apr-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-11)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Fin Bornholt	R&D Director	

Issued: April 27, 2012

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Accreditation No.: **SCS 108**

References

- [1] ANSI-C63.19-2007
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.
- [2] ANSI-C63.19-2011
American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- *Coordinate System:* y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm (15 mm for [2]) above the top metal edge of the dipole arms.
- *Measurement Conditions:* Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- *Antenna Positioning:* The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- *Feed Point Impedance and Return Loss:* These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- *E-field distribution:* E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1] and [2], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (15 mm for [2]) (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.
- *H-field distribution:* H-field is measured with an isotropic H-field probe with 100mW forward power to the antenna feed point, in the x-y-plane. The scan area and sensor distance is equivalent to the E-field scan. The maximum of the field is available at the center (subgrid 5) above the feed point. The H-field value stated as calibration value represents the maximum of the interpolated H-field, 10mm above the dipole surface at the feed point.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	10mm 15mm	
Scan resolution	dx, dy = 5 mm	
Frequency	1880 MHz \pm 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 1880 MHz

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW input power	0.461 A / m \pm 8.2 % (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	142.2 V / m
Maximum measured above low end	100 mW input power	138.0 V / m
Averaged maximum above arm	100 mW input power	140.1 V / m \pm 12.8 % (k=2)

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	88.6 V / m
Maximum measured above low end	100 mW input power	87.8 V / m
Averaged maximum above arm	100 mW input power	88.2 V / m \pm 12.8 % (k=2)

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%.

Appendix

Antenna Parameters

Frequency	Return Loss	Impedance
1730 MHz	24.9 dB	$50.9 \Omega + 5.7 j\Omega$
1880 MHz	20.8 dB	$51.6 \Omega + 9.2 j\Omega$
1900 MHz	21.0 dB	$54.4 \Omega + 8.2 j\Omega$
1950 MHz	27.6 dB	$54.3 \Omega + 0.6 j\Omega$
2000 MHz	21.8 dB	$42.8 \Omega + 2.2 j\Omega$

3.2 Antenna Design and Handling

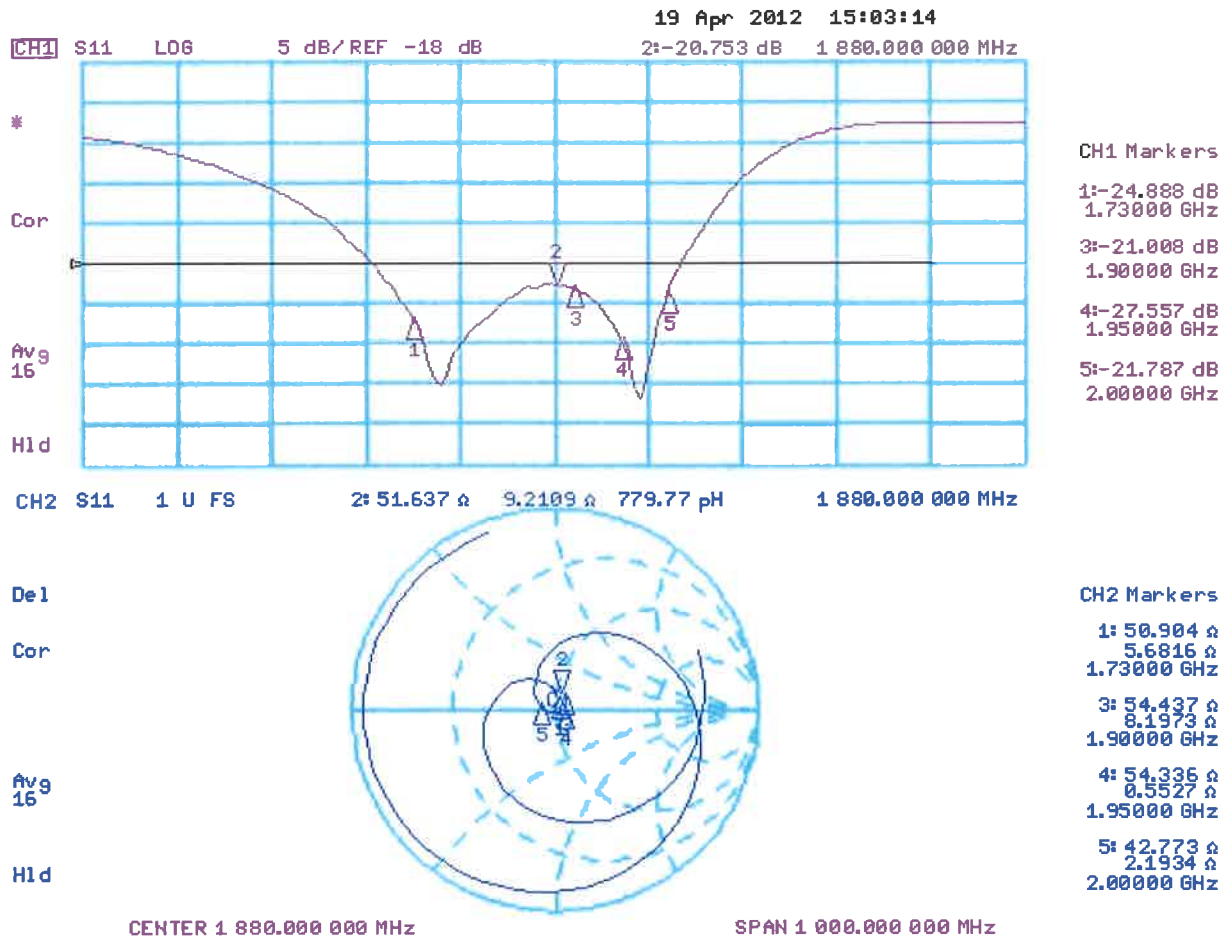
The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Impedance Measurement Plot



Dipole E-Field measurement @ 1880MHz/E-Scan - 1880MHz d=15mm/Hearing Aid Compatibility Test (41x181x1):

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

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 157.1 V/m; Power Drift = -0.00 dB

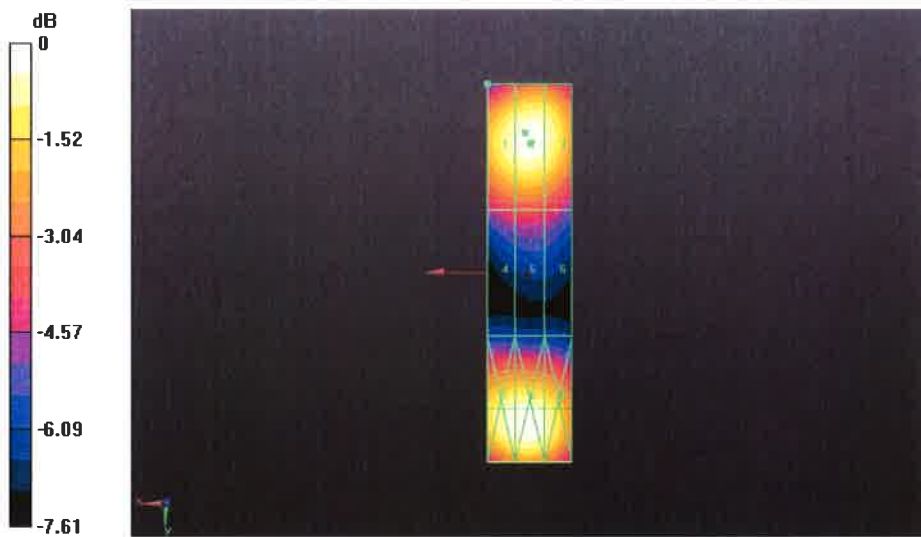
PMR not calibrated. PMF = 1.000 is applied.

E-field emissions = 87.77 V/m

Near-field category: M3 (AWF 0 dB)

PMF scaled E-field

Grid 1 M3 86.19 V/m	Grid 2 M3 87.77 V/m	Grid 3 M3 86.19 V/m
Grid 4 M3 67.85 V/m	Grid 5 M3 68.46 V/m	Grid 6 M3 67.31 V/m
Grid 7 M3 87.74 V/m	Grid 8 M3 88.63 V/m	Grid 9 M3 86.31 V/m



0 dB = 142.2 V/m = 43.06 dB V/m



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Accreditation No.: **SCS 108**

Client **B. V. ADT (Auden)**

Certificate No: **H3-6274_Feb12**

CALIBRATION CERTIFICATE

Object **H3DV6 - SN:6274**

Calibration procedure(s) **QA CAL-03.v6, QA CAL-25.v4
Calibration procedure for H-field probes optimized for close near field
evaluations in air**

Calibration date: **February 17, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe H3DV6	SN: 6182	11-Oct-11 (No. H3-6182_Oct11)	Oct-12
DAE4	SN: 789	30-Jan-12 (No. DAE4-789_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: February 22, 2012

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