



Appendix A. Plots of System Performance Check

The plots are shown as follows.

HAC_E_Dipole_835_120502**DUT: HAC-Dipole 835 MHz**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

E 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 = 167.9 V/m

Probe Modulation Factor = 1.000

Reference Value = 112.6 V/m; Power Drift = -0.01 dB

Average value of Total=(167.9+160.6) /2 = 164.25V/m

Peak E-field in V/m

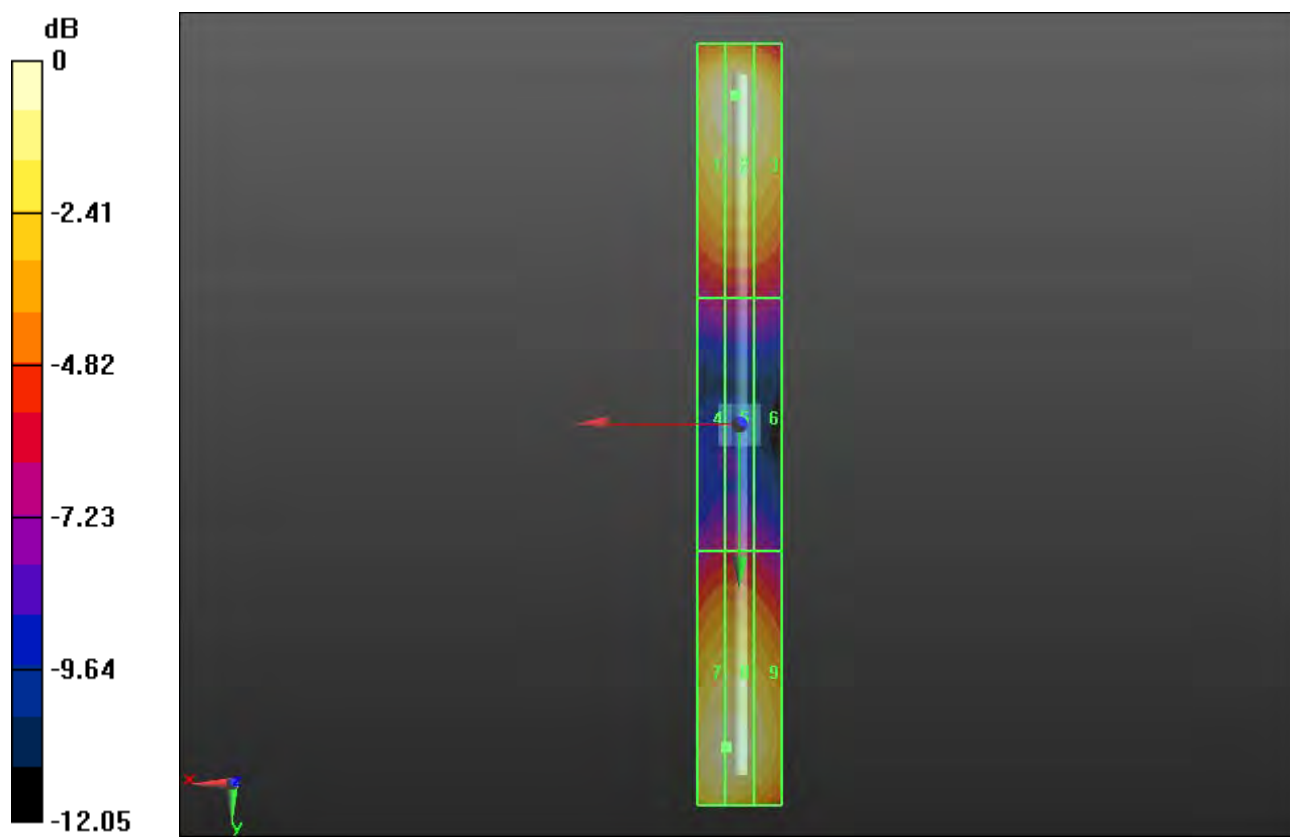
Grid 1 165.5 M4	Grid 2 167.9 M4	Grid 3 160.1 M4
Grid 4 81.320 M4	Grid 5 81.736 M4	Grid 6 81.388 M4
Grid 7 160.3 M4	Grid 8 160.6 M4	Grid 9 151.2 M4

Cursor:

Total = 167.9 V/m

E Category: M4

Location: 1, -78, 4.7 mm



HAC_E_Dipole_1880_120502**DUT: HAC Dipole 1880 MHz**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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 = 143.8 V/m

Probe Modulation Factor = 1.000

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 145.0 V/m; Power Drift = 0.02 dB

Average value of Total=(143.8+142.0) /2 = 142.9V/m

Peak E-field in V/m

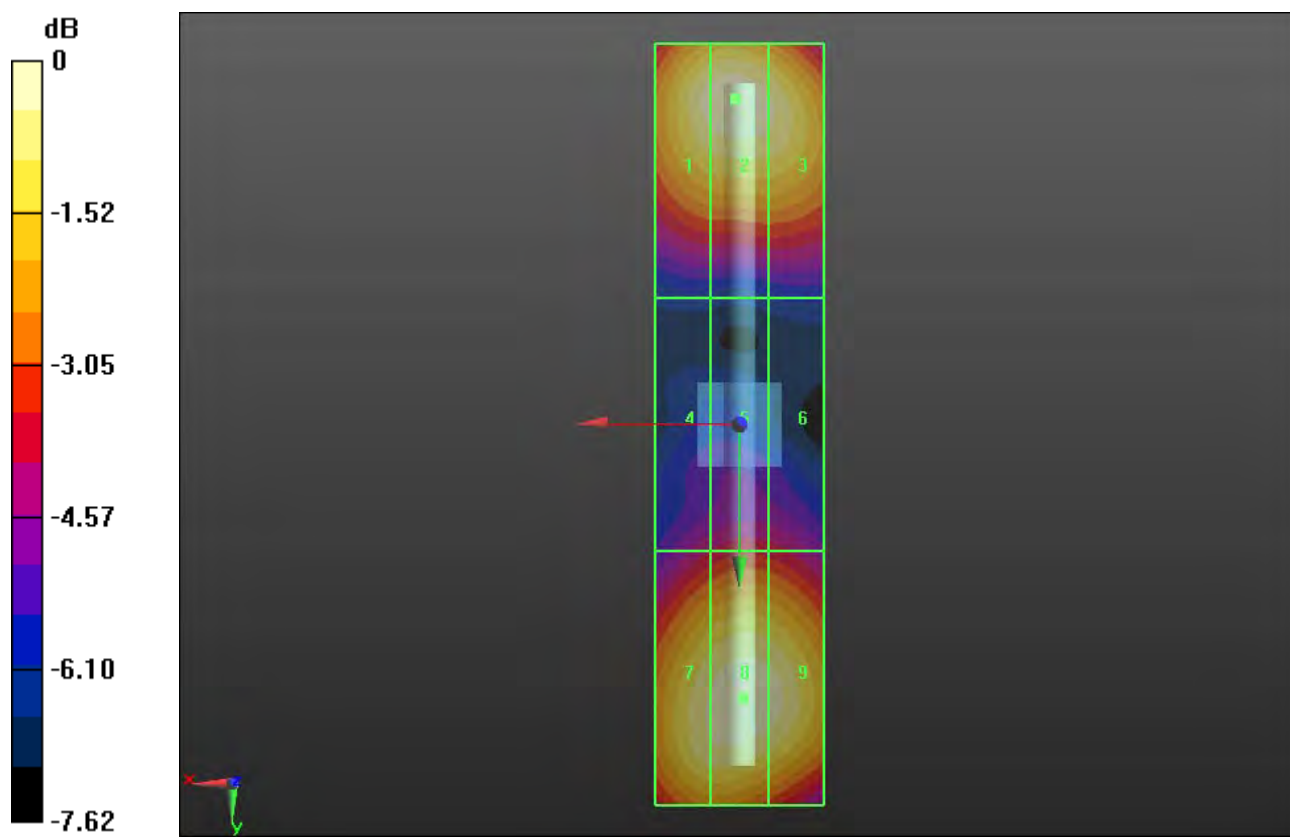
Grid 1 139.8 M2	Grid 2 143.8 M2	Grid 3 137.7 M2
Grid 4 90.320 M3	Grid 5 94.900 M3	Grid 6 93.617 M3
Grid 7 137.3 M2	Grid 8 142.0 M2	Grid 9 139.8 M2

Cursor:

Total = 143.8 V/m

E Category: M2

Location: 0.5, -38.5, 4.7 mm



0 dB = 143.8V/m

HAC_H_Dipole_835_120502**DUT: HAC-Dipole 835 MHz**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

H Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm

Probe Modulation Factor = 1.000

Reference Value = 0.481 A/m; Power Drift = 0.02 dB

Maximum value of peak Total field = 0.454 A/m

Peak H-field in A/m

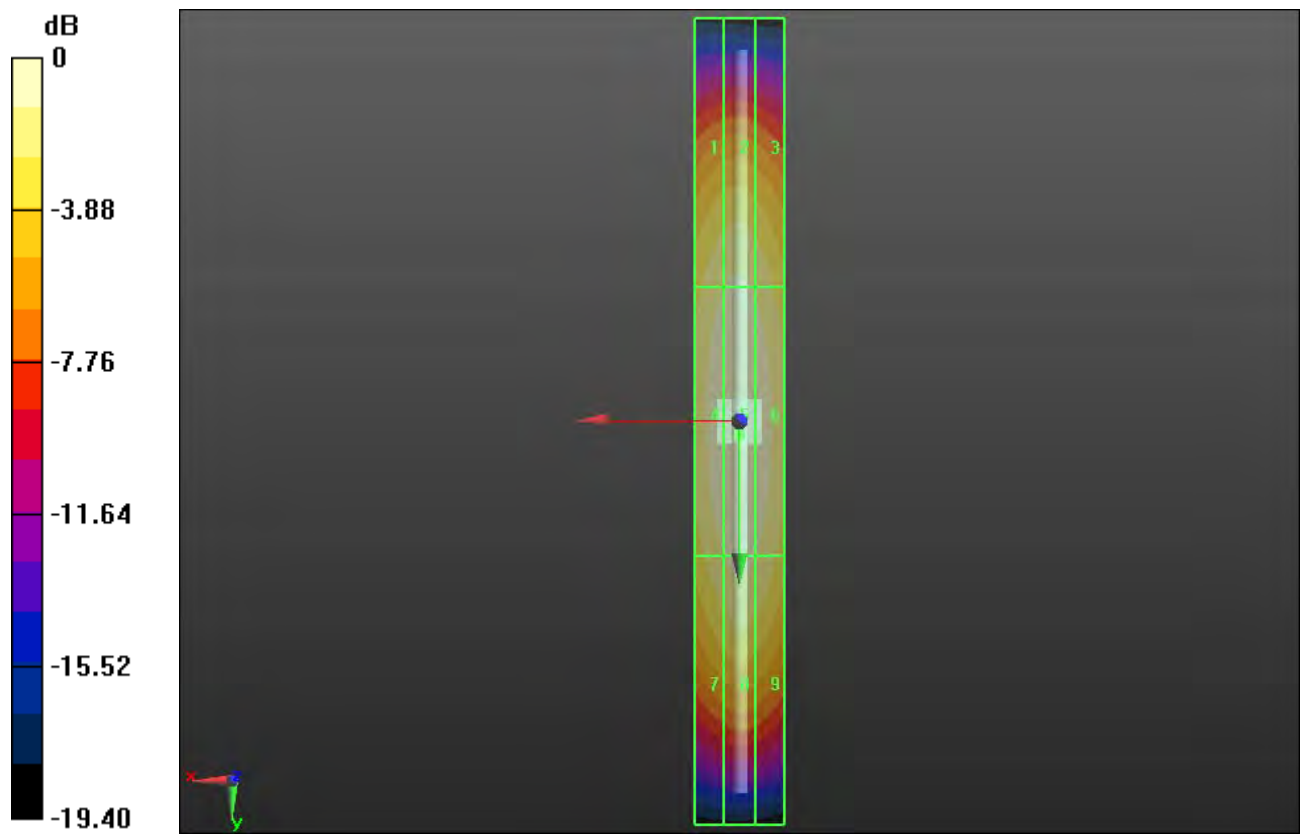
Grid 1	Grid 2	Grid 3
0.386 M4	0.401 M4	0.380 M4
Grid 4	Grid 5	Grid 6
0.434 M4	0.454 M4	0.433 M4
Grid 7	Grid 8	Grid 9
0.385 M4	0.407 M4	0.389 M4

Cursor:

Total = 0.454 A/m

H Category: M4

Location: 0, 3, 4.7 mm



0 dB = 0.450A/m

HAC_H_Dipole_1880_120502**DUT: HAC Dipole 1880 MHz**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm

Probe Modulation Factor = 1.000

Reference Value = 0.482 A/m; Power Drift = -0.0045 dB

Maximum value of peak Total field = 0.457 A/m

Peak H-field in A/m

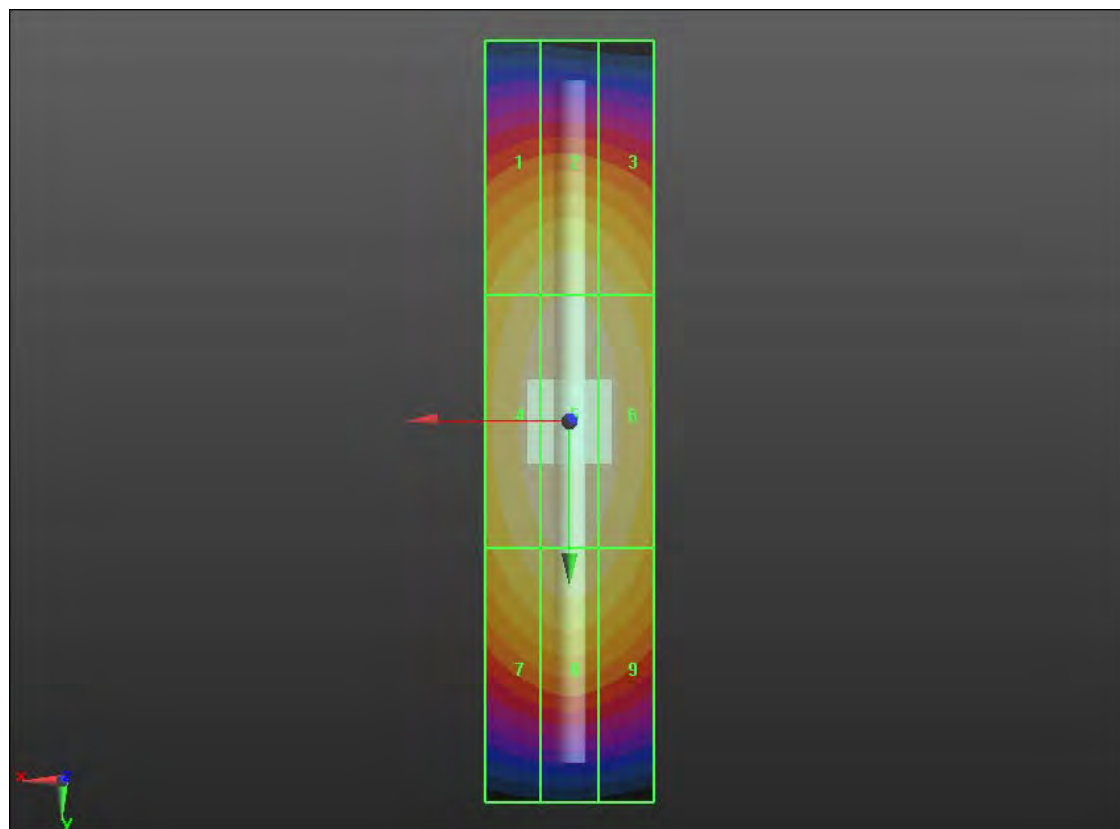
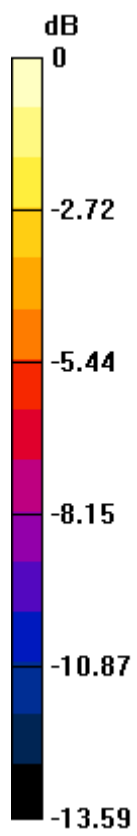
Grid 1	Grid 2	Grid 3
0.400 M2	0.414 M2	0.400 M2
Grid 4	Grid 5	Grid 6
0.440 M2	0.457 M2	0.440 M2
Grid 7	Grid 8	Grid 9
0.402 M2	0.420 M2	0.402 M2

Cursor:

Total = 0.457 A/m

H Category: M2

Location: 0, 0, 4.7 mm



0 dB = 0.460A/m



Appendix B. Plots of RF Emission Measurement

The plots are shown as follows.

#01 RF_CDMA2000 BC0_RC3 SO55_CH1013(E)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C;

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 70.112 V/m

Probe Modulation Factor = 1.150

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 78.338 V/m; Power Drift = -0.12 dB

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

Peak E-field in V/m

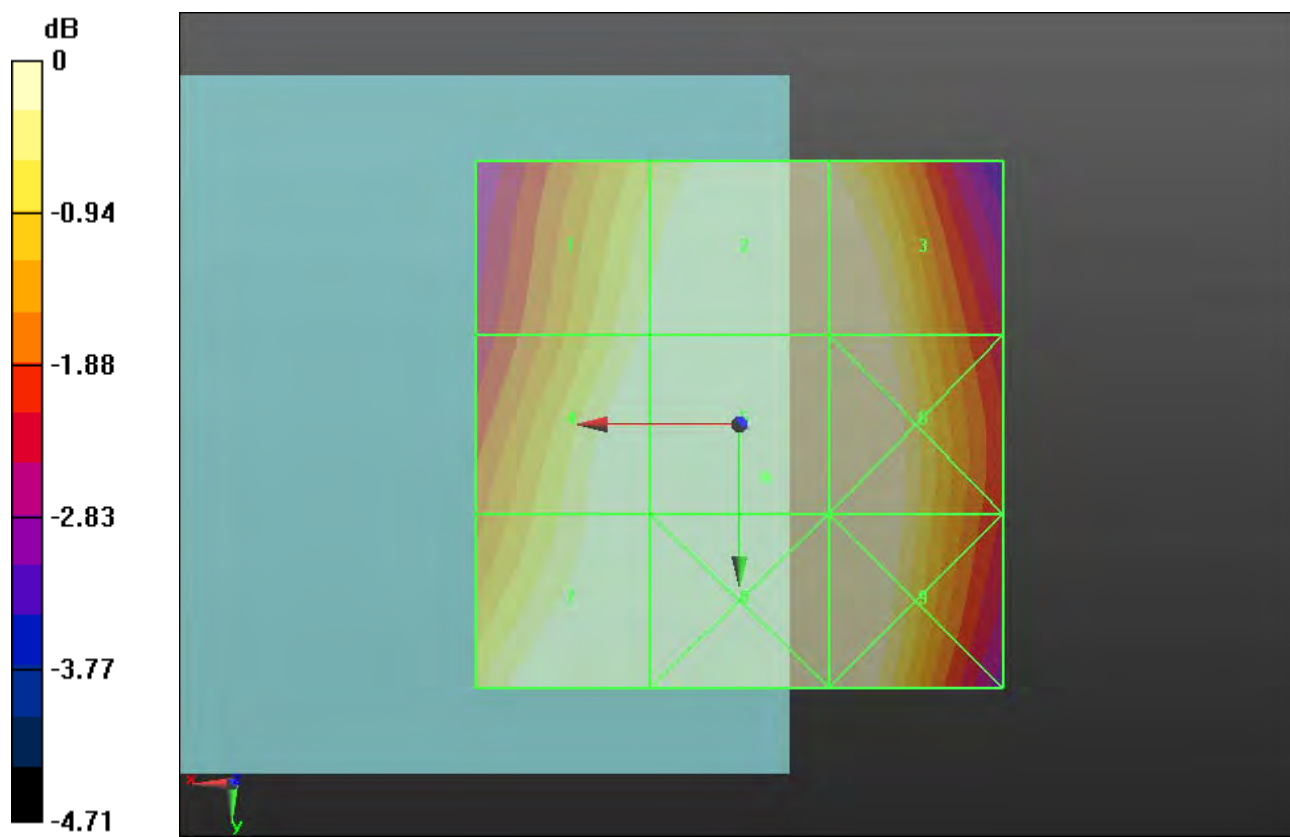
Grid 1 59.928 M4	Grid 2 66.832 M4	Grid 3 65.023 M4
Grid 4 64.168 M4	Grid 5 70.112 M4	Grid 6 67.654 M4
Grid 7 67.393 M4	Grid 8 69.760 M4	Grid 9 67.237 M4

Cursor:

Total = 70.112 V/m

E Category: M4

Location: -2.5, 5, 8.7 mm



#02 RF_CDMA2000 BC0_RC3 SO55_CH384(E)**DUT: 230902**

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch384/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 70.752 V/m

Probe Modulation Factor = 1.150

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 78.467 V/m; Power Drift = -0.06 dB

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

Peak E-field in V/m

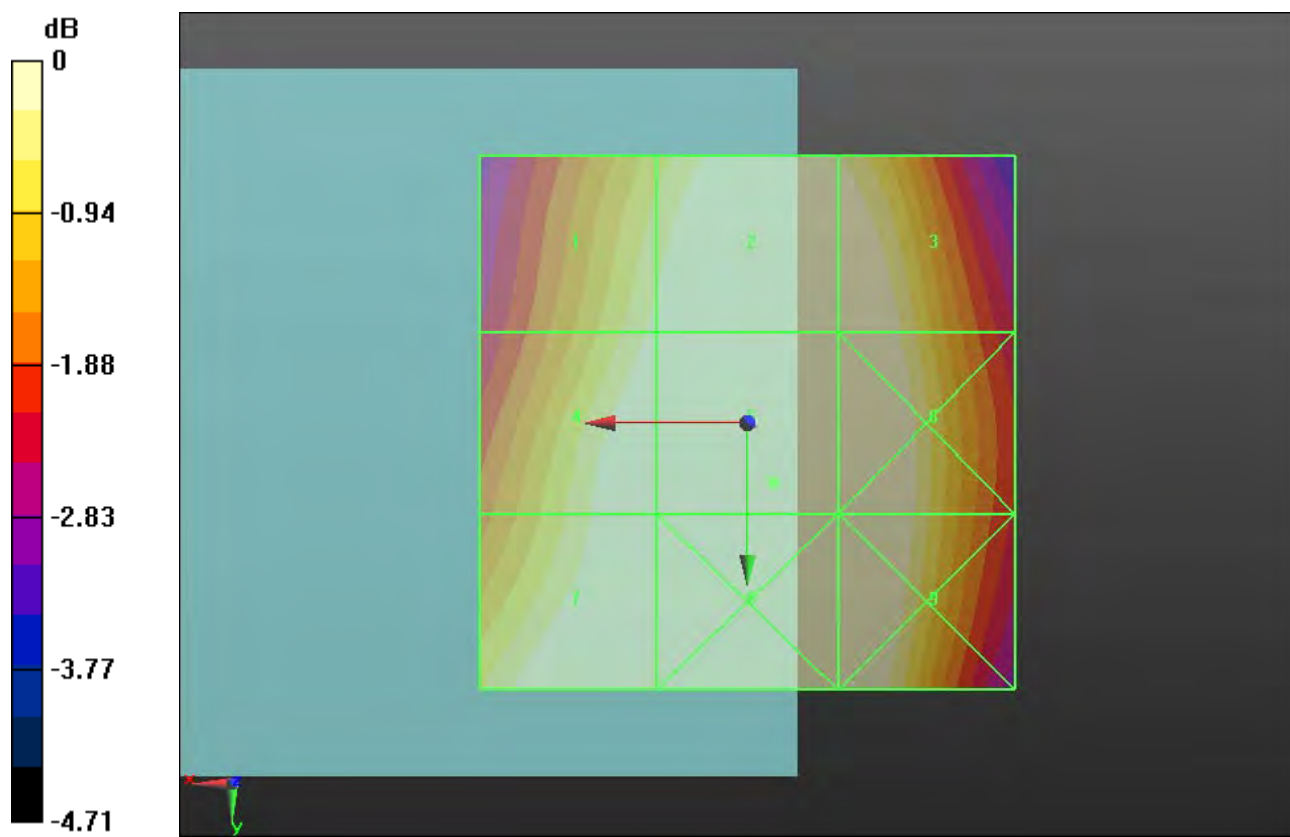
Grid 1 60.286 M4	Grid 2 67.290 M4	Grid 3 65.550 M4
Grid 4 64.722 M4	Grid 5 70.752 M4	Grid 6 68.306 M4
Grid 7 68.237 M4	Grid 8 70.460 M4	Grid 9 67.920 M4

Cursor:

Total = 70.752 V/m

E Category: M4

Location: -2.5, 5.5, 8.7 mm



0 dB = 61.520V/m

#03 RF_CDMA2000 BC0_RC3 SO55_CH777(E)**DUT: 230902**

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 78.640 V/m

Probe Modulation Factor = 1.150

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 87.075 V/m; Power Drift = -0.04 dB

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

Peak E-field in V/m

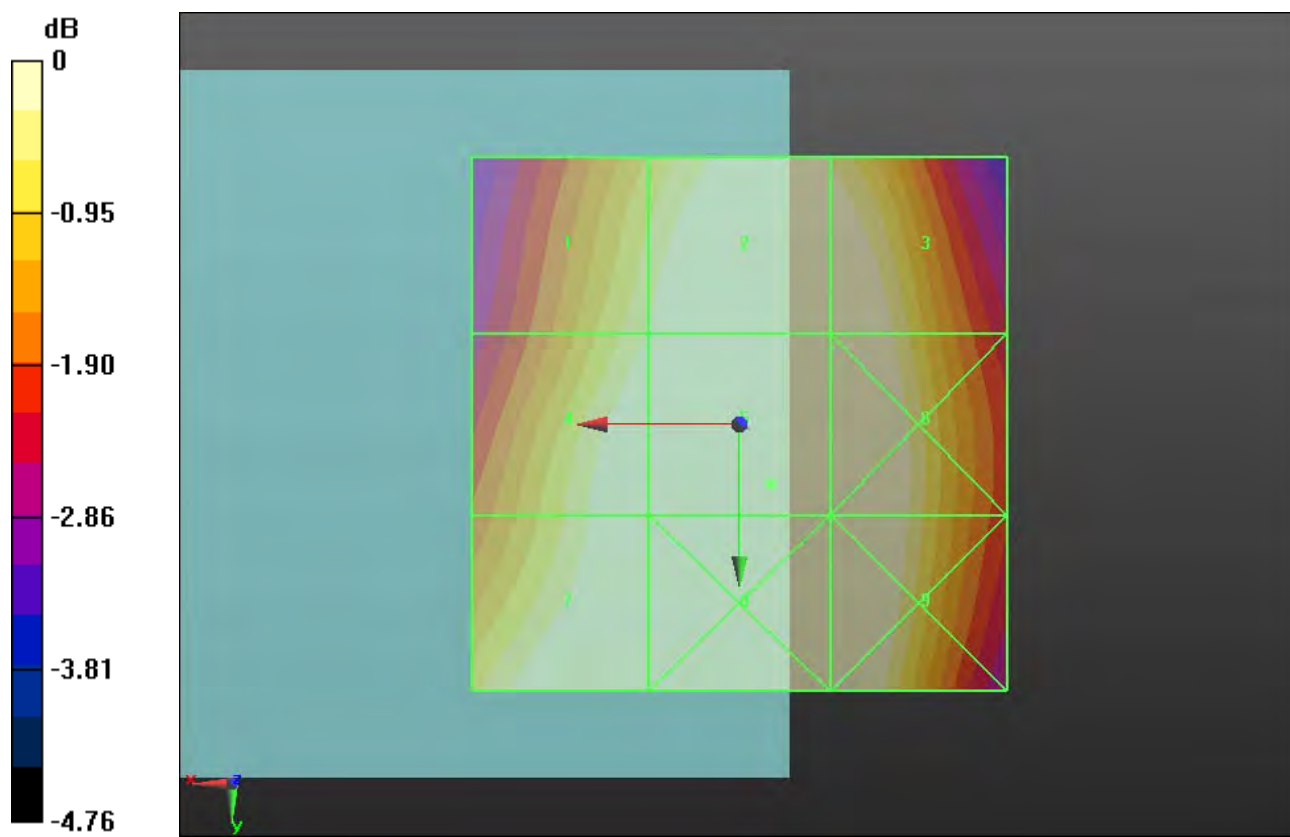
Grid 1 66.358 M4	Grid 2 74.599 M4	Grid 3 72.837 M4
Grid 4 71.750 M4	Grid 5 78.640 M4	Grid 6 76.231 M4
Grid 7 75.919 M4	Grid 8 78.630 M4	Grid 9 75.896 M4

Cursor:

Total = 78.640 V/m

E Category: M4

Location: -3, 5.5, 8.7 mm



0 dB = 68.380V/m

#04 RF_CDMA2000 BC1_RC3 SO55_CH25(E)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 35.644 V/m

Probe Modulation Factor = 1.040

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 23.885 V/m; Power Drift = -0.16 dB

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

Peak E-field in V/m

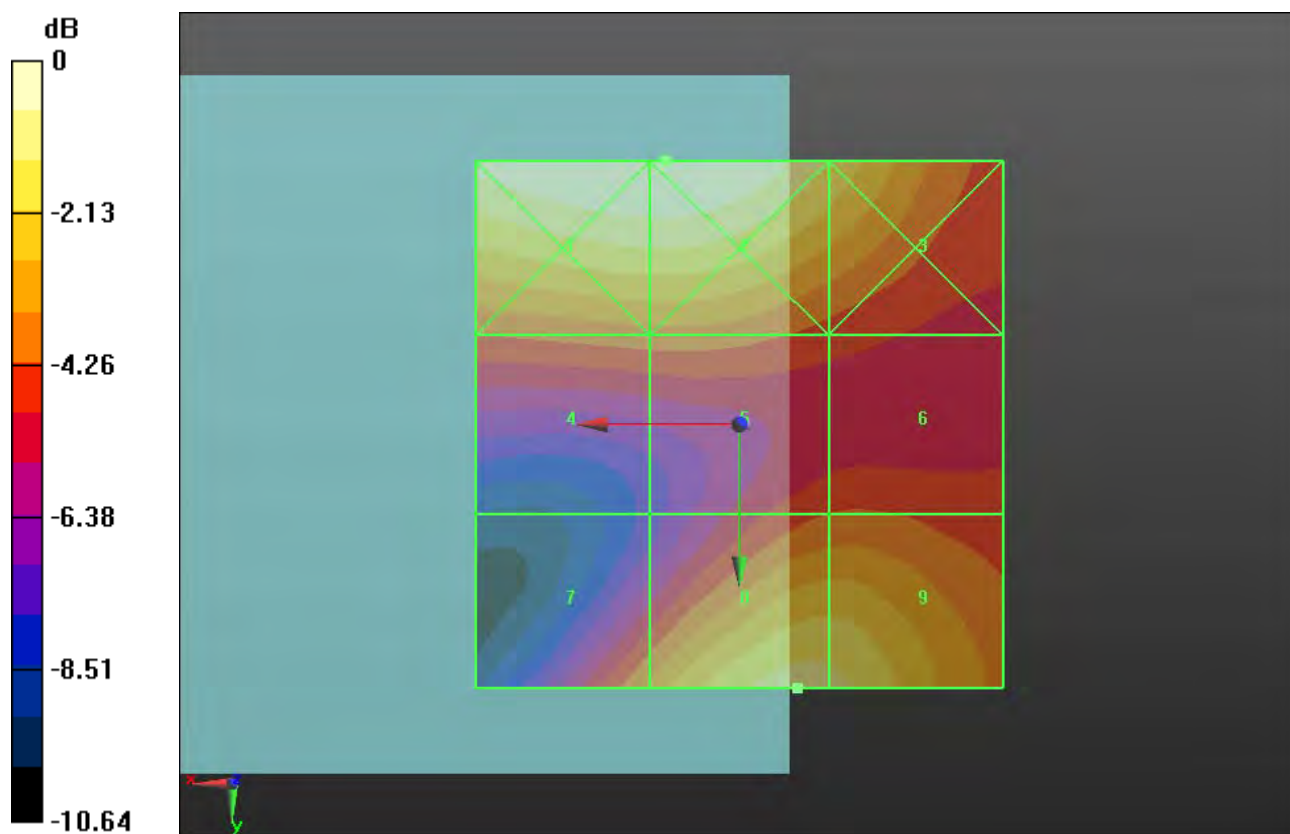
Grid 1 41.892 M4	Grid 2 41.933 M4	Grid 3 34.099 M4
Grid 4 26.029 M4	Grid 5 26.147 M4	Grid 6 25.035 M4
Grid 7 27.630 M4	Grid 8 35.644 M4	Grid 9 35.160 M4

Cursor:

Total = 41.933 V/m

E Category: M4

Location: 7, -25, 8.7 mm



0 dB = 40.320V/m

#05 RF_CDMA2000 BC1_RC3 SO55_CH600(E)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21

- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18

- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;

- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 30.640 V/m

Probe Modulation Factor = 1.040

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 24.067 V/m; Power Drift = -0.05 dB

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

Peak E-field in V/m

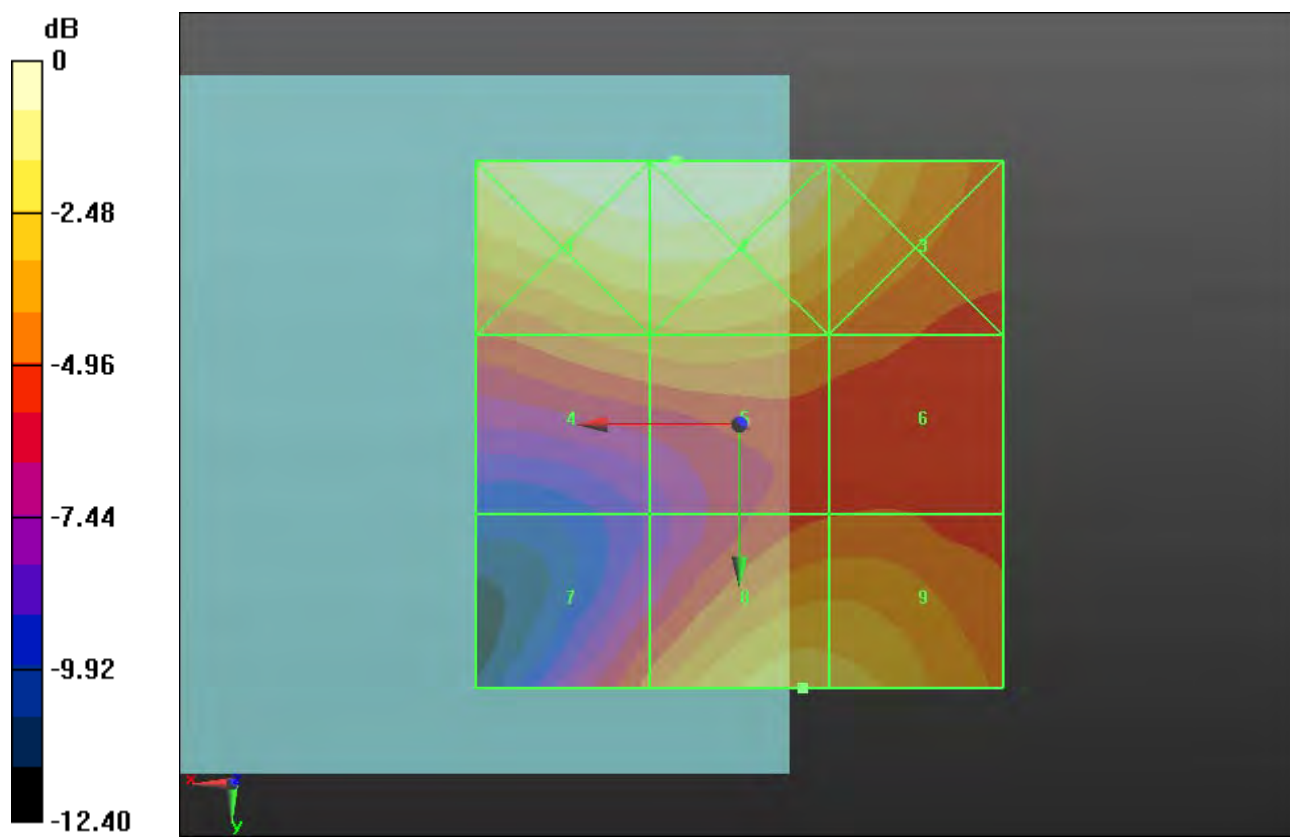
Grid 1 39.666 M4	Grid 2 39.832 M4	Grid 3 32.435 M4
Grid 4 25.314 M4	Grid 5 25.899 M4	Grid 6 23.668 M4
Grid 7 22.860 M4	Grid 8 30.640 M4	Grid 9 30.307 M4

Cursor:

Total = 39.832 V/m

E Category: M4

Location: 6, -25, 8.7 mm



0 dB = 38.300V/m

#06 RF_CDMA2000 BC1_RC3 SO55_CH1175(E)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 26.456 V/m

Probe Modulation Factor = 1.040

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 23.242 V/m; Power Drift = 0.04 dB

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

Peak E-field in V/m

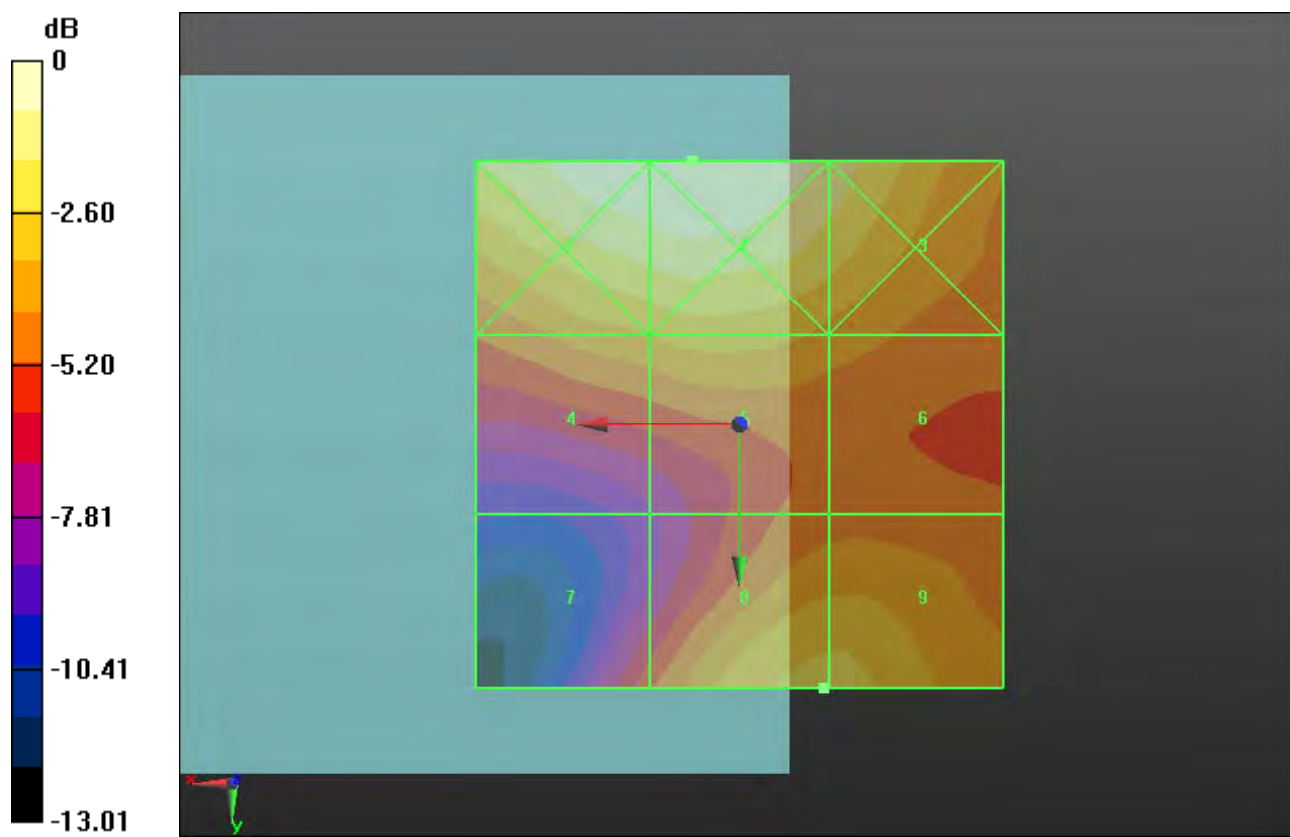
Grid 1 35.435 M4	Grid 2 36.005 M4	Grid 3 30.280 M4
Grid 4 23.286 M4	Grid 5 24.346 M4	Grid 6 22.561 M4
Grid 7 18.747 M4	Grid 8 26.456 M4	Grid 9 26.454 M4

Cursor:

Total = 36.006 V/m

E Category: M4

Location: 4.5, -25, 8.7 mm



0 dB = 34.620V/m

#07 RF_CDMA2000 BC15_RC3 SO55_CH25(E)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 47.210 V/m

Probe Modulation Factor = 1.040

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 28.456 V/m; Power Drift = -0.09 dB

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

Peak E-field in V/m

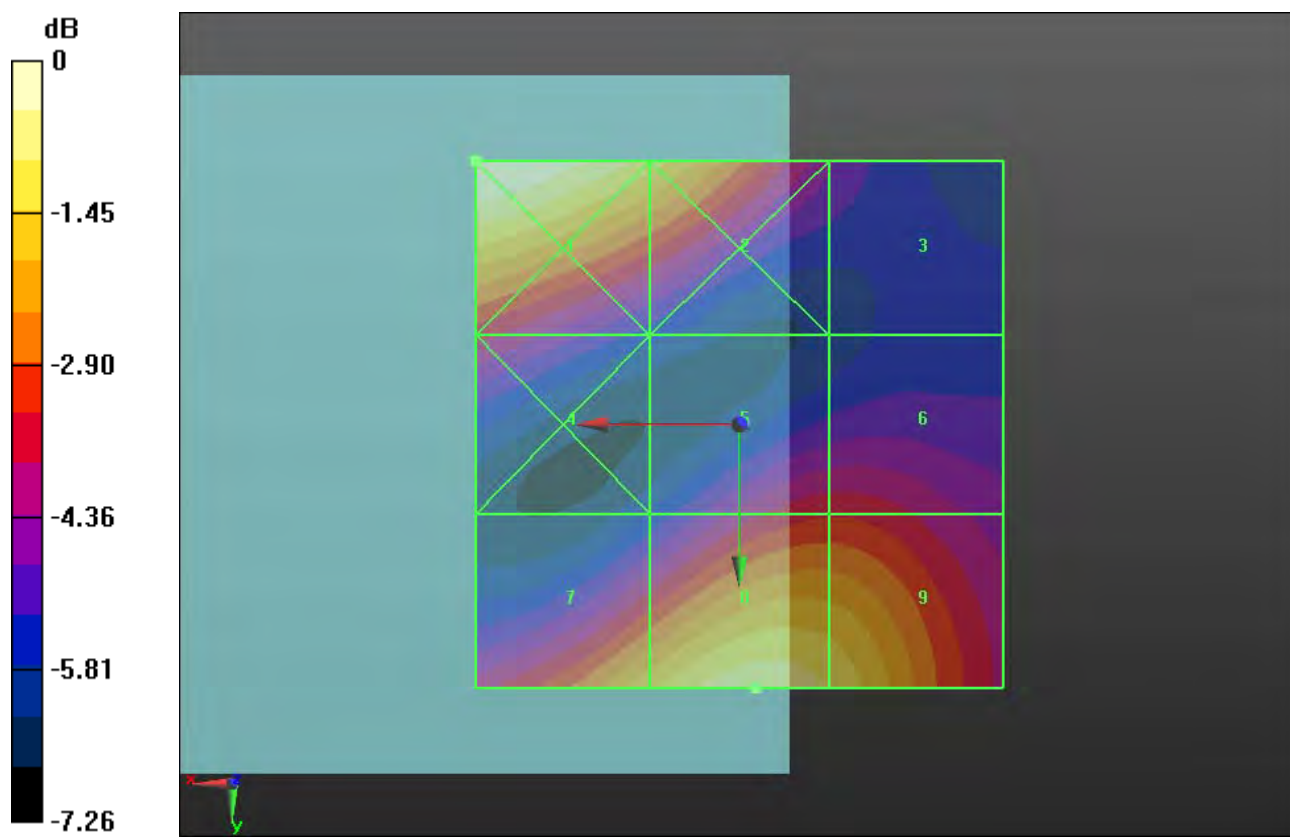
Grid 1 52.743 M4	Grid 2 44.045 M4	Grid 3 29.470 M4
Grid 4 33.417 M4	Grid 5 34.082 M4	Grid 6 34.088 M4
Grid 7 42.416 M4	Grid 8 47.210 M4	Grid 9 45.254 M4

Cursor:

Total = 52.743 V/m

E Category: M4

Location: 25, -25, 8.7 mm



0 dB = 50.710V/m

#08 RF_CDMA2000 BC15_RC3 SO55_CH425(E)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 45.680 V/m

Probe Modulation Factor = 1.040

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 27.158 V/m; Power Drift = -0.03 dB

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

Peak E-field in V/m

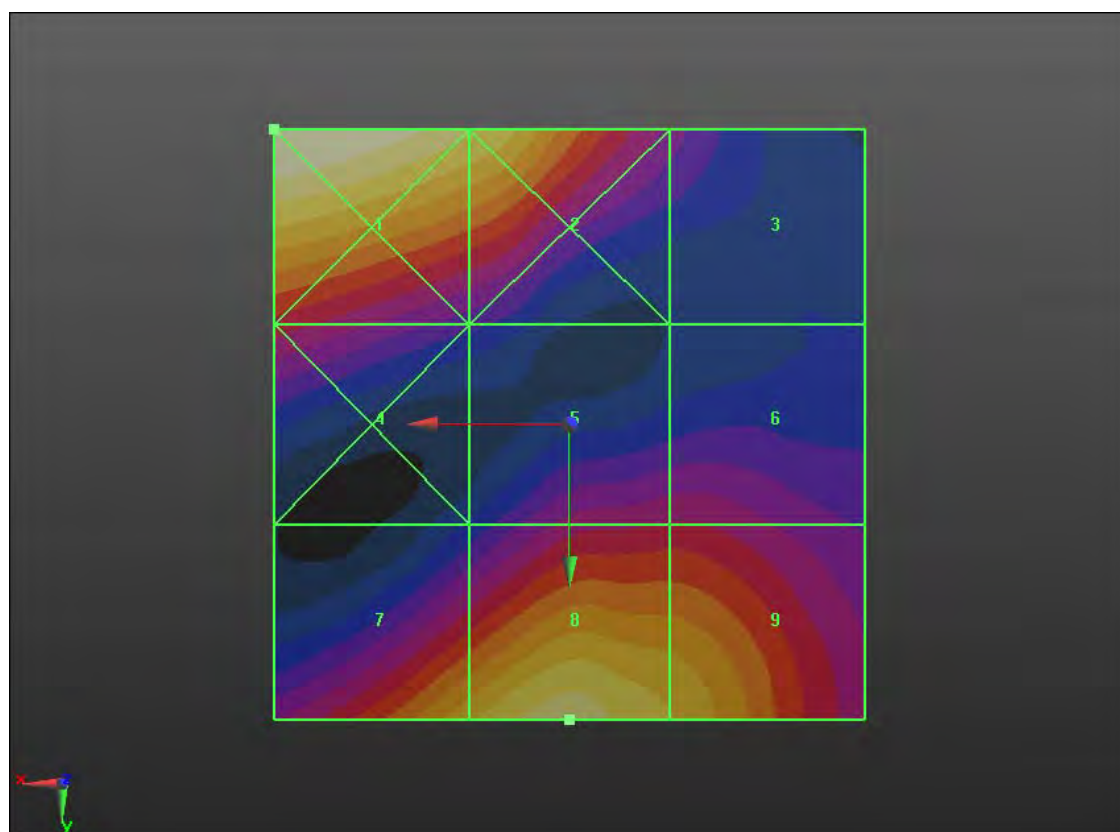
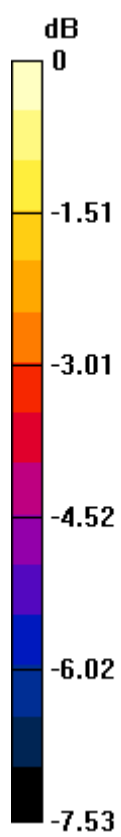
Grid 1 50.994 M4	Grid 2 44.154 M4	Grid 3 28.519 M4
Grid 4 32.077 M4	Grid 5 31.086 M4	Grid 6 31.115 M4
Grid 7 40.796 M4	Grid 8 45.680 M4	Grid 9 41.487 M4

Cursor:

Total = 50.994 V/m

E Category: M4

Location: 25, -25, 8.7 mm



0 dB = 49.030V/m

#09 RF_CDMA2000 BC15_RC3 SO55_CH875(E)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 43.834 V/m

Probe Modulation Factor = 1.040

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 26.647 V/m; Power Drift = 0.0068 dB

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

Peak E-field in V/m

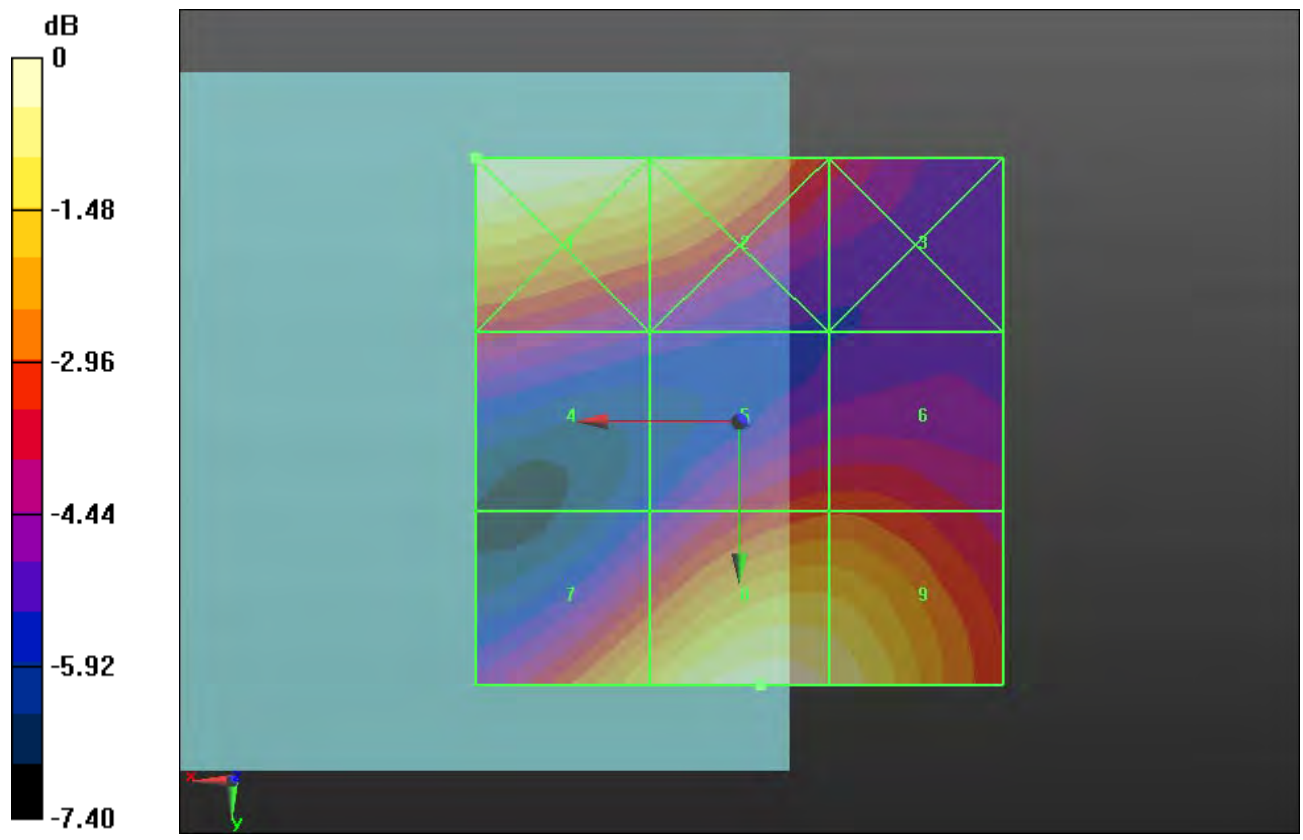
Grid 1 46.717 M4	Grid 2 42.364 M4	Grid 3 29.824 M4
Grid 4 29.508 M4	Grid 5 31.690 M4	Grid 6 31.739 M4
Grid 7 38.490 M4	Grid 8 43.834 M4	Grid 9 42.330 M4

Cursor:

Total = 46.717 V/m

E Category: M4

Location: 25, -25, 8.7 mm



0 dB = 44.920V/m

#01 RF_CDMA2000 BC0_RC3 SO55_CH1013(H)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.137 A/m

Probe Modulation Factor = 1.020

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.078 A/m; Power Drift = 0.07 dB

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

Peak H-field in A/m

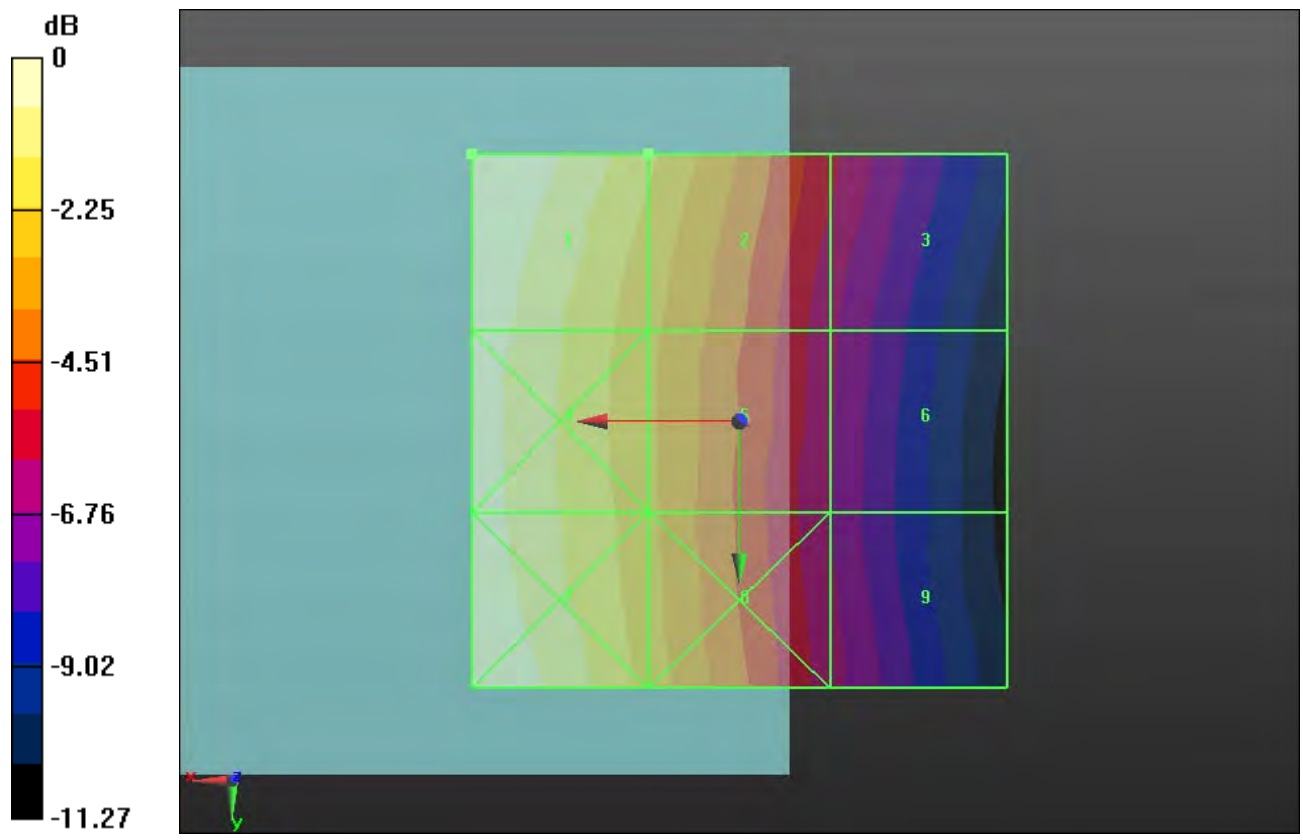
Grid 1 0.137 M4	Grid 2 0.102 M4	Grid 3 0.067 M4
Grid 4 0.125 M4	Grid 5 0.094 M4	Grid 6 0.061 M4
Grid 7 0.134 M4	Grid 8 0.098 M4	Grid 9 0.062 M4

Cursor:

Total = 0.137 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.130A/m

#02 RF_CDMA2000 BC0_RC3 SO55_CH384(H)**DUT: 230902**

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch384/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.132 A/m

Probe Modulation Factor = 1.020

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.074 A/m; Power Drift = 0.10 dB

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

Peak H-field in A/m

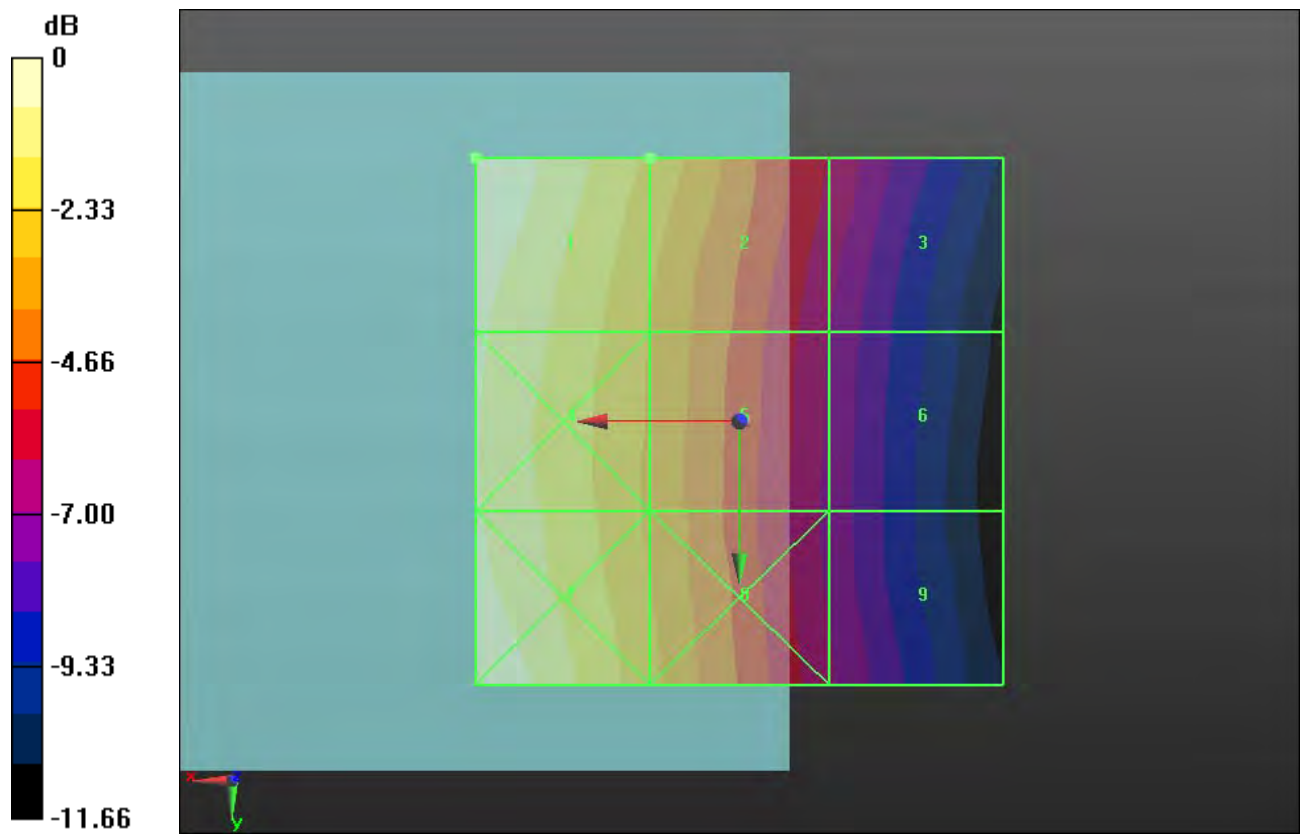
Grid 1 0.132 M4	Grid 2 0.098 M4	Grid 3 0.063 M4
Grid 4 0.121 M4	Grid 5 0.091 M4	Grid 6 0.058 M4
Grid 7 0.130 M4	Grid 8 0.093 M4	Grid 9 0.059 M4

Cursor:

Total = 0.132 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.130A/m

#03 RF_CDMA2000 BC0_RC3 SO55_CH777(H)**DUT: 230902**

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.149 A/m

Probe Modulation Factor = 1.020

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.085 A/m; Power Drift = -0.0049 dB

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

Peak H-field in A/m

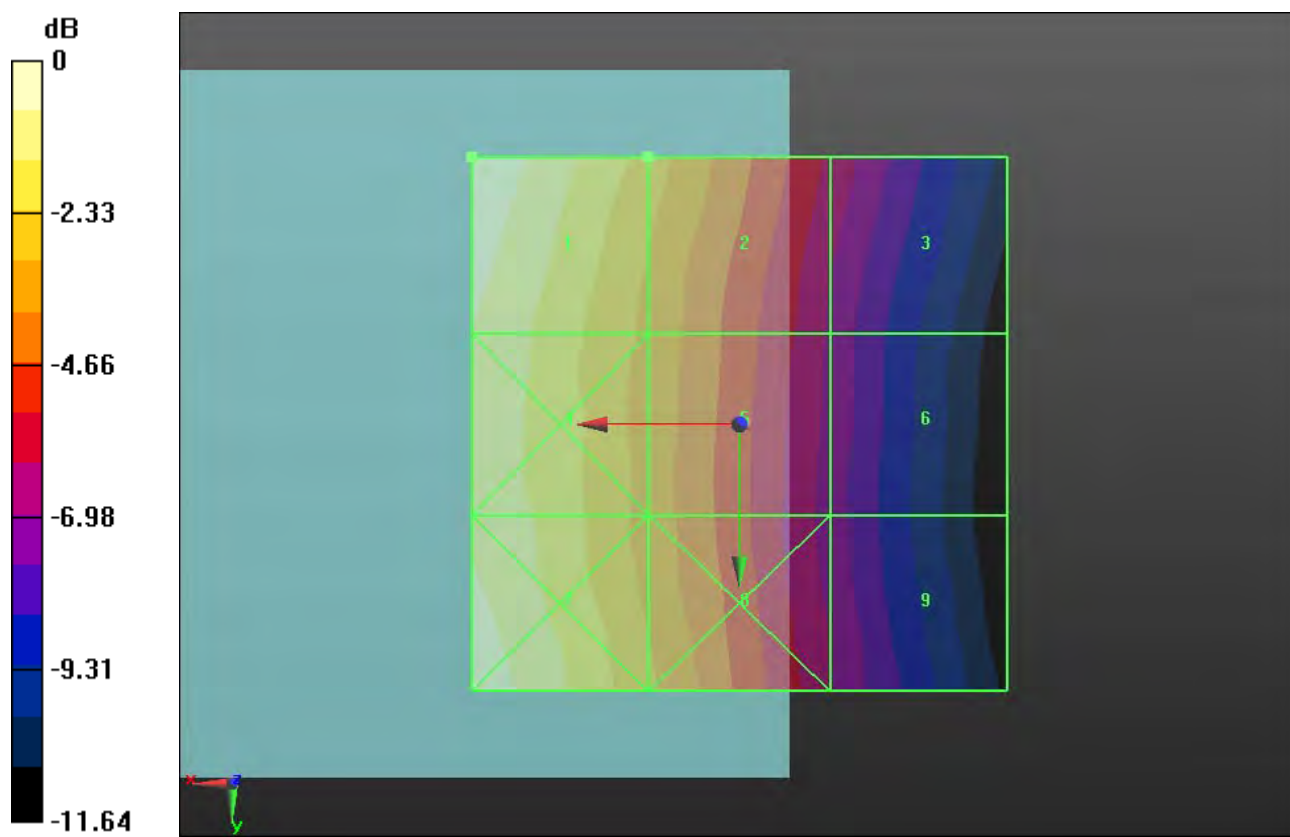
Grid 1 0.149 M4	Grid 2 0.111 M4	Grid 3 0.072 M4
Grid 4 0.137 M4	Grid 5 0.102 M4	Grid 6 0.066 M4
Grid 7 0.147 M4	Grid 8 0.107 M4	Grid 9 0.068 M4

Cursor:

Total = 0.149 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.150A/m

#04 RF_CDMA2000 BC1_RC3 SO55_CH25(H)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.112 A/m

Probe Modulation Factor = 1.070

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.123 A/m; Power Drift = -0.05 dB

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

Peak H-field in A/m

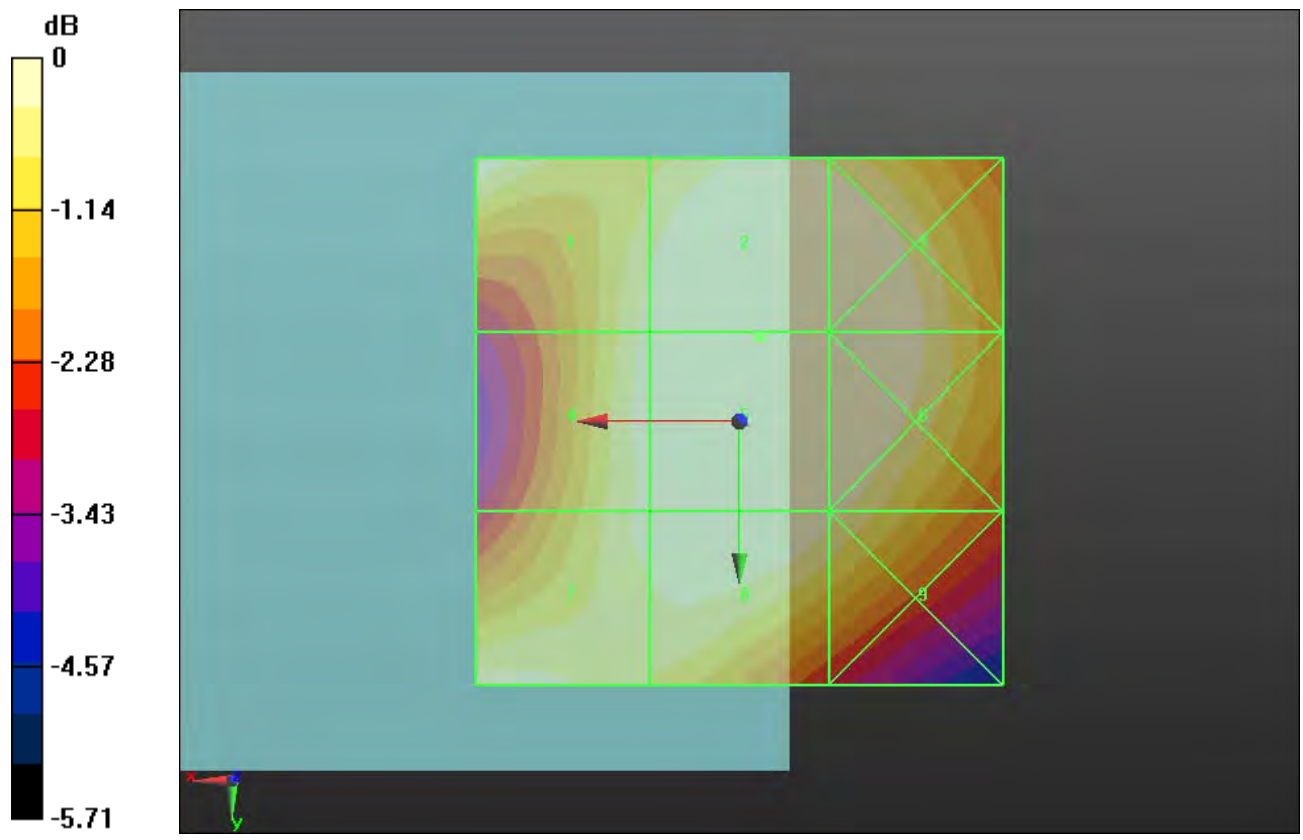
Grid 1 0.102 M4	Grid 2 0.112 M4	Grid 3 0.108 M4
Grid 4 0.099 M4	Grid 5 0.112 M4	Grid 6 0.108 M4
Grid 7 0.098 M4	Grid 8 0.104 M4	Grid 9 0.098 M4

Cursor:

Total = 0.112 A/m

H Category: M4

Location: -2, -8, 8.7 mm



0 dB = 0.100A/m

#05 RF_CDMA2000 BC1_RC3 SO55_CH600(H)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.107 A/m

Probe Modulation Factor = 1.070

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.119 A/m; Power Drift = -0.15 dB

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

Peak H-field in A/m

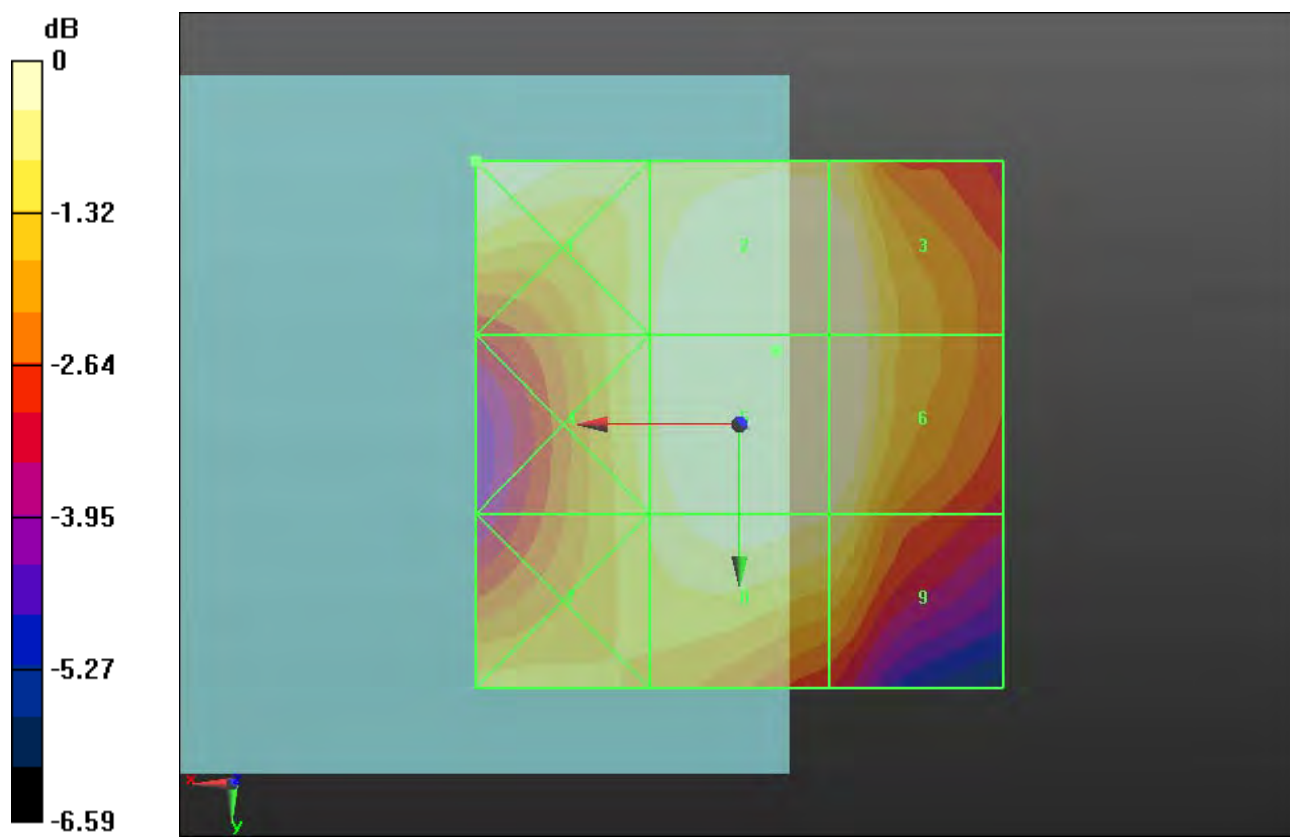
Grid 1 0.109 M4	Grid 2 0.107 M4	Grid 3 0.105 M4
Grid 4 0.094 M4	Grid 5 0.107 M4	Grid 6 0.105 M4
Grid 7 0.091 M4	Grid 8 0.099 M4	Grid 9 0.095 M4

Cursor:

Total = 0.109 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.100A/m

#06 RF_CDMA2000 BC1_RC3 SO55_CH1175(H)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.084 A/m

Probe Modulation Factor = 1.070

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.091 A/m; Power Drift = -0.01 dB

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

Peak H-field in A/m

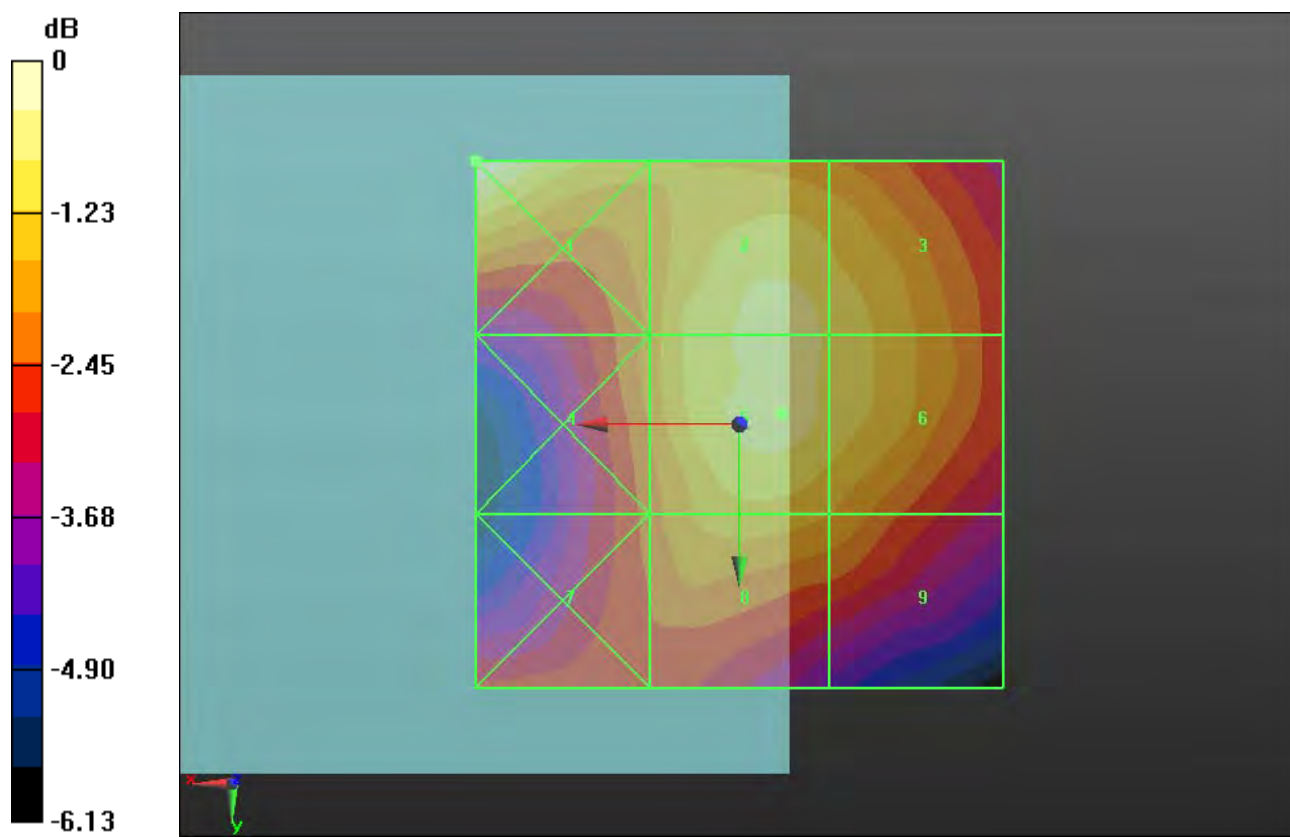
Grid 1 0.091 M4	Grid 2 0.084 M4	Grid 3 0.081 M4
Grid 4 0.073 M4	Grid 5 0.084 M4	Grid 6 0.082 M4
Grid 7 0.069 M4	Grid 8 0.077 M4	Grid 9 0.075 M4

Cursor:

Total = 0.091 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.090A/m

#07 RF_CDMA2000 BC15_RC3 SO55_CH25(H)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.134 A/m

Probe Modulation Factor = 1.070

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.138 A/m; Power Drift = -0.02 dB

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

Peak H-field in A/m

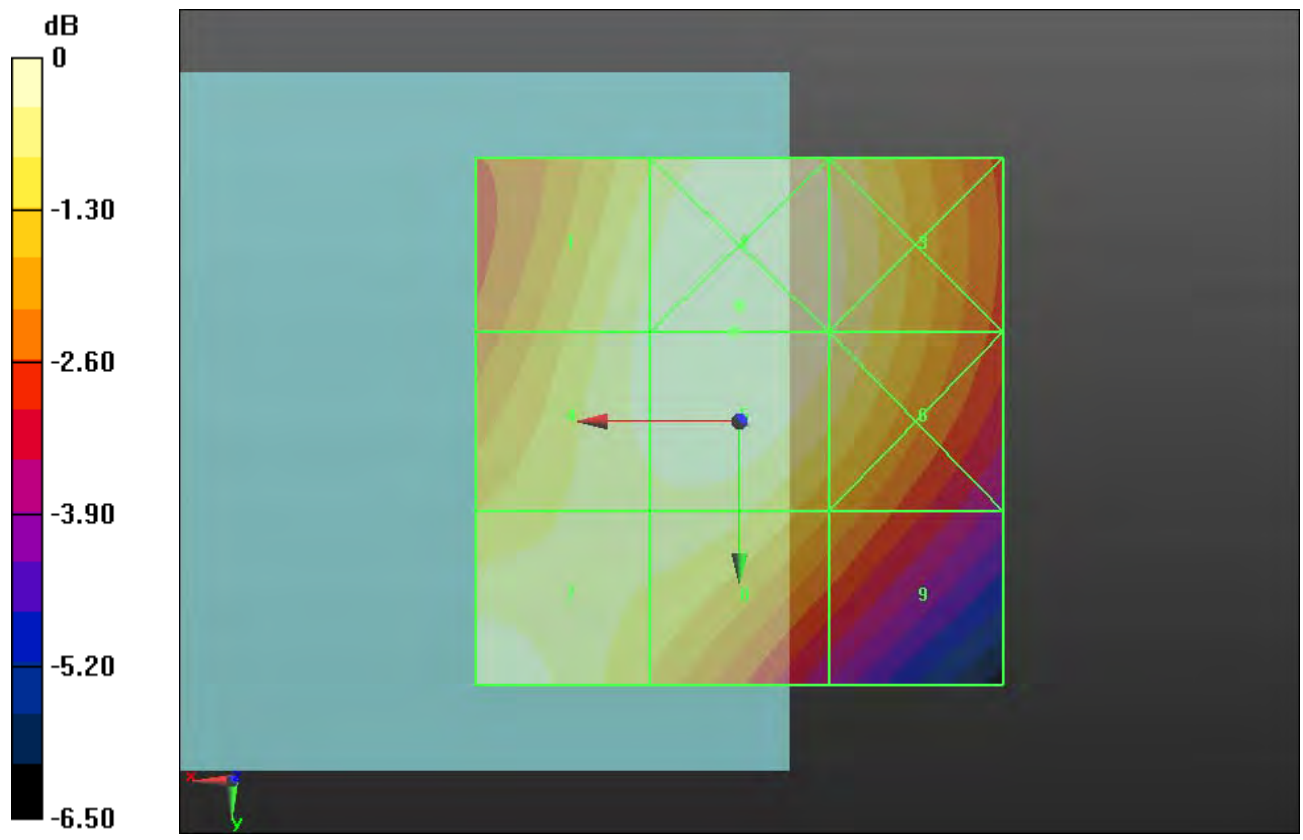
Grid 1 0.126 M4	Grid 2 0.134 M4	Grid 3 0.126 M4
Grid 4 0.126 M4	Grid 5 0.134 M4	Grid 6 0.125 M4
Grid 7 0.131 M4	Grid 8 0.122 M4	Grid 9 0.107 M4

Cursor:

Total = 0.134 A/m

H Category: M4

Location: 0, -11, 8.7 mm



0 dB = 0.130A/m

#08 RF_CDMA2000 BC15_RC3 SO55_CH425(H)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.127 A/m

Probe Modulation Factor = 1.070

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.143 A/m; Power Drift = -0.02 dB

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

Peak H-field in A/m

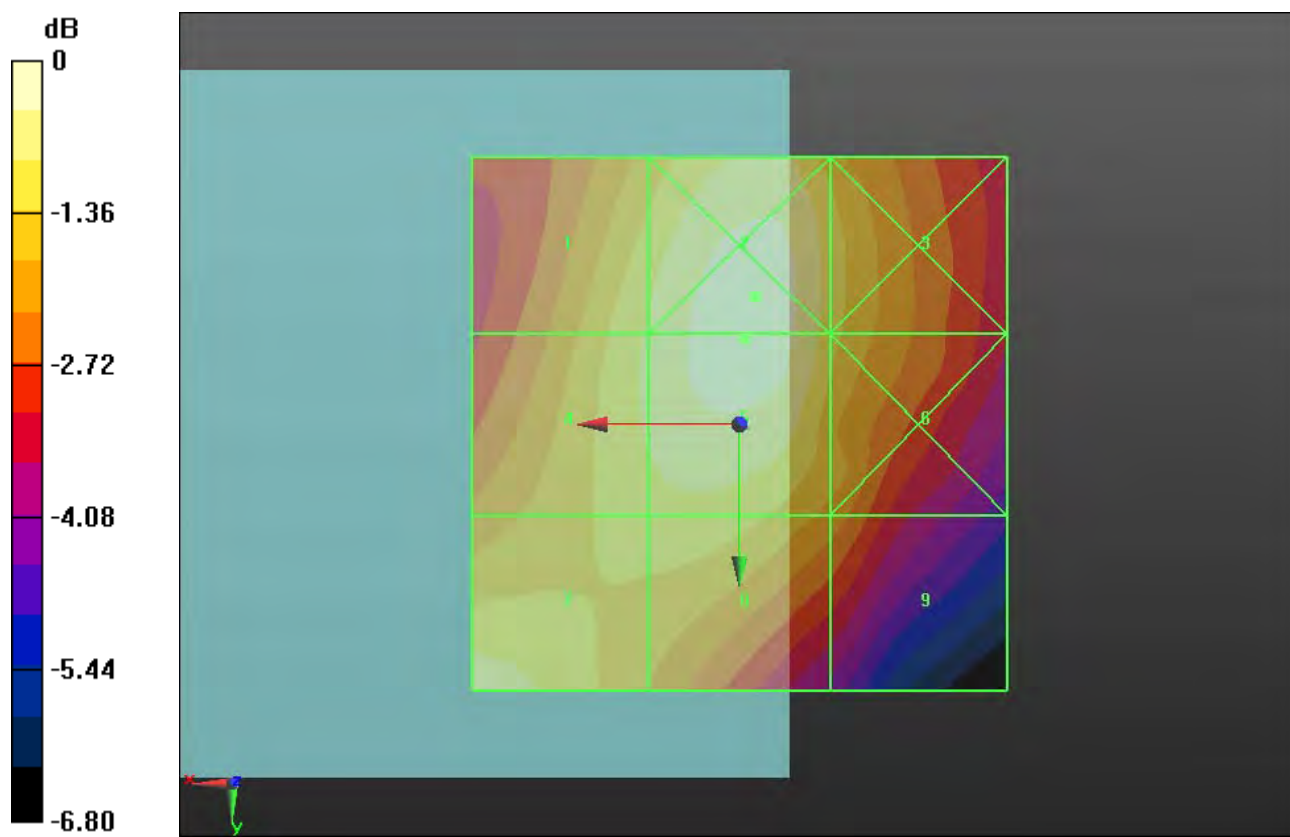
Grid 1 0.118 M4	Grid 2 0.127 M4	Grid 3 0.115 M4
Grid 4 0.119 M4	Grid 5 0.127 M4	Grid 6 0.114 M4
Grid 7 0.122 M4	Grid 8 0.115 M4	Grid 9 0.104 M4

Cursor:

Total = 0.127 A/m

H Category: M4

Location: -1.5, -12, 8.7 mm



0 dB = 0.130A/m

#09 RF_CDMA2000 BC15_RC3 SO55_CH875(H)**DUT: 230902**

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

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

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

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

Maximum value of peak Total field = 0.159 A/m

Probe Modulation Factor = 1.070

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.169 A/m; Power Drift = -0.07 dB

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

Peak H-field in A/m

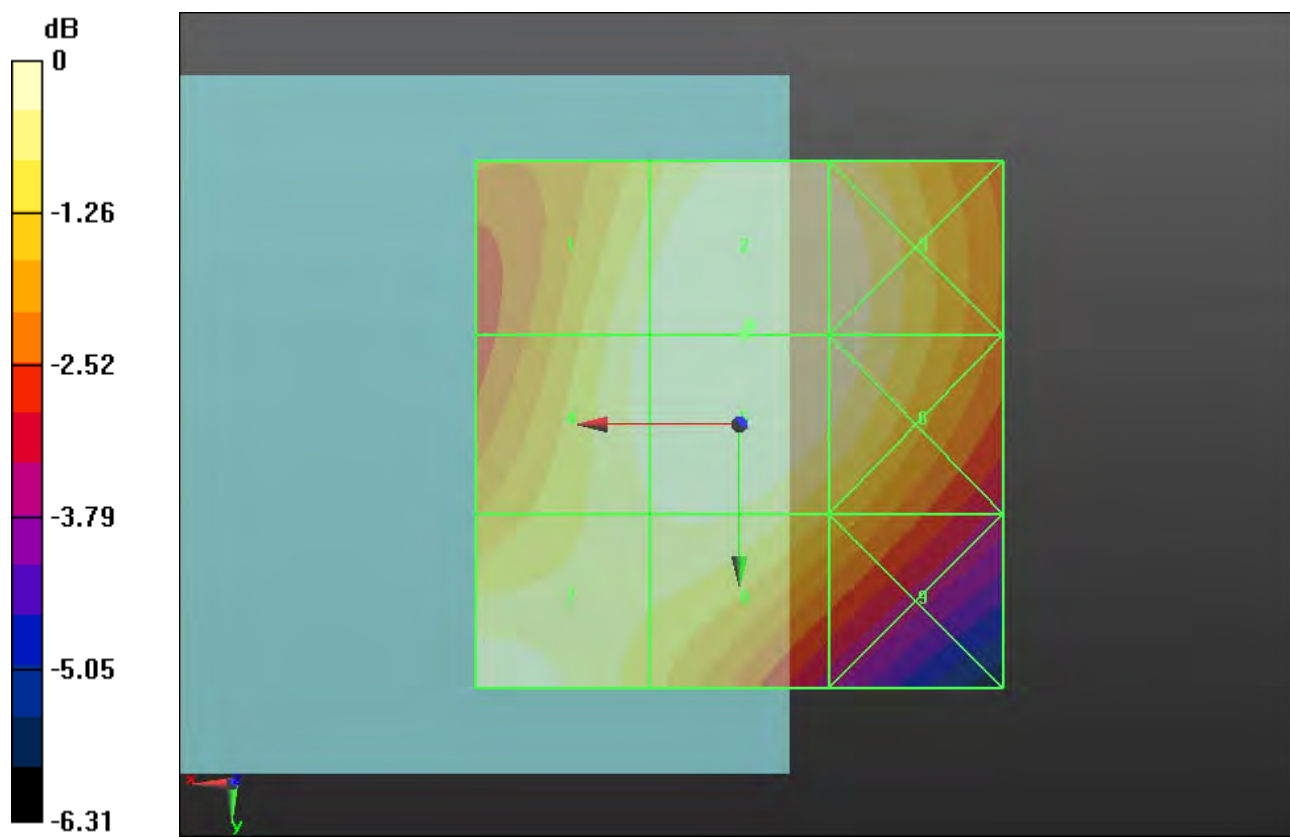
Grid 1 0.146 M4	Grid 2 0.159 M4	Grid 3 0.151 M4
Grid 4 0.147 M4	Grid 5 0.159 M4	Grid 6 0.150 M4
Grid 7 0.152 M4	Grid 8 0.144 M4	Grid 9 0.130 M4

Cursor:

Total = 0.159 A/m

H Category: M4

Location: -1, -9.5, 8.7 mm



0 dB = 0.150A/m



Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.



Accredited by the Swiss Accreditation Service (SAS)
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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sporton Kunshan (Auden)**

Certificate No: **CD835V3-1171_May11**

CALIBRATION CERTIFICATE

Object **CD835V3 - SN: 1171**

Calibration procedure(s) **QA CAL-20.v5**
Calibration procedure for dipoles in air

Calibration date: **May 02, 2011**

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 $(22 \pm 3)^\circ\text{C}$ 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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Probe ER3DV6	SN: 2336	29-Dec-10 (No. ER3-2336_Dec10)	Dec-11
Probe H3DV6	SN: 6065	29-Dec-10 (No. H3-6065_Dec10)	Dec-11
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-10)	in house check: Oct-11
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-10)	in house check: Oct-11
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-10)	in house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	in house check: Oct-11
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-09)	in house check: Oct-11

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Fin Bornholt	R&D Director	

Issued: May 9, 2011

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



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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 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], 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.

1 Measurement Conditions

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

DASY Version	DASY5	V52.6.2 (424)
DASY PP Version	SEMCAD X	V14.4.4 (2829)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 180 mm
Frequency	835 MHz $\pm$ 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2 Maximum Field values

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW forward power	0.474 A/m

Uncertainty for H-field measurement: 8.2% (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end-	100 mW forward power	168.0 V/m
Maximum measured above low end	100 mW forward power	162.5 V/m
Averaged maximum above arm	100 mW forward power	165.3 V/m

Uncertainty for E-field measurement: 12.8% (k=2)

3 Appendix

3.1 Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	17.2 dB	(43.2 - j11.1) Ohm
835 MHz	24.6 dB	(48.9 + j5.7) Ohm
900 MHz	16.7 dB	(58.2 - j13.7) Ohm
950 MHz	22.9 dB	(46.3 + j5.9) Ohm
960 MHz	17.0 dB	(52.4 + j14.4) Ohm

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.

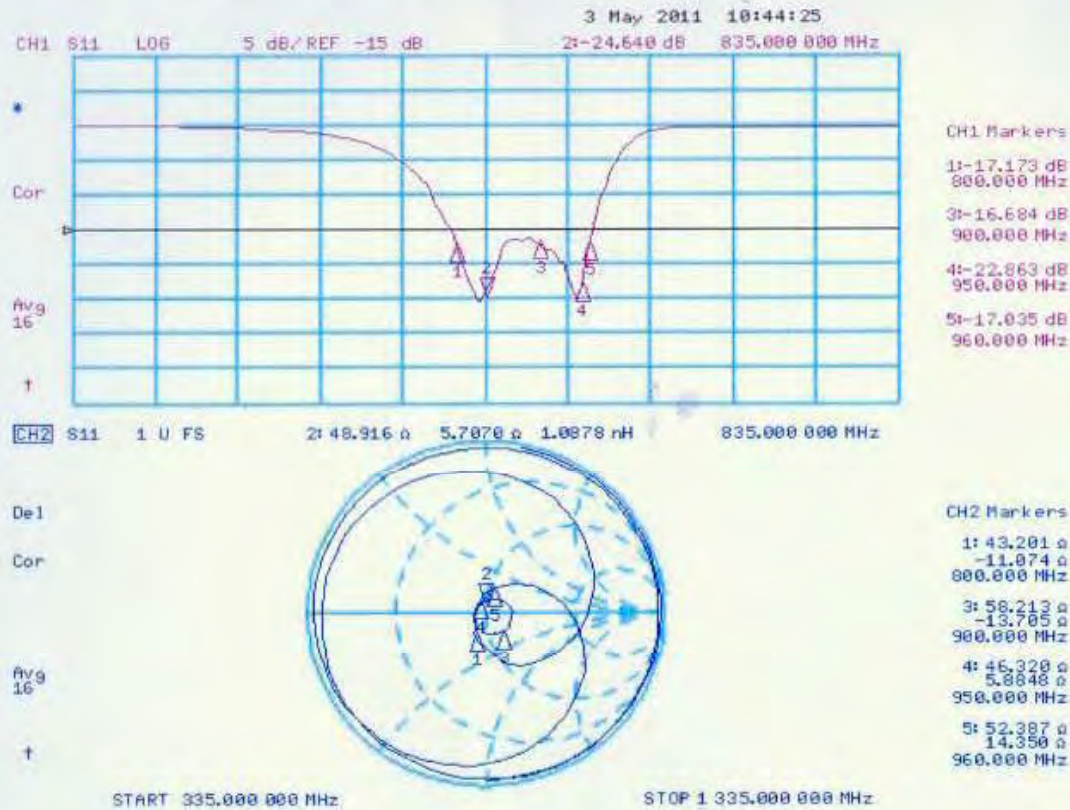
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

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.

3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



3.3.2 DASY4 H-field Result

Date/Time: 02.05.2011 14:16:10

Test Laboratory: SPEAG Lab2

HAC RF_CD835_1171_H_110502_CL

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1171

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)

DASY5 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

Dipole H-Field measurement @ 835MHz/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 = 0.474 A/m

Probe Modulation Factor = 1.000

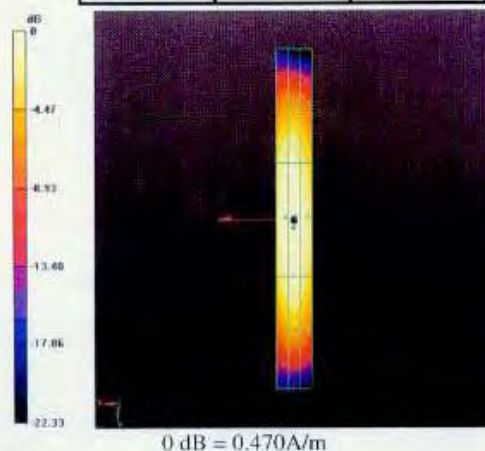
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.503 A/m; Power Drift = 0.03 dB

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

Peak H-field in A/m

Grid 1 0.403 M4	Grid 2 0.415 M4	Grid 3 0.383 M4
Grid 4 0.456 M4	Grid 5 0.474 M4	Grid 6 0.442 M4
Grid 7 0.403 M4	Grid 8 0.424 M4	Grid 9 0.397 M4



3.3.3 DASY4 E-field Result

Date/Time: 02.05.2011 11:43:42

Test Laboratory: SPEAG Lab2

HAC RF_CD835_1171_E_110502_CL

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1171

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)

DASY5 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

Dipole E-Field measurement @ 835MHz/E 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 = 168.0 V/m

Probe Modulation Factor = 1.000

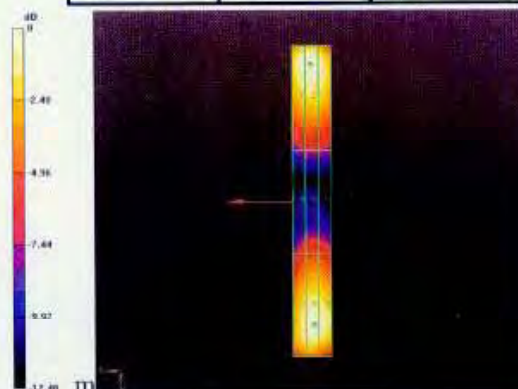
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 125.4 V/m; Power Drift = -0.02 dB

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

Peak E-field in V/m

Grid 1 164.0 M4	Grid 2 168.0 M4	Grid 3 162.2 M4
Grid 4 86.716 M4	Grid 5 91.288 M4	Grid 6 89.980 M4
Grid 7 153.2 M4	Grid 8 162.5 M4	Grid 9 159.9 M4



0 dB = 168.0V/m



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sporton Kunshan (Auden)**

Certificate No: **CD1880V3-1155_May11**

CALIBRATION CERTIFICATE

Object **CD1880V3 - SN: 1155**

Calibration procedure(s) **QA CAL-20.v5
 Calibration procedure for dipoles in air**

Calibration date: **May 03, 2011**

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 $(22 \pm 3)^{\circ}\text{C}$ 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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Probe ER3DV6	SN: 2336	29-Dec-10 (No. ER3-2336_Dec10)	Dec-11
Probe H3DV6	SN: 6065	29-Dec-10 (No. H3-6065_Dec10)	Dec-11
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-10)	In house check: Oct-11
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-09)	In house check: Oct-11

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

Issued: May 10, 2011

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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

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 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], 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.

1. Measurement Conditions

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

DASY Version	DASY5	V52.6.2 (424)
DASY PP Version	SEMCAD X	V14.4.4 (2829)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 90 mm
Frequency	1880 MHz $\pm$ 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2. Maximum Field values

H-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured	100 mW forward power	0.464 A/m

Uncertainty for H-field measurement: 8.2% (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW forward power	145.7 V/m
Maximum measured above low end	100 mW forward power	138.3 V/m
Averaged maximum above arm	100 mW forward power	142.0 V/m

Uncertainty for E-field measurement: 12.8% (k=2)

3. Appendix

3.1 Antenna Parameters

Frequency	Return Loss	Impedance
1730 MHz	34.6 dB	(51.5 - j1.2) Ohm
1880 MHz	18.9 dB	(43.4 + j8.3) Ohm
1900 MHz	19.0 dB	(45.5 + j9.7) Ohm
1950 MHz	23.7 dB	(49.6 + j6.5) Ohm
2000 MHz	19.4 dB	(43.1 + j7.3) Ohm

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.

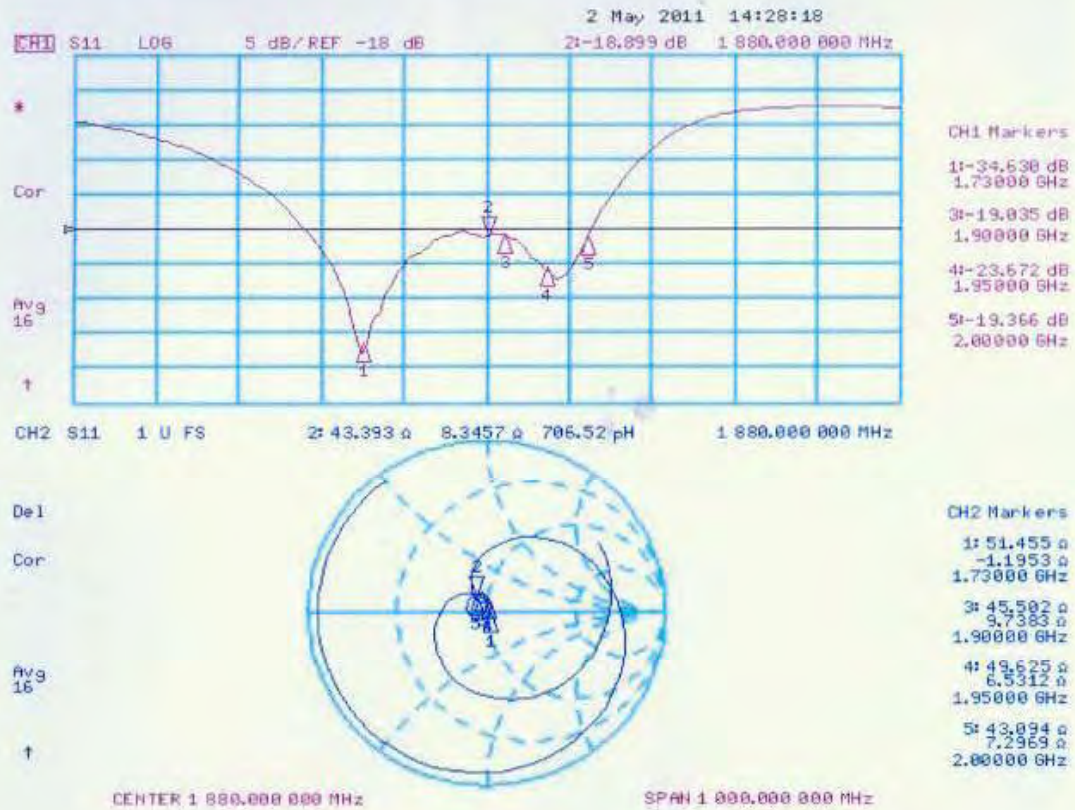
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

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.

3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



3.3.2 DASY4 H-Field Result

Date/Time: 03.05.2011 11:59:33

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1155_H_110503_JK

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1155

Communication System: CW; Frequency: 1880 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)

DASY5 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

Dipole H-Field measurement @ 1880MHz/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 = 0.464 A/m

Probe Modulation Factor = 1.000

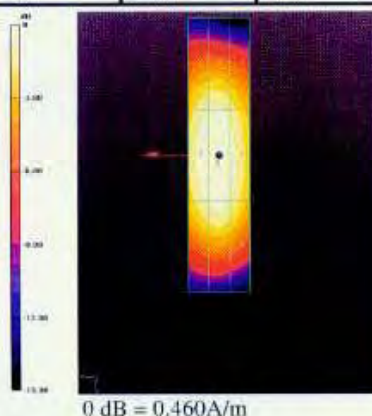
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.492 A/m; Power Drift = -0.01 dB

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

Peak H-field in A/m

Grid 1 0.408 M2	Grid 2 0.419 M2	Grid 3 0.391 M2
Grid 4 0.449 M2	Grid 5 0.464 M2	Grid 6 0.435 M2
Grid 7 0.416 M2	Grid 8 0.433 M2	Grid 9 0.406 M2



3.3.3 DASY4 E-Field Result

Date/Time: 03.05.2011 10:35:18

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1155_E_110503_JK

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1155

Communication System: CW; Frequency: 1880 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)

DASY5 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

Dipole H-Field measurement @ 1880MHz/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 = 145.7 V/m

Probe Modulation Factor = 1.000

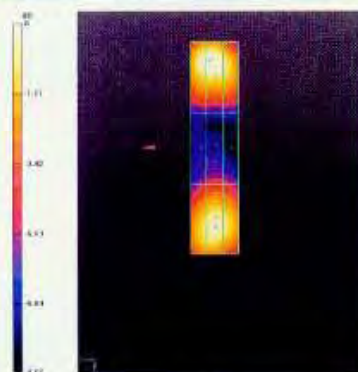
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 143.3 V/m; Power Drift = -0.02 dB

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

Peak E-field in V/m

Grid 1 143.6 M2	Grid 2 145.7 M2	Grid 3 137.7 M2
Grid 4 83.236 M3	Grid 5 87.574 M3	Grid 6 85.990 M3
Grid 7 133.2 M2	Grid 8 138.3 M2	Grid 9 134.9 M2



0 dB = 145.7V/m



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sporton CN (Auden)**

Certificate No: **DAE4-1210_Nov11**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BJ - SN: 1210**

Calibration procedure(s) **QA CAL-06.v23
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **November 18, 2011**

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

All calibrations have been conducted in the closed laboratory facility; environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box VI.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12

	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: November 18, 2011

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Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** Typical value for information; DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 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	404.131 $\pm$ 0.1% (k=2)	404.957 $\pm$ 0.1% (k=2)	405.070 $\pm$ 0.1% (k=2)
Low Range	3.99774 $\pm$ 0.7% (k=2)	3.98274 $\pm$ 0.7% (k=2)	3.99864 $\pm$ 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	68.0 $^{\circ}$ $\pm$ 1 $^{\circ}$
---	------------------------------------

Appendix

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200005.7	-6.32	-0.00
Channel X + Input	20001.20	1.40	0.01
Channel X - Input	-19997.25	2.05	-0.01
Channel Y + Input	199993.7	-8.34	-0.00
Channel Y + Input	19998.85	-0.85	-0.00
Channel Y - Input	-19999.24	0.86	-0.00
Channel Z + Input	199997.0	-3.96	-0.00
Channel Z + Input	19999.03	-0.47	-0.00
Channel Z - Input	-19998.10	1.00	-0.01

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	1999.9	-0.19	-0.01
Channel X + Input	201.19	1.19	0.59
Channel X - Input	-199.00	1.20	-0.60
Channel Y + Input	1999.7	-0.22	-0.01
Channel Y + Input	200.05	0.15	0.07
Channel Y - Input	-200.98	-0.68	0.34
Channel Z + Input	1999.9	-0.10	-0.00
Channel Z + Input	199.80	-0.10	-0.05
Channel Z - Input	-199.54	0.26	-0.13

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	-5.74	-7.76
	- 200	9.09	7.53
Channel Y	200	-5.73	-4.92
	- 200	7.43	6.93
Channel Z	200	12.31	12.18
	- 200	-13.75	-14.25

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	-	2.68	0.40
Channel Y	200	1.60	-	4.29
Channel Z	200	2.18	0.10	-

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	15945	17150
Channel Y	15956	16019
Channel Z	15867	16444

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	-0.50	-1.63	0.38	0.33
Channel Y	-0.92	-1.95	-0.17	0.36
Channel Z	-2.02	-4.12	-0.96	0.41

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

	Zeroing (k Ω m)	Measuring (M Ω m)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

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

9. Power Consumption (Typical values for information)

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

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Zeughausstrasse 43, 8004 Zurich, Switzerland



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

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sporton CN (Auden)**

Certificate No: **ER3-2476_Nov11**

CALIBRATION CERTIFICATE

Object **ER3DV6 - SN:2476**

Calibration procedure(s) **QA CAL-02.v6, QA CAL-25.v4
Calibration procedure for E-field probes optimized for close near field
evaluations in air**

Calibration date: **November 21, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	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 ER3DV6	SN: 2328	11-Oct-11 (No. ER3-2328_Oct11)	Oct-12
DAE4	SN: 789	6-Apr-11 (No. DAE4-789_Apr11)	Apr-12
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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: November 23, 2011			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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Glossary:

NORM _{x,y,z}	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ for XY sensors and $\vartheta = 90$ for Z sensor ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart).
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- Spherical isotropy (3D deviation from isotropy)**: in a locally homogeneous field realized using an open waveguide setup.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

Probe ER3DV6

SN:2476

Manufactured: March 31, 2009
Calibrated: November 21, 2011

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

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2476

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$)	1.94	1.72	2.25	$\pm 10.1 \%$
DCP (mV) ^b	100.5	98.2	99.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^c (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	122.3	$\pm 2.7 \%$
			Y	0.00	0.00	1.00	121.0	
			Z	0.00	0.00	1.00	121.5	

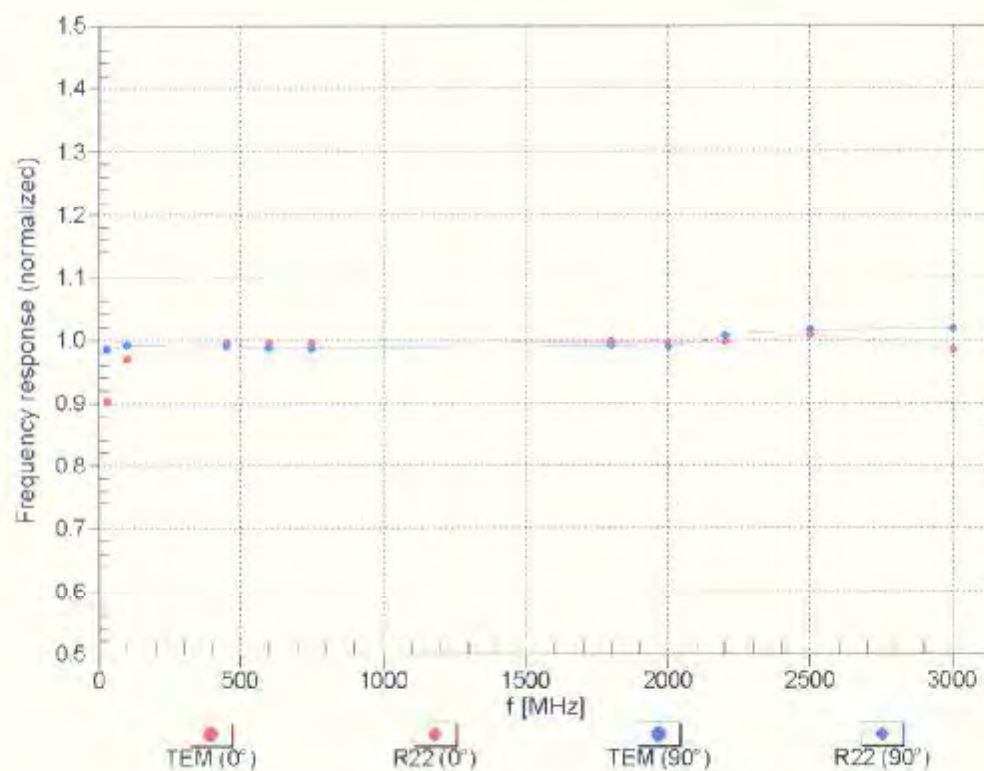
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^b Numerical linearization parameter: uncertainty not required.

^c Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Frequency Response of E-Field

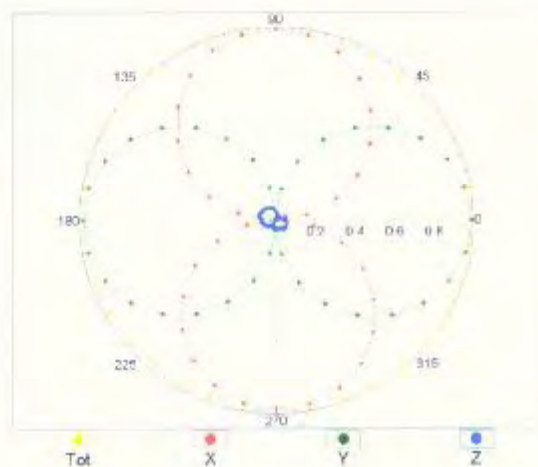
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

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

f=600 MHz,TEM,0°

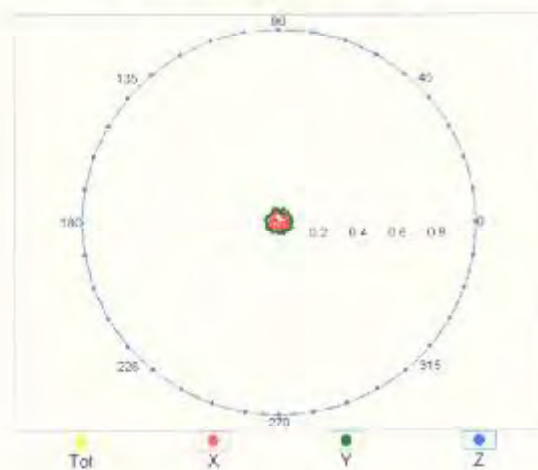


f=2500 MHz,R22,0°

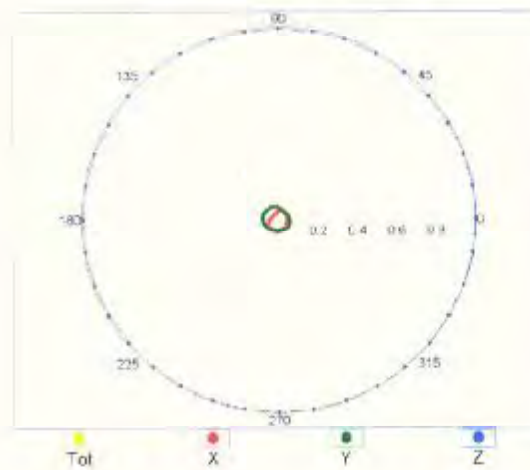


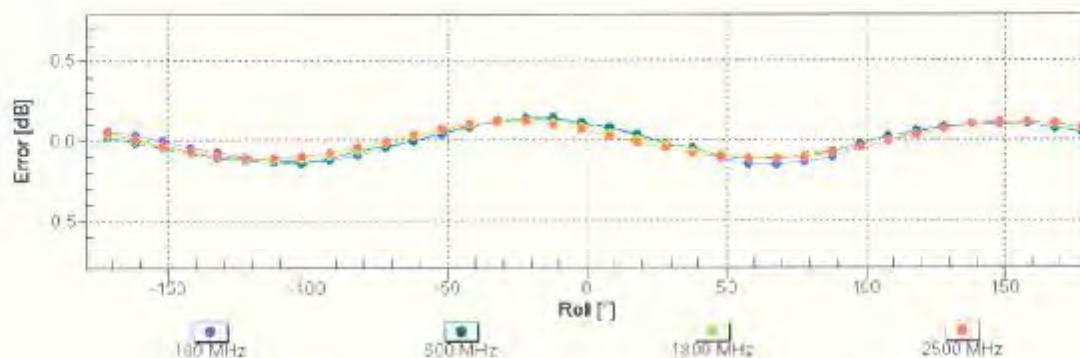
Receiving Pattern (ϕ), $\vartheta = 90^\circ$

f=600 MHz,TEM,90°

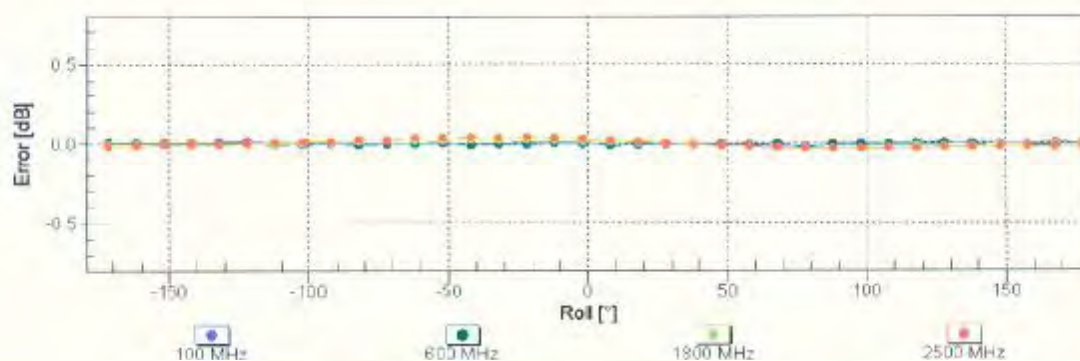


f=2500 MHz,R22,90°



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

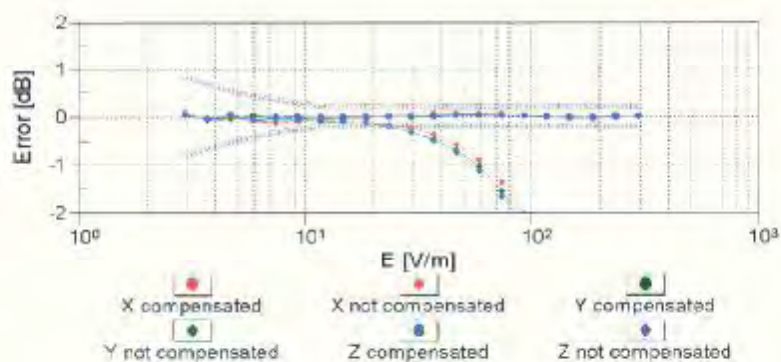
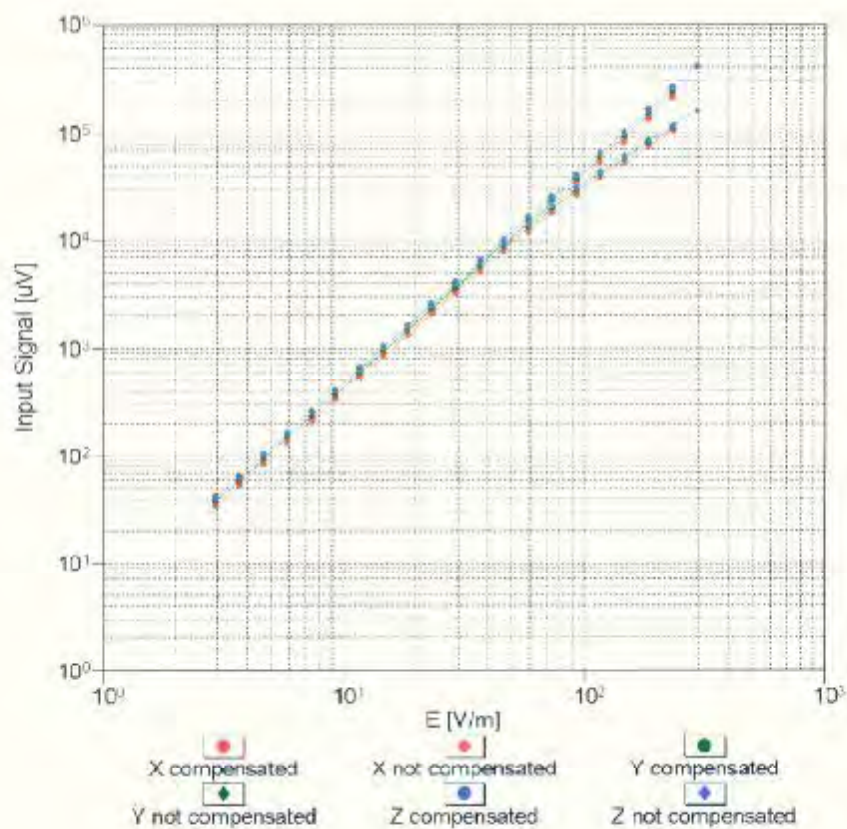
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 90^\circ$ 

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

Dynamic Range f(E-field)

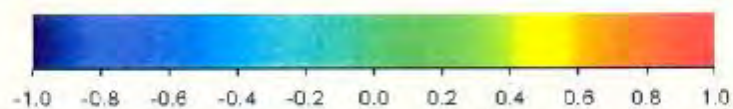
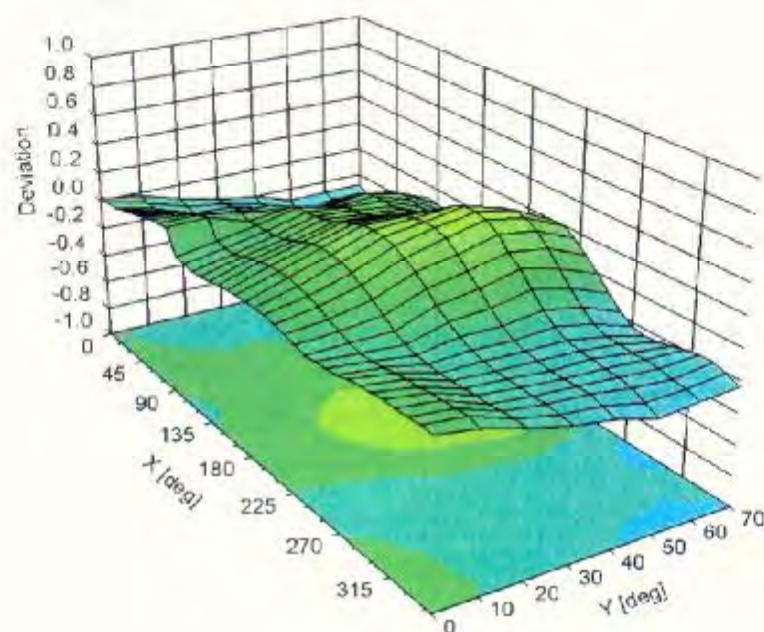
(TEM cell , $f = 900$ MHz)



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

Deviation from Isotropy in Air

Error (ϕ , θ), $f = 900$ MHz



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

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2476

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	18
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	8 mm
Probe Tip to Sensor X Calibration Point	2.5 mm
Probe Tip to Sensor Y Calibration Point	2.5 mm
Probe Tip to Sensor Z Calibration Point	2.5 mm

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Accreditation No.: SCS 108

Client Sporton CN (Auden)

Certificate No: H3-6300_Nov11

CALIBRATION CERTIFICATE

Object H3DV6 - SN:6300

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: November 22, 2011

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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	6-Apr-11 (No. DAE4-789_Apr11)	Apr-12
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

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: November 23, 2011			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

NORM _{x,y,z}	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ for XY sensors and $\vartheta = 90$ for Z sensor ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide).
- X, Y, Z(f)_a0a1a2 = X, Y, Z_a0a1a2* frequency_response** (see Frequency Response Chart).
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- Spherical isotropy (3D deviation from isotropy)**: in a locally homogeneous field realized using an open waveguide setup.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the X_a0a1a2 (no uncertainty required).

Probe H3DV6

SN:6300

Manufactured: December 16, 2008
Calibrated: November 22, 2011

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

DASY/EASY - Parameters of Probe: H3DV6 - SN:6300

Basic Calibration Parameters

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / $\sqrt{\text{mV}}$)	a0	2.48E-003	2.46E-003	3.09E-003	$\pm 5.1 \%$
Norm (A/m / $\sqrt{\text{mV}}$)	a1	-5.52E-005	1.37E-005	-5.61E-006	$\pm 5.1 \%$
Norm (A/m / $\sqrt{\text{mV}}$)	a2	-1.57E-005	5.91E-006	3.39E-005	$\pm 5.1 \%$
DCP (mV) ^B		93.3	94.2	93.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	107.9	$\pm 2.7 \%$
			Y	0.00	0.00	1.00	106.0	
			Z	0.00	0.00	1.00	90.5	

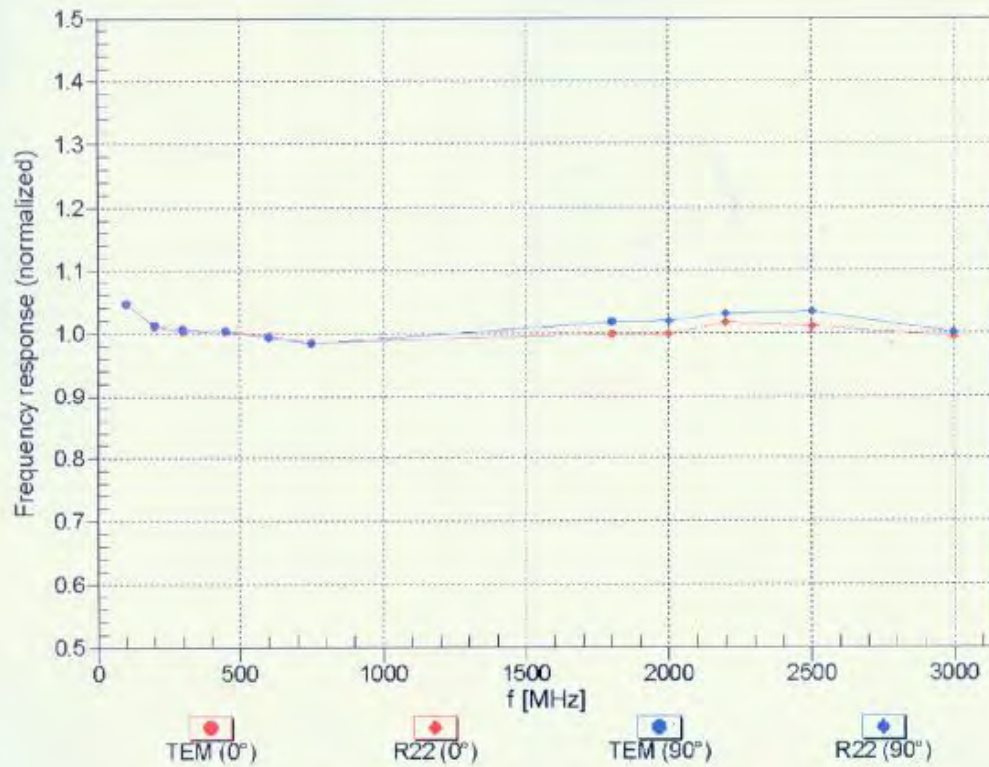
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^B Numerical linearization parameter; uncertainty not required.

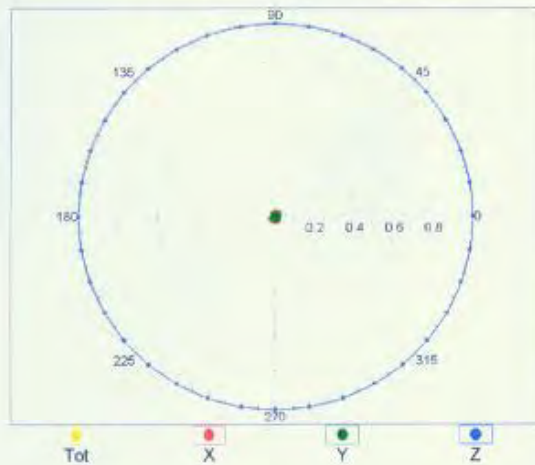
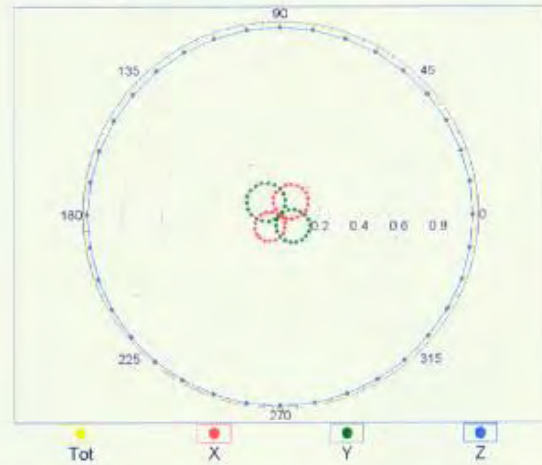
^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Frequency Response of H-Field

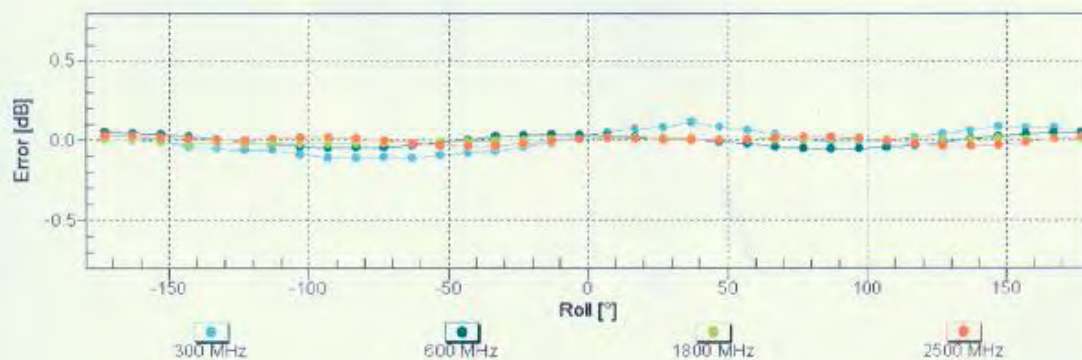
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

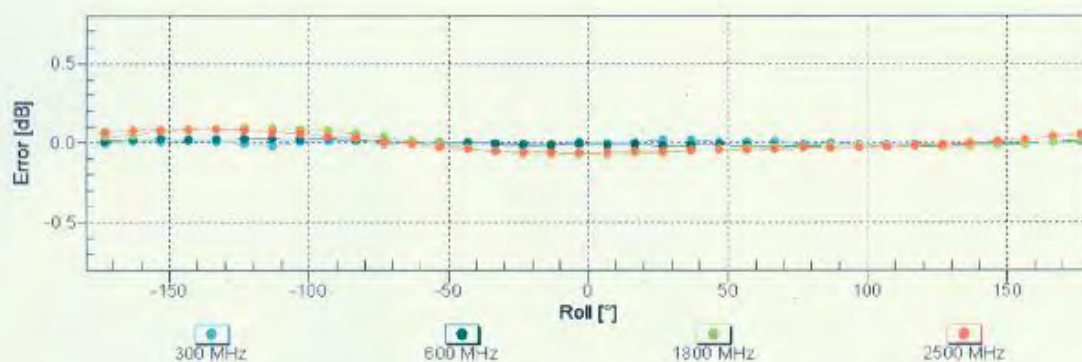
Receiving Pattern (ϕ), $\vartheta = 0^\circ$ **f=600 MHz,TEM,0°****f=2500 MHz,R22,0°****Receiving Pattern (ϕ), $\vartheta = 90^\circ$** **f=600 MHz,TEM,90°****f=2500 MHz,R22,90°**

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



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

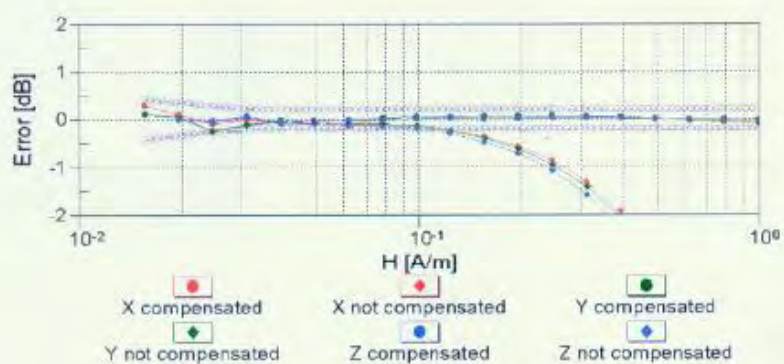
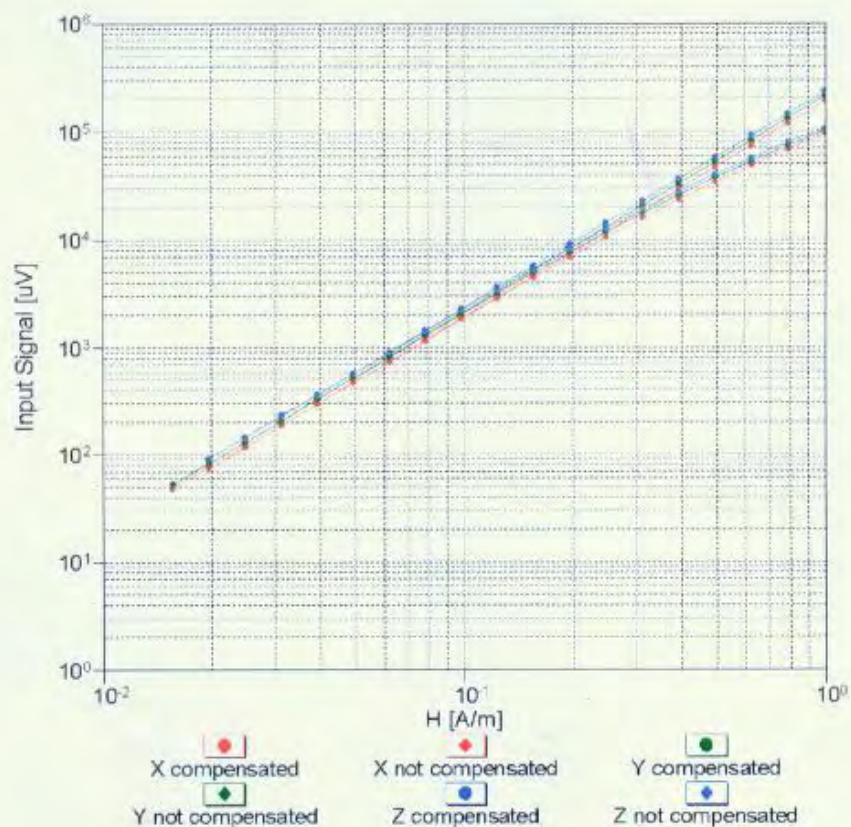
Receiving Pattern (ϕ), $\vartheta = 90^\circ$



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

Dynamic Range f(H-field)

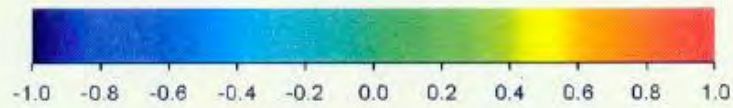
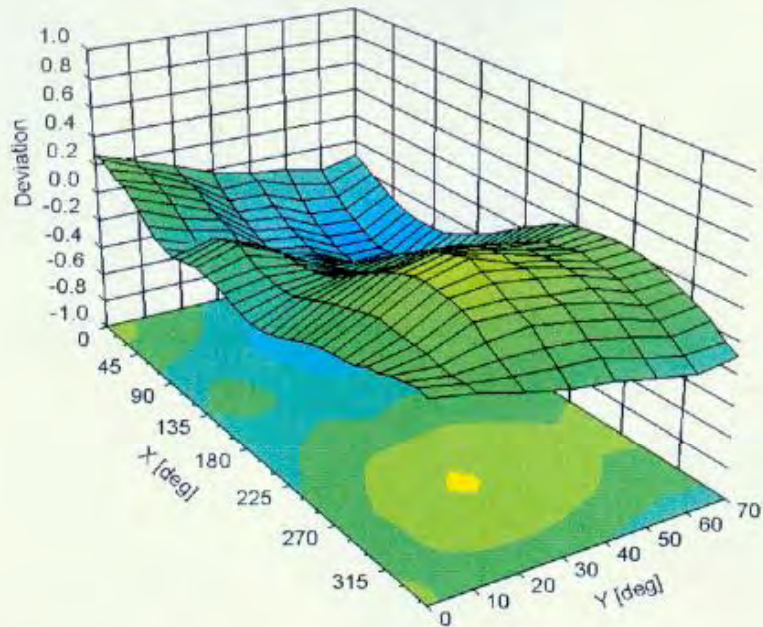
(TEM cell, $f = 900$ MHz)



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

Deviation from Isotropy in Air

Error (ϕ , θ), $f = 900$ MHz



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

DASY/EASY - Parameters of Probe: H3DV6 - SN:6300**Other Probe Parameters**

Sensor Arrangement	Rectangular
Connector Angle (°)	-43.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	20 mm
Tip Diameter	6 mm
Probe Tip to Sensor X Calibration Point	3 mm
Probe Tip to Sensor Y Calibration Point	3 mm
Probe Tip to Sensor Z Calibration Point	3 mm