	Category T2	10 dB to 20 dB
	Category T3	20 dB to 30 dB
	Category T4	> 30 dB

Cursor:

ABM1 comp = 0.312 dB A/m

BWC Factor = 0.158027 dB

Location: -2, 0, 3.7 mm

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1/ABM2 = 44.9 dB

ABM1 comp = -0.093 dB A/m

BWC Factor = 0.158027 dB

Location: -2, 4, 3.7 mm

Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f) (1x1x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_300-3000_2s.wav

Output Gain: 56.4

Measure Window Start: 0ms

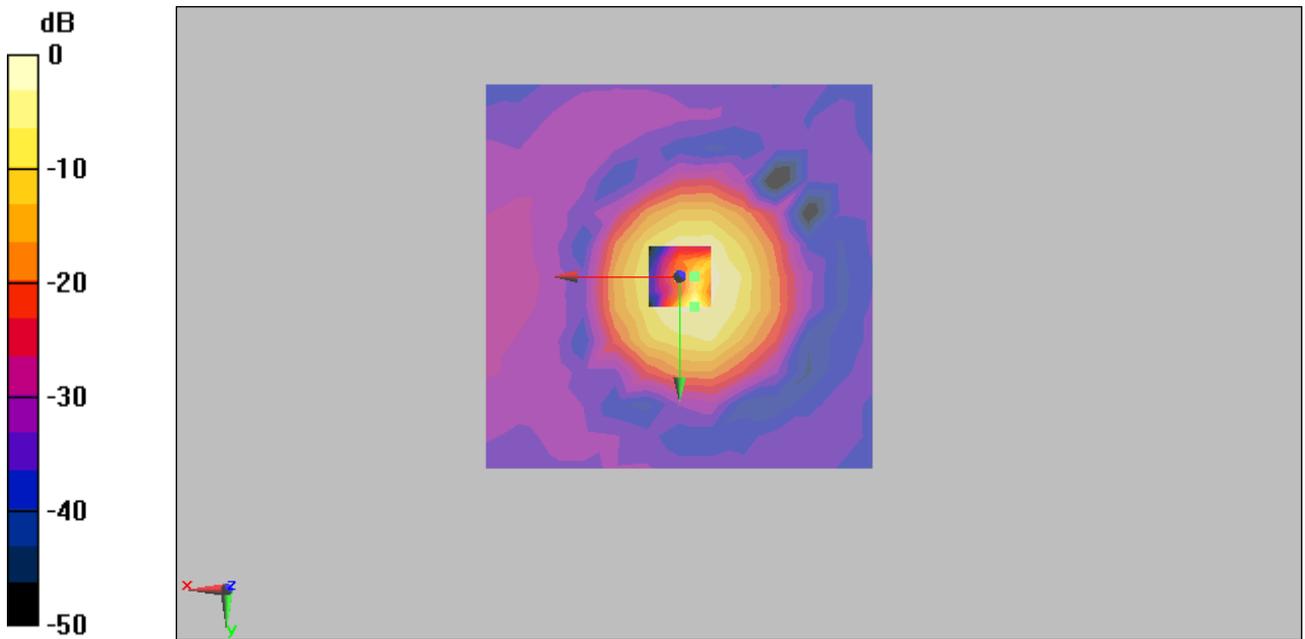Measure Window Length: 2000ms

BWC applied: 10.8 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

Diff = 1.32 dB

BWC Factor = 10.8 dB

Location: -2, 4, 3.7 mm

$0 \text{ dB} = 1\text{A/m}$

Figure 13 T-Coil CDMA Cellular Z Axial

T-Coil CDMA PCS X longitudinal

Date/Time: 1/7/2011 10:58:46 AMDate/Time: 1/7/2011 11:06:47 AM

Communication System: CDMA PCS; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: AM1DV3 - 3082; ; Calibrated: 11/29/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

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

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Scans/x (longitudinal) 4.2mm 50 x 50/ABM Signal(x,y,z) (13x13x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -7.76 dB A/m

BWC Factor = 0.158027 dB

Location: 4.2, 0, 3.7 mm

Scans/x (longitudinal) fine 3mm 42 x 6/ABM Signal(x,y,z) (15x3x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB

Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -7.95 dB A/m

BWC Factor = 0.158027 dB

Location: 3, 0, 3.7 mm

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1/ABM2 = 30.3 dB

ABM1 comp = -9.78 dB A/m

BWC Factor = 0.158027 dB
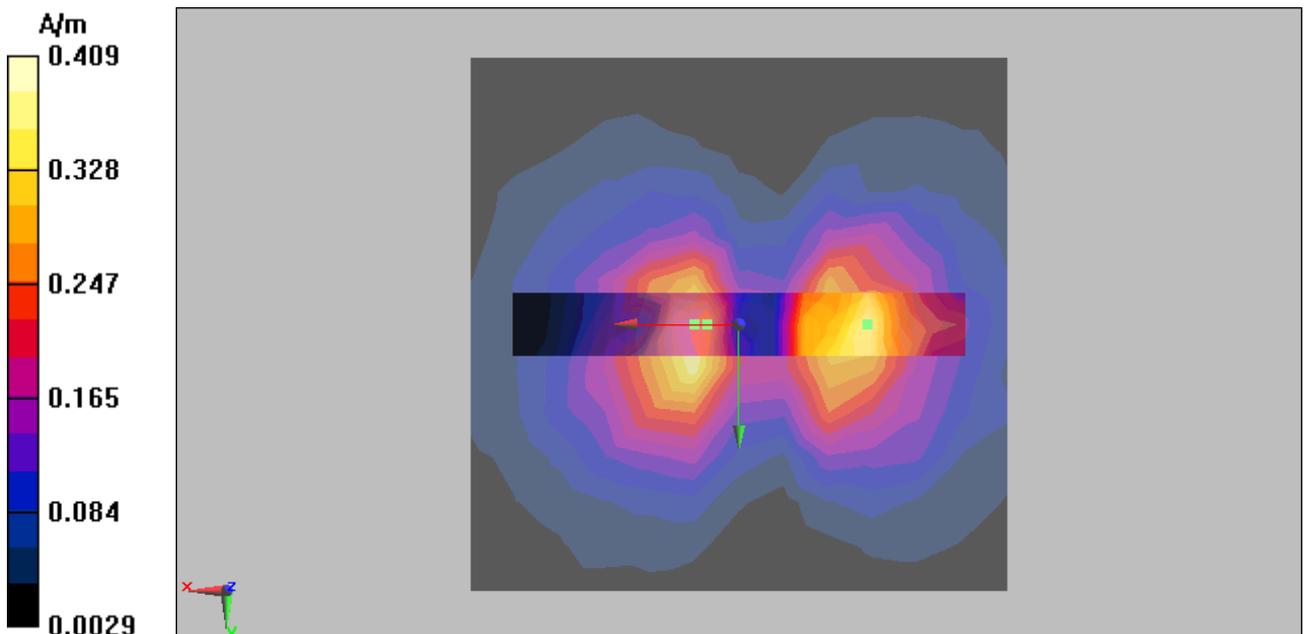
Location: -12, 0, 3.7 mm

Figure 14 T-Coil CDMA PCS X longitudinal

T-Coil CDMA PCS Y transversal

Date/Time: 1/7/2011 11:11:19 AMDate/Time: 1/7/2011 11:19:07 AM

Communication System: CDMA PCS; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: AM1DV3 - 3082; ; Calibrated: 11/29/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

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

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Scans/y (transversal) 4.2mm 50 x 50/ABM Signal(x,y,z) (13x13x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -7.96 dB A/m

BWC Factor = 0.158027 dB

Location: 0, -4.2, 3.7 mm

Scans/y (transversal) fine 3mm 6 x 42/ABM Signal(x,y,z) (3x15x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB

Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -7.55 dB A/m

BWC Factor = 0.158027 dB

Location: -3, -6, 3.7 mm

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1/ABM2 = 40.2 dB

ABM1 comp = -7.55 dB A/m
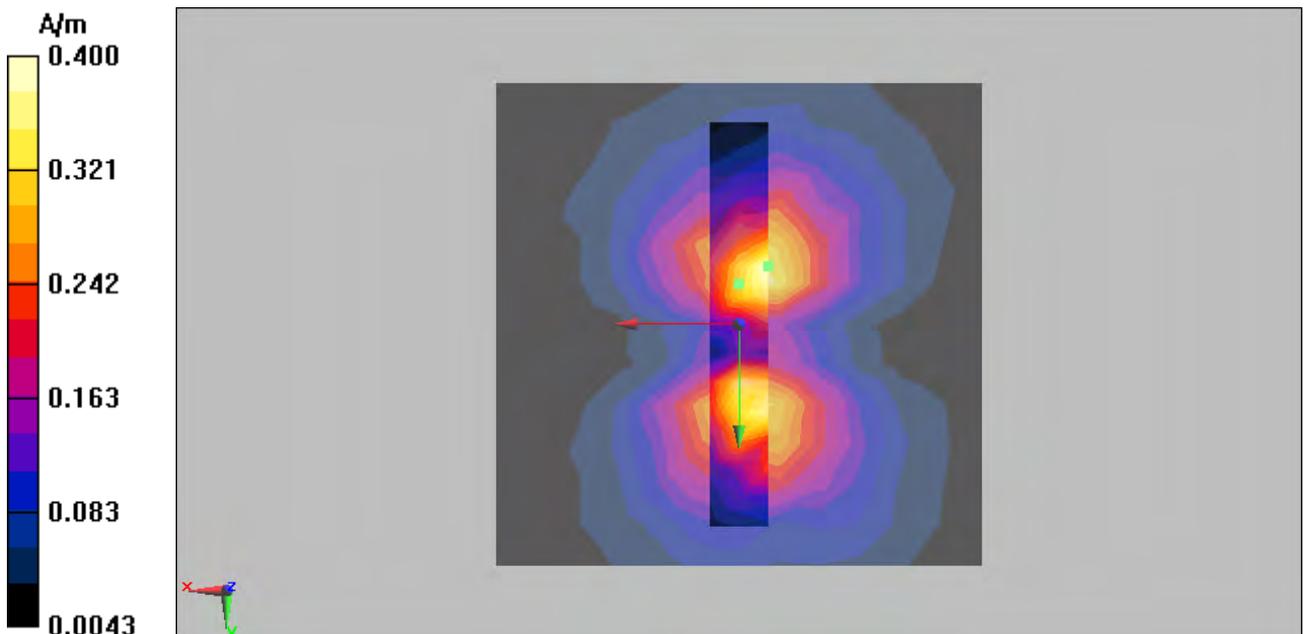
BWC Factor = 0.158027 dB

Location: -3, -6, 3.7 mm

Figure 15 T-Coil CDMA PCS Y transversal

T-Coil CDMA PCS Z Axial

Date/Time: 1/7/2011 10:48:10 AMDate/Time: 1/7/2011 10:55:43 AMDate/Time: 1/7/2011 10:58:08 AM

Communication System: CDMA PCS; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: AM1DV3 - 3082; ; Calibrated: 11/29/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

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

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Scans/z (axial) 4.2mm 50 x 50/ABM Signal(x,y,z) (13x13x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = 0.663 dB A/m

BWC Factor = 0.158027 dB

Location: 0, 0, 3.7 mm

Scans/z (axial) fine 2mm 8 x 8/ABM Signal(x,y,z) (5x5x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB

Category	
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -0.102 dB A/m

BWC Factor = 0.158027 dB

Location: -2, 0, 3.7 mm

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1/ABM2 = 44.7 dB

ABM1 comp = -1.19 dB A/m

BWC Factor = 0.158027 dB

Location: -2, 4, 3.7 mm

Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f) (1x1x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_300-3000_2s.wav

Output Gain: 56.4

Measure Window Start: 0ms

Measure Window Length: 2000ms

BWC applied: 10.8 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

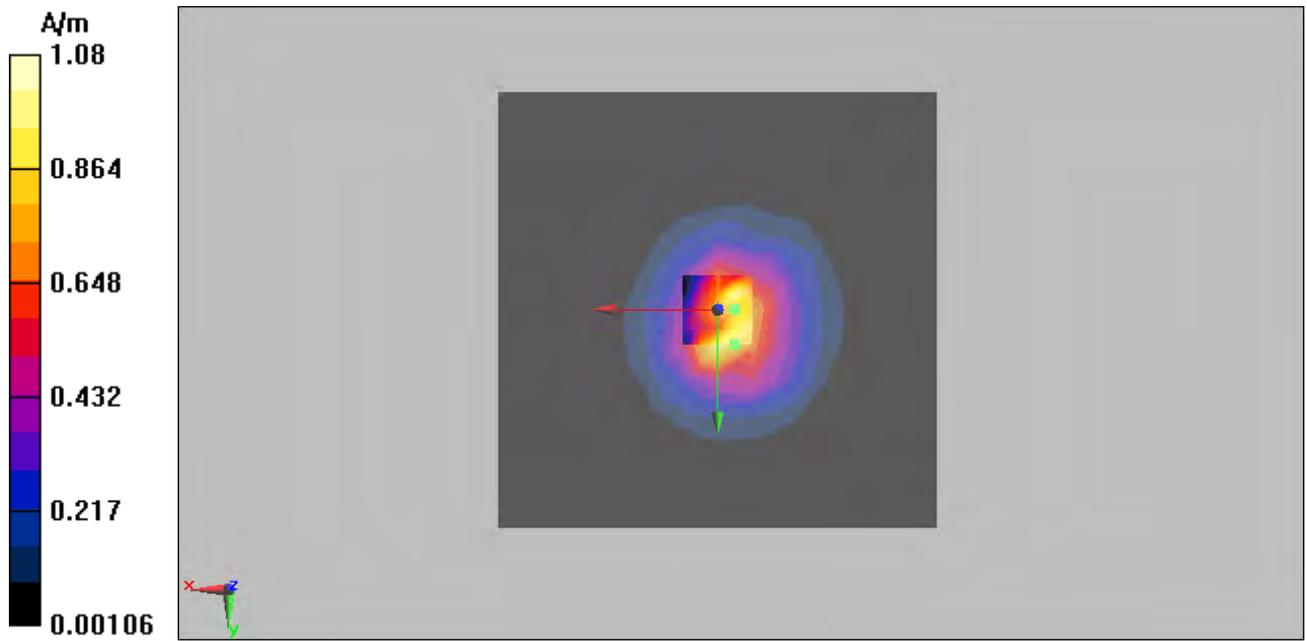Diff = 1.39 dB

BWC Factor = 10.8 dB

Location: -2, 4, 3.7 mm

Figure 16 T-Coil CDMA PCS Z Axial

T-Coil CDMA AWS X longitudinal

Date/Time: 1/7/2011 11:38:06 AMDate/Time: 1/7/2011 11:46:06 AM

Communication System: CDMA AWS; Frequency: 1732.5 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, $ε_r$ = 1; ρ = 1 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: AM1DV3 - 3082; ; Calibrated: 11/29/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

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

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Scans/x (longitudinal) 4.2mm 50 x 50/ABM Signal(x,y,z) (13x13x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -8.32 dB A/m

BWC Factor = 0.158027 dB

Location: 4.2, 0, 3.7 mm

Scans/x (longitudinal) fine 3mm 42 x 6/ABM Signal(x,y,z) (15x3x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB

Category T4	> 30 dB

Cursor:

ABM1 comp = -8.16 dB A/m

BWC Factor = 0.158027 dB

Location: 4.8, 3, 3.7 mm

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1/ABM2 = 21.5 dB

ABM1 comp = -10.2 dB A/m

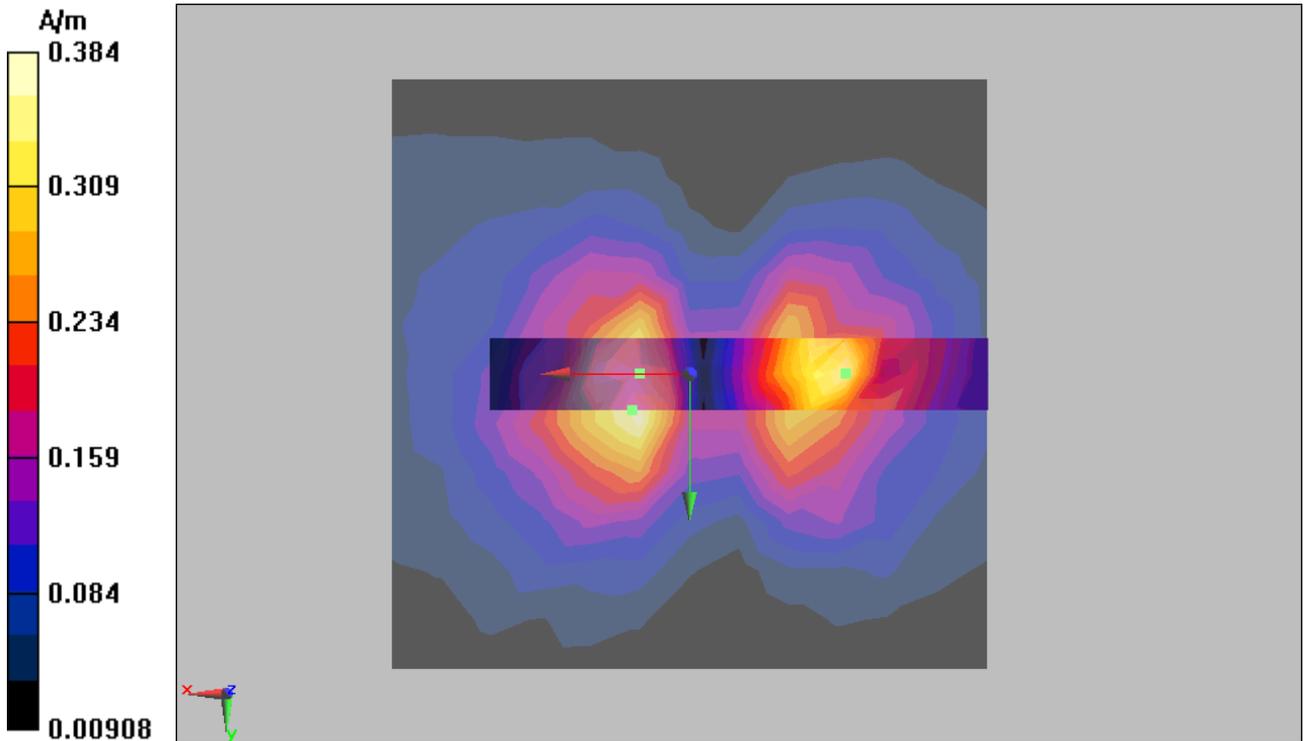BWC Factor = 0.158027 dB

Location: -13.2, 0, 3.7 mm

Figure 17 T-Coil CDMA AWS X longitudinal

T-Coil CDMA AWS Y transversal

Date/Time: 1/7/2011 11:51:14 AMDate/Time: 1/7/2011 12:09:29 PM

Communication System: CDMA AWS; Frequency: 1732.5 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3

Ambient Temperature:22.3 ℃   Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: AM1DV3 - 3082; ; Calibrated: 11/29/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

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

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Scans/y (transversal) 4.2mm 50 x 50/ABM Signal(x,y,z) (13x13x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -8.68 dB A/m

BWC Factor = 0.158027 dB

Location: -4.2, 8.3, 3.7 mm

Scans/y (transversal) fine 3mm 6 x 42/ABM Signal(x,y,z) (3x15x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB

Category T4   > 30 dB

Cursor:

ABM1 comp = -8.74 dB A/m

BWC Factor = 0.158027 dB

Location: -4.2, -6, 3.7 mm

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1/ABM2 = 39.1 dB

ABM1 comp = -10.3 dB A/m

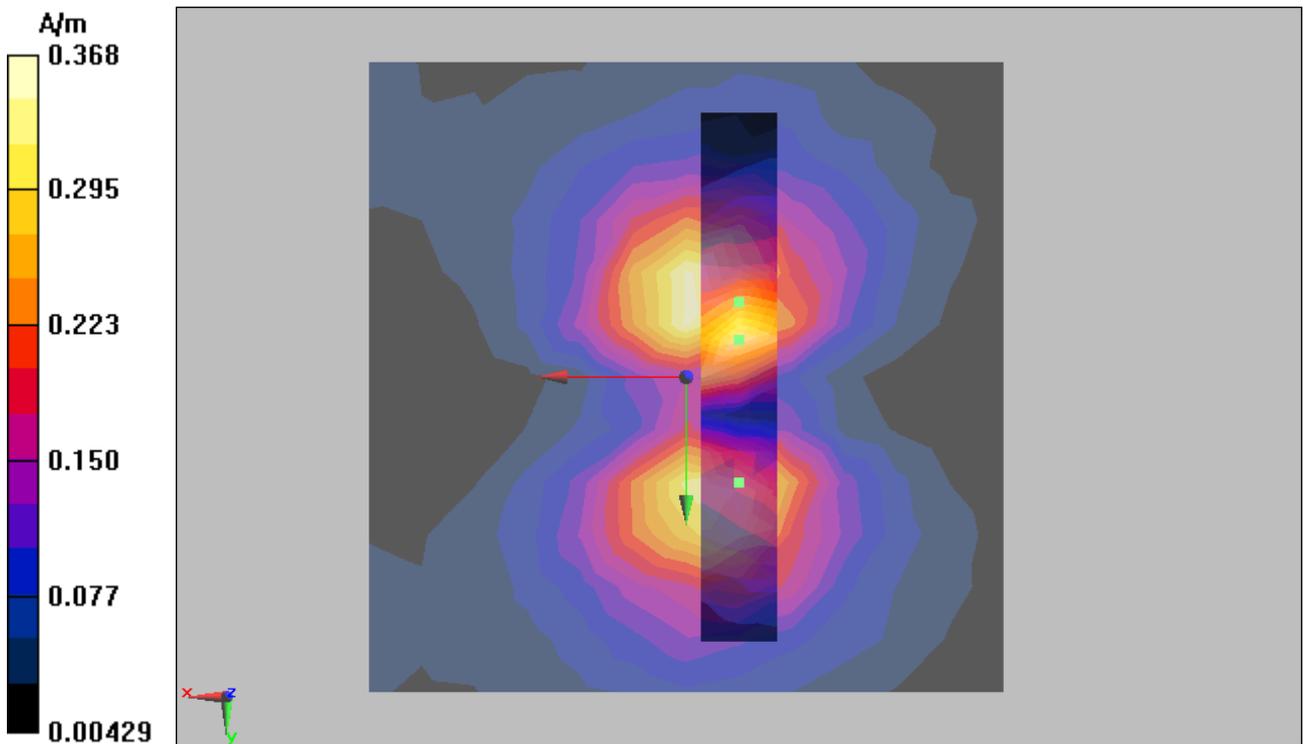BWC Factor = 0.158027 dB

Location: -4.2, -3, 3.7 mm

Figure 18 T-Coil CDMA AWS Y transversal

T-Coil CDMA AWS Z Axial

Date/Time: 1/7/2011 11:27:24 AMDate/Time: 1/7/2011 11:34:52 AMDate/Time: 1/7/2011 11:37:18 AM

Communication System: CDMA AWS; Frequency: 1732.5 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3

Ambient Temperature:22.3 ℃　　　　Liqiud Temperature: 21.5℃

DASY5 Configuration:

Probe: AM1DV3 - 3082; ; Calibrated: 11/29/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

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

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Scans/z (axial) 4.2mm 50 x 50/ABM Signal(x,y,z) (13x13x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1 comp = -0.563 dB A/m

BWC Factor = 0.158027 dB

Location: -4.2, 0, 3.7 mm

Scans/z (axial) fine 2mm 8 x 8/ABM Signal(x,y,z) (5x5x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB

Category T3	20 dB to 30 dB	
Category T4	> 30 dB	

Cursor:

ABM1 comp = -0.161 dB A/m

BWC Factor = 0.158027 dB

Location: -2.2, 2, 3.7 mm

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav

Output Gain: 28.8

Measure Window Start: 0ms

Measure Window Length: 1000ms

BWC applied: 0.158027 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

ABM1/ABM2 = 42.7 dB

ABM1 comp = -0.161 dB A/m

BWC Factor = 0.158027 dB

Location: -2.2, 2, 3.7 mm

Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f) (1x1x1):

Measurement grid: dx=10mm, dy=10mm

Signal Type: Audio File (.wav) 48k_voice_300-3000_2s.wav

Output Gain: 56.4

Measure Window Start: 0ms

Measure Window Length: 2000ms

BWC applied: 10.8 dB

Device Reference Point: 0, 0, -6.3 mm

Category	Telephone parameters WD signal quality [(signal+noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

Cursor:

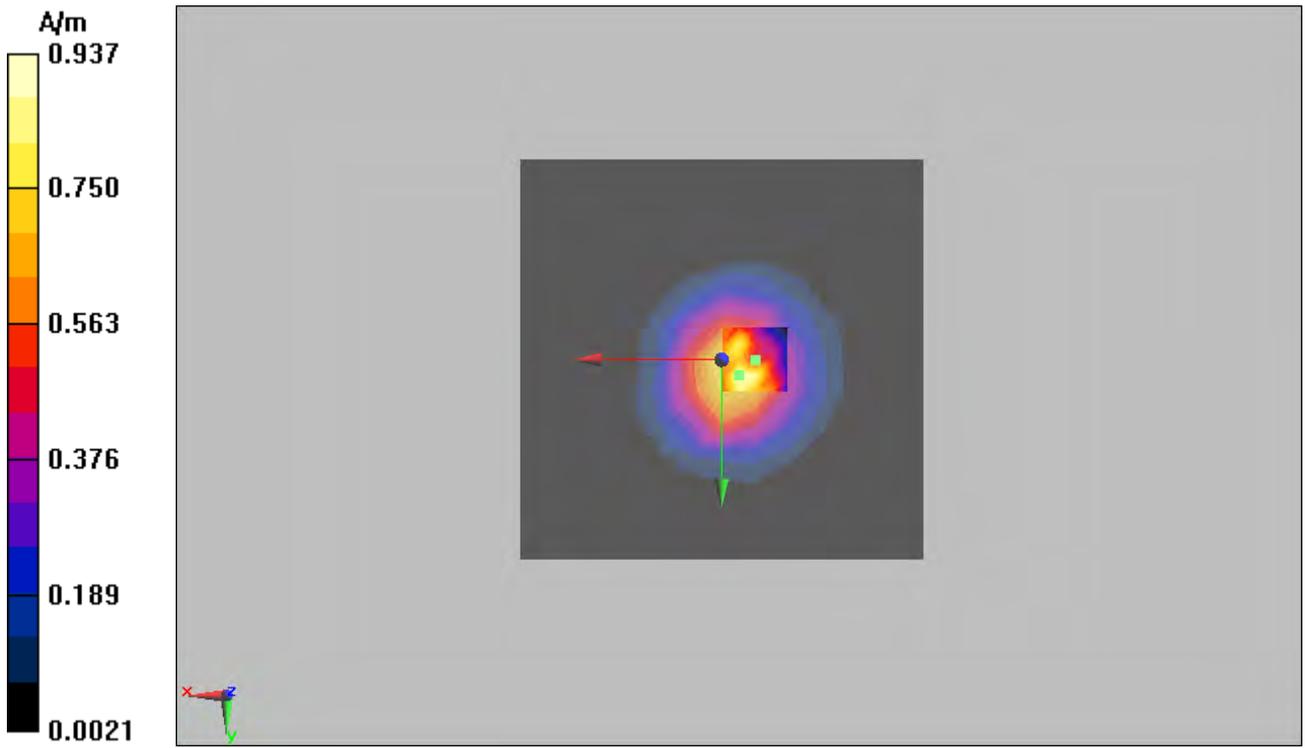Diff = 1.84 dB

BWC Factor = 10.8 dB

Location: -2.2, 2, 3.7 mm

Figure 19 T-Coil CDMA AWS Z Axial

ANNEX C: Probe Calibration Certificate

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

ilac-MRA

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

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

Client   **TA Technology SH (Auden)**

Certificate No: **AM1DV3-3082_Nov10**

CALIBRATION CERTIFICATE

Object	AM1DV3 - SN: 3082
Calibration procedure(s)	**QA CAL-24.v2** **Calibration procedure for AM1D magnetic field probes and TMFS in the audio range**
Calibration date:	November 29, 2010

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
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-10 (No:10376)	Sep-11
Reference Probe AM1DV3	SN: 3000	6-Sep-10 (No. AM1D-3000_Sep10)	Sep-11
DAE4	SN: 781	22-Jan-10 (No. DAE4-781_Jan10)	Jan-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
AMCC	1050	15-Oct-09 (in house check Oct-09)	Oct-11

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: November 29, 2010

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

Certificate No: AM1D-3082_Nov10   Page 1 of 3

References

[1]   ANSI C63.19-2007
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.
[2]   DASY4 manual, Chapter: Hearing Aid Compatibility (HAC) T-Coil Extension

Description of the AM1D probe

The AM1D Audio Magnetic Field Probe is a fully shielded magnetic field probe for the frequency range from 100 Hz to 20 kHz. The pickup coil is compliant with the dimensional requirements of [1]. The probe includes a symmetric low noise amplifier for the signal available at the shielded 3 pin connector at the side. Power is supplied via the same connector (phantom power supply) and monitored via the LED near the connector. The 7 pin connector at the end of the probe does not carry any signals, but determines the angle of the sensor when mounted on the DAE. The probe supports mechanical detection of the surface.
The single sensor in the probe is arranged in a tilt angle allowing measurement of 3 orthogonal field components when rotating the probe by 120° around its axis. It is aligned with the perpendicular component of the field, if the probe axis is tilted nominally 35.3° above the measurement plane, using the connector rotation and sensor angle stated below.
The probe is fully RF shielded when operated with the matching signal cable (shielded) and allows measurement of audio magnetic fields in the close vicinity of RF emitting wireless devices according to [1] without additional shielding.

Handling of the item

The probe is manufactured from stainless steel. In order to maintain the performance and calibration of the probe, it must not be opened. The probe is designed for operation in air and shall not be exposed to humidity or liquids. For proper operation of the surface detection and emergency stop functions in a DASY system, the probe must be operated with the special probe cup provided (larger diameter).

Methods Applied and Interpretation of Parameters

- *Coordinate System:* The AM1D probe is mounted in the DASY system for operation with a HAC Test Arch phantom with AMCC Helmholtz calibration coil according to [2], with the tip pointing to "southwest" orientation.

- *Functional Test:* The functional test preceding calibration includes test of
Noise level
RF immunity (1kHz AM modulated signal). The shield of the probe cable must be well connected.
Frequency response verification from 100 Hz to 10 kHz.

- *Connector Rotation:* The connector at the end of the probe does not carry any signals and is used for fixation to the DAE only. The probe is operated in the center of the AMCC Helmholtz coil using a 1 kHz magnetic field signal. Its angle is determined from the two minima at nominally +120° and –120° rotation, so the sensor in the tip of the probe is aligned to the vertical plane in z-direction, corresponding to the field maximum in the AMCC Helmholtz calibration coil.

- *Sensor Angle:* The sensor tilting in the vertical plane from the ideal vertical direction is determined from the two minima at nominally +120° and –120°. DASY system uses this angle to align the sensor for radial measurements to the x and y axis in the horizontal plane.

- *Sensitivity:* With the probe sensor aligned to the z-field in the AMCC, the output of the probe is compared to the magnetic field in the AMCC at 1 kHz. The field in the AMCC Helmholtz coil is given by the geometry and the current through the coil, which is monitored on the precision shunt resistor of the coil.

AM1D probe identification and configuration data

Item	AM1DV3 Audio Magnetic 1D Field Probe
Type No	SP AM1 001 BA
Serial No	**3082**

Overall length	296 mm
Tip diameter	6.0 mm (at the tip)
Sensor offset	3.0 mm (centre of sensor from tip)
Internal Amplifier	20 dB

Manufacturer / Origin	Schmid & Partner Engineering AG, Zürich, Switzerland
Manufacturing date	May-2010
Last calibration date	n/a

Calibration data

Connector rotation angle	(in DASY system)	**2.1 °**	+/- 3.6 ° (k=2)
Sensor angle	(in DASY system)	**0.61 °**	+/- 0.5 ° (k=2)
Sensitivity at 1 kHz	(in DASY system)	**0.00738 V / (A/m)**	+/- 2.2 % (k=2)

ANNEX D: DAE4 Calibration Certificate

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

ilac-MRA

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

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

Accreditation No.: **SCS 108**

Client   **TA – SH (Auden)**   Certificate No: **DAE4-871_Nov10**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 871
Calibration procedure(s)	QA CAL-06.v22 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 18, 2010

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
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-10 (No:10376)	Sep-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	07-Jun-10 (in house check)	In house check: Jun-11

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

Issued: November 18, 2010

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

Certificate No: DAE4-871_Nov10   Page 1 of 5

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

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

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

Accreditation No.: **SCS 108**

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 = 6.1µV ,	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	404.757 ± 0.1% (k=2)	404.740 ± 0.1% (k=2)	405.181 ± 0.1% (k=2)
Low Range	3.98219 ± 0.7% (k=2)	3.93489 ± 0.7% (k=2)	3.96831 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	90.0 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	200001.2	-1.56	-0.00
Channel X	+ Input	20000.71	0.71	0.00
Channel X	- Input	-19997.87	1.63	-0.01
Channel Y	+ Input	199994.3	1.99	0.00
Channel Y	+ Input	19998.92	-1.08	-0.01
Channel Y	- Input	-20000.26	-0.76	0.00
Channel Z	+ Input	200009.2	-1.04	-0.00
Channel Z	+ Input	19998.70	-1.10	-0.01
Channel Z	- Input	-20000.16	-0.76	0.00

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.1	0.16	0.01
Channel X	+ Input	199.58	-0.52	-0.26
Channel X	- Input	-200.79	-0.89	0.45
Channel Y	+ Input	1999.9	-0.03	-0.00
Channel Y	+ Input	199.45	-0.55	-0.27
Channel Y	- Input	-200.31	-0.41	0.21
Channel Z	+ Input	2000.1	0.33	0.02
Channel Z	+ Input	199.13	-0.77	-0.38
Channel Z	- Input	-201.47	-1.37	0.69

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	14.25	12.86
	- 200	-12.68	-14.21
Channel Y	200	-10.04	-10.39
	- 200	9.20	9.17
Channel Z	200	-0.85	-1.40
	- 200	-0.34	-0.31

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	-	2.85	0.69
Channel Y	200	2.41	-	2.73
Channel Z	200	2.54	0.73	-

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	15920	15517
Channel Y	16171	16732
Channel Z	15803	16474

5. Input Offset Measurement

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

Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.03	-2.35	0.86	0.43
Channel Y	-0.50	-1.49	-0.49	0.38
Channel Z	-0.92	-2.21	0.14	0.44

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
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