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HAC T-Coil Signal Test Report

Test report no.:	Salo_HAC_0637_18	**Date of report:**	2006-Sep-19
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Testing laboratory:	TCC Salo P.O. Box 86 Joensuunkatu 7H / Kiila 1B FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 (0) 7180 45220	**Client:**	Nokia Corporation P.O. Box 300 Yrttipellontie 6 FIN-90230 OULU, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 (0) 7180 58300
Responsible test engineer:	Ari Orte	**Product contact person:**	Sonja Perälä
Measurements made by:	Ari Orte		
Tested devices:	RM-198 (Hearing aid mode active), HW: 12010901		
FCC ID:	LJPRM-198H	**IC:**	661E-RM198
Supplement reports:	Salo_HAC_0637_17.pdf related HAC RF report		
Testing has been carried out in accordance with:	**ANSI C63.19-2006** American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test results:	**The tested device complies with the requirements in respect of all parameters subject to the test.** The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		

Date and signatures: **2006-09-19**

For the contents:

Digitally signed by Ari Orte
DN: CN = Ari Orte, C = FI, O = Nokia, OU = CertMT
Date: 2006.09.19 13:22:25 +03'00'

Ari Orte
Test System Manager

TCC
Nokia

CONTENTS

1. SUMMARY OF HAC T-COIL SIGNAL TEST REPORT

1.1 Test Details

Period of test	2006-Sep-12 – 2006-Sep-13
SN, HW, SW and DUT numbers of tested device	SN: 004400/87/16796/9, HW: 12010901, SW: vp03.32
Batteries used in testing	BL-5C, DUT: 10803, 10295
State of sample	Prototype unit
Notes	AWF = -5 for GSM

1.2 Summary of T-Coil Test Results

1.2.1 T-Coil Coupling Field Intensity

1.2.1.1 Axial Field Intensity

Mode	Minimum limit [dB (A/m)]	Result [dB (A/m)]	Verdict
GSM 850	-13	9.2	Pass
GSM 1900	-13	9.9	Pass

1.2.1.2 Radial Field Intensity

Mode	Minimum limit [dB (A/m)]	Minimum Result [dB (A/m)]	Verdict
GSM 850	-18	0.3	Pass
GSM 1900	-18	1.1	Pass

1.2.2 Frequency Response at Axial Measurement Point

Mode	Verdict
GSM 850	Pass
GSM 1900	Pass

1.2.3 Signal Quality

Mode	Minimum limit [dB]				Minimum result [dB]	Category
	T1	T2	T3	T4		
GSM 850	-15	-5	5	15	36.0	T4
GSM 1900	-15	-5	5	15	41.3	T4

Mode	RF emissions category at T-coil axial measurement point (E- and H-fields)*	HAC category of the tested device (RF emissions and T-coil requirements combined)
GSM 850	M3	M3/T3
GSM 1900	M3	M3/T3

*See separate report 'Salo_HAC_0637_17.pdf'

1.3 Description of the Device Under Test (DUT)

Modes and Bands of Operation	GSM 850	GSM 1900
Modulation Mode	GMSK	GMSK
Duty Cycle	1/8	1/8
Transmitter Frequency Range (MHz)	824...849	1850...1910

Outside of USA, tested device is also capable of operating in GSM900 and GSM1800 band, which are not part of this test.

1.3.1 Picture of Device

*See separate report 'Salo_HAC_0637_17_setup photos.pdf'

2. TEST CONDITIONS

2.1 Temperature and Humidity

Ambient temperature (°C):	20.0 to 22.0
Ambient humidity (RH %):	40 to 60

2.2 WD Control

The transmitter of the device was put into operation by using a call tester. Communications between the device and the call tester were established by air link. EFR speech codec was used during testing.

The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.

In all operating bands the measurements were performed on middle channel.

2.3 WD Parameters

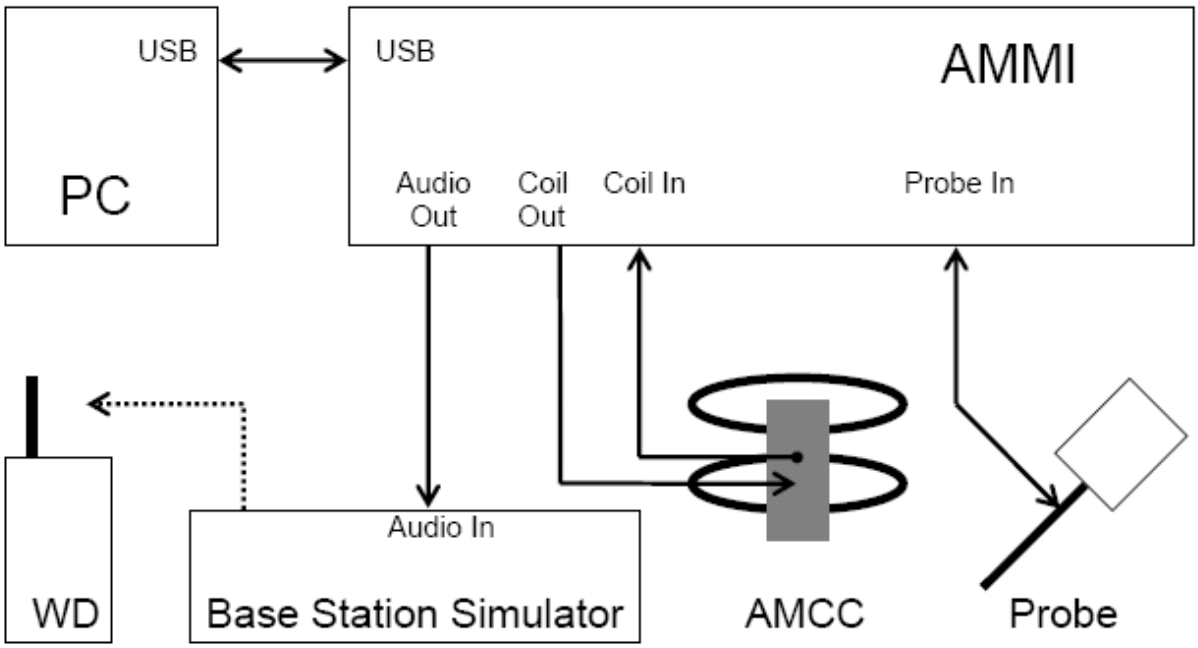
HAC mode was switched on from the WD user interface, volume setting was set to maximum and microphone was muted.

3. DESCRIPTION OF THE TEST EQUIPMENT

3.1 Measurement system and components

The measurements were performed using an automated near-field scanning system, DASY 4 software version 4.7, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland.

Components and signal paths of used measurement system are pictured below:



The following table lists calibration dates of measurement equipment:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DAE V4	538	12 months	05/07
AMMI Audio Magnetic Measurement Instrument	1002	12 months	02/07
AM1DV3 Audio Magnetic Probe	3036	12 months	08/07
AMCC Helmholtz Audio Magnetic Calibration Coil	1004	12 months	02/07
R&S CMU200 Radio Communication Test Set	104983	-	-

3.1.1 Audio Magnetic Probe AM1DV3

Construction	Fully RF shielded metal construction (RF sensitivity < -100dB)
Calibration	Calibrated using Helmholtz coil
Frequency	0.1 – 20 kHz
Sensitivity	< -50 dB A/m
Dimensions	Overall length: 290 mm; Tip diameter: 6 mm

3.1.2 Audio Magnetic Measurement Instrument AMMI

Sampling Rate	48 kHz / 24 bit
Dynamic Range	85 dB
Test Signal Generation	User selectable and predefined (via PC)
Calibration	Auto-calibration / full system calibration using AMCC with monitor output

3.1.3 Audio Magnetic Calibration Coil AMCC

Dimensions	370 x 370 x 196 mm (ANSI-PC63.19 compliant)

3.1.4 WD positioner

The WD positioner and Test Arch are manufactured by Speag (http://www.dasy4.com/hac). Test arch is used for all tests i.e. for both validation testing and device testing. The positioner and test arch conforms to the requirements of ANSI C63.19.

The SPEAG device holder (see Section 4.1) was used to position the test device in all tests.

3.2 Verification of the System

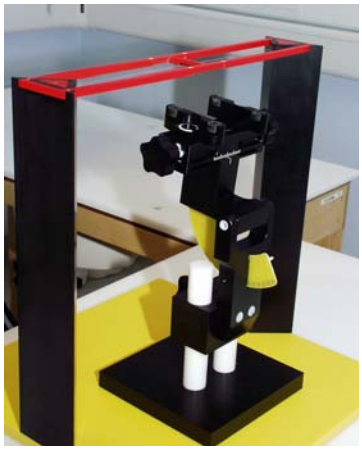
Audio Magnetic Probe AM1D is calibrated in AMCC Helmholtz Audio Magnetic Calibration Coil before each measurement procedure using calibration and reference signals.

R&S CMU200 audio codec and SPEAG AMMI audio paths (gain) were calibrated according to manufacturer's instructions.

4. DESCRIPTION OF THE TEST PROCEDURE

4.1 Test Arch and Device Holder

The test device was placed in the Device Holder (illustrated below) that is supplied by SPEAG. Using this positioner the tested device is positioner under Test Arch.



Device holder and Test Arch supplied by SPEAG

4.2 Test Positions

The device was positioned such that Device Reference level was touching the bottom of the Test Arch. The speaker output is aligned with the intersection of the Test Arch's middle bar and dielectric wire. The WD is positioned always this way to ensure repeatability of the measurements. Coordinate system depicted below is used to define exact locations of measurement points relative to the center of the speaker output.

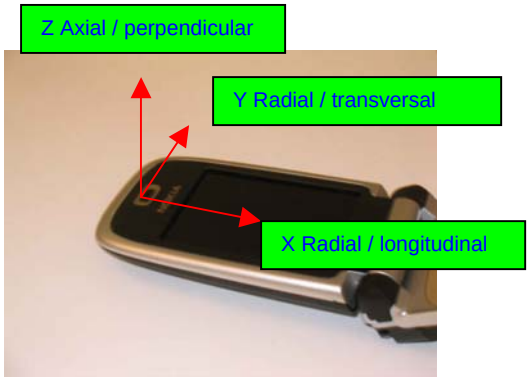


Photo of the device positioned under Test Arch and coordinate system (The EUT in picture is generic phone sample and does not represent the actual equipment under test)

4.3 T-coil Scan Procedures

Manufacturer can either define measurement locations for WD categorization or optimum locations can be found using following procedure; First, coarse scans in all measurement orientations, centered at the earpiece, are made to find approximate locations of optimum signal. More accurate fine scans are made in these locations to find final measurement points.

4.4 Measurement procedure and used test signals

During measurements signal is fed to WD via communication tester. Proper gain setting is used in software to ensure correct signal level fed to communication tester speech input. Measurement software compares fed signal and signal from measurement probe and applies proper filtering and integration procedures.

Broadband voice-like signals are used during scans and frequency response measurement to ensure proper operation of WD vocoder and audio enhancement algorithms.

Both signal (ABM1) and undesired audio noise (ABM2) are measured consequently to enable determination of signal+noise to noise ratio (SNR).

In final measurement sine signal is used to determine signal strength @ 1 kHz.

4.5 T-coil Requirements and Category Limits

RF Emissions

Wireless device has to fulfill RF emission requirements at the axial measurement location.

Axial Field Intensity

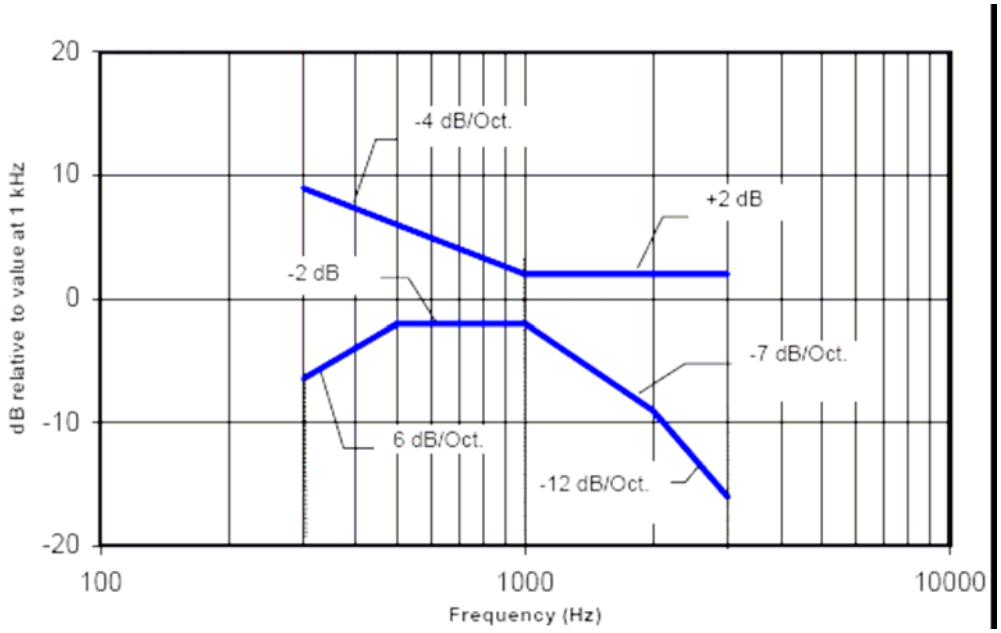
The axial component of the magnetic field shall be ≥-13dB(A/m) at 1 kHz, in 1/3 octave band filter.

Radial Field Intensity

The radial components of the magnetic field shall be ≥-18dB(A/m) at 1 kHz, in 1/3 octave band filter.

Frequency Response

Frequency response of the axial component must follow the frequency curve depicted below:



Frequency response window applicable for devices with axial field strength > -10dB(A/m)

Signal Quality

The worst result of three T-coil signal measurements is used to define WD Hearing Aid T-category according to the category limits:

Category	AWF [dB]	Limits for Signal Quality [dB]
T1	0	-20
	-5	-15
T2	0	-10
	-5	-5
T3	**0**	**0**
	-5	**5**
T4	0	10
	-5	15

5. MEASUREMENT UNCERTAINTY

Measurement uncertainty budget presented in Appendix B.

6. RESULTS

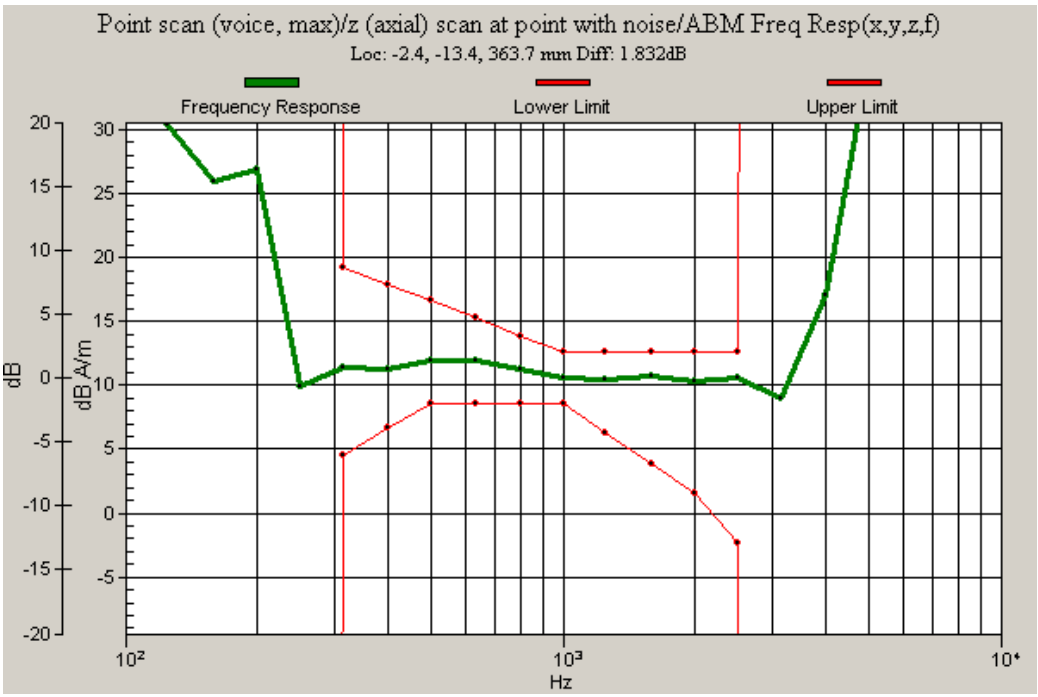
Measurement position coordinates are defined as deviation from earpiece center in millimeters. Coordinate system is defined in chapter 4.2

Axial measurement location was defined by the manufacturer of the device as the center of the earpiece. Maximum values for axial field are listed for informative purposes but results at earpiece center were used in evaluating T-category of the device.

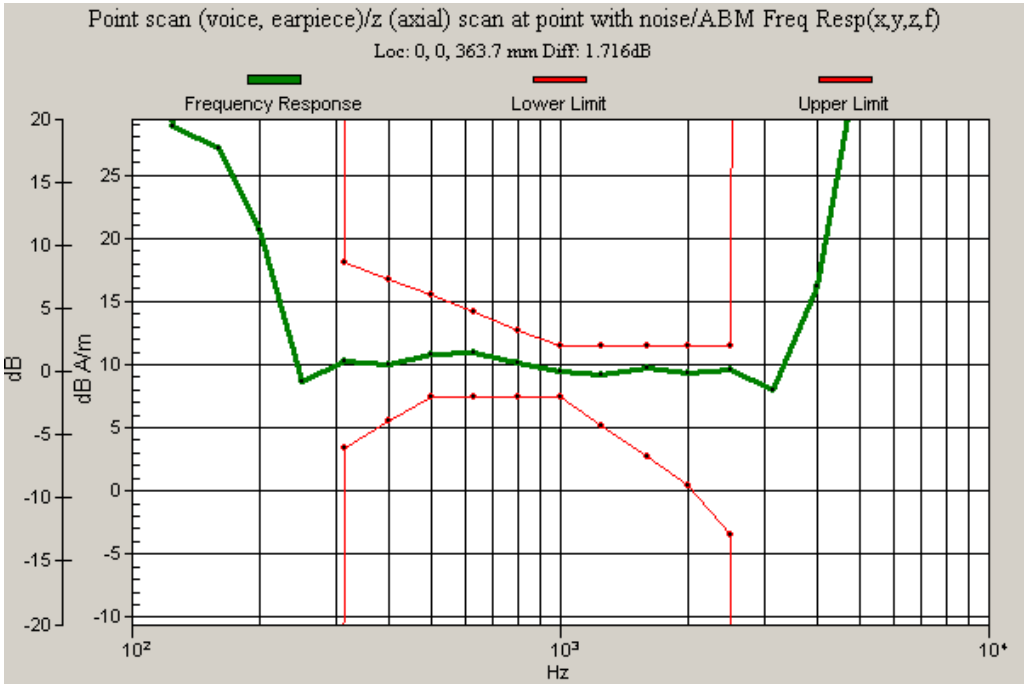
	Radial 1 (longitudinal)		Radial 2 (transversal)		Axial			
Mode	850	1900	850	1900	850		1900	
Measurement position (x,y) [mm]	6,-15	6,-15	-1.6,-5	-1.6,-5	-2.4,-13.4	0, 0	-2.4,-13.4	0, 0
Signal strength [dB A/m]	0.3	1.1	10.6	11.1	11.1	9.2	11.8	9.9
ABM2 [dB A/m]	-35.6	-40.2	-45.3	-43.6	-44.9	-44.3	-42.9	-43.8
Signal quality [dB]	36.0	41.3	55.9	54.7	55.9	53.5	54.7	53.8
Ambient backround noise at point (0,0) ABM [dB A/m]	-53.9	-53.6	-53.9	-54.0	-52.0	-52.0	-50.8	-50.8

Plots of the signal strength measurement scans are presented in Appendix A.

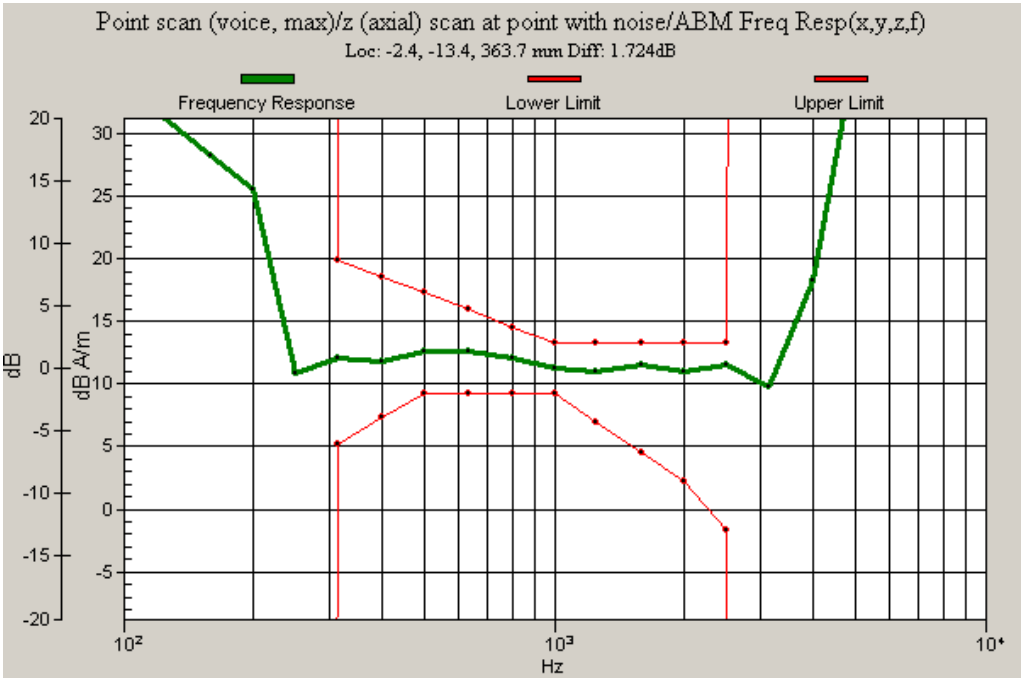
The curves illustrating frequency response for GSM850 and GSM1900 modes:



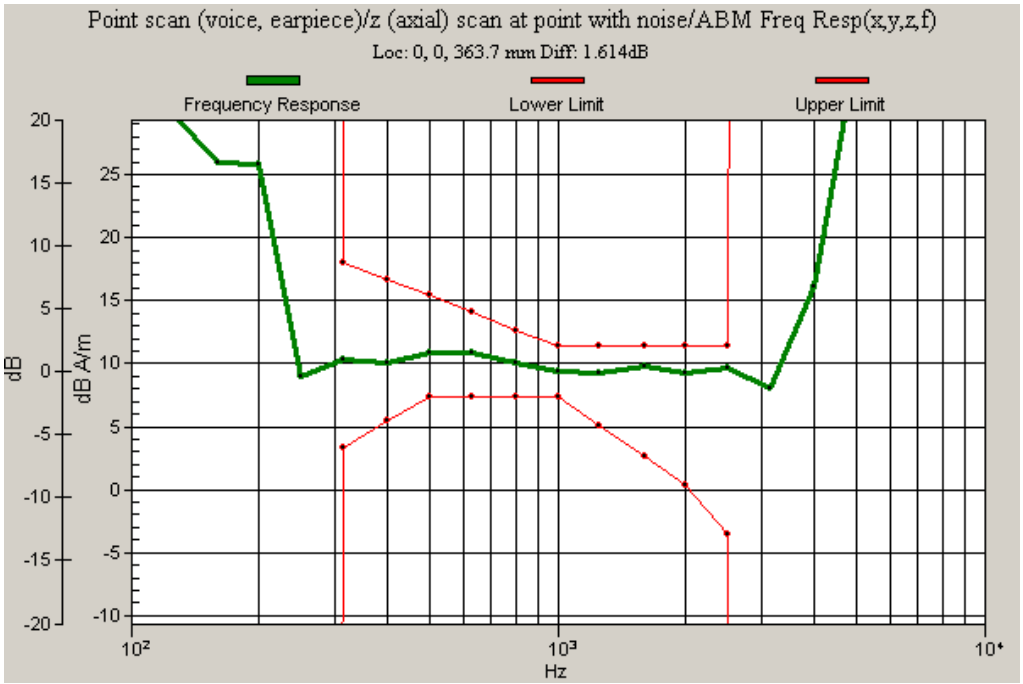
Frequency response in GSM850 mode, the point of maximum signal strength (axial)



Frequency response in GSM850 mode, point 0,0 (axial)



Frequency response in GSM1900 mode, the point of maximum signal strength (axial)



Frequency response in GSM1900 mode, point 0,0 (axial)

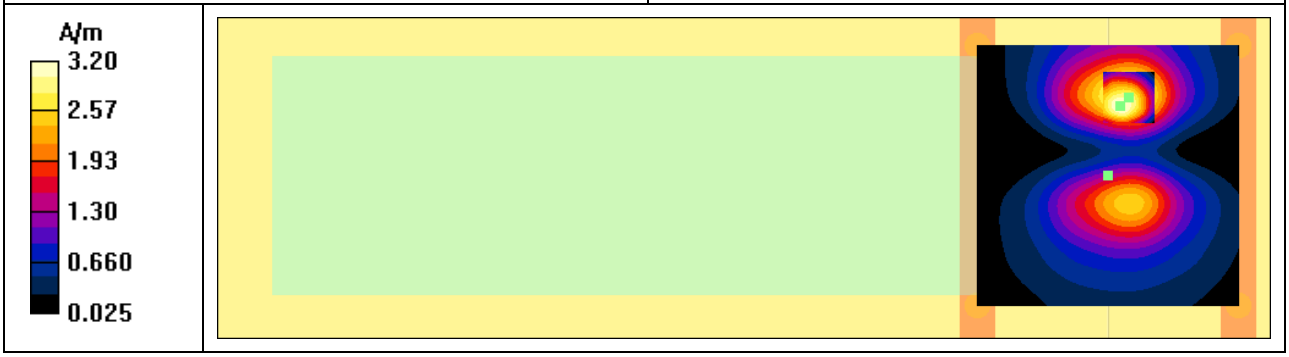
APPENDIX A: MEASUREMENT SCANS

Date/Time: 2006-09-13 14:56:41 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: GSM850** Frequency: 836.6 MHz; Duty Cycle: 1:7 Medium: Air; Medium Notes: Not Specified Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3 Phantom section: AMB with Coil Section	**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Coarse scan/z (axial) scan 50 x 50 (grid 10) with noise/ABM Interpolated Signal(x,y,z) (51x51x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = 10.0933 dB A/m
BWC Factor = 10.8 dB
Location: -4, -15, 363.7 mm

Fine scan/z (axial) scan 10 x 10 (grid 2) with noise/ABM Interpolated Signal(x,y,z) (51x51x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = 10.5997 dB A/m
BWC Factor = 10.8 dB
Location: -2.4, -13.4, 363.7 mm

Point scan (sinewave, max)/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1): Measurement grid: dx=10mm, dy=10mm Cursor: ABM1 comp = 11.0739 dB A/m BWC Factor = -0.209998 dB Location: -2.4, -13.4, 363.7 mm **Point scan (sinewave, max)/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -44.8672 dB A/m Location: -2.4, -13.4, 363.7 mm **Point scan (sinewave, max)/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM1/ABM2 = 55.9411 dB BWC Factor = -0.209998 dB Location: -2.4, -13.4, 363.7 mm	**Point scan (sinewave, earpiece)/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM1 comp = 9.19384 dB A/m BWC Factor = -0.206004 dB Location: 0, 0, 363.7 mm **Point scan (sinewave, earpiece)/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -44.3169 dB A/m Location: 0, 0, 363.7 mm **Point scan (sinewave, earpiece)/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM1/ABM2 = 53.5107 dB BWC Factor = -0.206004 dB Location: 0, 0, 363.7 mm



Date/Time: 2006-09-13 19:32:43 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: DCS 1900** Frequency: 1880 MHz; Duty Cycle: 1:8.3 Medium: Air; Medium Notes: Not Specified Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3 Phantom section: AMB with Coil Section	**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171
Point scan (sinewave, max)/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1): Measurement grid: dx=10mm, dy=10mm Cursor: ABM1 comp = 11.7614 dB A/m BWC Factor = -0.202998 dB Location: -2.4, -13.4, 363.7 mm **Point scan (sinewave, max)/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -42.903 dB A/m Location: -2.4, -13.4, 363.7 mm **Point scan (sinewave, max)/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM1/ABM2 = 54.6644 dB BWC Factor = -0.202998 dB Location: -2.4, -13.4, 363.7 mm	**Point scan (sinewave, earpiece)/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM1 comp = 9.91006 dB A/m BWC Factor = -0.211004 dB Location: 0, 0, 363.7 mm **Point scan (sinewave, earpiece)/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -43.8463 dB A/m Location: 0, 0, 363.7 mm **Point scan (sinewave, earpiece)/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM1/ABM2 = 53.7564 dB BWC Factor = -0.211004 dB Location: 0, 0, 363.7 mm

Date/Time: 2006-09-13 14:40:50 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: GSM850** Frequency: 836.6 MHz; Duty Cycle: 1:7 Medium: Air; Medium Notes: Not Specified Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3 Phantom section: AMB with Coil Section	**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

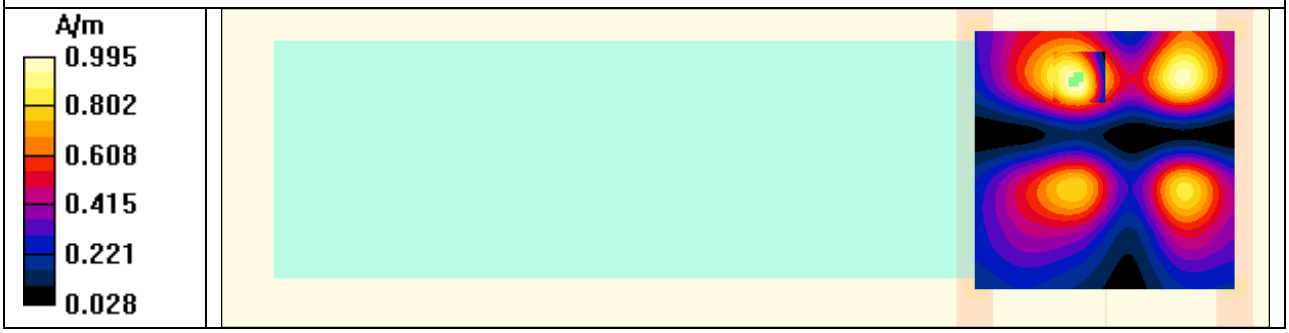
Coarse scan/x (longitudinal) scan 50 x 50 (grid 10) with noise/ABM Interpolated Signal(x,y,z) (51x51x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -0.0408128 dB A/m
BWC Factor = 10.8 dB
Location: 5, -16, 363.7 mm

Fine scan/x (longitudinal) scan 10 x 10 (grid 2) with noise/ABM Interpolated Signal(x,y,z) (51x51x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -0.0596369 dB A/m
BWC Factor = 10.8 dB
Location: 6, -15, 363.7 mm

Point scan (sinewave, max)/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = 0.349794 dB A/m
BWC Factor = -0.209998 dB
Location: 6, -15, 363.7 mm

Point scan (sinewave, max)/x (longitudinal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -35.6423 dB A/m
Location: 6, -15, 363.7 mm

Point scan (sinewave, max)/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 35.9921 dB
BWC Factor = -0.209998 dB
Location: 6, -15, 363.7 mm



Date/Time: 2006-09-13 19:32:43 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: DCS 1900** Frequency: 1880 MHz; Duty Cycle: 1:8.3 Medium: Air; Medium Notes: Not Specified Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3 Phantom section: AMB with Coil Section	**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Point scan (sinewave, max)/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = 1.14021 dB A/m
BWC Factor = -0.202998 dB
Location: 6, -15, 363.7 mm

Point scan (sinewave, max)/x (longitudinal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -40.1931 dB A/m
Location: 6, -15, 363.7 mm

Point scan (sinewave, max)/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 41.3333 dB
BWC Factor = -0.202998 dB
Location: 6, -15, 363.7 mm

Date/Time: 2006-09-13 14:45:37 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: GSM850** Frequency: 836.6 MHz; Duty Cycle: 1:7 Medium: Air; Medium Notes: Not Specified Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3 Phantom section: AMB with Coil Section	**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

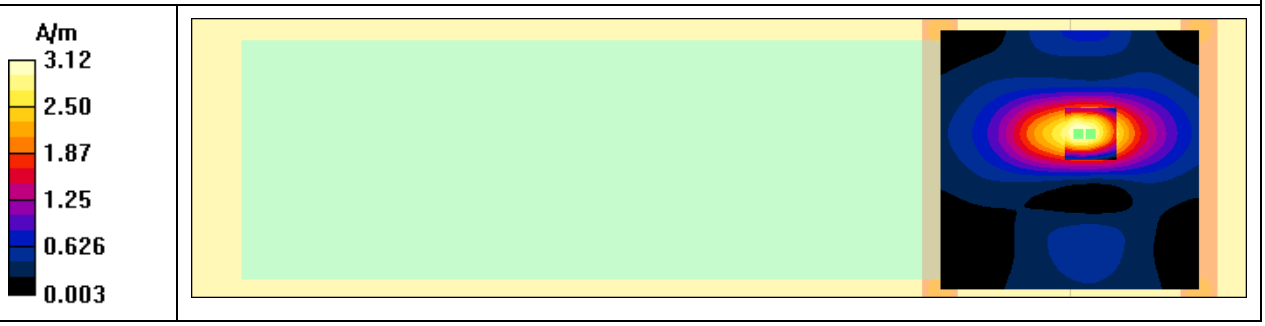
Coarse scan/y (transversal) scan 50 x 50 (grid 10) with noise/ABM Interpolated Signal(x,y,z) (51x51x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = 9.89646 dB A/m
BWC Factor = 10.8 dB
Location: -4, -5, 363.7 mm

Fine scan/y (transversal) scan 10 x 10 (grid 2) with noise/ABM Interpolated Signal(x,y,z) (51x51x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = 10.138 dB A/m
BWC Factor = 10.8 dB
Location: -1.6, -5, 363.7 mm

Point scan (sinewave, max)/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = 10.5541 dB A/m
BWC Factor = -0.209998 dB
Location: -1.6, -5, 363.7 mm

Point scan (sinewave, max)/y (transversal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -45.326 dB A/m
Location: -1.6, -5, 363.7 mm

Point scan (sinewave, max)/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 55.8801 dB
BWC Factor = -0.209998 dB
Location: -1.6, -5, 363.7 mm



Date/Time: 2006-09-13 19:32:43 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: DCS 1900** Frequency: 1880 MHz; Duty Cycle: 1:8.3 Medium: Air; Medium Notes: Not Specified Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3 Phantom section: AMB with Coil Section	**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Point scan (sinewave, max)/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = 11.1036 dB A/m
BWC Factor = -0.202998 dB
Location: -1.6, -5, 363.7 mm

Point scan (sinewave, max)/y (transversal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -43.6343 dB A/m
Location: -1.6, -5, 363.7 mm

Point scan (sinewave, max)/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 54.7378 dB
BWC Factor = -0.202998 dB
Location: -1.6, -5, 363.7 mm

Date/Time: 2006-09-13 14:45:37 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: GSM850** Frequency: 836.6 MHz; Duty Cycle: 1:7 Medium: Air; Medium Notes: Not Specified Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3 Phantom section: AMB with Coil Section		**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171
Background noise 5mm above Grid Reference/z (axial) noise/ABM Noise(x,y,z) (1x1x1): Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -51.9907 dB A/m Location: 0, 0, 368.7 mm	**Background noise 5mm above Grid Reference/x (longitudinal) noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -53.87 dB A/m Location: 0, 0, 368.7 mm	**Background noise 5mm above Grid Reference/y (transversal) noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -53.8646 dB A/m Location: 0, 0, 368.7 mm

Date/Time: 2006-09-13 16:57:38 Test Laboratory: TCC Nokia, Salo Laboratory **Type: RM-198;** Serial: 004400/87/16796/9 **Communication System: DCS 1900** Frequency: 1880 MHz; Duty Cycle: 1:8.3 Medium: Air; Medium Notes: Not Specified Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3 Phantom section: AMB with Coil Section		**DASY4 Configuration:** - Probe: AM1DV3 - 3036; Probe Notes: SP AM1 001 BA - ; Calibrated: 2006-08-03 - Sensor-Surface: 0mm (Fix Surface) - Electronics: DAE4 Sn538; Calibrated: 2006-05-17 - Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1004 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171
Background noise 5mm above Grid Reference/z (axial) noise/ABM Noise(x,y,z) (1x1x1): Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -50.8092 dB A/m Location: 0, 0, 368.7 mm	**Background noise 5mm above Grid Reference/x (longitudinal) noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -53.6088 dB A/m Location: 0, 0, 368.7 mm	**Background noise 5mm above Grid Reference/y (transversal) noise/ABM Noise(x,y,z) (1x1x1):** Measurement grid: dx=10mm, dy=10mm Cursor: ABM2 = -53.9641 dB A/m Location: 0, 0, 368.7 mm

APPENDIX B: MEASUREMENT UNCERTAINTY

Measurement uncertainty budget is currently under evaluation.

APPENDIX C: AUDIO MAGNETIC PROBE AM1D CALIBRATION DOCUMENT

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Client

Certificate of test and configuration

Item	Audio Magnetic 1D Field Probe **AM1DV3**
Type No	SP AM1 001 BA
Series No	**3036**
Manufacturer / Origin	Schmid & Partner Engineering AG Zurich, Switzerland

Description of the item
The 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 20dB 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 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 the DASY4 system, the probe must be operated with the special probe cup provided (larger diameter).

Functional test
The probe configuration data were evaluated after a functional test including amplification, dynamic range and RF immunity.

DASY4 configuration data for the probe

Configuration item	Condition	Configuration Data	Dimension
Overall length	mounted on DAE in DASY4 system	**296**	mm
Tip diameter	at the cylindrical part	6	mm
Sensor offset	center of sensor, from tip	3	mm
Connector rotation	Evaluated in homogeneous 1 kHz magnetic field generated with AMCC Helmholtz Calibration Coil	**-7.0**	°
Sensor angle		**0.34**	°
Sensitivity	typical, at 1 kHz	0.0068	V / (A/m)

Standards
[1] ANSI-C63.19-2006

Date 03.08.2006

Signature