Hearing Aid Compatibility Audio Band Magnetic (ABM) T-Coil Test Report

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Statement of Compliance: RIM Testing Services (RTS) declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices.

This wireless portable device has been shown to be in compliance with FCC 20.19 (10-1-04 Edition), Hearing Aid-Compatible Mobile Handsets and FCC Public Notice DA 06-1215 (June 6, 2006).

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1.0 Introduction

This test report demonstrates the measurement of the Audio Band Magnetic fields (ABM) generated by a wireless communication device in the region where a hearing aid would be used in the T-Coil mode.

Three quantities are measured and evaluated. The first is the field intensity of the desired signal at the center of the audio band. The second is the frequency response of the desired signal measured across the audio band. The third is the signal quality, which is defined as the ratio between the desired and undesired magnetic field levels.

The SPEAG DASY4 T-Coil extension together with the HAC RF extension allows complete characterization of the emissions of a wireless device (WD). The signals measured during these tests represent the field picked up by the T-Coil of a hearing aid. Using DASY4, three orthogonal axes are scanned with a probe incorporating a sensor coil: one axial (perpendicular), and two radial (transverse and longitudinal) directions with respect to the plane and main axis of the WD.

The WD is mounted on the Test Arch phantom (provided with the HAC RF extension). Its acoustic center is centered and represents the reference for the combination of ABM and RF field evaluation. The ABM fields of the WD (frequency range <20 kHz) are scanned with a fully RF shielded active 1D magnetic probe. The probe axis is oriented in space diagonal to the three orthogonal axes, and its single sensor can be oriented to the axes by 120° rotation. The probe signal is evaluated by an Audio Magnetic Measurement Instrument (AMMI) which is interfaced to the DASY4 computer via USB. The AMMI also provides test and calibration signals and interfaces to the Helmholtz Audio Magnetic Calibration Coil (AMCC).

Predefined or user-definable audio signals for injection into the WD during the test are available at a connector of the AMMI. The DASY4 software allows flexible control of scan, rotation, measurement duration, as well as selection of the measurement mode and signal source for all ABM measurements. Filtering as specified by the standard is applied to the sampled signal resulting in the signal level, (weighted) noise level and a third-octave resolution spectrum for the frequency response. This information is represented numerically and graphically during the scans and graphically evaluated in the postprocessor. The combination of the quantities (signal level, frequency response, signal to noise ratio) leads to an overall classification according to ANSI-C63.19. Coarse, fine and point scan together with user selectable test signals, minimize the time to find the “optimal point” with the highest class for the WD.

The background noise evaluations are made for each probe orientation without an active WD in the area of the WD scan. The background noise level shall be lower by 10 dB than the measurements.

1.1 Audio signals:

The following audio signal files are used for calibration and measurements:

1.025 kHz sinewave (duration 10 s): used alternatively instead of 1 kHz, according to [1] 6.3.1 step 2, if the internal 1.0 kHz signal would cause interferences inside the WD. The bandwidth is suited for signal quality or signal level measurements.

Multisine signal 50 Hz – 5 kHz (duration 10 s): Signal with carrier centered in each third-octave band, as used during the calibration.

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48k_voice_300-3000 (duration 2 s): The signal is voicelike and has been processed to have a duration of 2 seconds for fast measurement.

1.2 Input level measurement

To determine correct input level, the Encoder / Decoder of a Rohde & Schwarz CMU 200 base station simulator was calibrated for measured full-scale input voltage level. From the measured full-scale voltage level, the equivalent input voltage level of -18 dBm0 was calculated as shown in section 5.1.

Time averaging was used with an artificial speech based signal when setting the input reference level. The averaging period was adequate to cover the signal period and the averaging method was the same for setting the reference level and performing the measurement.

1.3 Bandwidth compensation

ABM1 values and deducted quantities (SNR and frequency response scaling) are based on the measured field in the 1 kHz third-octave filter. Bandwidth compensated values are available under the following conditions:

● A reference measurement with the same signal type is available (T-Coil job marked with “use as
reference”) before the job to be compensated.
● The reference measurement is taken in the AMCC (z orientation), evaluating the coil signal.
● The reference measurement precedes the job within the same procedure.
● Before displaying the desired value based on the measured ABM1 value, a pop-up window appears, proposing a default value based on the reference measurement.

The proposed value is calculated as the ratio of (power sum of third-octave filters from 100 Hz to 5 kHz) / (ABM1 in 1 kHz third-octave filter). This factor leads to the “ABM1 bandwidth compensated” which is an estimation of the signal level of a narrowband ABM1 signal with the same input amplitude. The estimated value may however differ from a measurement with a narrowband signal due to nonlinearity effects or contribution of noise and interference available during the reference measurement.

1.4 Vocoder type

For the CDMA 2000 ABM measurements, the best quality vocoder was measured which is “8k Enhanced Low” full rate.

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2.0 Applicable references

[1] ANSI C63.19 revision 3.12, American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids.

[2] FCC 47CFR § 20.19 (10-1-05 Edition), Hearing Aid-Compatible Mobile Handsets.

[3] FCC Public Notice DA 06-1215 (June 6, 2006).

[4] SPEAG DASY4 V4.7 draft user manual, May 2006.

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3.0 Equipment unit tested

3.1 Picture of Handheld

Figure 1: BlackBerry Wireless Handheld

3.2 Handheld description

Handheld Model	RAR20CN		
FCC ID	L6ARAR20CN		
PIN Number	FFFFFFFF		
Prototype or Production Unit	Production		
Mode(s) of Operation	CDMA 800	CDMA 1900	* Bluetooth
Transmitting Frequency Range	824.70-848.31 MHz	1851.25-1908.75 MHz	2402-2483MHz
Nominal Maximum conducted RF Output Power**	24.50 dBm	23.50 dBm	3.5 dBm
Tolerance in Power Setting on centre channel	± 0.50 dB	± 0.50 dB	N/A
Duty Cycle	1:1	1:1	N/A

Table 1. Test device characterization

*For this product, a headset is the only Bluetooth application. Therefore, HAC RF Emission or Audio Band Magnetic (ABM) T-Coil testing are not applicable to Bluetooth.

**The measured conducted power presented in the EMC, SAR and HAC reports are within 0.20dB of each other. The differences are due to the use of different test equipment.

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3.3 Antenna description

Type	Internal fixed antenna
Location	Top back center
Configuration	Internal fixed antenna

Table 2. Antenna description

4.0 List of test equipment

Manufacturer	Test Equipment	Model Number	Serial Number	Calibration Due Date
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE3)	DAE3 V1	473	09-Mar-07
SCHMID & Partner Engineering AG	Audio Band Magnetic Probe	AM1DV2	1016	18-Apr-07
SCHMID & Partner Engineering AG	Helmholtz Coil AMCC	N/A	1021	CNR
SCHMID & Partner Engineering AG	Audio Band Magnetic Measuring Instrument (AMMI)	N/A	1013	CNR
Agilent	Dynamic Signal Analyzer	35670A	3940A04298	CNR
Rohde & Schwarz	Base Station Simulator	CMU 200	109747	08-Feb-07
Rohde & Schwarz	Audio Analyzer	UPL16	100070	20-May-06

Table 3. List of test equipment

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5.0 DASY4 HAC T-Coil measurement system and setup

5.1 Phantom

Figure 2 shows the phantom setup in a DASY4 system. The AMCC is mounted on the same plane as the HAC Test Arch phantom available from the HAC RF extension.

5.2 AMCC

The Audio Magnetic Calibration coil is a Helmholtz Coil designed according to [1], section D.9 for calibration of the AM1D probe. The two horizontal coils generate a homogeneous magnetic field in the z direction. The DC input resistance is adjusted by a series resistor to approximately 50 Ohm, and a shunt resistor of 10 Ohm allows monitoring the current with a scale of 1:10.
Coil In BNC 50 Ohm Coil Monitor BNO 10 Ohm +/- 1% (100mV corresponding to 1 A/m)

5.3 AM1D probe

The AM1D probe is an active probe with a single sensor according to [1] section D.8. It is fully RF shielded and has a rounded tip of 6 mm diameter incorporating a pickup coil with its center offset 3mm from the tip and the sides. The symmetric signal preamplifier in the probe signal is fed via the shielded symmetric output cable from the AMMI with a 48V “phantom” voltage supply.

Figure 2: T-Coil set up with HAC Test Arch with Helmholtz Coil (AMCC)

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5.4 AMMI

The Audio Magnetic Measuring Instrument (AMMI) is a desktop 19-inch unit containing a sampling unit, a waveform generator for test and calibration signals and a USB interface.

Audio Out BNC, audio signal to the base station simulator, for > 500 Ohm load
Coil Out BNC, test and calibration signal to the AMCC (top connector), for 50 Ohm load
Coil In XLR, monitor signal from the AMCC BNO connector, 600 Ohm
Probe In XLR, probe signal and phantom supply to the probe connector

.

Figure 3: The Audio Band Magnetic Field measurement

5.5 Cabling

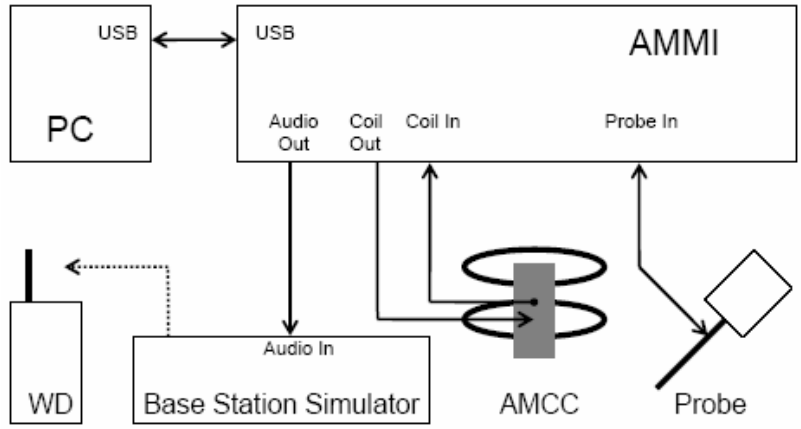

Figure 4: T-Coil set up cabling

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6.0 Measurement procedures

6.1 Surface Check Job

***Calibrate HAC phantom**:* After teaching of the reference points P1, P2 and P3 of the HAC Test Arch and installation of a WD below the Test Arch, the plane defined by the 3 points may correspond to the top plane of the Test Arch. This option of the Surface Check job measures the mechanical surface with the probe in vertical position, using all 4 points and determines the optimal plane for all the following measurements. The coordinate system of the whole setup is adjusted to the resulting plane.

Calibrate AM1D probe: This option allows the adjustment of the sensor center of the AM1D probe accurately at the desired measurement point. In Southwest tilting mode, the probe center should be aligned to the position 3.0mm above point P1 by shifting the x, y and z coordinates. The probe surface is in this situation directly located at the center of point P1. The offset resulting from this teaching process is stored in the installation of the phantom for further use with the same configuration.

Calibration
If the “Calibration” signal is selected in the T-Coil measurement job, a 3-phase calibration is performed.

In phase 1, the audio output is switched off, and a 200 mV_pp symmetric rectangular signal of 1 kHz is generated and internally connected directly to both channels of the sampling unit (coil in, probe in).

In phase 2, the audio output is off, and a 20 mV_pp symmetric 100 Hz signal is internally connected.

The signals during these phases are available at the output on the rear panel of the AMMI. The output must however not be loaded in order not to influence the calibration. After the first two phases, the two input channels are both calibrated for absolute measurements. The resulting factors are displayed above the multimeter window.

In phase 3, a multisine signal covering each third-octave band from 50 Hz to 5 kHz is generated and applied to both audio outputs. The probe should be positioned in the center of the AMCC (user point “coil center”) and aligned in the z-direction, the field orientation of the AMCC. The coil in channel is measuring the voltage over the AMCC internal shunt, which is exactly proportional to the magnetic field in the AMCC. The probe in channel measures the amplified signal picked up by the probe coil. The ratio of the two voltages – in each third-octave filter – leads to the calibration factor of the probe over the frequency band of interest for the spectral representation. The internal calibration factors of the coil and probe channel are listed.

The graphics represents the values (applying the calibration factors from the previous steps) for the probe and coil channel in dB V for each third-octave filter from 100 Hz to 5 kHz. The single values are interconnected with a blue line for the probe and a green line for the coil channel.

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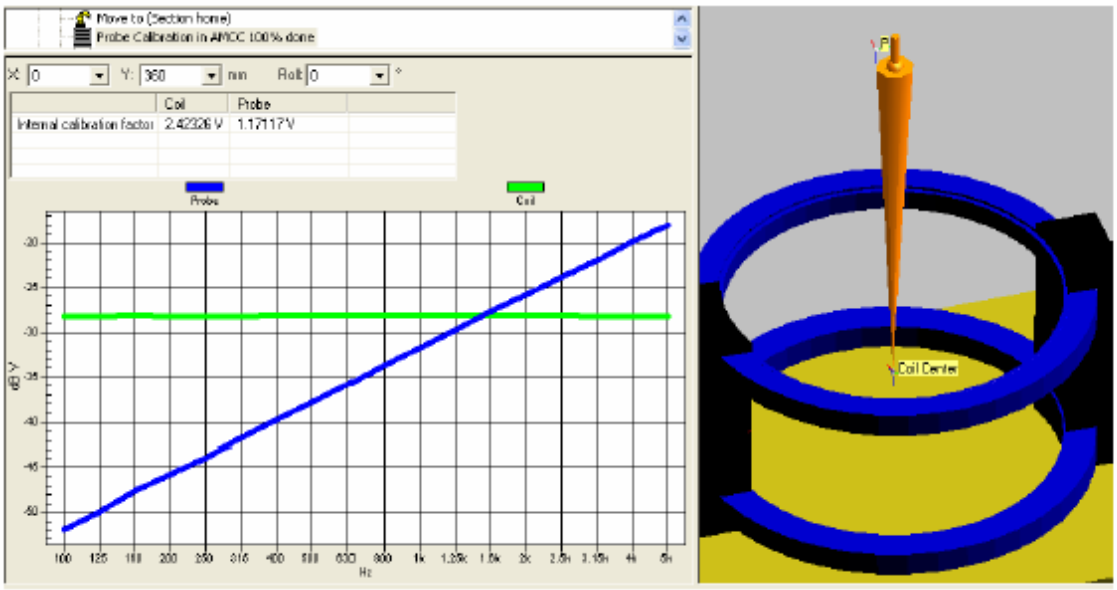

Figure 5. DASY4 ABM probe calibration

6.2 Input level measurement

DECODER: When an acoustic signal is provided to the microphone of the device under test it travels through the device audio path and then over the air to the CMU. At the CMU this digital signal is DECODED and an analog voltage is generated at the CMU output. This voltage is measured and related to the dBm0 level according to the DECODER calibration. The calibration of the CMU DECODER provides the relationship between the voltage generated and the dBm0 level. When the CMU DECODER CAL is selected the CMU generates a voltage equivalent to the full-scale value (3.14 dBm0). Measuring this voltage provides the DECODER calibration. The DECODER calibration was determined to be 3.39 dB.

ENCODER: When a voltage signal is provided to the CMU, it is ENCODED and sent over the air to the device under test. Once it reaches the device it travels through the device audio path to either the receiver (earpiece for handset mode) or the loudspeaker (for handsfree or speakerphone mode). The calibration procedure for the CMU ENCODER involves determining the gain/loss in the ENCODER and the signal required to produce a full-scale digital signal. The calibration of the CMU ENCODER is slightly more complicated than for the DECODER because during calibration (ENCODER CAL) the input signal to the CMU ENCODER travels back through the DECODER so the DECODER calibration must be taken into account in the calculation procedure – a signal is input to the CMU ENCODER and goes through the CMU DECODER and back out again. The calibration is determined from the level of the input signal and the output signal and knowing the previously determined DECODER calibration level. The voltage required to produce a full-scale signal for the CMU was determined to be 1056 mV.

Once calibration is complete, it is a simple matter to determine the voltage required to produce a desired dBm0 level for the device under test.

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Z = Y - (3.14 - X)

Where:
Z = signal required into CMU (dBV)
Y = desired dBm0 level (-18 dBm0 for CDMA HAC T-coil testing)
X = full-scale calibration value (dBV)

Example:
Y = -18 dBm0
X = 1056 mV = 0.47 dBV
Therefore, Z = -18 - (3.14 - 0.47) = - 20.67 dBV (93 mV)

For this particular CMU an input voltage of 93 mV will generate a -18 dBm0 signal.

6.3 Test measurement

1. Calibrate the AM1D probe using a Helmholtz coil, a known input signal source with reference and calibration signal as per 6.1.
2. For each probe orientation, measure ambient noise.
3. Position the WD in the test setup as shown on Figure 2 and connect the WD RF connector to a base station simulator.
4. Set the reference drive level for the system with the maximum volume control setting. The drive level is set such that the reference input level is input to the base station in the 1 kHz, 1/3 octave band. This drive level shall be used for the audio band signal test (ABM1 at fi). Either a sine wave at 1025 Hz or a voice-like signal shall be used for the reference audio signal If interference is found at 1025 Hz an alternate reference audio signal frequency may be used. The same drive level will be used for the ABM1 frequency response measurements at each 1/3 octave band center frequency.
5. Determine the peak audio magnetic measurement for the WD device by scanning a 5x5 cm coarse and fine scans for each probe orientation.
6. At each peak field measurement location measure and record the desired audio band magnetic signals (ABM1 at fi). The desired audio band input frequency (fi) shall be centered in each 1/3 octave band maintaining the same drive level and the reading taken for that band.
7. A separation distance of 1 cm is controlled between the center of the probe sensor and the top highest surface of the WD, throughout the measurement.

The following reference input levels that correlate to a normal speech input level shall be used for the standard transmission protocols.

STANDARD	TECHNOLOGY	INPUT (dBm0)
TIA/EIA/IS-2000	CDMA	-18
TIA/EIA/IS-136	TDMA (50 Hz)	-18
J-STD-007	GSM (217 Hz)	-16
IDEN	TDMA (22 and 11 Hz)	-18
T1/T1P1/3GPP	UMTS (WCDMA)	-16

Table 2: Normal speech input levels

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8. At each peak field measurement location measure and record the undesired broadband audio magnetic signal (ABM2) with no signal applied (or digital zero applied, if appropriate) using A-weighting, and calculate the ratio of the desired to undesired signal strength (i.e. – signal quality)
9. From the measured signal to noise ratio, classify signal quality as T1 to T4 using the limits from Table 3.

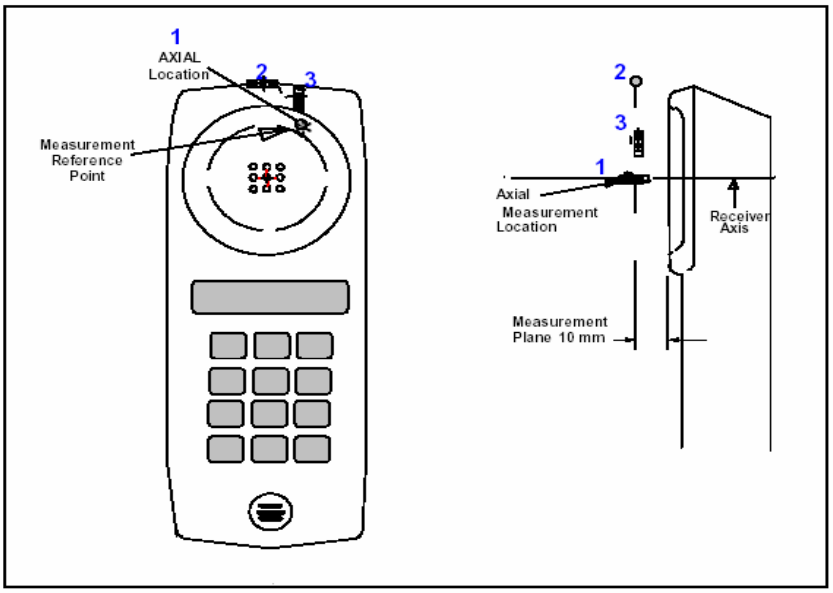

Figure 6: Axis & planes for WD audio band magnetic field measurements

Category	Telephone parameters WD signal quality ((signal + noise)-to-noise ratio in dB)	
	AWF = 0	AWF = -5
Category T1	-20 to -10 dB	-15 to -5 dB
Category T2	-10 to 0 dB	-5 to 5 dB
Category T3	0 to 10 dB	5 to 15 dB
Category T4	> 10 dB	>15 dB

Table 3: T-Coil signal quality categories

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7.0 Summary of results

Table 4 shows the results of the Audio Band Magnetic (ABM) T-Coil tests.

Wireless Device: BlackBerry Wireless Handheld – Model: RAV20CW									
Audio Band Magnetic (ABM) T-Coil Test									
Mode	**Probe location**	**Signal type**	**ABM1 dB (A/m)**	**ABM2 dB (A/m)**	**ABM1/ ABM2 dB**	**Freq. Resp. Verdict**	**T-Rating**	**Noise Floor ABM1 dB (A/m)**	**Noise Floor ABM2 dB (A/m)**
CDMA 800	Axial	sine	-0.15	-26.45	26.31		4	-69.05	-59.55
	Radial L	sine	-10.42	-31.08	20.67		4	-68.76	-59.01
	Radial T	sine	-8.70	-42.00	33.28		4	-69.21	-59.62
	Axial	voice	-3.26	-31.50	28.28	Pass	4	-69.05	-59.55
	Radial L	voice	-11.16	-31.99	20.84		4	-68.76	-59.01
	Radial T	voice	-13.40	-44.33	30.93		4	-69.21	-59.62
CDMA 1900	Axial	sine	-3.87	-28.50	24.62		4	-69.25	-59.55
	Radial L	sine	-8.08	-29.27	21.19		4	-68.63	-59.02
	Radial T	sine	-8.72	-42.00	33.28		4	-69.21	-59.62
	Axial	voice	-5.11	-38.73	33.62	Pass	4	-69.25	-59.55
	Radial L	voice	-10.27	-30.38	20.11		4	-68.63	-59.02
	Radial T	voice	-12.42	-42.77	30.35		4	-69.21	-59.62
Overall T-Rating							**T4**		
M-rating							**M4 ***		
Overall M/T rating							**M4T4**		

Table 4: ABM Data Summary

* M rating is taken from the revised HAC RF emission report number RTS-0228-0506-02 rev 02 that was submitted in August 2005. The M ratings are adjusted in the revised report number RTS-0228-0506-02 rev 03 (12-June-06) in accordance with ANSI C63.19 revision 3.12.

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7.1 Conclusion

The RIM BlackBerry 7250 Wireless Handheld Model Number RAR20CN is categorized to be M4T4 based on RF emission and Audio Band Magnetic (ABM) T-Coil performance in accordance with ANSI C63.19, revision 3.12: American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids.

Therefore, the handheld is found to be in compliance with the requirements of FCC 20.19 (10-1-04 Edition) Hearing Aid-Compatible Mobile Handsets and FCC Public Notice DA 06-1215 (June 6, 2006).

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8.0 Measurement uncertainty

Table 5 outlines the measurement uncertainty for the SPEAG DASY4 measurement system.

Error Description	Uncertainty value [%]	Prob. Dist.	Div.	c ABM1	c ABM2	Std. Unc. ABM1	Std. Unc. ABM2
PROBE SENSITIVITY							
Reference level	3.0	N	1.0	1	1	3.0	3.0
AMCC geometry	0.4	R	1.7	1	1	0.2	0.2
AMCC current	0.6	R	1.7	1	1	0.4	0.4
Probe positioning during calibration	1.0	R	1.7	1	1	0.6	0.6
Noise contribution	0.7	R	1.7	0.014	1	0.0	0.4
Frequency slope	5.9	R	1.7	0.1	1.0	0.3	3.5
PROBE SYSTEM							
Repeatability / Drift	1.0	R	1.7	1	1	0.6	0.6
Linearity / Dynamic range	0.6	R	1.7	1	1	0.4	0.4
Acoustic noise	1.0	R	1.7	0.1	1	0.1	0.6
Probe angle	2.3	R	1.7	1	1	1.4	1.4
Spectral processing	0.9	R	1.7	1	1	0.5	0.5
Integration time	0.6	N	1.0	1	5	0.6	3.0
Field disturbation	0.2	R	1.7	1	1	0.1	0.1
TEST SIGNAL							
Reference signal spectral response	0.6	R	1.7	0	1	0.0	0.4
POSITIONING							
Probe positioning	1.9	R	1.7	1	1	1.1	1.1
Phantom thickness	0.9	R	1.7	1	1	0.5	0.5
DUT positioning	1.9	R	1.7	1	1	1.1	1.1
EXTERNAL CONTRIBUTIONS							
RF interference	0.0	R	1.7	1	1	0.0	0.0
Test signal variation	2.0	R	1.7	1	1	1.2	1.2
COMBINED UNCERTAINTY							
Combined Std. uncertainty (ABM field)						4.1	6.2
Expanded Std. uncertainty [%]						**8.2**	**12.3**

Table 5: Worst-Case uncertainty budget for HAC Audio Band Magnetic (ABM) T-Coil assessment according to ANSI C63.19 revision 3.12

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8.1 Site-Specific Uncertainty

RF Reflections

ANSI C63.19 requires that any RF reflecting objects are a minimum distance of 2 wavelengths away from the WD under test. For this WD, the longest wavelength occurs when the WD is transmitting at 824.7MHz. The wavelength is:

$$\lambda = \frac{c}{f} = \frac{3 \cdot 10^8 m/s}{824.7MHz} = 0.364m$$

Therefore, 2 wavelengths result in a distance of 0.73m. Tests are performed in an RF shielded chamber. The distance to the nearest wall is >1m and the distance to the robot's safety guardrail is ~1.0m, both satisfying the requirement. In addition, RF absorbing cones are placed at the base of the robot to further reduce reflections. The HAC phantom arch is made of low dielectric constant plastic and should not be a source of reflections.

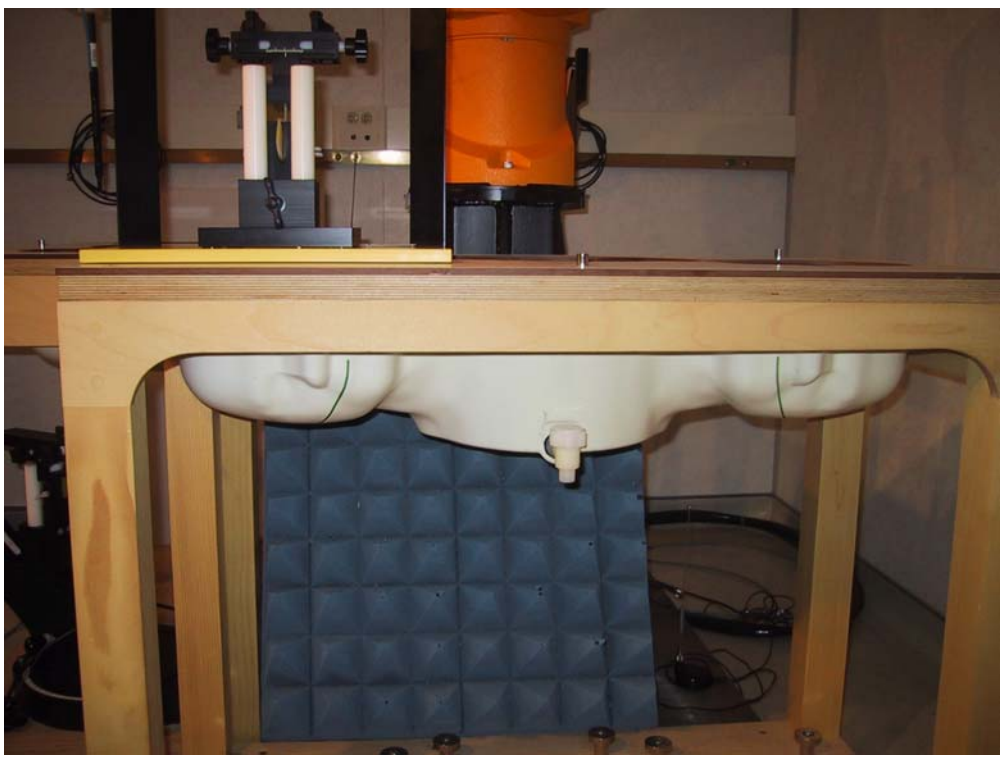

Figure 7: DASY4 system with absorbing material

Environmental Conditions

During measurements, the temperature of the test lab was kept between 21°C and 25°C and relative humidity was maintained between 20% and 55%.

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Ambient Noise

ANSI C63.19 section 6 requires the ambient ABM noise to be at least 10 dB below the measurement level. Measurement of the ambient magnetic field was performed for each probe orientation and the levels are shown in the Table 4 and Annex B plots to be lower by 10 dB.

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Annex A: Probe calibration and reference signal measurement plots

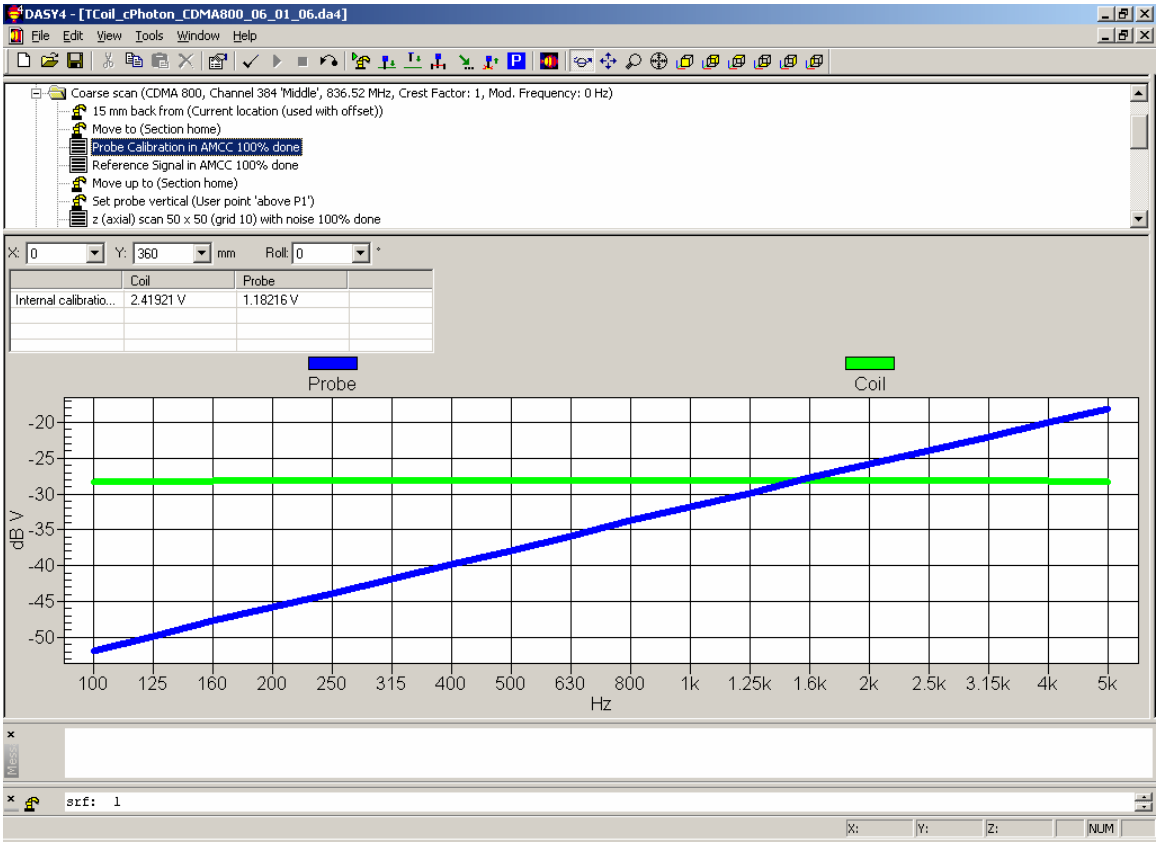

Figure A1: Probe calibration data for coil and probe

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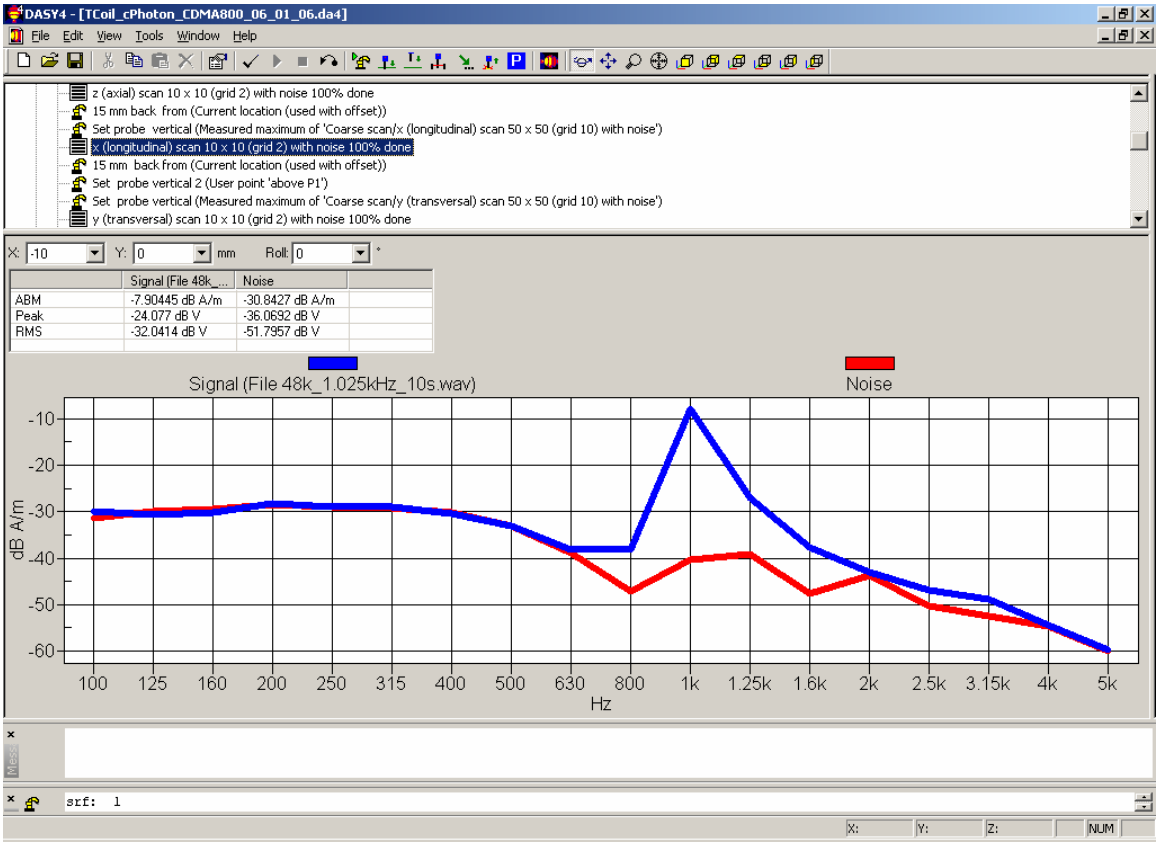

Figure A2: Reference sinusoidal 1.025 KHz signal and noise

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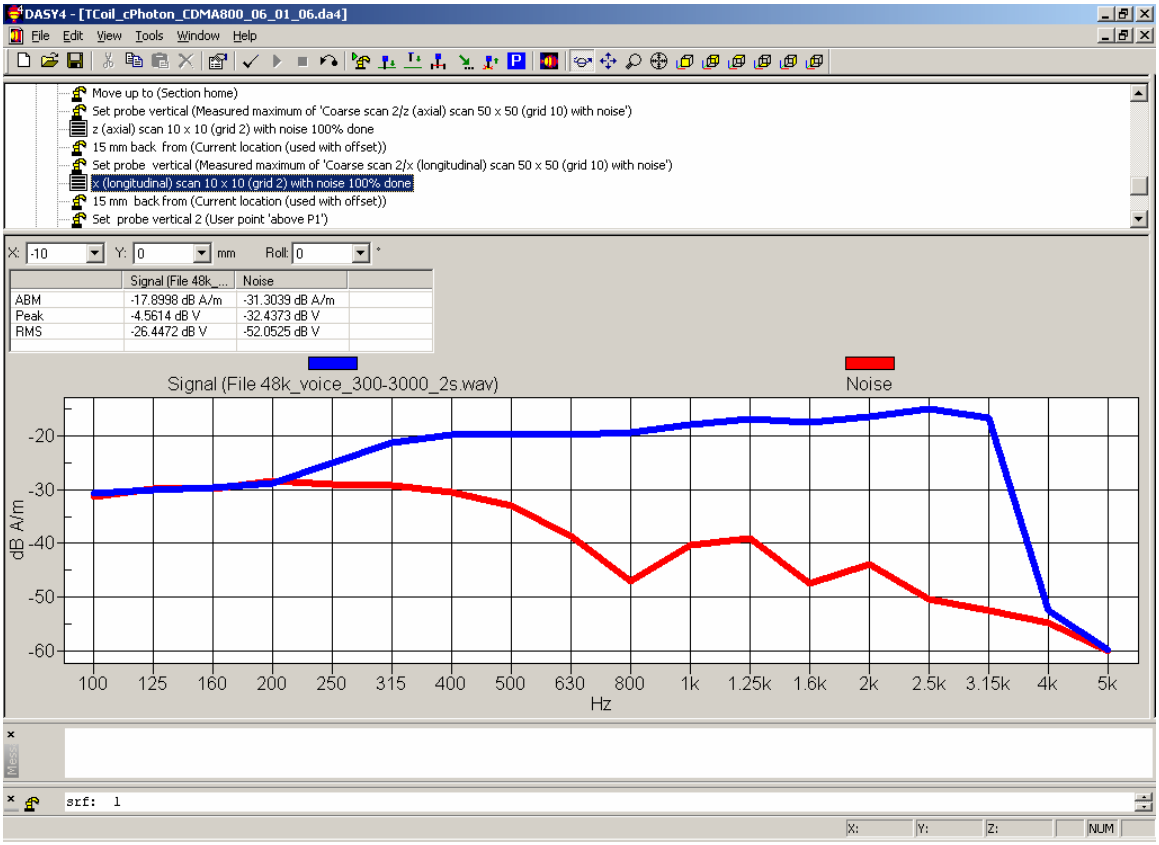

Figure A3: Reference voice simulated signal and noise

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Annex B: Ambient noise floor data and plots

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Date/Time: 01/06/2006 9:03:15 AM

Test Laboratory: RTS
File Name: TCoil_cPhoton_CDMA800_06_01_06.da4

DUT: BlackBerry Wireless Handheld; Type: Sample ; Serial: Not Specified
Program Name: HAC_TCoil_WD_Emission

Communication System: CDMA 800; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: AMB with Coil Section

DASY4 Configuration:
- Probe: AM1DV2 - 1016; ; Calibrated: 18/04/2006
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn473; Calibrated: 09/03/2006
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 21; Postprocessing SW: SEMCAD, V1.8 Build 170

Background noise 5mm above Grid Reference/z (axial) noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -69.0493 dB A/m
BWC Factor = 0 dB
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/z (axial) noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -59.5469 dB A/m
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/z (axial) noise/ABM Noise Spectrum(x,y,z,f) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM = -59.5469 dB A/m
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/x (longitudinal) noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -68.7623 dB A/m
BWC Factor = 0 dB
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

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Cursor:
ABM2 = -59.0148 dB A/m
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/x (longitudinal) noise/ABM Noise Spectrum(x,y,z,f) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM = -59.0148 dB A/m
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/y (transversal) noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -69.2051 dB A/m
BWC Factor = 0 dB
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 = -59.6182 dB A/m
Location: 0, 0, 368.7 mm

0 dB = 1.00A/m

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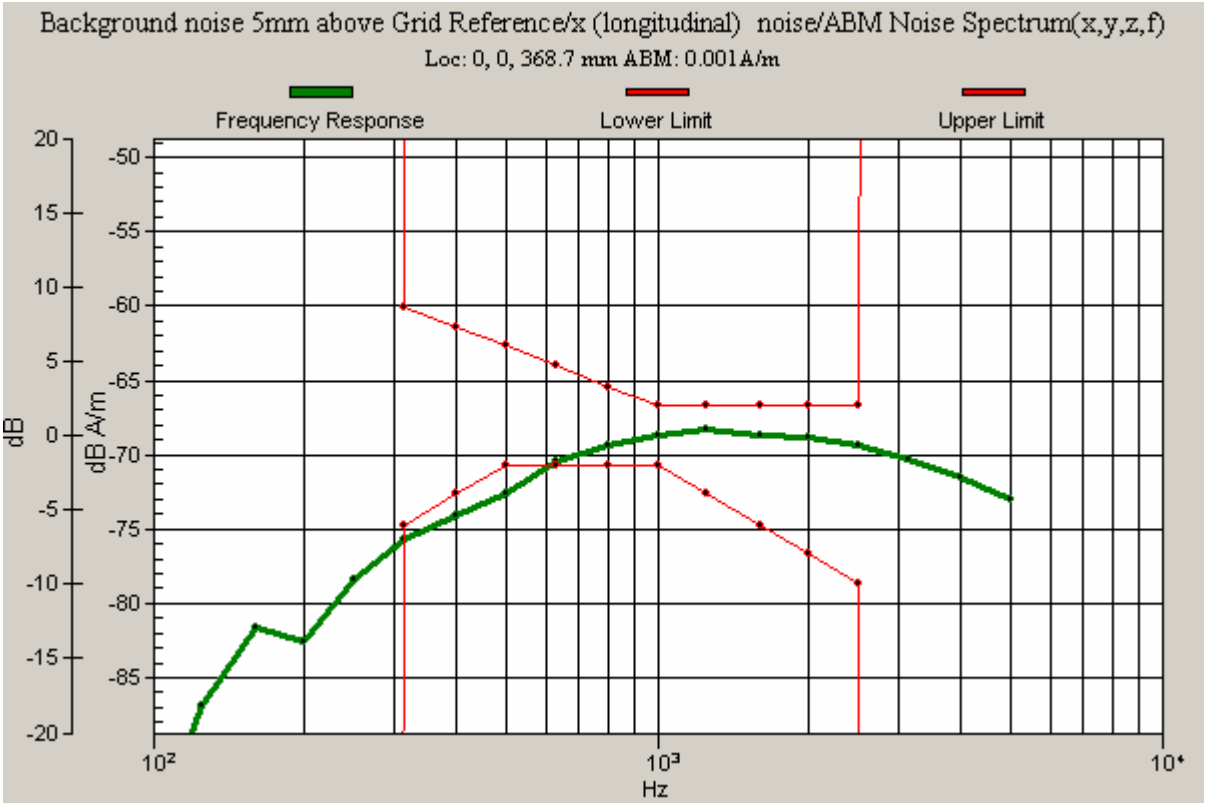

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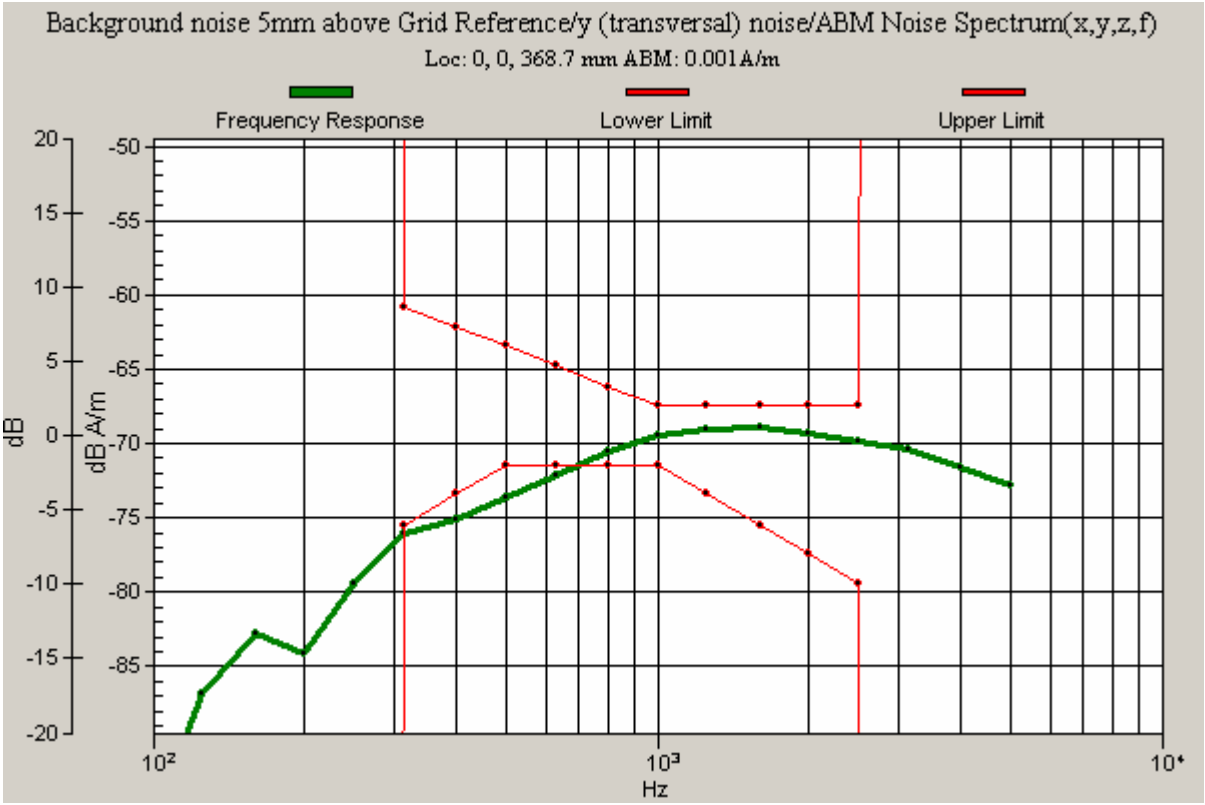

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Date/Time: 01/06/2006 11:01:14 AM

Test Laboratory: RTS

TCoil_cPhoton_CDMA1900_axial_sine
DUT: BlackBerry Wireless Handheld; Type: Sample ; Serial: Not Specified
Communication System: CDMA 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: AMB with Coil Section
DASY4 Configuration:

- Probe: AM1DV2 - 1016; ; Calibrated: 18/04/2006
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn473; Calibrated: 09/03/2006
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 21; Postprocessing SW: SEMCAD, V1.8 Build 170

Background noise 5mm above Grid Reference/z (axial) noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -69.2525 dB A/m
BWC Factor = 0 dB
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/z (axial) noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -59.5497 dB A/m
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/x (longitudinal) noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -68.6311 dB A/m
BWC Factor = 0 dB
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 = -59.0179 dB A/m
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/x (longitudinal) noise/ABM Noise Spectrum(x,y,z,f) (1x1x1):

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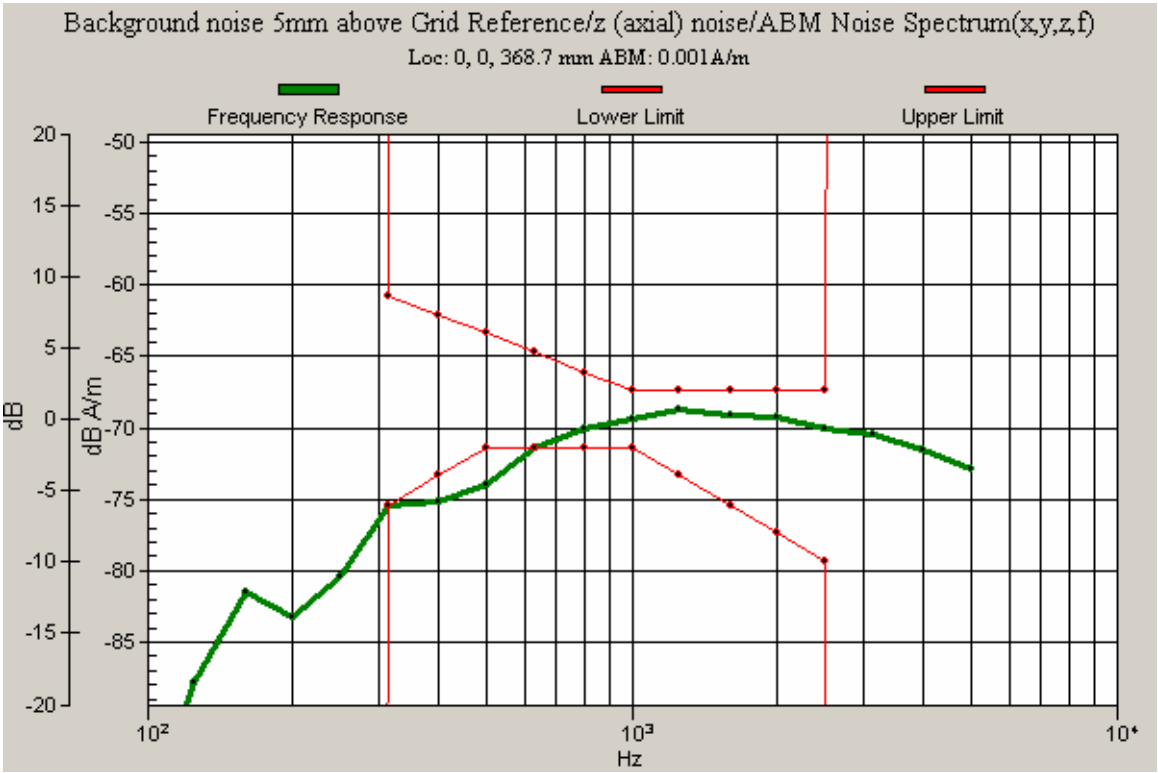
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM = -59.0179 dB A/m
Location: 0, 0, 368.7 mm

Background noise 5mm above Grid Reference/y (transversal) noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -69.2051 dB A/m
BWC Factor = 0 dB
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 = -59.6182 dB A/m
Location: 0, 0, 368.7 mm



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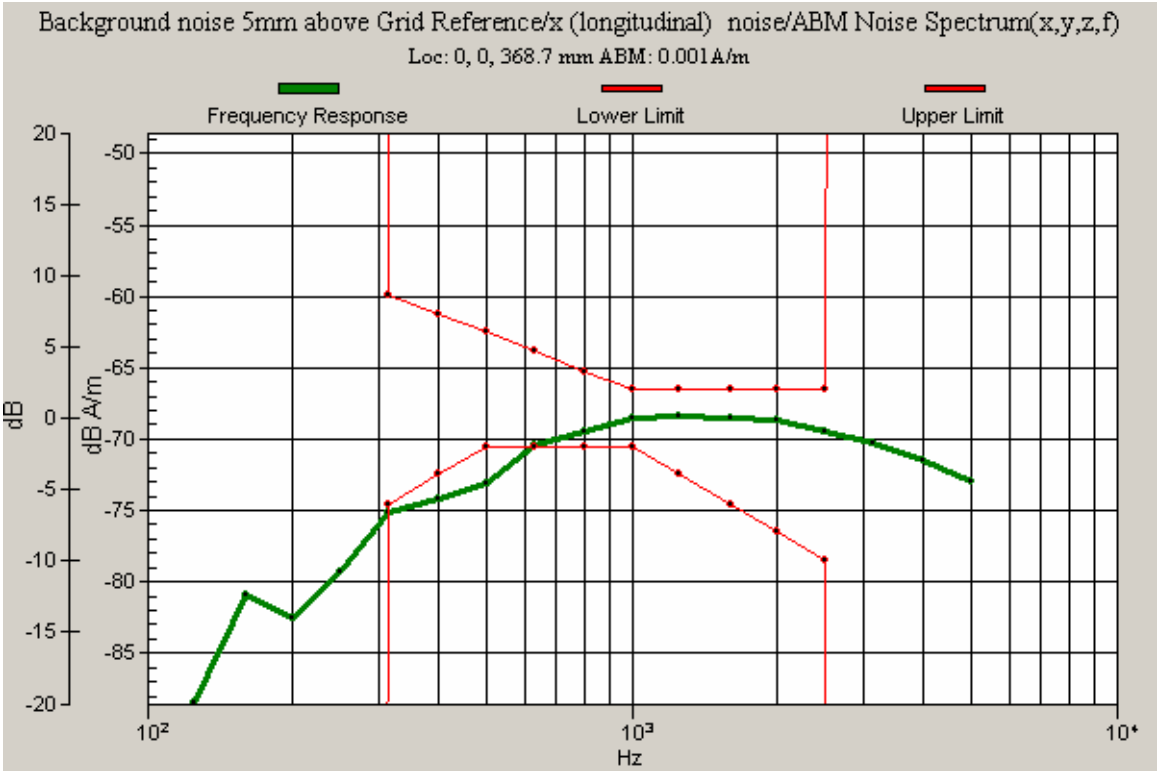

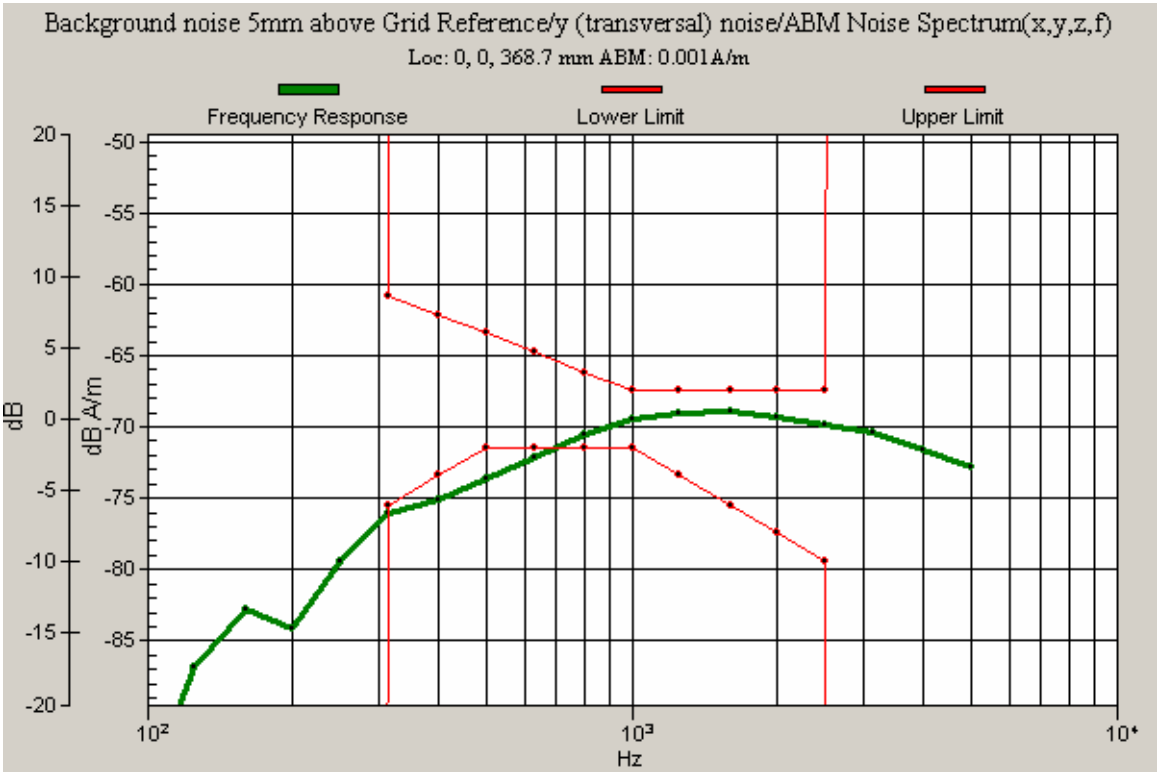

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Annex C: Audio Band Magnetic measurement data and plots

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1.025 KHz sinusoidal signal

Date/Time: 01/06/2006 9:03:15 AM

Test Laboratory: RTS
File Name: TCoil_cPhoton_CDMA800_06_01_06.da4

DUT: BlackBerry Wireless Handheld; Type: Sample ; Serial: Not Specified
Program Name: HAC_TCoil_WD_Emission

Communication System: CDMA 800; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: AMB with Coil Section

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 = -3.54298 dB A/m
BWC Factor = -0.206004 dB
Location: -3, 5, 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 = -0.0256556 dB A/m
BWC Factor = -0.206004 dB
Location: -3.4, 3.8, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -0.14774 dB A/m
BWC Factor = -0.206004 dB
Location: -4, 4, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -26.4532 dB A/m
Location: -4, 4, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:

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ABM1/ABM2 = 26.3054 dB
BWC Factor = -0.206004 dB
Location: -4, 4, 363.7 mm

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 = -9.52829 dB A/m
BWC Factor = -0.206004 dB
Location: -14, 4, 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 = -7.32245 dB A/m
BWC Factor = -0.206004 dB
Location: -10, 3.4, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -10.4162 dB A/m
BWC Factor = -0.206004 dB
Location: -12, 6, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -31.0822 dB A/m
Location: -12, 6, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 20.666 dB
BWC Factor = -0.206004 dB
Location: -12, 6, 363.7 mm

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 = -10.0108 dB A/m
BWC Factor = -0.206004 dB
Location: 2, -5, 363.7 mm

Fine scan/y (transversal) scan 10 x 10 (grid 2) with noise/ABM Interpolated Signal(x,y,z)

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(51x51x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 = -7.74841 dB A/m
BWC Factor = -0.206004 dB
Location: -2.2, -4.4, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -8.72233 dB A/m
BWC Factor = -0.206004 dB
Location: -4, -4, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -42.0012 dB A/m
Location: -4, -4, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 33.2789 dB
BWC Factor = -0.206004 dB
Location: -4, -4, 363.7 mm

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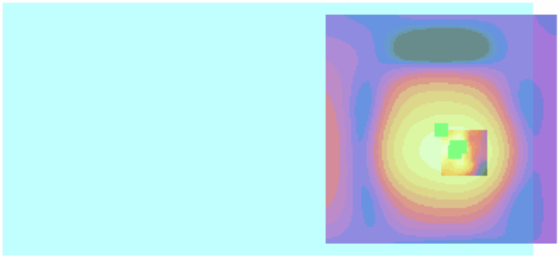

Axial; CDMA800; 1.025 KHz sinusoidal

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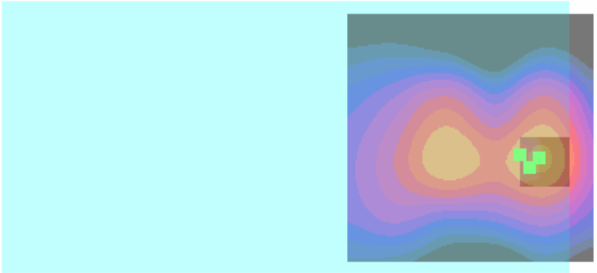

Radial T; CDMA800; 1.025 KHz sinusoidal

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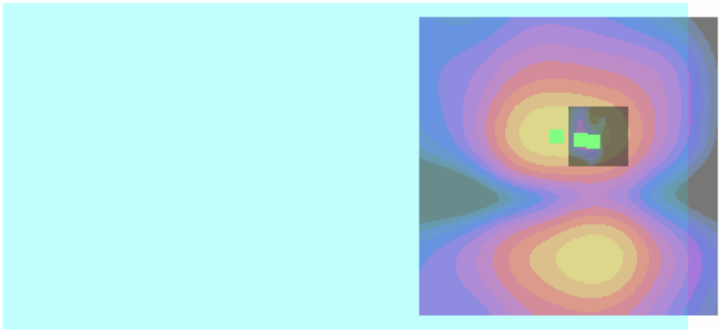

Radial L; CDMA800; 1.025 KHz sinusoidal

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Voice simulated signal

Date/Time: 01/06/2006 9:50:54 AM

Test Laboratory: RTS
File Name: TCoil_cPhoton_CDMA800_06_01_06.da4

DUT: BlackBerry Wireless Handheld; Type: Sample ; Serial: Not Specified
Program Name: HAC_TCoil_WD_Emission

Communication System: CDMA 800; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: AMB with Coil Section

DASY4 Configuration:
- Probe: AM1DV2 - 1016; ; Calibrated: 18/04/2006
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn473; Calibrated: 09/03/2006
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 21; Postprocessing SW: SEMCAD, V1.8 Build 170

Coarse scan 2/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 = -3.3354 dB A/m
BWC Factor = 10.8 dB
Location: -4, 5, 363.7 mm

Fine scan 2/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 = -0.320505 dB A/m
BWC Factor = 10.8 dB
Location: -3.8, 2.2, 363.7 mm

Point scan 2/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -3.25677 dB A/m
BWC Factor = 10.8 dB
Location: -4, 2, 363.7 mm

Point scan 2/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -31.4984 dB A/m
Location: -4, 2, 363.7 mm

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Point scan 2/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 28.2416 dB
BWC Factor = 10.8 dB
Location: -4, 2, 363.7 mm

Coarse scan 2/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 = -10.9112 dB A/m
BWC Factor = 10.8 dB
Location: 25, 7, 363.7 mm

Fine scan 2/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 = -7.09981 dB A/m
BWC Factor = 10.8 dB
Location: -10, 0, 363.7 mm

Point scan 2/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -11.1556 dB A/m
BWC Factor = 10.8 dB
Location: -10, 8, 363.7 mm

Point scan 2/x (longitudinal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -31.9941 dB A/m
Location: -10, 8, 363.7 mm

Point scan 2/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 20.8385 dB
BWC Factor = 10.8 dB
Location: -10, 8, 363.7 mm

Coarse scan 2/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 = -11.9544 dB A/m
BWC Factor = 10.8 dB
Location: -4, -6, 363.7 mm

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Fine scan 2/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 = -9.34846 dB A/m
BWC Factor = 10.8 dB
Location: -4, -4, 363.7 mm

Point scan 2/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -13.4067 dB A/m
BWC Factor = 10.8 dB
Location: -8, -6, 363.7 mm

Point scan 2/y (transversal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -44.3341 dB A/m
Location: -8, -6, 363.7 mm

Point scan 2/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 30.9274 dB
BWC Factor = 10.8 dB
Location: -8, -6, 363.7 mm

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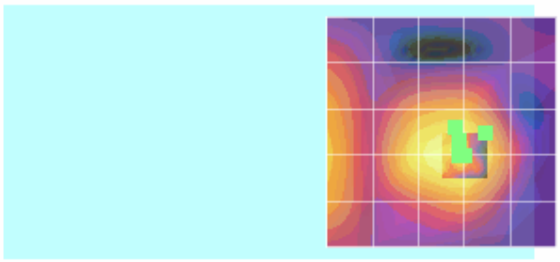

Axial ; CDMA800; voice simulated signal

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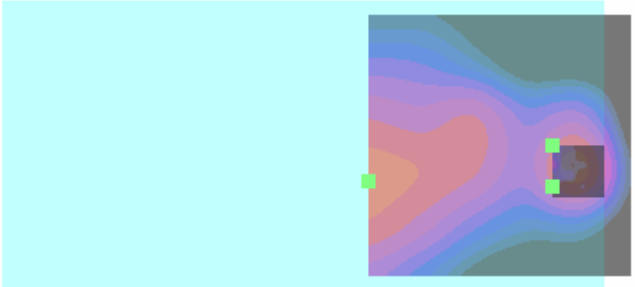

Radial L ; CDMA800; voice simulated signal

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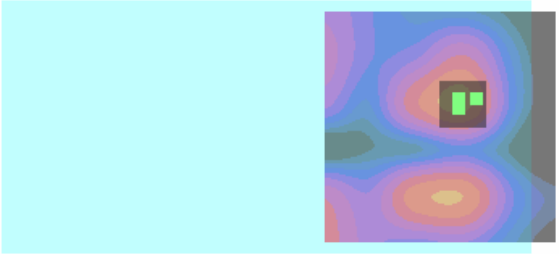

Radial T ; CDMA800; voice simulated signal

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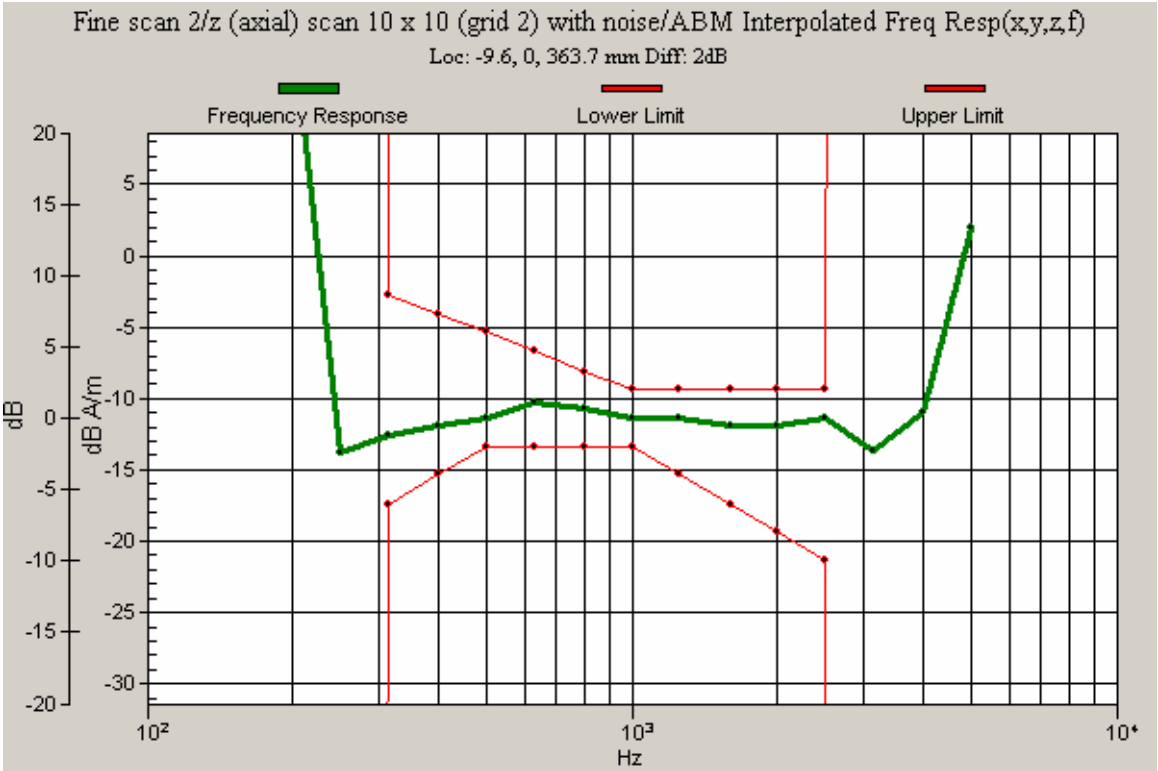

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1.025 KHz sinusoidal

Date/Time: 01/06/2006 11:01:14 AM

Test Laboratory: RTS

TCoil_cPhoton_CDMA1900_axial_sine
DUT: BlackBerry Wireless Handheld; Type: Sample ; Serial: Not Specified
Communication System: CDMA 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: AMB with Coil Section
DASY4 Configuration:

- Probe: AM1DV2 - 1016; ; Calibrated: 18/04/2006
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn473; Calibrated: 09/03/2006
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 21; Postprocessing SW: SEMCAD, V1.8 Build 170

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 = -1.08894 dB A/m
BWC Factor = -0.206004 dB
Location: -4, 5, 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 = -0.00172107 dB A/m
BWC Factor = -0.206004 dB
Location: -2, 2, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -3.87321 dB A/m
BWC Factor = -0.206004 dB
Location: 0, 10, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -28.4978 dB A/m
Location: 0, 10, 363.7 mm

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Point scan/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 24.6246 dB
BWC Factor = -0.206004 dB
Location: 0, 10, 363.7 mm

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 = -11.1897 dB A/m
BWC Factor = -0.206004 dB
Location: 4, 4, 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 = -7.71991 dB A/m
BWC Factor = -0.206004 dB
Location: -10, 5.6, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -8.07859 dB A/m
BWC Factor = -0.206004 dB
Location: -12, 4, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -29.2724 dB A/m
Location: -12, 4, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 21.1938 dB
BWC Factor = -0.206004 dB
Location: -12, 4, 363.7 mm

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 = -10.0108 dB A/m
BWC Factor = -0.206004 dB
Location: 2, -5, 363.7 mm

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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 = -7.74841 dB A/m
BWC Factor = -0.206004 dB
Location: -2.2, -4.4, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -8.72233 dB A/m
BWC Factor = -0.206004 dB
Location: -4, -4, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -42.0012 dB A/m
Location: -4, -4, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 33.2789 dB
BWC Factor = -0.206004 dB
Location: -4, -4, 363.7 mm

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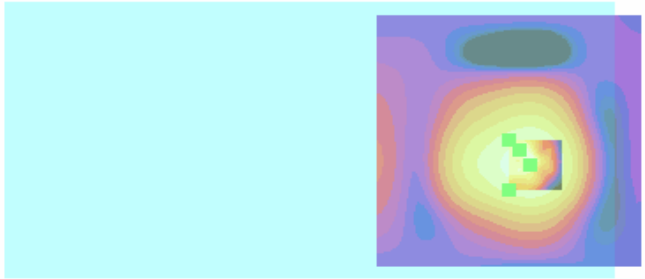
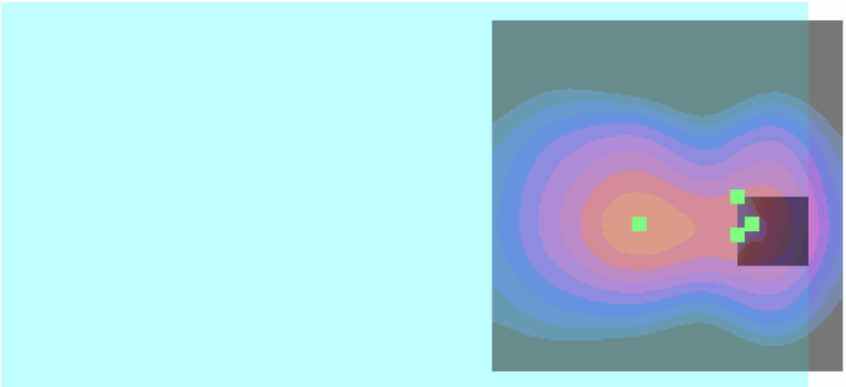


Axial; CDMA1900; 1.025 KHz sinusoidal



Radial L; CDMA1900; 1.025 KHz sinusoidal

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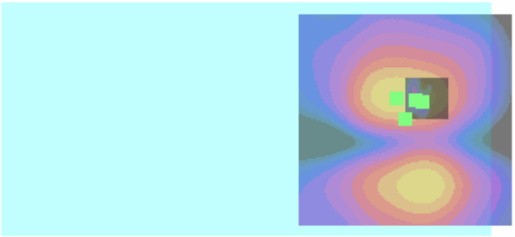

Radial T; CDMA1900; 1.025 KHz sinusoidal

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Voice simulated signal

Date/Time: 01/06/2006 11:44:14 AM

Test Laboratory: RTS

TCoil_cPhoton_CDMA1900_axial_voice
DUT: BlackBerry Wireless Handheld; Type: Sample ; Serial: Not Specified
Communication System: CDMA 1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: AMB with Coil Section
DASY4 Configuration:

- Probe: AM1DV2 - 1016; ; Calibrated: 18/04/2006
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn473; Calibrated: 09/03/2006
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 21; Postprocessing SW: SEMCAD, V1.8 Build 170

Coarse scan 2/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 = -1.22147 dB A/m
BWC Factor = 10.8 dB
Location: -5, 5, 363.7 mm

Fine scan 2/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 = -0.659864 dB A/m
BWC Factor = 10.8 dB
Location: -1.8, 5.4, 363.7 mm

Point scan 2/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -5.11187 dB A/m
BWC Factor = 10.8 dB
Location: 0, 10, 363.7 mm

Point scan 2/z (axial) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -38.7342 dB A/m
Location: 0, 10, 363.7 mm

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Point scan 2/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 33.6223 dB
BWC Factor = 10.8 dB
Location: 0, 10, 363.7 mm

Coarse scan 2/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 = -11.8955 dB A/m
BWC Factor = 10.8 dB
Location: -13, 5, 363.7 mm

Fine scan 2/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 = -7.81609 dB A/m
BWC Factor = 10.8 dB
Location: -10, 4.2, 363.7 mm

Point scan 2/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -10.2747 dB A/m
BWC Factor = 10.8 dB
Location: -14, 4, 363.7 mm

Point scan 2/x (longitudinal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -30.3799 dB A/m
Location: -14, 4, 363.7 mm

Point scan 2/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 20.1052 dB
BWC Factor = 10.8 dB
Location: -14, 4, 363.7 mm

Coarse scan 2/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 = -10.913 dB A/m
BWC Factor = 10.8 dB

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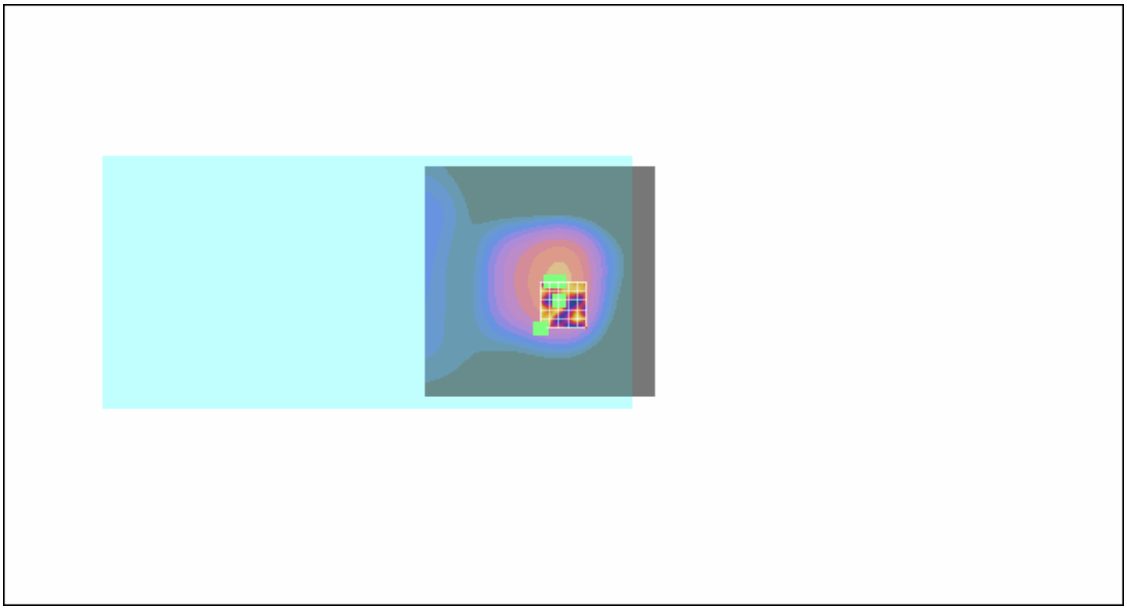
Location: -4, 15, 363.7 mm

Fine scan 2/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 = -6.99541 dB A/m
BWC Factor = 10.8 dB
Location: -2.4, -4.4, 363.7 mm

Point scan 2/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1 comp = -12.4196 dB A/m
BWC Factor = 10.8 dB
Location: -4, -4, 363.7 mm

Point scan 2/y (transversal) scan at point with noise/ABM Noise(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM2 = -42.7696 dB A/m
Location: -4, -4, 363.7 mm

Point scan 2/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Cursor:
ABM1/ABM2 = 30.3501 dB
BWC Factor = 10.8 dB
Location: -4, -4, 363.7 mm



Axial; CDMA1900; voice simulated

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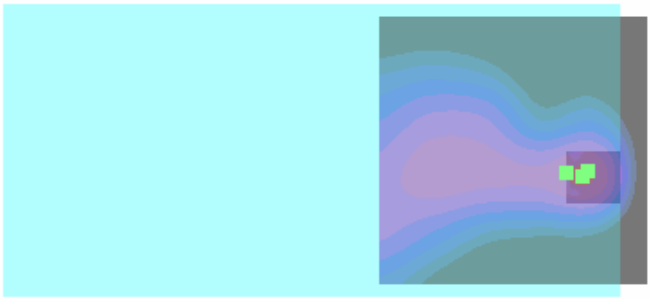
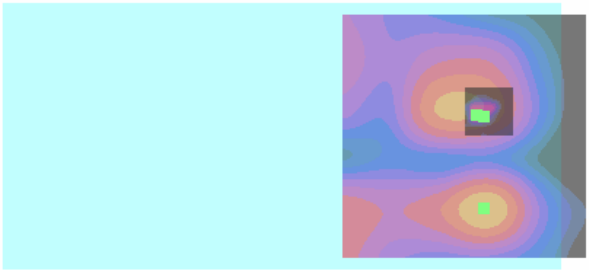


Radial L; CDMA1900; voice simulated



Radial T; CDMA1900; voice simulated

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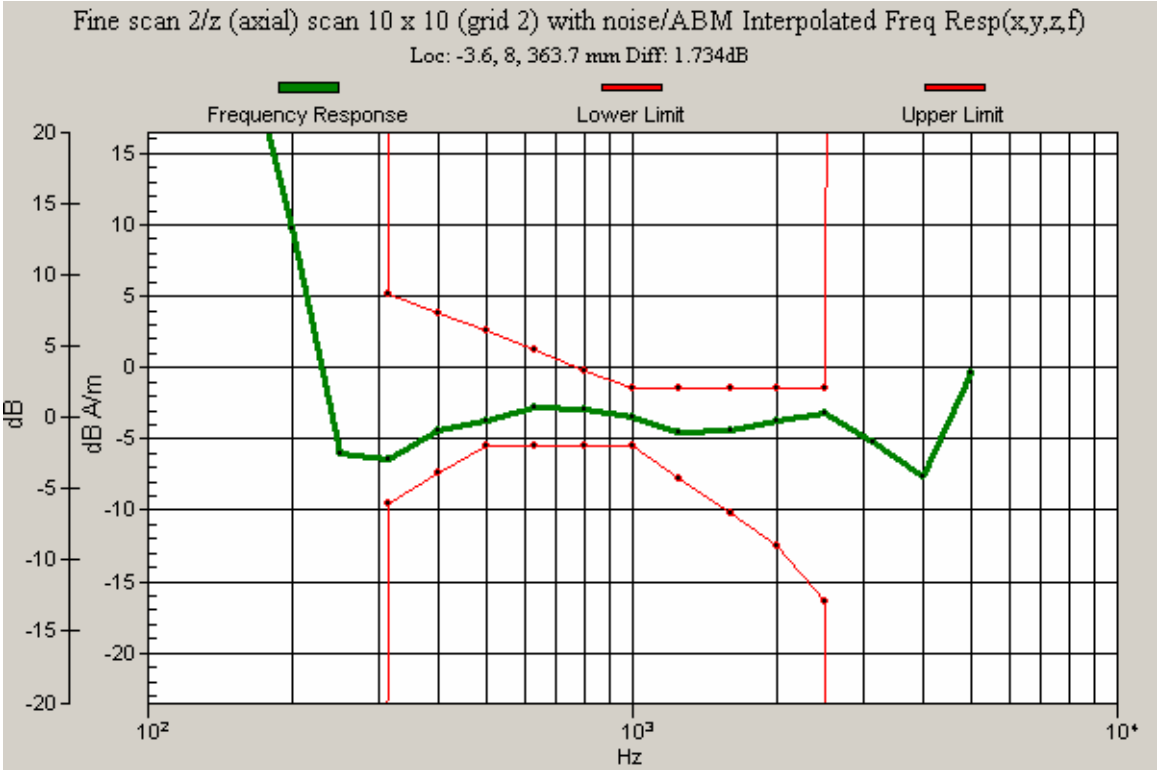

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Annex D: Probe certificate and equipment spec

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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

Certificate of test and configuration

Item	Audio Magnetic 1D Field Probe **AM1DV2**
Type No	SP AM1 001 A
Series No	**1016**
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 40dB 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 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	**253**	°

Standards

[1] ANSI PC63.19-2006 Draft 3.12

Date 18.4.2006

Signature

Doc No 884 – SP AM1 001 A – 1016 – A Page 1 (1)

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Specifications

Audio Magnetic Field Probe AM1D
frequency range 0.1 - 20 kHz (RF sensitivity <-100 dB, fully RF shielded)
sensitivity <-50 dB A/m @ 1 kHz
pre-amplifier 40 dB, symmetric
dimensions tip diameter / length: 6 / 290 mm, sensor according to ANSI-PC63.19

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
dimensions 482 x 65 x 270 mm

Helmholtz Calibration Coil (AMCC)
dimensions 370 x 370 x 196 mm, according to ANSI-PC63.19

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Annex E: Test Setup Photos

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Figure E1: Probe calibration and reference signal measurement setup

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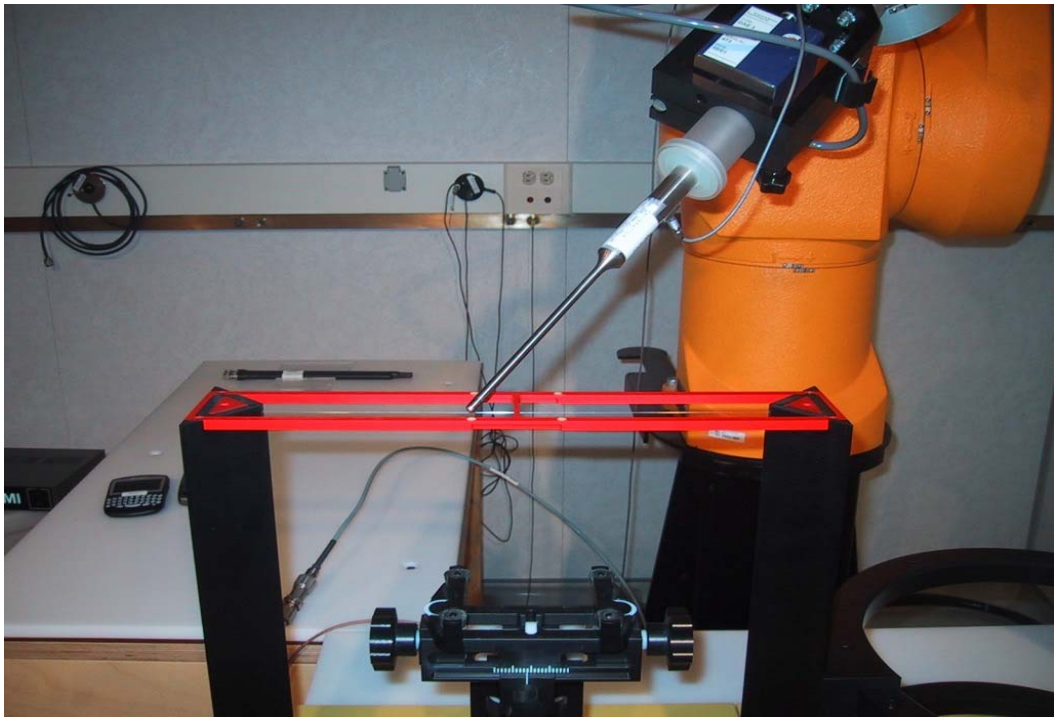

Figure E2: Ambient noise measurement setup

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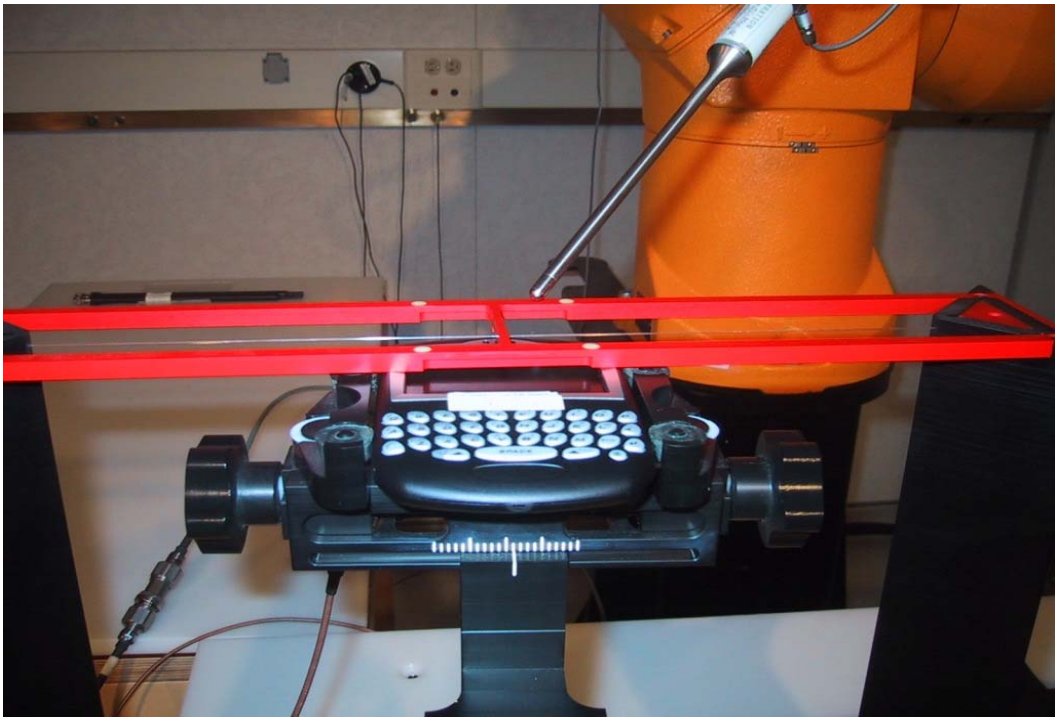

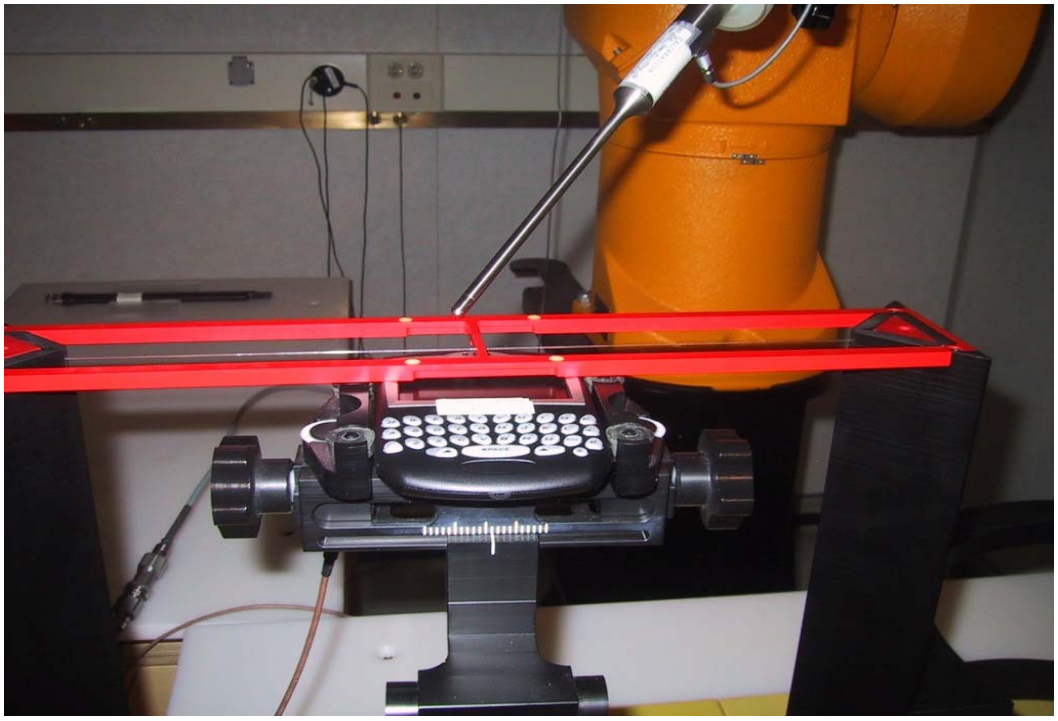

Figure E3: Audio Band Magnetic (ABM) T-Coil measurement setup

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