Hearing Aid Compatibility (HAC) T-Coil Test Report

for

High Tech Computer Corp.

on the

Smart Phone

Report No.	:	HA821901
Trade Name	:	hTC
Model Name	:	CONV100
FCC ID	:	NM8CV
Date of Testing	:	Mar. 20, 2008
Date of Report	:	Apr. 02, 2008
Date of Review	:	Apr. 02, 2008

- **Results Summary : T Category = T3**
- The test results refer exclusively to the presented test model/sample only.
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- Report Version: Rev.01

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

Table of Contents

1. Statement of Compliance

The Hearing Aid Compliance (HAC) maximum results found during testing for the High Tech Computer Corp. Smart Phone hTC CONV100 are as follows (with expanded uncertainly ±8.1% for AMB1 and ±12.3% for AMB2)**:**

Reference (63.19)	Description	Verdict	Section
7.3.1.1	Axial Field Intensity	Pass	9.2.1
7.3.1.2	Radial Field Intensity	Pass	9.2.2
7.3.2	Frequency Response	Pass	9.2.3
7.3.3	Signal Quality	T4	9.2.4

Band	(S+N)/N in dB	T Rating
GSM850	8.91	T3
PCS1900	11.1	T3

They are in compliance with HAC limits specified in guidelines FCC 47CFR §20.19 and ANSI Standard ANSI C63.19 for HAC Rated category.

Results Summary : T Category = T3

Approved by

Roy Wu
Manager

2. Administration Data

2.1 Testing Laboratory

Company Name :	Sporton International Inc.
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2.2 Detail of Applicant

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Address :	No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan

2.3 Detail of Manufacturer

Company Name :	High Tech Computer Corp.
Address:	No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan

2.4 Application Details

Date of reception of application:	Feb. 19, 2008
Start of test :	Mar. 20, 2008
End of test :	Mar. 20, 2008

3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type :	Smart Phone
Trade Name :	hTC
Model Name :	CONV100
FCC ID :	NM8CV
Tx Frequency :	GSM850 : 824 MHz ~ 849 MHz PCS1900 : 1850 MHz ~1910 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz WLAN : 2400 MHz ~ 2483.5 MHz
Rx Frequency :	GSM850 : 869 MHz ~ 894 MHz PCS1900 : 1930 MHz ~ 1990 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz WLAN : 2400 MHz ~ 2483.5 MHz
Maximum Output Power to Antenna :	GSM850 : 32.64 dBm PCS1900 : 29.48 dBm
Antenna Type :	GSM : Fixed Internal Bluetooth : PIFA Antenna WLAN : PIFA Antenna
Antenna Gain :	GSM : 0 dBi Bluetooth : 0.5 dBi WLAN : 1 dBi
HW Version :	XA
SW Version :	W15.18.0.10
Type of Modulation :	GSM : GMSK Bluetooth : GFSK WLAN : DSSS / OFDM
DUT Stage :	Production Unit

3.2 Applied Standards

The Standard ANSI C63.19:2006 represents performance requirements for acceptable interoperability of hearing aids with wireless communications devices. When these parameters are met, a hearing aid operates acceptably in close proximity to a wireless communications device.

3.3 Test Conditions

3.3.1 Ambient Condition

Ambient Temperature (°C)	20-24℃
Humidity (%)	<60%
Acoustic Ambient Noise	>10dB below the measurement level

3.3.2 Test Configuration

The device was controlled by using a base station emulator R&S CMU200. Communication between the device and the emulator was established by coaxial connection.

The DUT was set from the emulator to radiate maximum output power during all testing.

4. Hearing Aid Compliance (HAC)

4.1 Introduction

In September 2006, the T-Coil requirements of ANSI C63.19-2006 Standard went into effect. The federal communication commission (FCC) adopted ANSI C63.19 as HAC test standard.

5. HAC T-Coil Measurement Setup

5.1 System Configuration

Figure 5.1: T-Coil setup with HAC Test Arch and AMCC

The DASY4 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY4 software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Dipole for evaluating the proper functioning of the system
- Arch Phantom

Some of the components are described in details in the following sub-sections.

5.2 AM1D probe

The AM1D probe is an active probe with a single sensor. It is fully RF-shielded and has a rounded tip 6mm in diameter incorporating a pickup coil with its center offset 3mm from the tip and the sides. The symmetric signal preamplifier in the probe is fed via the shielded symmetric output cable from the AMMI with a 48V "phantom" voltage supply. The 7-pin connector on the back in the axis of the probe does not carry any signals. It is mounted to the DAE for the correct orientation of the sensor. If the probe axis is tilted 54.7 degree from the vertical, the sensor is approximately vertical when the signal connector is at the underside of the probe (cable hanging downwards).

Specification:

Frequency range	0.1 ~ 20 kHz (RF sensitivity <-100dB, fully RF shielded)
Sensitivity	<-50dB A/m @ 1 kHz
Pre-amplifier	40 dB, symmetric
Dimensions	Tip diameter/ length: 6/ 290 mm, sensor according to ANSI-PC63.19

5.2.1 Probe Tip Description

HAC field measurements take place in the close near field with high gradients. Increasing the measuring distance from the source will generally decrease the measured field values (in case of the validation dipole approx. 10%per mm).

Magnetic field sensors are measuring the integral of the H-field across their sensor area surrounded by the loop. They are calibrated in a precise, homogeneous field. When measuring a gradient field, the result will be very close to the field in the center of the loop which is equivalent to the value of a homogeneous field equivalent to the center value. But it will be different from the field at the field at the border of the loop.

Consequently, two sensors with different loop diameters – both calibrated ideally – would give different results when measuring from the edge of the probe sensor elements. The behavior for electrically small E-field sensors is equivalent. See below for distance plots from a WD which show the conservative nature of field readings at the probe element center vs. measurements at the sensor end.

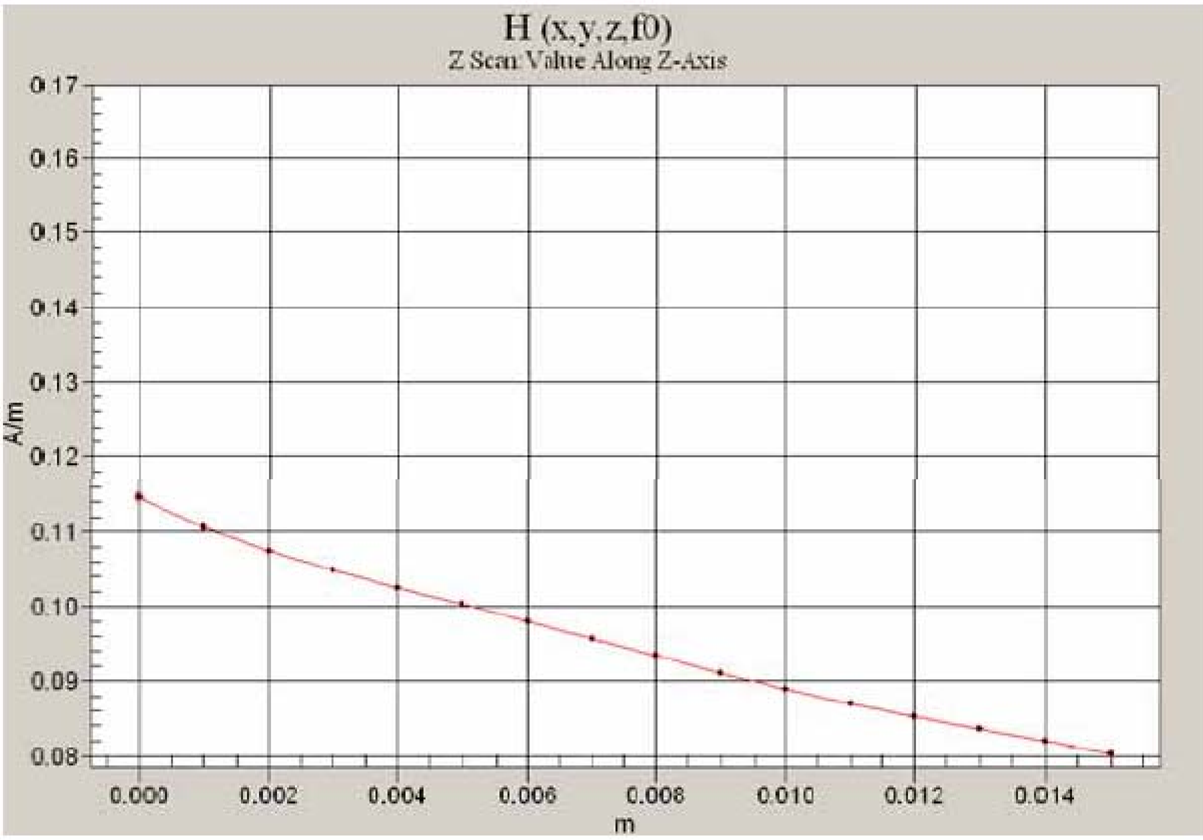


Figure 5.2: Z-Axis Scan at maximum point above a typical wireless device for H-field

5.2.2 Probe Calibration in AMCC

The probe sensitivity at 1 kHz is 0.0625214V/(A/m) (-24.0dBV/(A/m)) was calibrated by AMCC coil for verification of setup performance. The evaluated probe sensitivity was able to be compared to the calibration of the AM1D probe. The frequency response and sensitivity was shown in Figure 5.3. The probe signal is represented after application of an ideal integrator. The green curve represents the current though the AMCC, the blue curve the integrated probe signal. The DIFFERENCE between the two curves is equivalent to the frequency response of the probe system and shows the characteristics. The probe/system complies with the frequency response and linearity requirements in C63.19 according to the Speag's calibrated report as shown in Annex B (AM1D probe: SPAM100AF) (1)The frequency response has been tested within +/- 0.5 dB of ideal differentiator from 100 Hz to 10 kHz. (2)The linearity has also been tested within 0.1dB from 5 dB below limitation to 16 dB above noise level. The AMCC coil is qualified according to certificate report, SDHACPO02A as shown in Annex B.

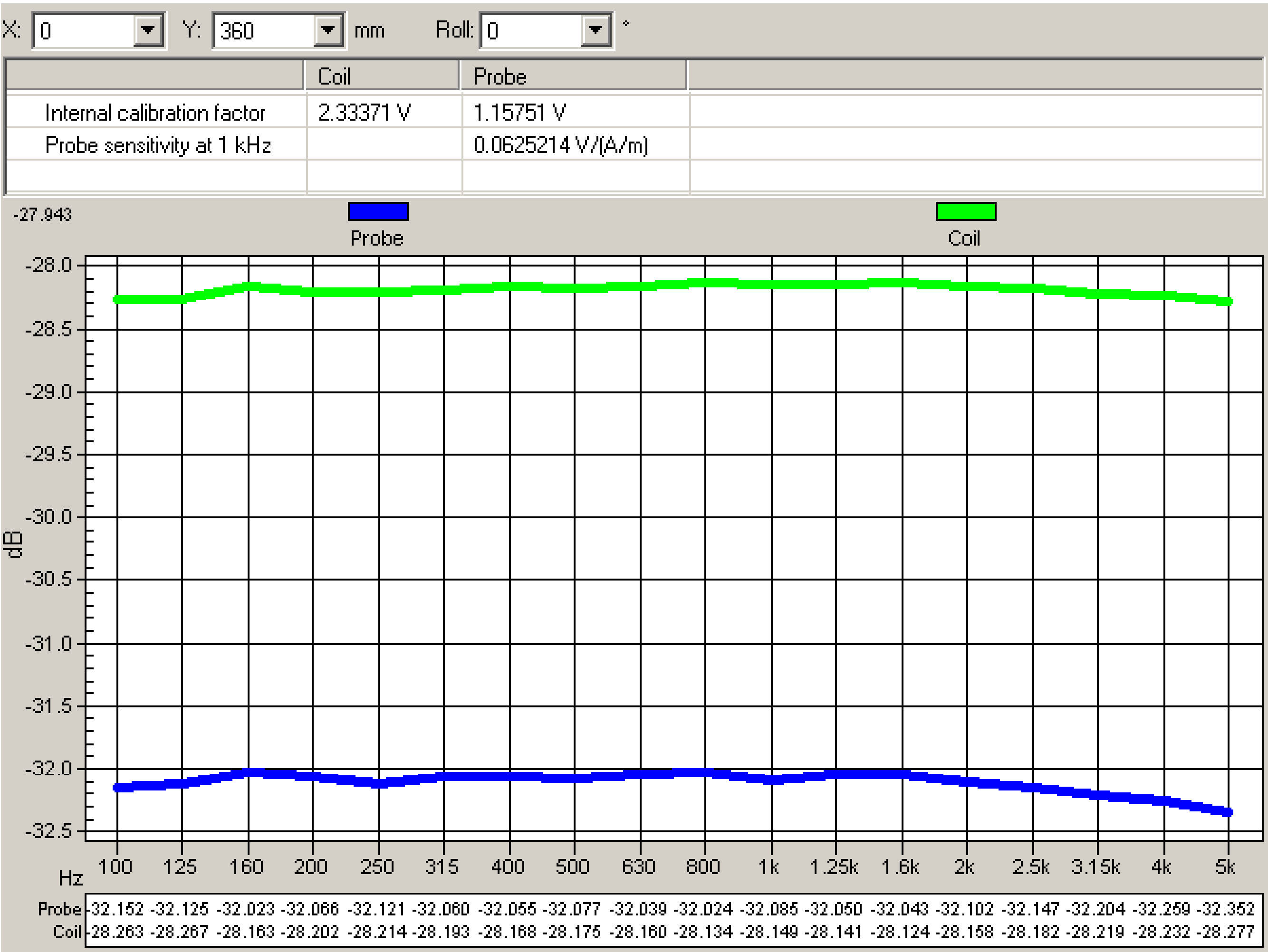


Figure 5.3: The frequency response and sensitivity of AM1D probe

5.3 AMCC

The Audio Magnetic Calibration coil is a Helmholtz Coil designed 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 50Ohm, and a shunt resistor of 10 Ohm permits monitoring the current with a scale of 1:10.

Port description:

Signal	Connector	Resistance
Coil In	BNC	typically 50 Ohm
Coil Monitor	BNO	10Ohm ±1%(100mV corresponding to 1 A/m)

Specification:

Dimensions	370 x 370 x 196 mm, according to ANSI-PC63.19

5.4 AMMI

Figure 5.4: AMMI front panel

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.

Specification:

Sampling rate	48 kHz/24 bit
Dynamic range	85 dB
Test signal generation	User selectable and predefined (vis PC)
Calibration	Auto-calibration/full system calibration using AMCC with monitor output
Dimensions	482 x 65 x 270 mm

5.5 DATA Acquisition Electronics (DAE)

The data acquisition electronics (DAE4) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

5.6 Robot

The DASY4 system uses the high precision robots RX90BL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY4 system, the CS7MB robot controller version from Stäubli is used. The RX robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

5.7 Measurement Server

The DASY4 measurement server is based on a PC/104 CPU board with
166 MHz CPU
32 MB chipset and
64 MB RAM.

Communication with
the DAE4 electronic box
the 16-bit AD-converter system for optical detection and digital I/O interface.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

5.8 Phone Positioner

The phone positioner shown in Figure 5.5 is used to adjust DUT to the suitable position.

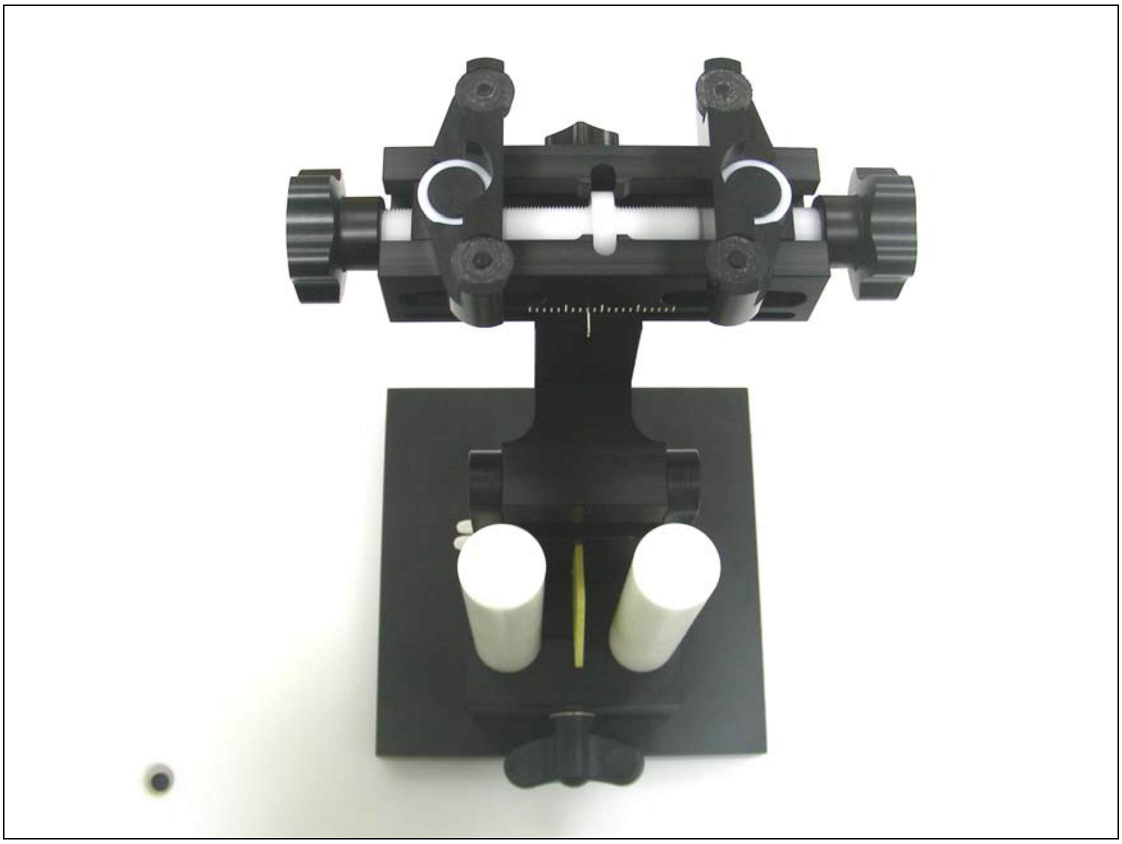


Figure 5.5: Phone Positioner

5.8.1 Test Arch Phantom

Construction	Enables easy and well defined positioning of the phone and validation dipoles as well as simple teaching of the robot.
Dimensions	370 x 370 x 370 mm

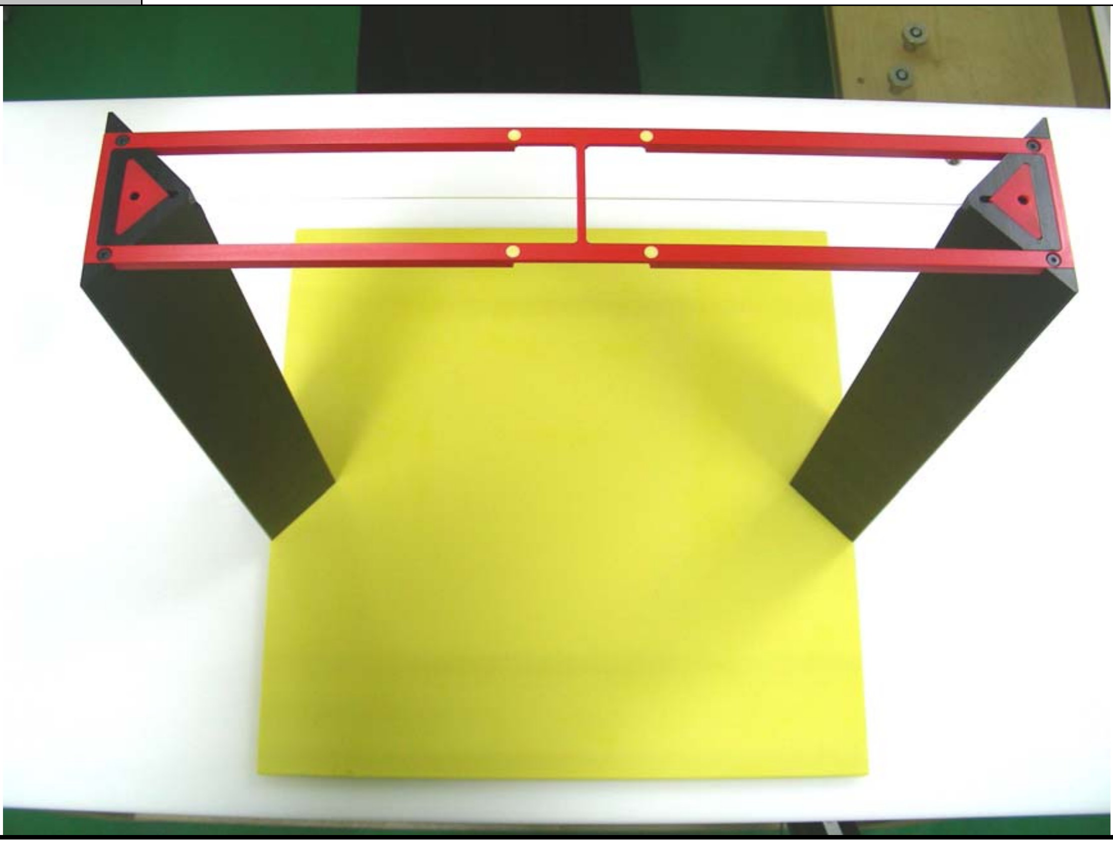


Figure 5.6: Test Arch Phantom

5.9 Cabling of System

The principal cabling of the T-Coil setup is shown in Figure 5.6. All cables provided with the basic setup have a length of approximately 5 m.

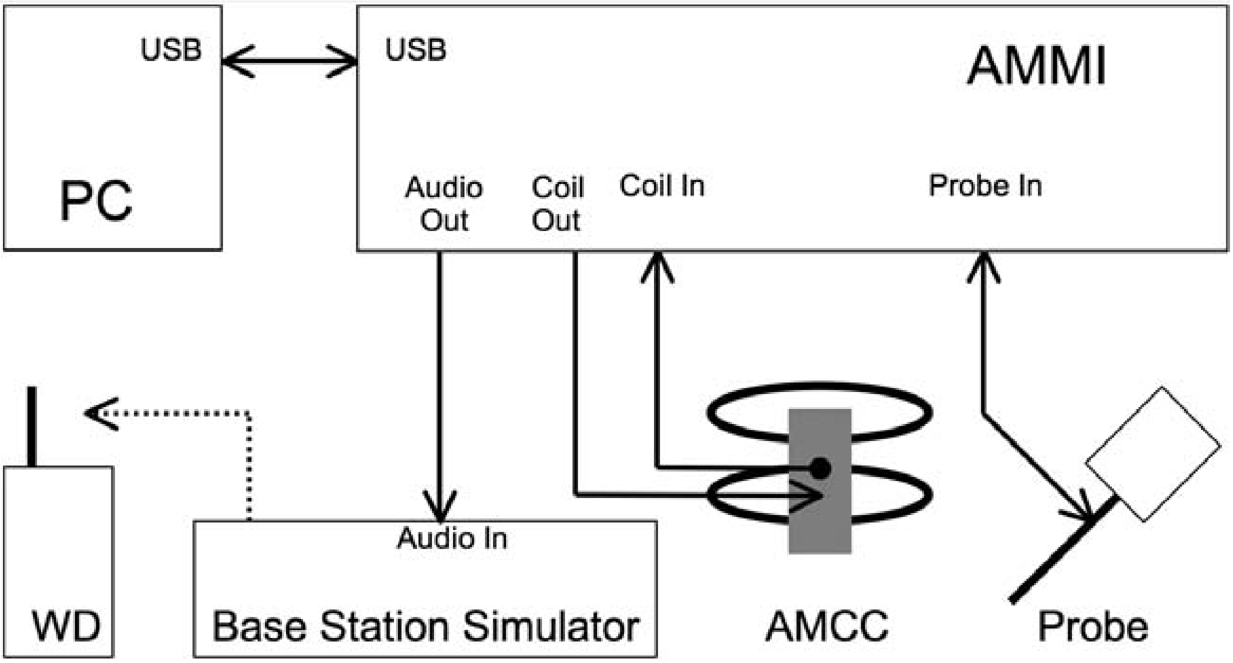


Figure 5.7: T-Coil setup cabling

5.10 HAC Extension Software for DASY4

Specification:

Precise teaching	Easy teaching with adaptive distance verification
Measurement area	Flexible selection of measurement area, predefined according to ANSI C63.19
Evaluation	ABM: spectral processing, filtering, weighting and evaluation according to ANSI C63.19
Report	Documentation ready for compliance report

5.11 Test Equipment List

Manufacture	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Audio Magnetic 1D Field Probe	AM1DV2	1038	Jan. 23, 2008	Jan. 23, 2009
SPEAG	Audio Magnetic Calibration Coil	AMCC	1049	NCR	NCR
SPEAG	Audio Measuring Instrument	AMMI	1041	NCR	NCR
SPEAG	HAC Test Arch	N/A	1041	NCR	NCR
SPEAG	Data Acquisition Electronics	DAE4	778	Sep. 17, 2007	Sep. 17, 2008
SPEAG	Software	DASY4 V4.7 Build 55	N/A	NCR	NCR
SPEAG	Software	SEMCAD V1.8 Build 176	N/A	NCR	NCR
R&S	Universal Radio Communication Tester	CMU200	103937	Oct. 19, 2007	Oct. 19, 2008

Table 5.1: Test Equipment List

5.12 Reference Input of Audio Signal Spectrum

With the reference job "use as reference" in the beginning of a procedure, measure the spectrum of the current when applied to the AMCC, i.e. the input magnetic field spectrum, as shown below Fig. 5.8 and Fig. 5.9. For this, the delay of the window shall be set to a multiple of the signal period and at least 2s. From the measurement on the device, using the same signal, the postprocessor deducts the input spectrum, so the result represents the net DUT response.

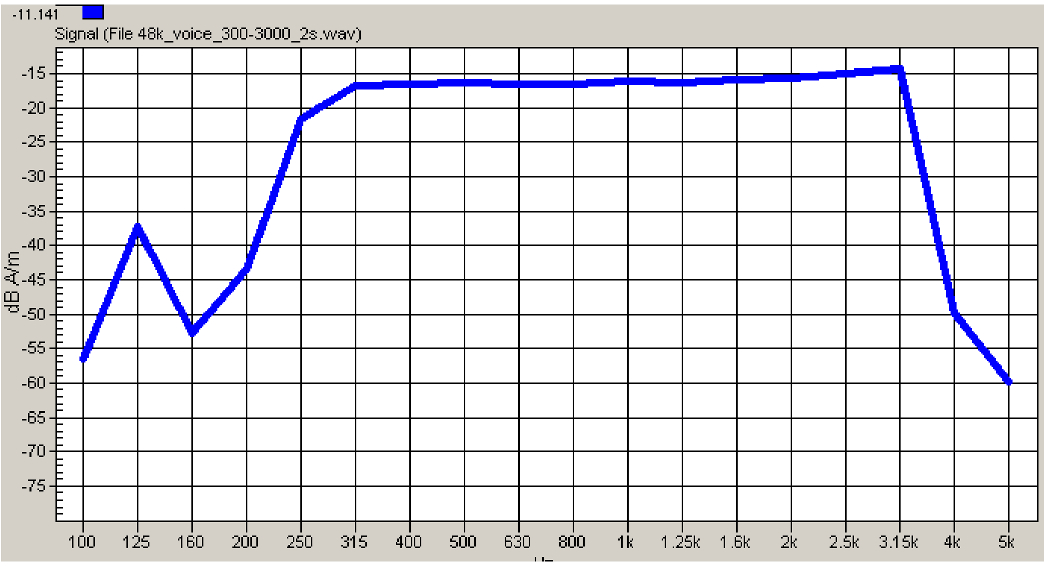


Figure 5.8: Audio signal spectrum of the broadband signal (48KHz_voice_300Hz~3KHz)

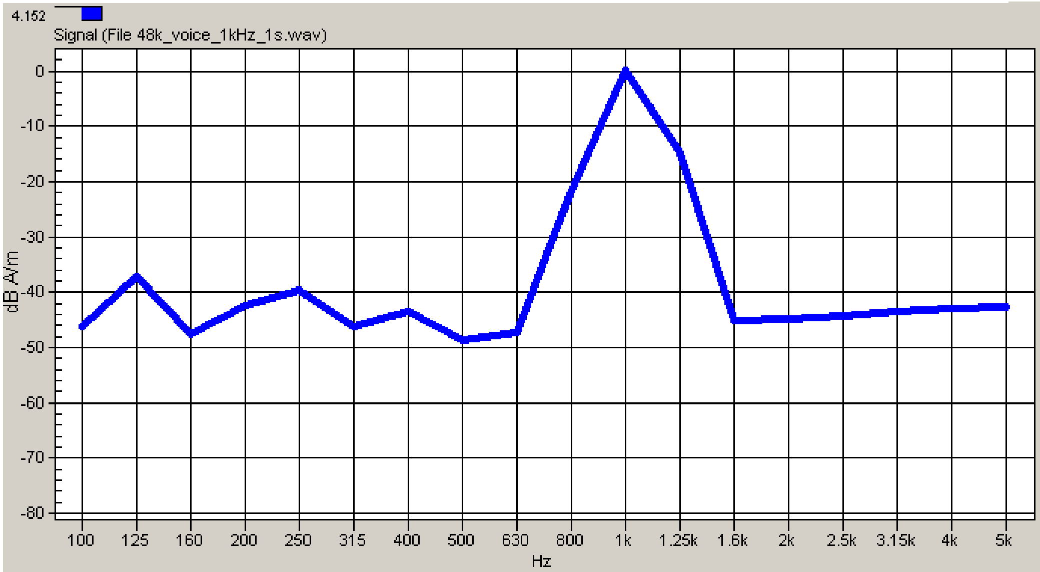


Figure 5.9: Audio signal spectrum of the narrowband signal (48KHz_voice_1KHz)

5.13 Signal Verification

According to ANSI C63.19:2006 section 6.3.2.1, the normal speech input level for HAC T-coil tests shall be set to -16 dBm0 for GSM and UMTS (WCDMA), and to -18 dBm0 for CDMA. This technical note shows a possibility to evaluate and set the correct level with the HAC T-Coil setup with a Rohde&Schwarz communication tester CMU200 with audio option B52 and B85.

Establish a call from the CMU200 to a wireless device. Select CMU200 Network Bitstream "Decoder Cal" to have a 1kHz signal with a level of 3.14 dBm0 at the speech output. Run the measurement job and read the voltage level at the multi-meter display "Coil signal". Read the RMS voltage corresponding to 3.14 dBm0 and note it. Calculate the desired signal levels of -16dBm0:

3.14 dBm0 = -2.36 dBV
-16 dBm0 = -21.50 dBV

Determine the 1kHz input level to generate the desired signal level of -18 dBm0. Select CMU200 Network Bitstream "Codec Cal" to loop the input via the codec to the output. Run the measurement job (AMMI 1kHz signal with gain 10 inserted) and read the voltage level at the multimeter display "Coil signal". Calculate the required gain setting for the above levels:

Gain 10 = -19.87 dBV
Difference for -16 dBm0 = -21.50 - (-19.87) = -1.63 dB
Gain factor = 10 ^ ((-1.63) / 20) = 0.829
Resulting Gain = 10 x 0.829 = 8.29

The predefined signal types have the following differences / factors compared to the 1kHz sine signal:

Signal Type	Duration (s)	Peak to RMS (dB)	RMS (dB)	Gain Factor	Gain Setting
1kHz	1	16.2	-12.7	4.33	35.891
300Hz ~ 3kHz	2	21.6	-18.6	8.48	70.290

6. Description for DUT Testing Position

Figure 6.1 illustrate the references and reference plane that shall be used in a typical DUT emissions measurement. The principle of this section is applied to DUT with similar geometry.

- The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.
- The grid is centered on the audio frequency output transducer of the DUT.
- The grid is in a reference plane, which is defined as the planar area that contains the highest point in the area of the phone that normally rests against the user's ear. It is parallel to the centerline of the receiver area of the phone and is defined by the points of the receiver-end of the DUT handset, which, in normal handset use, rest against the ear.
- The measurement plane is parallel to, and 1.0 cm in front of, the reference plane.

Figure 6.1: A typical DUT reference and plane for HAC measurements

7. T-Coil Test Procedure

The following illustrate a typical test scan over a wireless communications device:

1. Geometry and signal check: system probe alignment, proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed. A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the test Arch.
2. Set the reference drive level of signal voice defined in C63.19 per 6.3.2.1, as shown in this report of section 5.12.
3. The ambient and test system background noise (dB A/m) was measured as well as ABM2 over the full measurement. The maximum noise level must be at least 10dB below the limit of C63.19 per 7.3.2.
4. The DUT was positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.
5. The DUT operation for maximum rated RF output power was configured and connected by using of coaxial cable connection to the base station simulator at the test channel and other normal operating parameters as intended for the test. The battery was ensured to be fully charged before each test. The center sub-grid was centered over the center of the acoustic output (also audio band magnetic output, if applicable). The DUT audio output was positioned tangent (as physically possible) to the measurement plane.
6. The DUT's RF emission field was eliminated from T-coil results by using a well RF-shielding of the probe, AM1D, and by using of coaxial cable connection to a Base Station Simulator. One test channel was pre-measurement to avoid this possibility.
7. Determined the optimal measurement locations for the DUT by following the three steps, coarse resolution scan, fine resolution scans, and point measurement, as described in C63.19 per 6.3.4.4. At each measurement locations, samples in the measurement window duration were evaluated to get ABM1 and the signal spectrum. The noise measurement was performed after the scan with the signal, the same happened, just with the voice signal switched off. The ABM2 was calculated from this second scan.

(1) Coarse resolution scans (1 KHz signal at 50 x 50 mm grid area with 10 mm spacing). Only ABM1 was measured in order to find the location of T-Coil source.

(2)Fine resolution scans (1 KHz signal at 10 x 10 mm grid area with 2 mm spacing). The positioned appropriately based on optimal AMB1 of coarse resolution scan. Both ABM1 and ABM2 were measured in order to find the location of the SNR point.

(3) Point measurement (1 KHz signal) for ABM1 and ABM2 in axial, radial transverse and radial longitudinal. The positioned appropriately based on optimal SNR of fine resolution scan. The SNR was calculated for axial, radial transverse and radial longitudinal orientation.

(4) Point measurement (300Hz to 3 KHz signal) for frequency response in axial. The positioned appropriately based on optimal SNR of fine resolution axial scan.

8. All results resulting from a measurement point in a T-Coil job were calculated from the signal samples during this window interval. ABM values were averaged over the sequence of these samples.
9. At an optimal point measurement, the SNR (ABM1/ABM2) was calculated for axial, radial transverse and radial longitudinal orientation, and the frequency response was measured in axial axis.
10. Corrected for the frequency response after the DUT measurement since the DASY4 system had known the spectrum of the input signal by using a reference job, as shown in this report of section 5.12.
11. In SEMCAD post-processing, the spectral points are in addition scaled with the high-pass (half-band) and the A-weighting, bandwidth compensated factor (BWC) and those results are final as shown in this report.
12. Classified the signal quality based on the table 8.1: T-Coil Signal Quality Categories.

8. T-Coil Articulation Weighting Factor and Signal Quality Categories

8.1 Articulation weighting factor (AWF)

The following AWF factors shall be used for the standard transmission protocols:

Standard	Technology	AWF (dB)
TIA/EIA/IS-2000	CDMA	0
TIA/EIA-136	TDMA (50Hz)	0
J-STD-007	GSM (217)	-5
T1/P1P1/3GPP	UMTS (WCDMA)	0
iDEN™	TDMA (22 and 11 Hz)	0

8.2 Signal Quality Categories

This section provides the signal quality requirement for the intended T-Coil signal from a WD. Only the RF immunity of the hearing aid is measured in T-Coil mode. It is assumed that a hearing aid can have no immunity to an interference signal in the audio band, which is the intended reception band for this mode. A device is assessed beginning by determining the category of the RF environment in the area of the T-Coil source.

The RF measurements made for the T-Coil evaluation are used to assign the category T1 through T4. The limitation is given in Table 8.1. This establishes the RF environment presented by the WD to a hearing aid.

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
(Note: For cases where it can be shown that the audio-band interference is not dominated by the RF pulse rate of the phone, AWF does not apply)		

Table 8.1: T-Coil signal quality categories

9. Summary of Measurement Result

9.1 Test Result

9.1.1 Magnitude Result

The Table 9.1 shows testing result in position coordinates which are defined as deviation from earpiece center in millimeters. Axial measurement location was defined by the manufacture of the device. Signal strength measurement scans are presented in Annex A.

Slide Down								
Probe Position	Band	Channel	Measurement Position (x mm, y mm)	Ambient Background Noise (dB A/m)	ABM2 (dB A/m)	ABM1 (dB A/m)	AWF	SNR (dB)
Radial 1 (Longitudinal)	GSM850	128	(4, 2)	-44.95	-17.52	-8.60	-5	8.91
		189	(4, 2)	-44.93	-17.80	-8.76	-5	9.03
		251	(4, 2)	-35.70	-17.38	-8.43	-5	8.96
	PCS1900	512	(4, 2)	-44.99	-19.87	-8.69	-5	11.2
		661	(4, 2)	-45.54	-19.99	-8.85	-5	11.1
		810	(4, 2)	-44.91	-19.98	-8.51	-5	11.5
Radial 2 (Transversal)	GSM850	128	(-2, -6)	-43.22	-23.56	-8.61	-5	14.9
		189	(-2, -6)	-43.65	-23.93	-8.82	-5	15.1
		251	(0, -6)	-34.35	-22.69	-8.49	-5	14.2
	PCS1900	512	(0, 6)	-43.40	-25.13	-8.38	-5	16.8
		661	(0, -6)	-43.17	-25.05	-8.66	-5	16.4
		810	(-2, -6)	-42.84	-25.70	-8.65	-5	17.1
Axial	GSM850	128	(-2, -2)	-50.35	-21.24	-2.13	-5	19.1
		189	(-2, -2)	-51.09	-21.71	-2.40	-5	19.3
		251	(-2, 0)	-41.70	-21.03	-2.55	-5	18.5
	PCS1900	512	(-2, 2)	-51.22	-23.16	-2.57	-5	20.6
		661	(-2, 2)	-51.09	-22.98	-2.34	-5	20.6
		810	(-2, 2)	-51.05	-22.94	-1.98	-5	21.0

Table 9.1: Test Result for Various Positions for Slide Down

Slide Up								
Probe Position	**Band**	**Channel**	**Measurement Position (x mm, y mm)**	**Ambient Background Noise (dB A/m)**	**ABM2 (dB A/m)**	**ABM1 (dB A/m)**	**AWF**	**SNR (dB)**
Radial 1 (Longitudinal)	GSM850	128	(4, 2)	-45.19	-32.42	-8.42	-5	24.0
		189	(4, 2)	-44.19	-32.75	-8.57	-5	24.2
		251	(4, 2)	-44.24	-32.27	-8.13	-5	24.1
	PCS1900	512	(6, 2)	-45.01	-33.95	-8.87	-5	25.1
		661	(6, 2)	-45.42	-33.93	-8.53	-5	25.4
		810	(6, 2)	-45.00	-34.06	-8.17	-5	25.9
Radial 2 (Transversal)	GSM850	128	(-2, -6)	-42.52	-34.02	-8.94	-5	25.1
		189	(0, -6)	-42.10	-33.88	-9.33	-5	24.5
		251	(-2, -6)	-41.99	-33.92	-8.27	-5	25.7
	PCS1900	512	(-2, -6)	-43.00	-35.75	-8.86	-5	26.9
		661	(0, -6)	-42.68	-35.31	-8.41	-5	26.9
		810	(-2, -6)	-42.18	-35.76	-9.13	-5	26.6
Axial	GSM850	128	(-2, 2)	-51.24	-31.88	-2.75	-5	29.1
		189	(-2, 2)	-50.49	-32.17	-3.04	-5	29.1
		251	(-2, 2)	-50.09	-31.57	-2.69	-5	28.9
	PCS1900	512	(-2, 2)	-49.13	-33.42	-2.13	-5	31.3
		661	(-2, 2)	-52.08	-33.49	-2.43	-5	31.1
		810	(-2, 2)	-49.44	-33.42	-2.77	-5	30.7

Table 9.2: Test Result for Various Positions for Slide Up

Remark: The LCD backlight, Bluetooth and WLAN functions are turn off, and volume is adjusted to maximum level during T-Coil testing.

9.1.2 Frequency Response

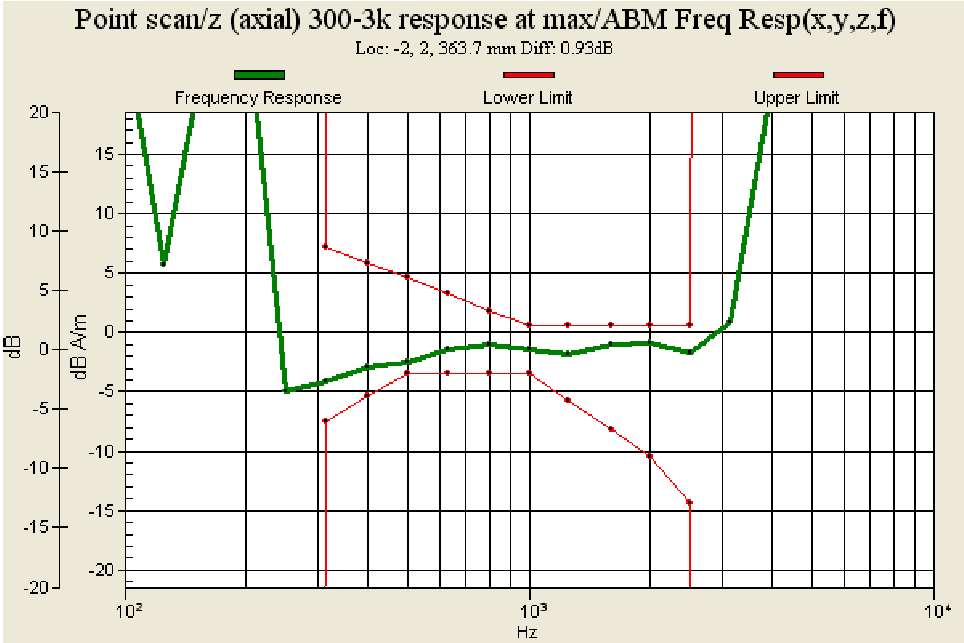


Figure 9.1: Frequency Response of GSM850 for Ch128 with EUT Slide Down

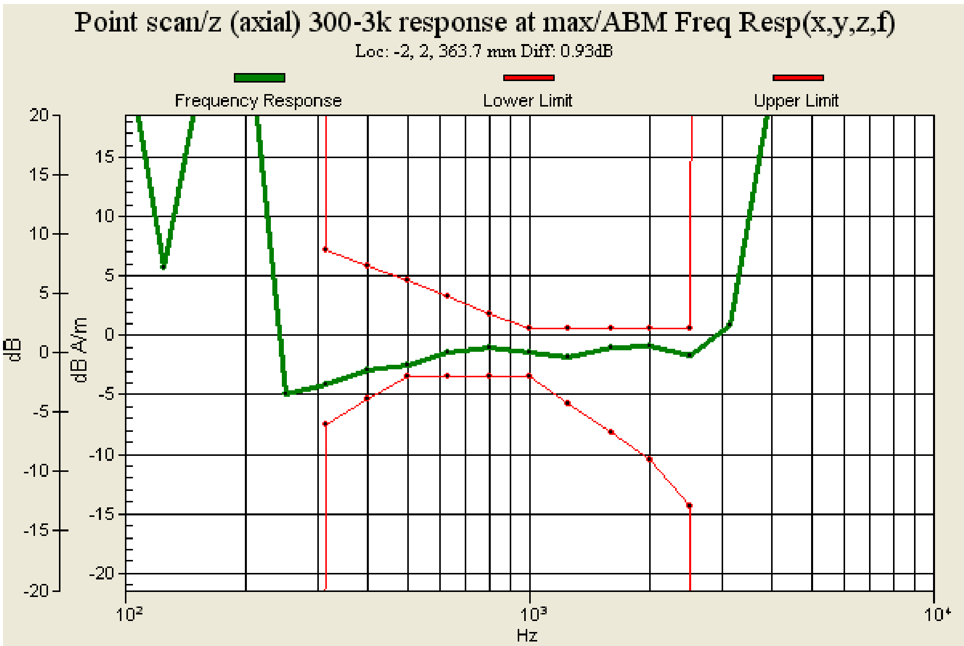


Figure 9.2: Frequency Response of GSM850 for Ch189 with EUT Slide Down

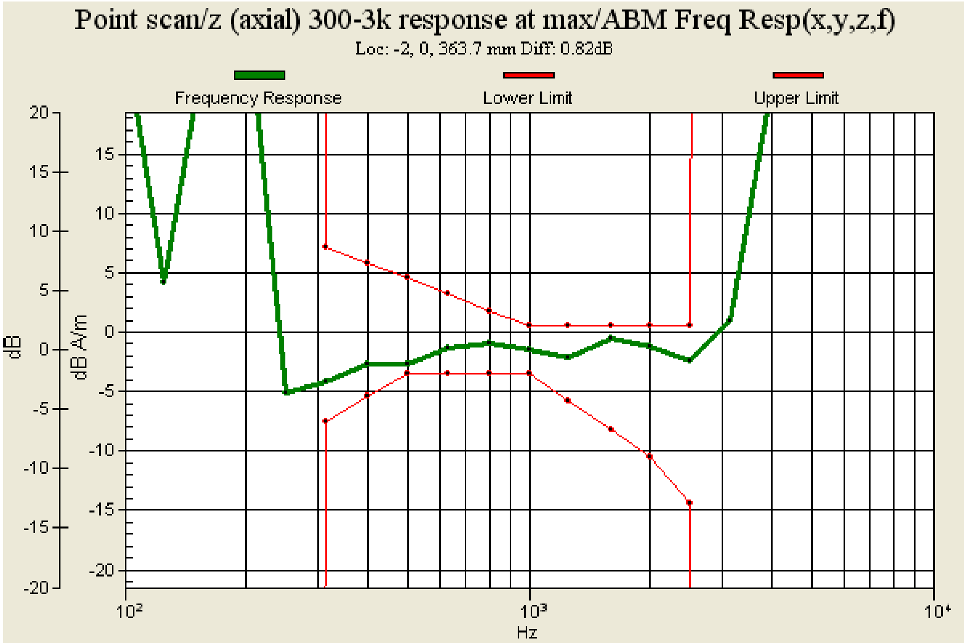


Figure 9.3: Frequency Response of GSM850 for Ch251 with EUT Slide Down

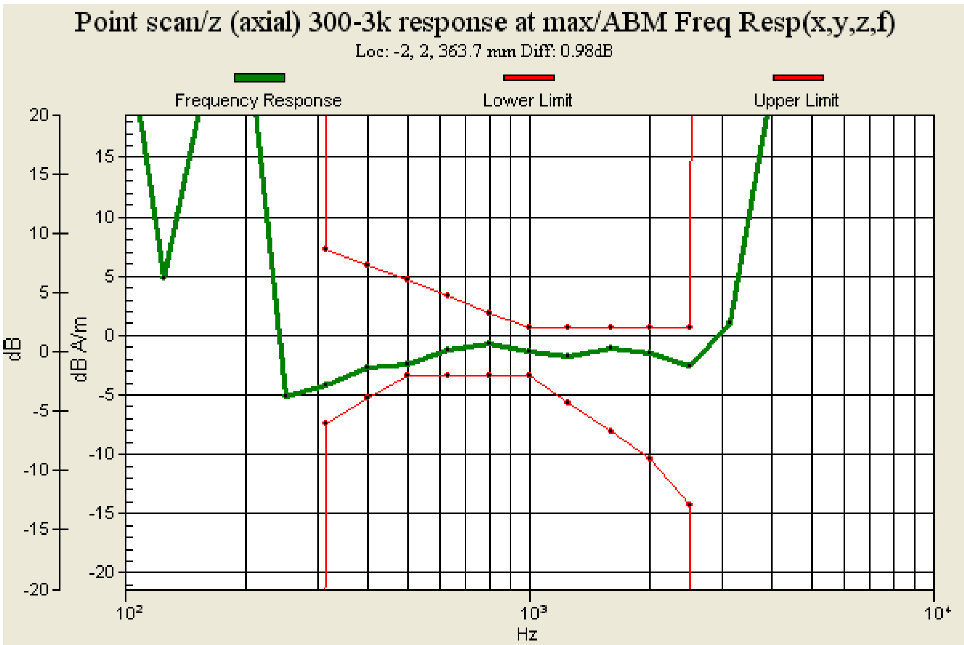


Figure 9.4: Frequency Response of PCS1900 for Ch512 with EUT Slide Down

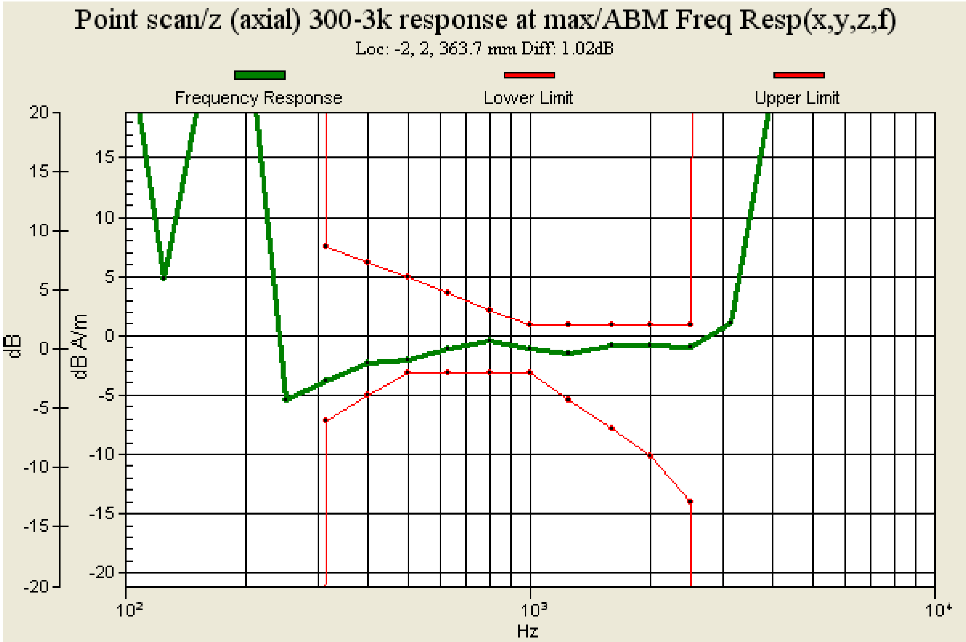


Figure 9.5: Frequency Response of PCS1900 for Ch661 with EUT Slide Down

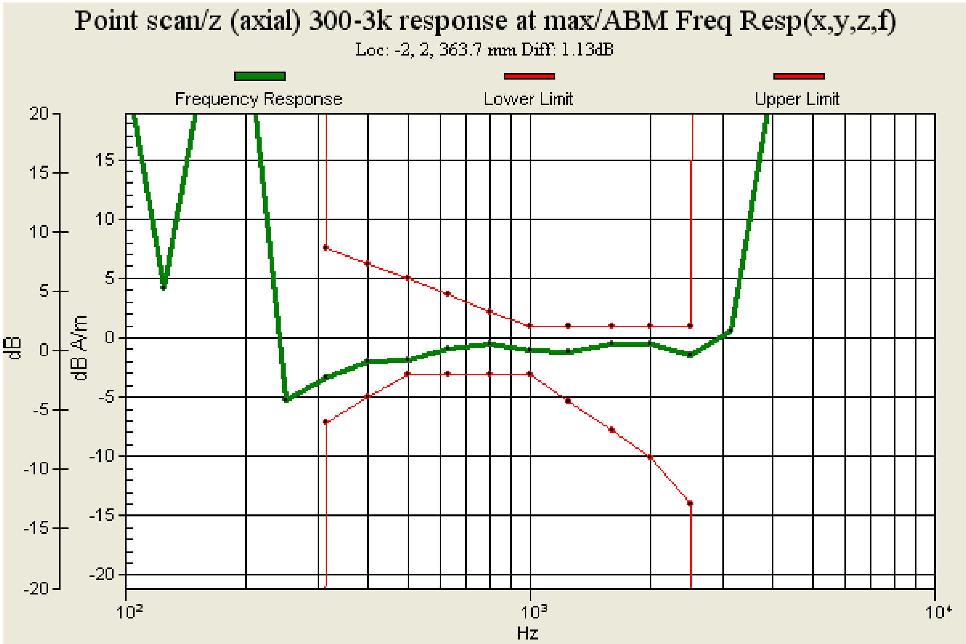


Figure 9.6: Frequency Response of PCS1900 for Ch810 with EUT Slide Down

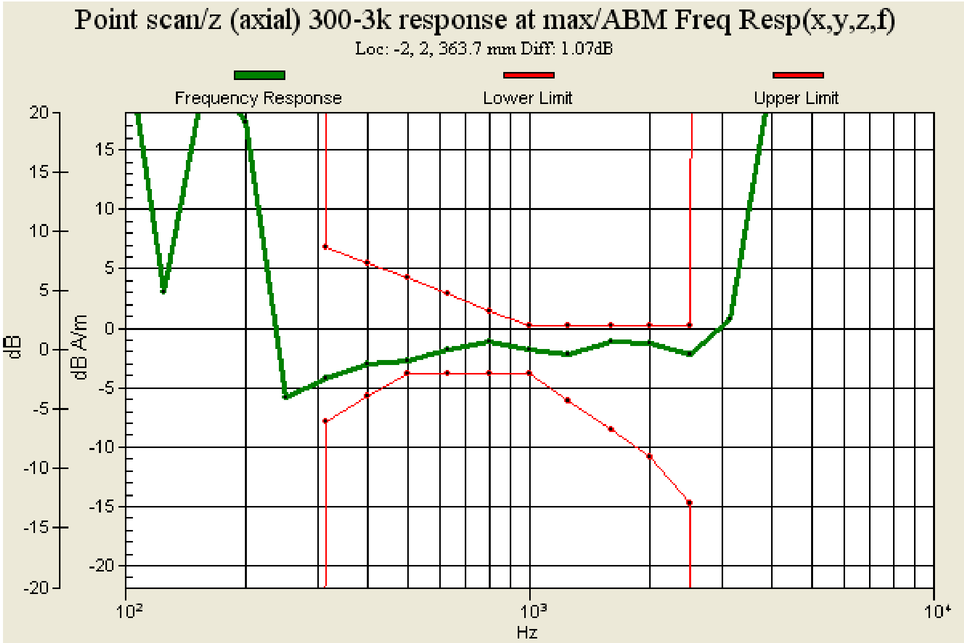


Figure 9.7: Frequency Response of GSM850 for Ch128 with EUT Slide Up

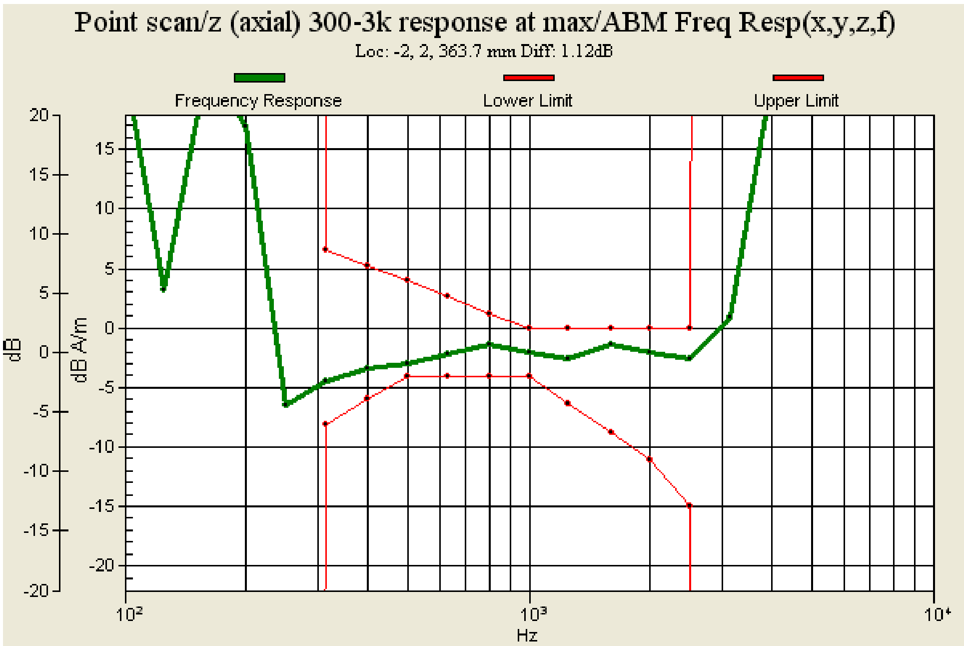


Figure 9.8: Frequency Response of GSM850 for Ch189 with EUT Slide Up

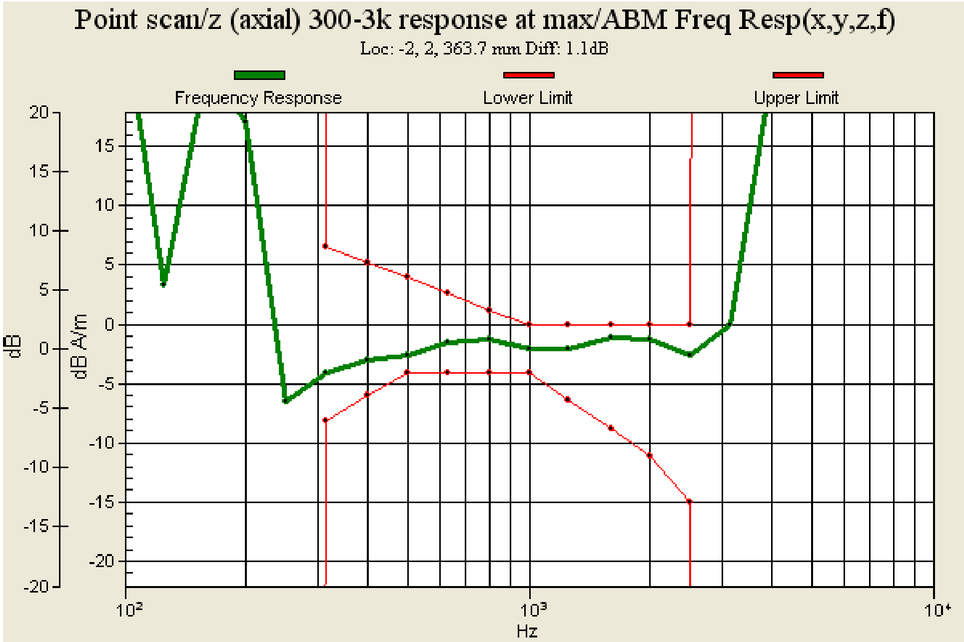


Figure 9.9: Frequency Response of GSM850 for Ch251 with EUT Slide Up

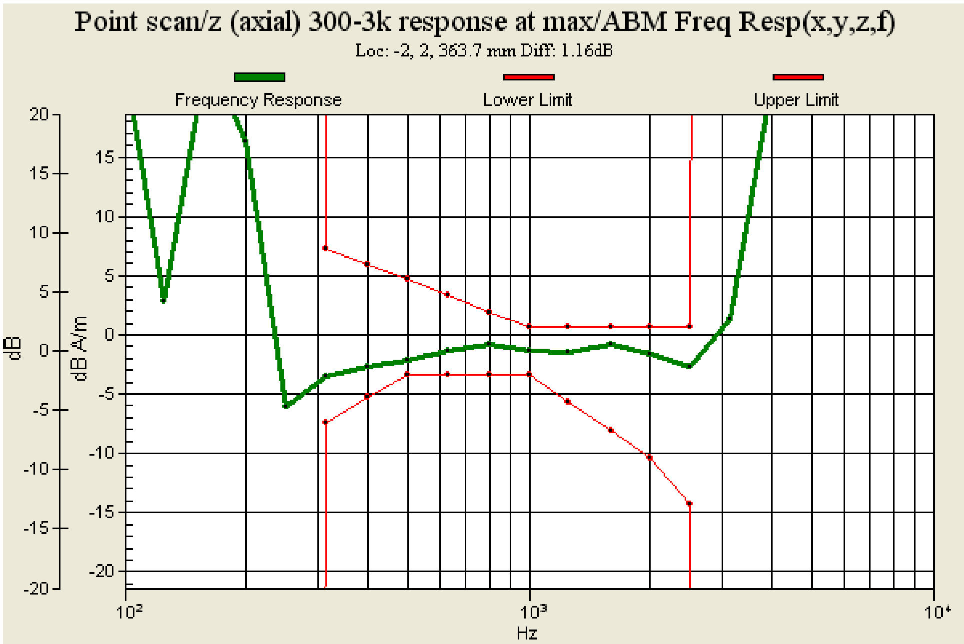


Figure 9.10: Frequency Response of PCS1900 for Ch512 with EUT Slide Up

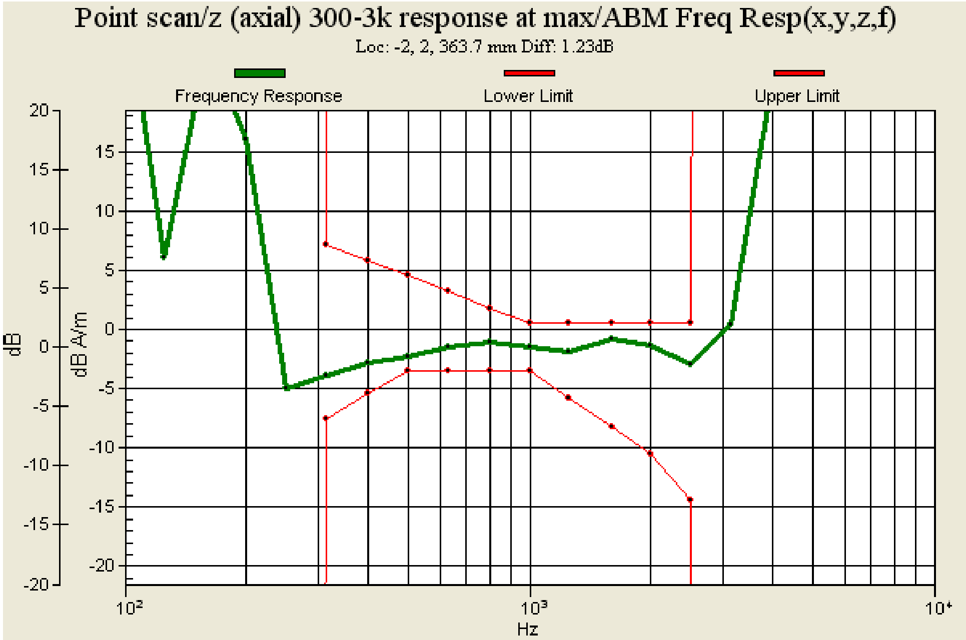


Figure 9.11: Frequency Response of PCS1900 for Ch661 with EUT Slide Up

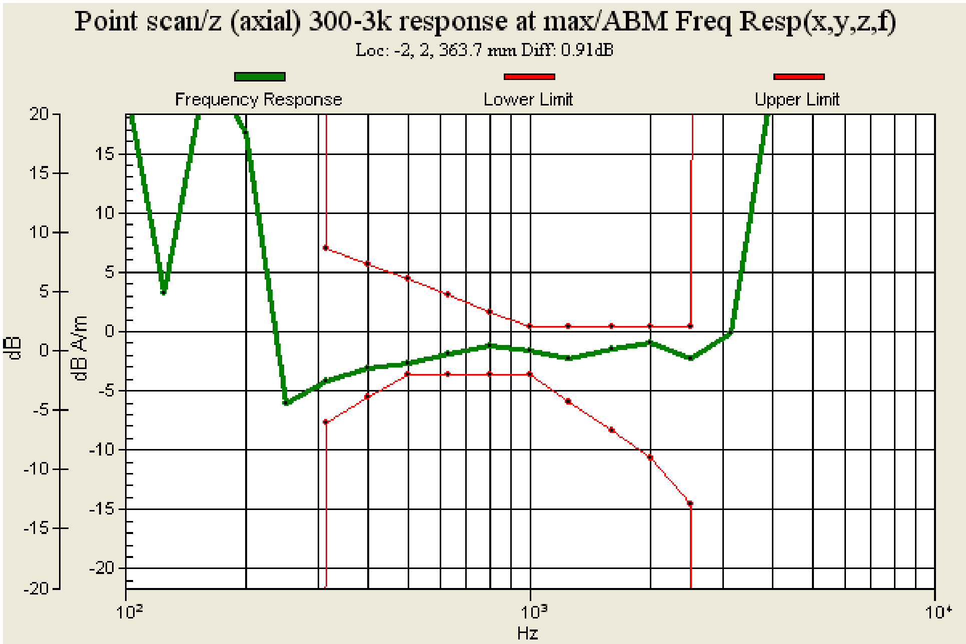


Figure 9.12: Frequency Response of PCS1900 for Ch810 with EUT Slide Up

9.2 T-Coil Coupling Field Intensity

9.2.1 Axial Field Intensity

EUT Slide Down			
Cell Phone Mode	Minimum limit (dB A/m)	Result (dB A/m)	Verdict
GSM850	-13	-2.55	**Pass**
PCS1900	-13	-2.57	**Pass**

EUT Slide Up			
Cell Phone Mode	Minimum limit (dB A/m)	Result (dB A/m)	Verdict
GSM850	-13	-3.04	**Pass**
PCS1900	-13	-2.77	**Pass**

9.2.2 Radial Field Intensity

EUT Slide Down			
Cell Phone Mode	Minimum limit (dB A/m)	Result (dB A/m)	Verdict
GSM850	-18	-8.82	**Pass**
PCS1900	-18	-8.85	**Pass**

EUT Slide Up			
Cell Phone Mode	Minimum limit (dB A/m)	Result (dB A/m)	Verdict
GSM850	-18	-9.33	**Pass**
PCS1900	-18	-9.13	**Pass**

9.2.3 Frequency Response at Axial Measurement Point

EUT Slide Down	
Cell Phone Mode	Verdict
GSM850	**Pass**
PCS1900	**Pass**

EUT Slide Up	
Cell Phone Mode	Verdict
GSM850	**Pass**
PCS1900	**Pass**

9.2.4 *Signal Quality*

EUT Slide Down						
Cell Phone Mode	**Minimum limit (dB)**				**Minimum Result (dB)**	**Verdict**
	T1	**T2**	**T3**	**T4**		
GSM850	-20	-10	0	10	8.91	**T3**
PCS1900	-20	-10	0	10	11.1	**T3**

EUT Slide Up						
Cell Phone Mode	**Minimum limit (dB)**				**Minimum Result (dB)**	**Verdict**
	T1	**T2**	**T3**	**T4**		
GSM850	-20	-10	0	10	24	**T4**
PCS1900	-20	-10	0	10	25.1	**T4**

10. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 10.1

Uncertainty Distributions	Normal	Rectangular	Triangular	U-shape
Multiplying factor[(a)]	1/k [(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) k is the coverage factor

Table 10.1: Uncertainty classification

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY4 uncertainty Budget is showed in Table 10.2.

Error Description	Uncertainty Value (± %)	Probability Distribution	Divisor	(Ci) ABM1	(Ci) ABM2	Std. Unc. ABM1	Std. Unc. ABM2
Probe Sensitivity							
Reference Level	± 3.0%	Normal	1	1	1	± 3.0%	± 3.0%
AMCC Geometry	± 0.4%	Rectangular	√3	1	1	± 0.2%	± 0.2%
AMCC Current	± 0.6%	Rectangular	√3	1	0.145	± 0.4%	± 0.4%
Probe Positioning during Calibration	± 0.1%	Rectangular	√3	1	1	± 0.1%	± 0.1%
Noise Contribution	± 0.7%	Rectangular	√3	0.0143	1	± 0.0%	± 0.4%
Frequency Slope	± 5.9%	Rectangular	√3	1	1	± 0.3%	± 3.5%
Probe System							
Repeatability/Drift	± 1.0%	Rectangular	√3	1	1	± 0.6%	± 0.6%
Linearity/Dynamic Range	± 0.6%	Rectangular	√3	1	1	± 0.4%	± 0.4%
Acoustic Noise	± 1.0%	Rectangular	√3	0.1	1	± 0.1%	± 0.6%
Probe Angle	± 2.3%	Rectangular	√3	1	1	± 1.4%	± 1.4%
Spectral Processing	± 0.9%	Rectangular	√3	1	1	± 0.5%	± 0.5%
Integration Time	± 0.6%	Normal	1	1	5	± 0.6%	± 3.0%
Field Distribution	± 0.2%	Rectangular	√3	1	1	± 0.1%	± 0.1%
Test Signal							
Ref. Signal Spectral Response	± 0.6%	Rectangular	√3	0	1	± 0.0%	± 0.4%
Positioning							
Probe Positioning	± 1.9%	Rectangular	√3	1	1	± 1.1%	± 1.1%
Phantom Thickness	± 0.9%	Rectangular	√3	1	1	± 0.5%	± 0.5%
DUT Positioning	± 1.9%	Rectangular	√3	1	1	± 1.1%	± 1.1%
External Contributions							
RF Interference	± 0.0%	Rectangular	√3	1	0.3	± 0.0%	± 0.0%
Test Signal Variation	± 2.0%	Rectangular	√3	1	1	± 1.2%	± 1.2%
Combined Uncertainty							
Combined Std. Uncertainty (ABM Field)						± 4.1%	± 6.1%
Expanded Std. Uncertainty						**± 8.1%**	**± 12.3%**

Table 10.2: Uncertainty of audio band magnetic measurements

11. References

[1] ANSI C63.19 2006, “American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids”
[2] DASY4 System Hand book.

Appendix A – HAC Measurement Data

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH128_Close X longitudinal

DUT: 821901

Communication System: GSM850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.2 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/x (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.181025 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

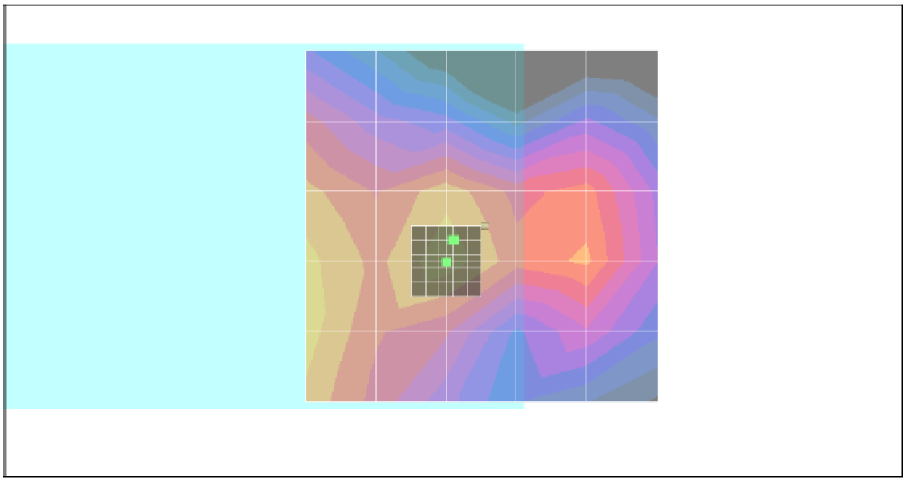
Cursor:
ABM1 comp = -9.70 dB A/m
BWC Factor = 0.181025 dB
Location: 5, 5, 363.7 mm

Fine scan/x (longitudinal) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.144027 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -9.10 dB A/m
BWC Factor = 0.144027 dB
Location: 4, 2, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.150005 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 8.91 dB
ABM1 comp = -8.60 dB A/m
BWC Factor = 0.150005 dB
Location: 4, 2, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH128_Close Y transversal

DUT: 821901

Communication System: GSM850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.4 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/y (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.181025 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

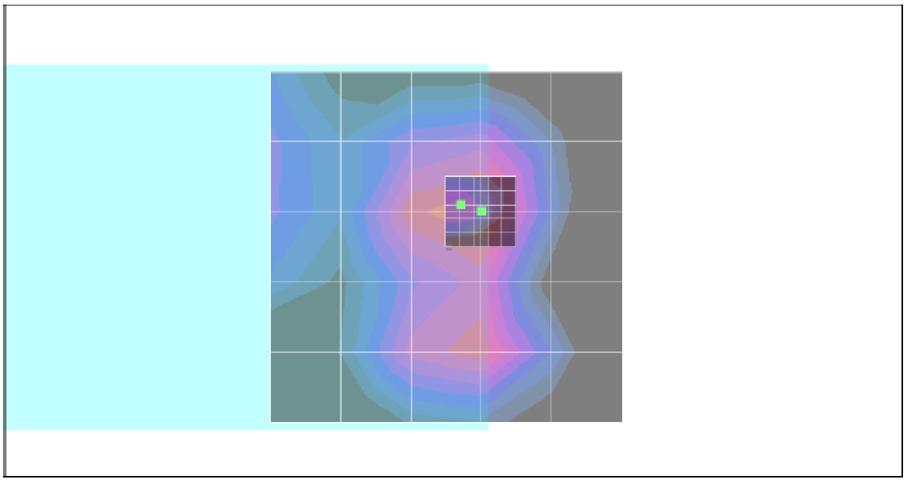
Cursor:
ABM1 comp = -10.4 dB A/m
BWC Factor = 0.181025 dB
Location: -5, -5, 363.7 mm

Fine scan/y (transversal) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.144027 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -9.26 dB A/m
BWC Factor = 0.144027 dB
Location: -2, -6, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.150005 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 14.9 dB
ABM1 comp = -8.61 dB A/m
BWC Factor = 0.150005 dB
Location: -2, -6, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH128_Close Z Axial

DUT: 821901

Communication System: GSM850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/z (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.181025 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -3.41 dB A/m
BWC Factor = 0.181025 dB
Location: -5, 5, 363.7 mm

Fine scan/z (axial) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.144027 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

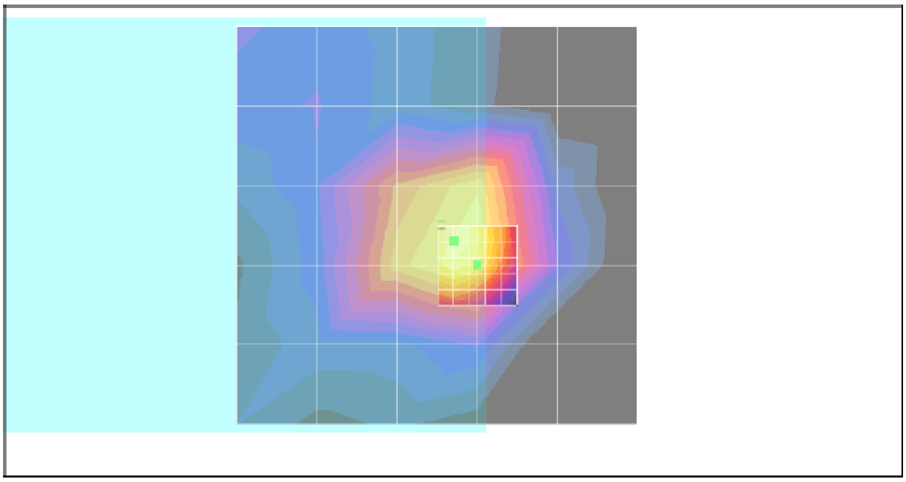
Cursor:
ABM1 comp = 0.222 dB A/m
BWC Factor = 0.144027 dB
Location: -2, 2, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.150005 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 19.1 dB
ABM1 comp = -2.13 dB A/m
BWC Factor = 0.150005 dB
Location: -2, 2, 363.7 mm

Point scan/z (axial) 300-3k response at max/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: 70.29
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.8 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
Diff = 1.16 dB
BWC Factor = 10.8 dB
Location: -2, 2, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH189_Close X longitudinal

DUT: 821901

Communication System: GSM850; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/x (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.135993 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

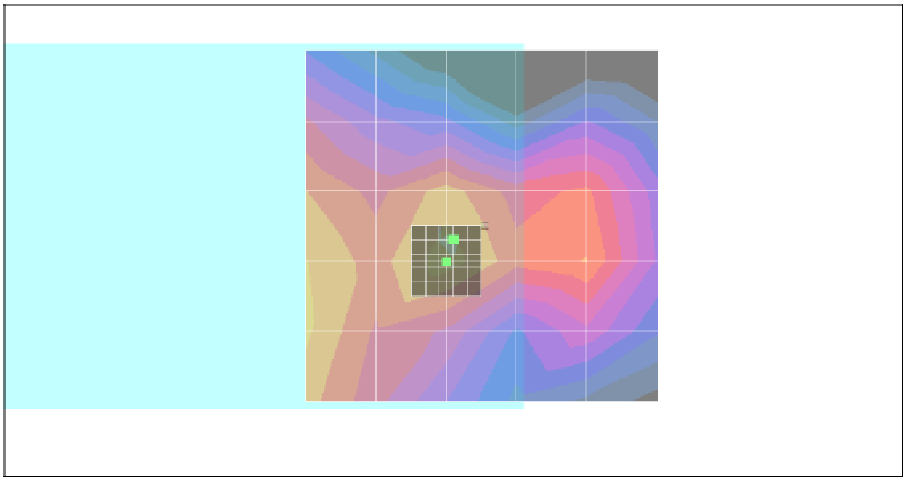
Cursor:
ABM1 comp = -9.93 dB A/m
BWC Factor = 0.135993 dB
Location: 5, 5, 363.7 mm

Fine scan/x (longitudinal) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.168 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -9.03 dB A/m
BWC Factor = 0.168 dB
Location: 4, 2, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.154017 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 9.03 dB
ABM1 comp = -8.76 dB A/m
BWC Factor = 0.154017 dB
Location: 4, 2, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH189_Close Y transversal

DUT: 821901

Communication System: GSM850; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/y (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.135993 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

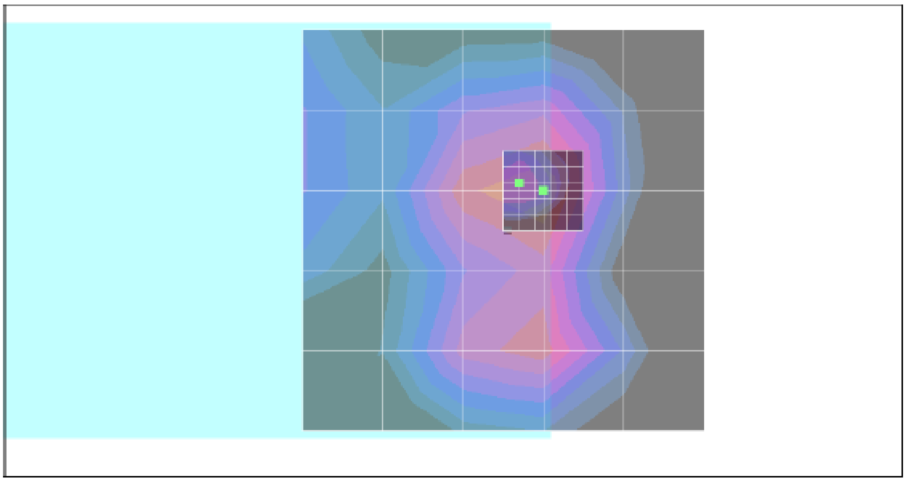
Cursor:
ABM1 comp = -10.4 dB A/m
BWC Factor = 0.135993 dB
Location: -5, -5, 363.7 mm

Fine scan/y (transversal) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.168 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -9.26 dB A/m
BWC Factor = 0.168 dB
Location: -2, -6, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.154017 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 15.1 dB
ABM1 comp = -8.82 dB A/m
BWC Factor = 0.154017 dB
Location: -2, -6, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH189_Close Z Axial

DUT: 821901

Communication System: GSM850; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.2 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/z (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.135993 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -3.64 dB A/m
BWC Factor = 0.135993 dB
Location: -5, 5, 363.7 mm

Fine scan/z (axial) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.168 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

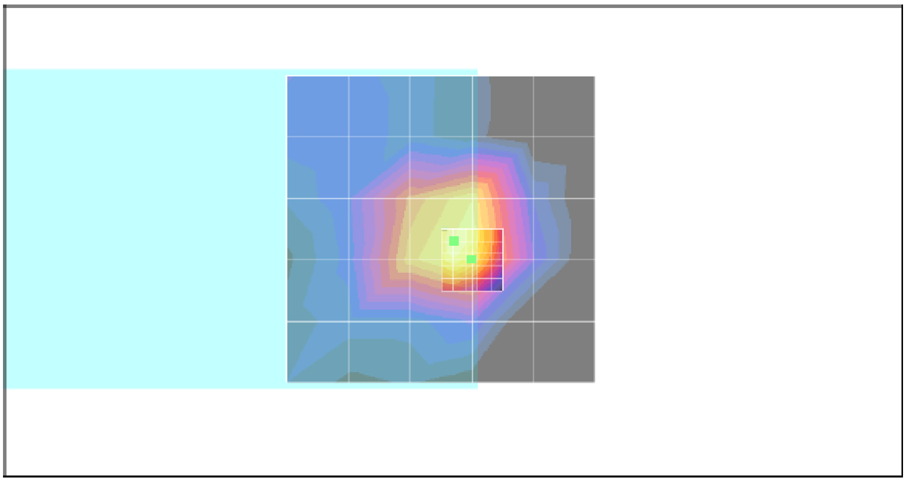
Cursor:
ABM1 comp = 0.371 dB A/m
BWC Factor = 0.168 dB
Location: -2, 2, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.154017 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 19.3 dB
ABM1 comp = -2.40 dB A/m
BWC Factor = 0.154017 dB
Location: -2, 2, 363.7 mm

Point scan/z (axial) 300-3k response at max/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: 70.29
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.8 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
Diff = 0.934 dB
BWC Factor = 10.8 dB
Location: -2, 2, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH251_Close X longitudinal

DUT: 821901

Communication System: GSM850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.2 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/x (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.115961 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

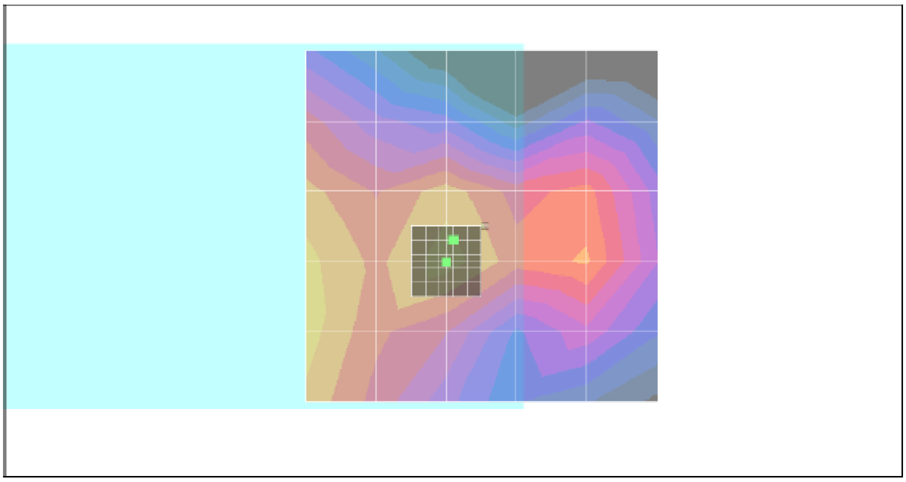
Cursor:
ABM1 comp = -10.0 dB A/m
BWC Factor = 0.115961 dB
Location: 5, 5, 363.7 mm

Fine scan/x (longitudinal) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.103009 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -9.21 dB A/m
BWC Factor = 0.103009 dB
Location: 4, 2, 363.7 mm

Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.11896 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 8.96 dB
ABM1 comp = -8.43 dB A/m
BWC Factor = 0.11896 dB
Location: 4, 2, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH251 _Close Y transversal

DUT: 821901

Communication System: GSM850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/y (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.115961 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

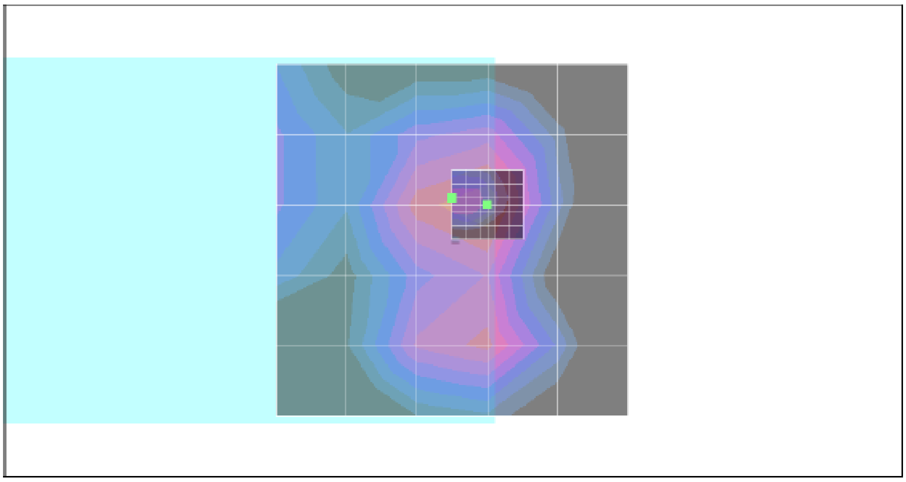
Cursor:
ABM1 comp = -10.4 dB A/m
BWC Factor = 0.115961 dB
Location: -5, -5, 363.7 mm

Fine scan/y (transversal) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.103009 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -9.33 dB A/m
BWC Factor = 0.103009 dB
Location: 0, -6, 363.7 mm

Point scan/y (transversal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.11896 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 14.2 dB
ABM1 comp = -8.49 dB A/m
BWC Factor = 0.11896 dB
Location: 0, -6, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH251_Close Z Axial

DUT: 821901

Communication System: GSM850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.2 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/z (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.115961 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -3.67 dB A/m
BWC Factor = 0.115961 dB
Location: -5, 5, 363.7 mm

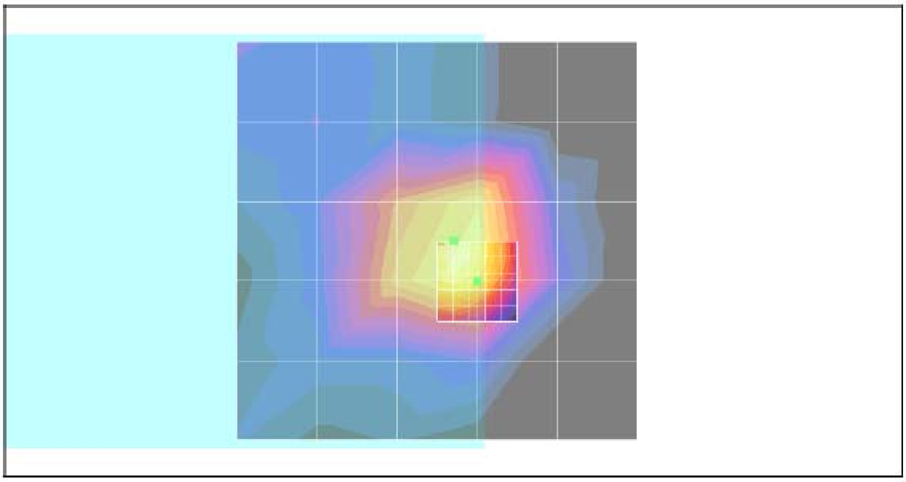
Fine scan/z (axial) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.103009 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -0.266 dB A/m
BWC Factor = 0.103009 dB
Location: -2, 0, 363.7 mm

Point scan/z (axial) scan at point with noise/ABM SNR(x,y,z) (1x1x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.11896 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1/ABM2 = 18.5 dB
ABM1 comp = -2.55 dB A/m
BWC Factor = 0.11896 dB
Location: -2, 0, 363.7 mm

Point scan/z (axial) 300-3k response at max/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: 70.29
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.8 dB
Device Reference Point: 0.000, 0.000, 353.7 mm
Cursor:
Diff = 0.822 dB
BWC Factor = 10.8 dB
Location: -2, 0, 363.7 mm



0 dB = 1.00A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date:2008/3/20

T-Coil_GSM850 CH128_Open X longitudinal

DUT: 821901

Communication System: GSM850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：22.1 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1038; ; Calibrated: 2008/1/23
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 100x
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Coarse Scans/x (axial) scan 50 x 50 (grid 10) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.110988 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -10.1 dB A/m
BWC Factor = 0.110988 dB
Location: 5, 5, 363.7 mm

Fine scan/x (longitudinal) scan 10 x 10 (grid 2) with noise/ABM Signal(x,y,z) (6x6x1):
Measurement grid: dx=10mm, dy=10mm
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 35.891
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.109959 dB
Device Reference Point: 0.000, 0.000, 353.7 mm

Cursor:
ABM1 comp = -9.06 dB A/m
BWC Factor = 0.109959 dB
Location: 4, 2, 363.7 mm