# Hearing Aid Compatibility (HAC)
# T-Coil Test Report
for
# ZTE CORPORATION
on the
# ZTE C79 CDMA1X Digital Mobile Phone

| | | |
|---|---|---|
| Report No. | : | HA810601 |
| Trade Name | : | ZTE |
| Model Name | : | ZTE C79 |
| FCC ID | : | Q78-ZTEC79 |
| Date of Testing | : | Jan. 16, 2008 |
| Date of Report | : | Feb. 14, 2008 |
| Date of Review | : | Feb. 14, 2008 |

- **Results Summary : T Category = T4**
- The test results refer exclusively to the presented test model/sample only.
- Without written approval of SPORTON International Inc., the test report shall not be reproduced
- except in full.
- Report Version: Rev.02

***SPORTON International Inc.***

No.52, Hwa-Ya 1st RD., Hwa Ya Technology Park, Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan,R.O.C.

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## 1. Statement of Compliance

The Hearing Aid Compliance (HAC) maximum results found during testing for the ZTE CORPORATION ZTE C79 CDMA1X Digital Mobile Phone ZTE C79 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 |
|---|---|---|
| CDMA2000 Cellular | 31.4 | T4 |
| CDMA2000 PCS | 27.7 | T4 |

They are in compliance with HAC limits specified in guidelines FCC 47CFR §20.19 and ANSI Standard ANSI PC 63.19 for HAC Rated category.

Results Summary : T Category = T4

Approved by

Roy Wu
Manager

# 2. Administration Data

## 2.1 Testing Laboratory

**Company Name :** Sporton International Inc.
**Department :** Antenna Design/SAR
**Address :** No.52, Hwa-Ya 1st RD., Hwa Ya Technology Park, Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
**Telephone Number :** 886-3-327-3456
**Fax Number :** 886-3-327-0973

## 2.2 Detail of Applicant

**Company Name :** ZTE CORPORATION
**Address :** ZTE Plaza, Keji Road South, Hi-Tech Industrial Park,Nanshan District,Shenzhen, Guangdong, 518057, P.R.China

## 2.3 Detail of Manufacturer

**Company Name :** ZTE CORPORATION
**Address:** ZTE Plaza, Keji Road South, Hi-Tech Industrial Park,Nanshan District,Shenzhen, Guangdong, 518057, P.R.China

## 2.4 Application Details

**Date of reception of application:** Jan. 06, 2008
**Start of test :** Jan. 16, 2008
**End of test :** Jan. 16, 2008

# 3. General Information

## 3.1 Description of Device Under Test (DUT)

| | |
|---|---|
| **DUT Type** : | ZTE C79 CDMA1X Digital Mobile Phone |
| **Trade Name** : | ZTE |
| **Model Name** : | ZTE C79 |
| **FCC ID** : | Q78-ZTEC79 |
| **Tx Frequency** : | CDMA2000 Cellular : 824 ~ 849 MHz<br>CDMA2000 AWS : 1710 ~ 1755 MHz<br>CDMA2000 PCS : 1850 ~1910 MHz |
| **Rx Frequency** : | CDMA2000 Cellular : 869 ~ 894 MHz<br>CDMA2000 AWS : 2110 ~ 2155 MHz<br>CDMA2000 PCS : 1930 ~1990 MHz |
| **Antenna Type** : | Fixed Internal |
| **HW ID :** | C67B |
| **SW Version :** | ZTEC79V1.0.0B02 |
| **Maximum Output Power to Antenna** : | **<for HAC>**<br>CDMA2000 Cellular : 24.12 dBm<br>CDMA2000 PCS : 23.68 dBm<br>**<for EMC>**<br>CDMA2000 Cellular : 23.75 dBm<br>CDMA2000 PCS : 23.59 dBm |
| **Type of Modulation** : | QPSK |

### 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 air link.

Measurements were performed on the middle channel of both bands.

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 PC 63.19 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 DASY5 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
- DASY5 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.

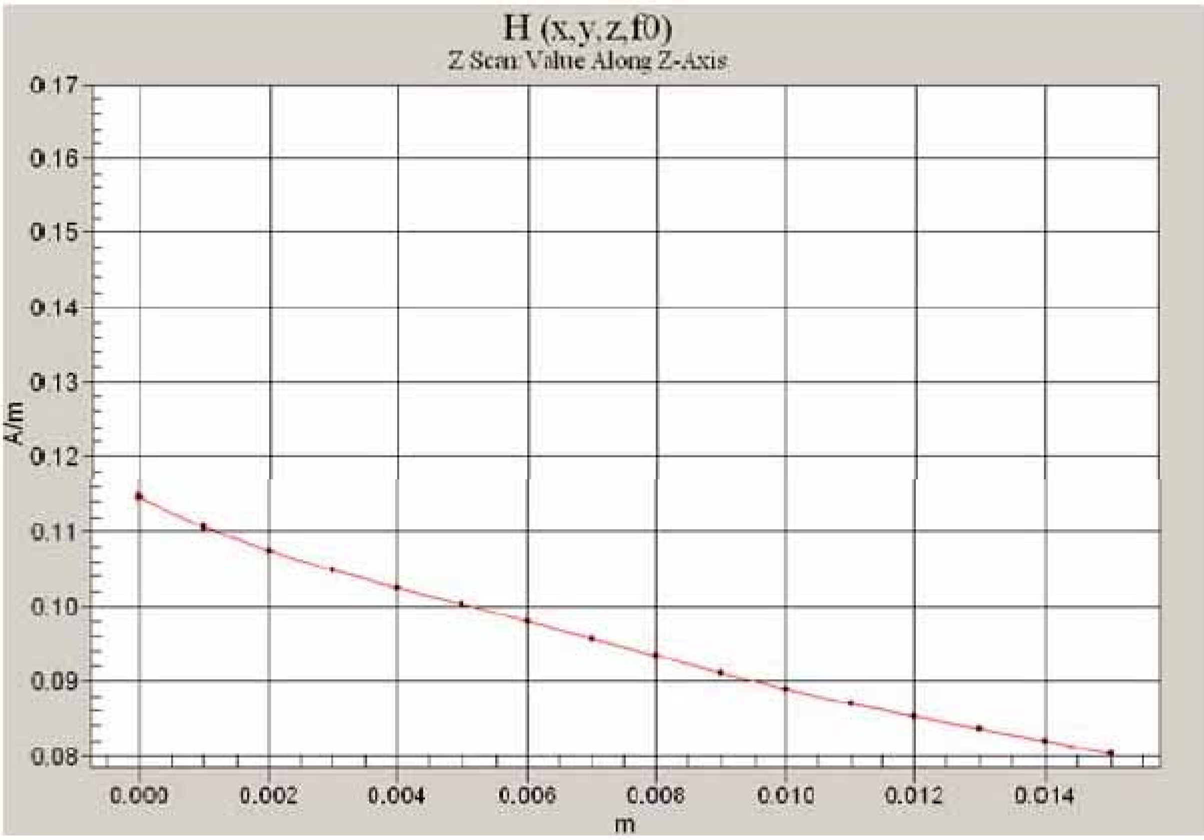



**Figure 5.2: Z-Axis Scan at maximum point above a typical wireless device for H-field**

### 5.2.2 Probe Calibration in AMCC

The AM1D probe is calibrated by AMCC coil. The frequency response and sensitivity is shown in Figure 5.3.

The probe sensitivity at 1 kHz is 0.0625214 V/(A/m).

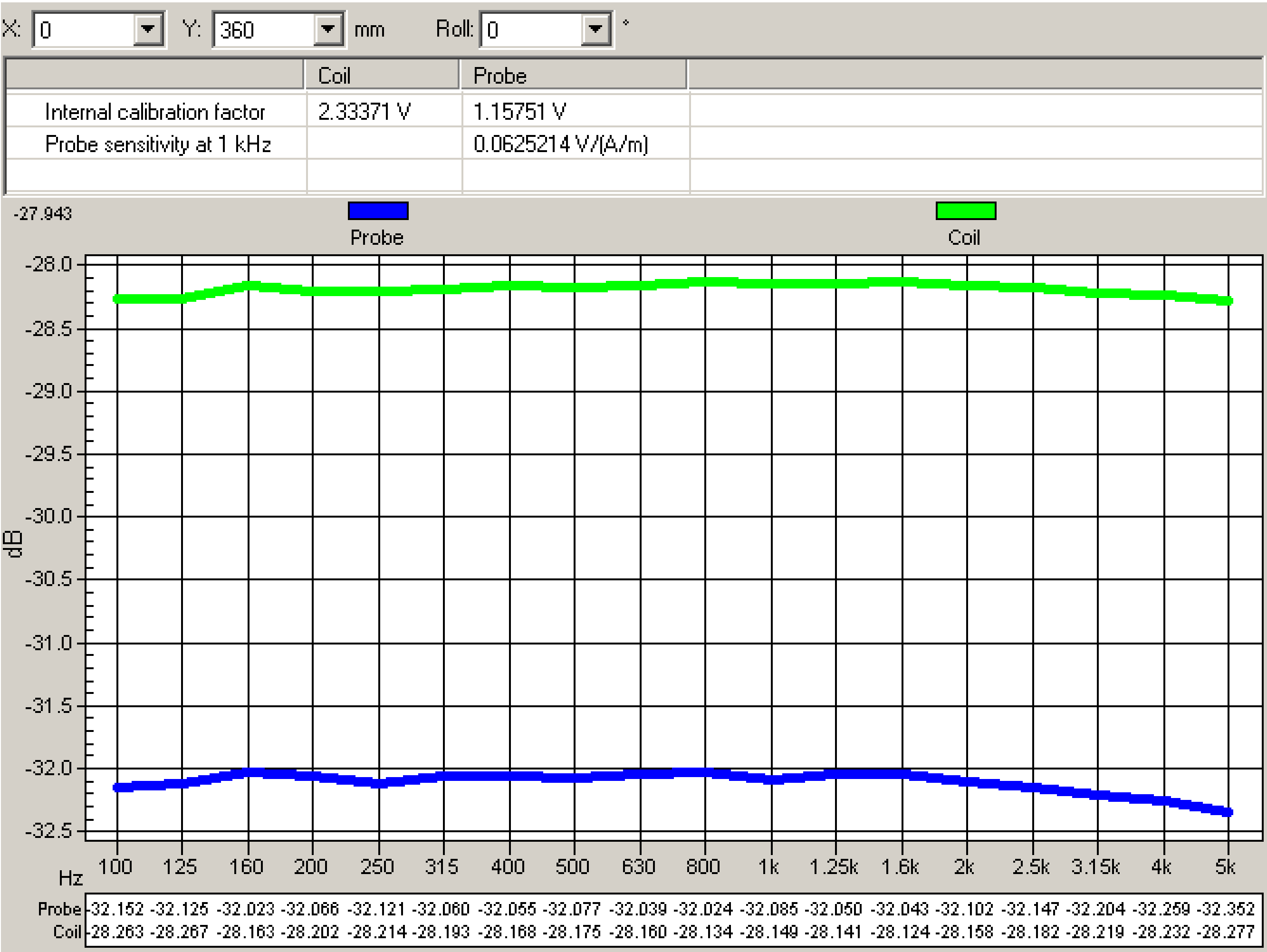



**Figure 5.3: The frequency response and sensitivity of AM1D probe**

### 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 (DAE3) 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 DAE3 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

## 5.6 Robot

The DASY5 system uses the high precision robots TX90 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used. The TX 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 DASY5 measurement server is based on a PC/104 CPU board with
400 MHz CPU
128 MB chipset and
128 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.

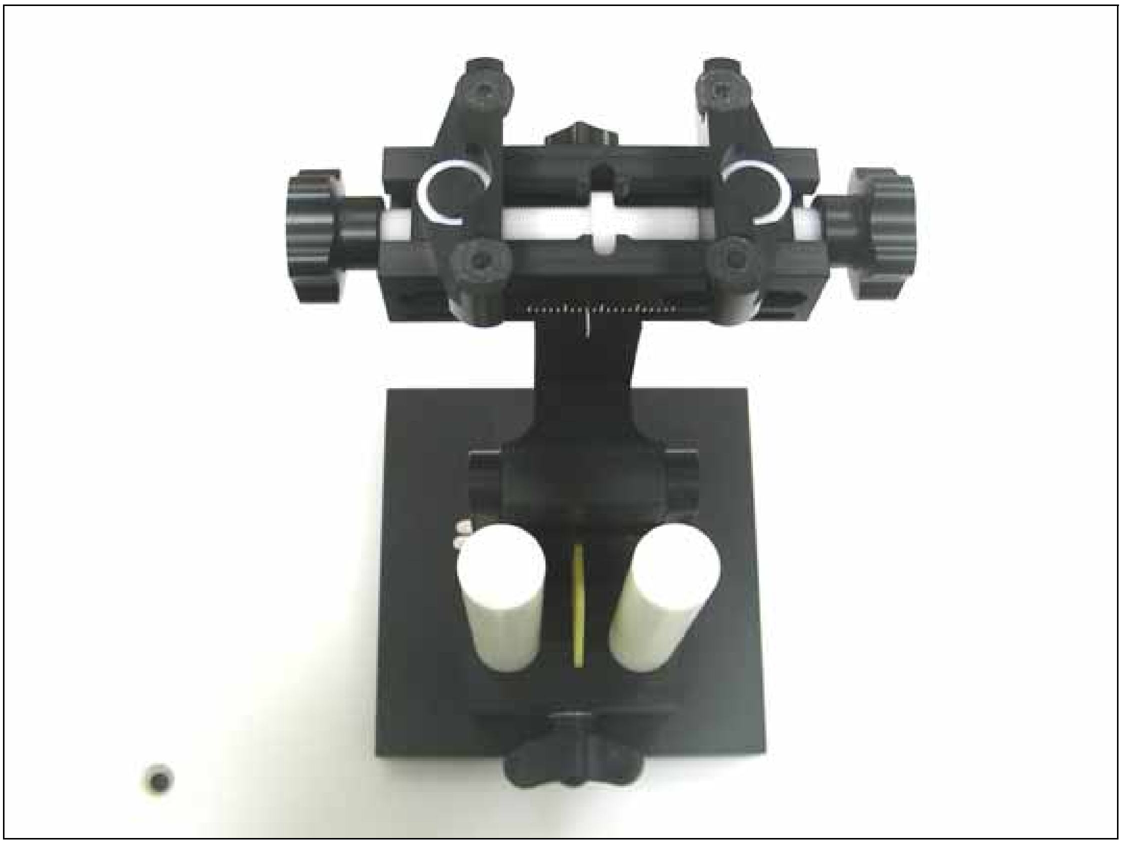


**Figure 5.5: Phone Positioner**

*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 |

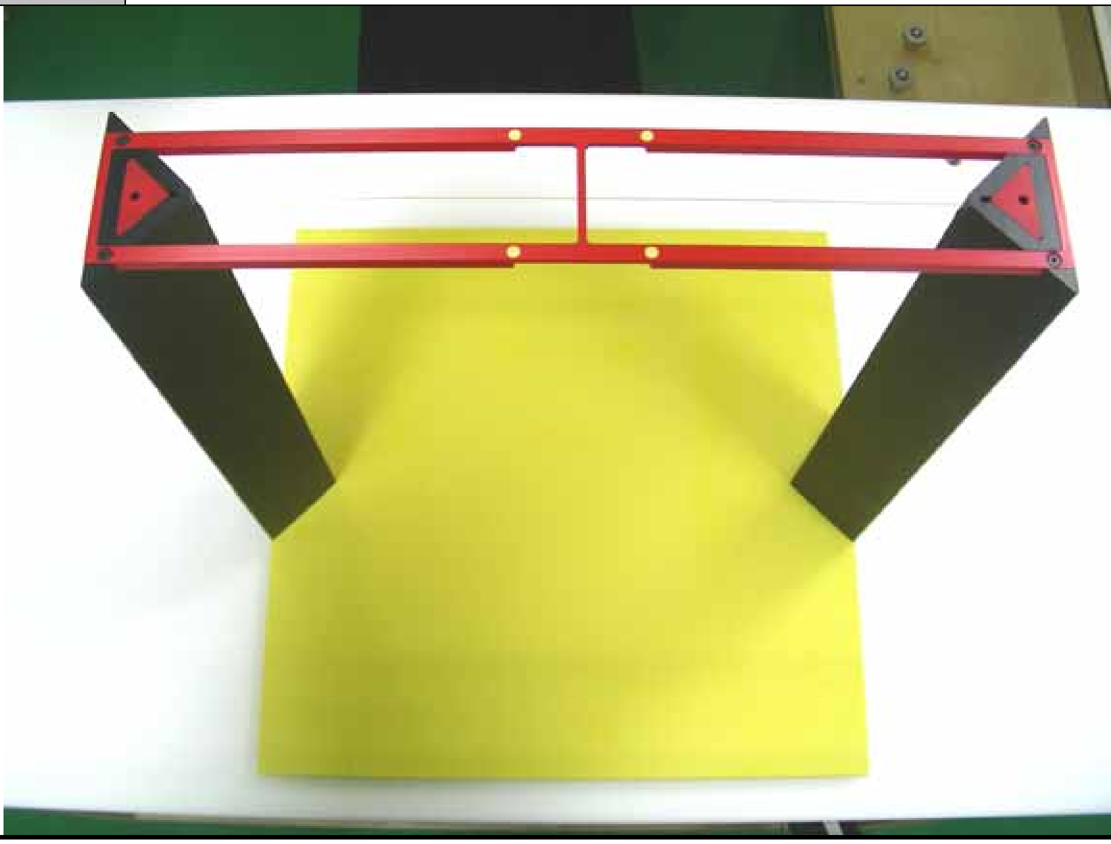


**Figure 5.6: Test Arch Phantom**

### 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.

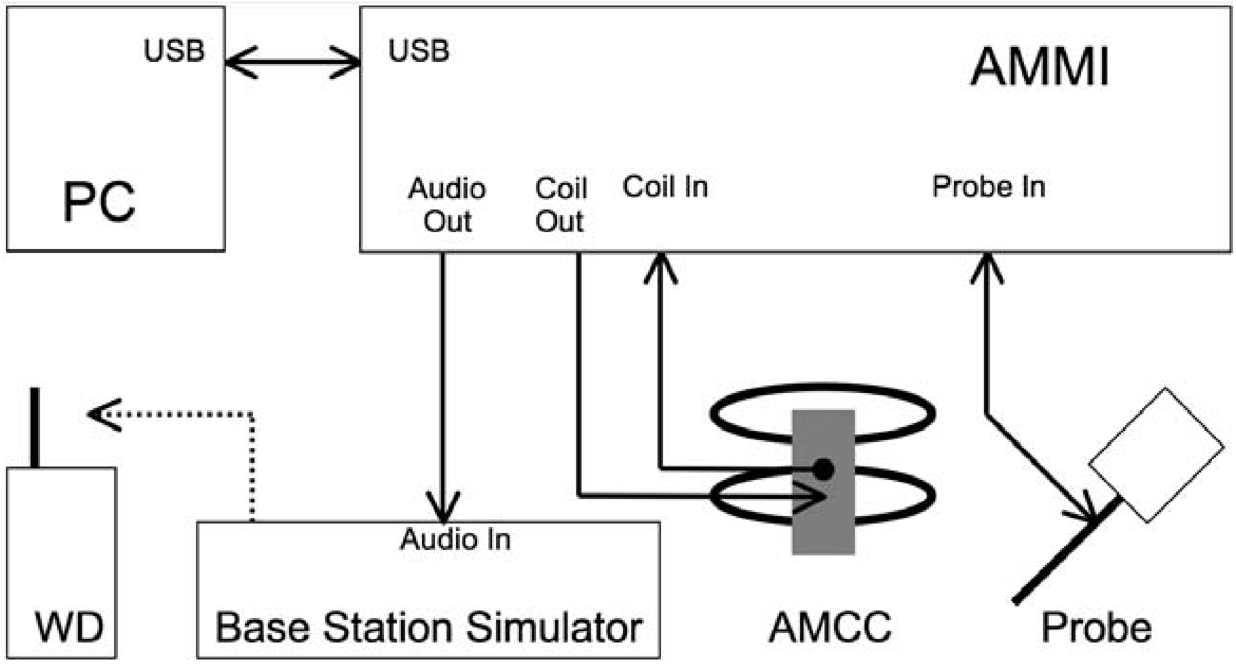



**Figure 5.7: T-Coil setup cabling**

### 5.10 HAC Extension Software for DASY5

Specification:

| | |
|---|---|
| Precise teaching | Easy teaching with adaptive distance verification |
| Measurement area | Flexible selection of measurement area, predefined according to ANSI-PC63.19 |
| Evaluation | ABM: spectral processing, filtering, weighting and evaluation according to ANSI-PC63.19 |
| 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. 18, 2007 | Jan. 18, 2008 |
| 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 | DAE3 | 577 | Nov. 16, 2007 | Nov. 16, 2008 |
| SPEAG | Software | DASY5 V5.0 Build 87 | N/A | NCR | NCR |
| SPEAG | Software | SEMCAD X V12.4 Build 52 | N/A | NCR | NCR |
| R&S | Universal Radio Communication Tester | CMU200 | 103937 | Oct. 19, 2007 | Oct. 19, 2008 |

**Table 5.1: Test Equipment List**

## 5.11 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 multimeter display “Coil signal”. Read the RMS voltage corresponding to 3.14 dBm0 and note it. Calculate the desired signal levels of -18dBm0:

3.14 dBm0 = -2.48 dBV
-18 dBm0 = -23.62 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 = -19.66 dBV
Difference for -18 dBm0 = -23.62 - (-19.66) = -3.96 dB
Gain factor = 10 ^ ((-3.96) / 20) = 0.6339
Resulting Gain = 10 x 0.63 = 6.3387

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 | 27.446 |
| 300Hz ~ 3kHz | 2 | 21.6 | -18.6 | 8.48 | 53.752 |

### *5.12 WD Radio Configuration Selection*

The device was chosen to be tested in the worst case ABM2 condition under RC1/SO3. The ABM2 summary as below:

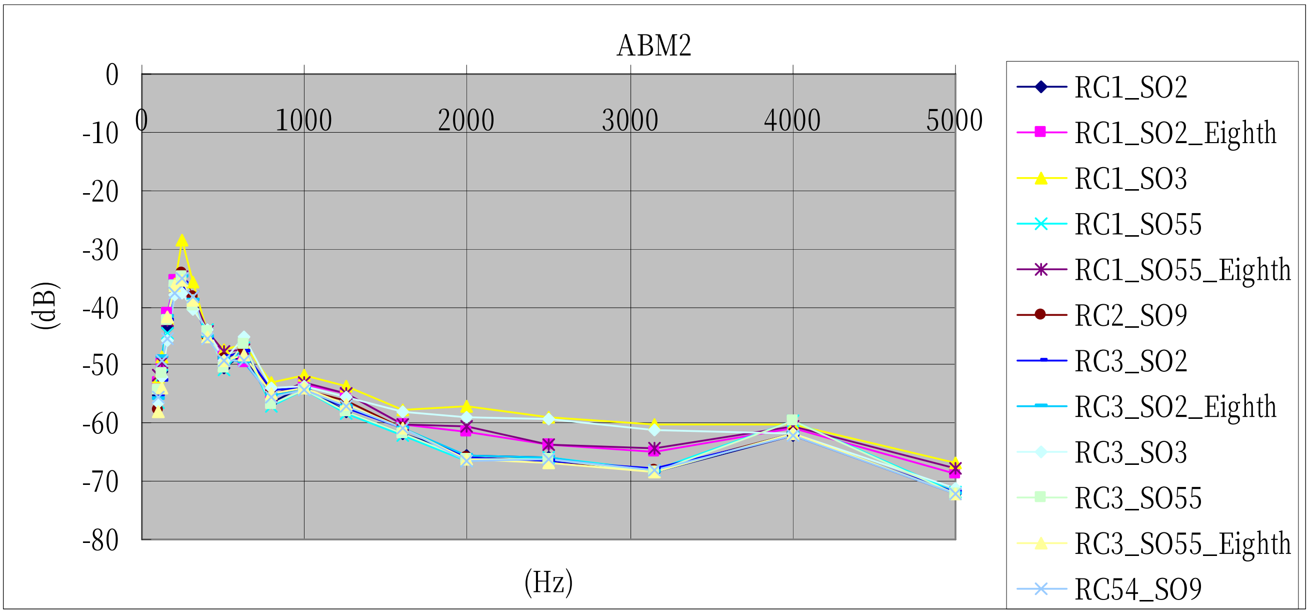



**Figure 5.8: Vocoder Analysis for ABM Noise**

## *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. Proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed.
2. DUT is positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.
3. The DUT operation for maximum rated RF output power was configured and confirmed with 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.
4. 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.
5. A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the test Arch.
6. Geometry and signal check.
7. Background noise check at the center of the earphone.
8. Coarse resolution scans (1kHz signal for 1 second measurement times at 50 x 50 mm grid area with 10 mm spacing). Only ABM1 is measured in order to find the location of T-Coil source.
9. Fine resolution scans (1kHz signal for 1 second measurement times 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 are measured in order to find the location of the SNR point.
10. Point measurement (1kHz signal for 1 second measurement times) for ABM1 and ABM2 in axial, radial transverse and radial longitudinal. The positioned appropriately based on optimal SNR of fine resolution scan. The SNR is calculated for axial, radial transverse and radial longitudinal orientation.
11. Point measurement (300Hz to 3kHz signal for 4 second measurement times) for frequency response in axial. The positioned appropriately based on optimal SNR of fine resolution axial scan.

# 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.

| 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) | Cellular | 1013 | (0, -10) | -42.68 | -41.97 | -4.45 | 0 | 37.5 |
| | | 384 | (-10, -8) | -44.1 | -42.28 | -10.5 | 0 | 31.7 |
| | | 777 | (0, -10) | -43 | -41.98 | -3.45 | 0 | 38.5 |
| | PCS | 25 | (0, -10) | -43.33 | -41.24 | -4.01 | 0 | 37.2 |
| | | 600 | (4, -6) | -43.97 | -40.92 | -13.2 | 0 | 27.7 |
| | | 1175 | (2, -10) | -42.19 | -42.54 | -3.34 | 0 | 39.2 |
| Radial 2 (Transversal) | Cellular | 1013 | (0, 0) | -46.27 | -41.73 | -3.06 | 0 | 38.7 |
| | | 384 | (-2, -14) | -44.89 | -44.03 | -12.6 | 0 | 31.4 |
| | | 777 | (0, 0) | -46.28 | -42.31 | -2.84 | 0 | 39.5 |
| | PCS | 25 | (-2, 0) | -47.02 | -43.47 | -2.23 | 0 | 41.2 |
| | | 600 | (-2, -12) | -45.21 | -45.39 | -10.7 | 0 | 34.7 |
| | | 1175 | (-2, -2) | -45.93 | -42.85 | -3.38 | 0 | 41.7 |
| Axial | Cellular | 1013 | (-6, -8) | -45.51 | -42.42 | 0.575 | 0 | 43 |
| | | 384 | (-2, -6) | -53.88 | -48.07 | -1.13 | 0 | 48 |
| | | 777 | (-6, -8) | -45.96 | -41.68 | 0.874 | 0 | 44.7 |
| | PCS | 25 | (-6, -8) | -46.7 | -42.98 | 1.41 | 0 | 44.6 |
| | | 600 | (-2, -6) | -54.94 | -45.55 | -2.84 | 0 | 45.7 |
| | | 1175 | (-4, -8) | -45.74 | -42.85 | 1.34 | 0 | 44.2 |

**Table 9.1: Test Result for Various Positions**

Remark :
1. The device was chosen to be tested in the worst case ABM2 condition under RC1/SO3.
2. The LCD backlight is turn on, Bluetooth function is turn off and volume is adjusted to maximum level during T-Coil testing.

*9.1.2 Frequency Response*

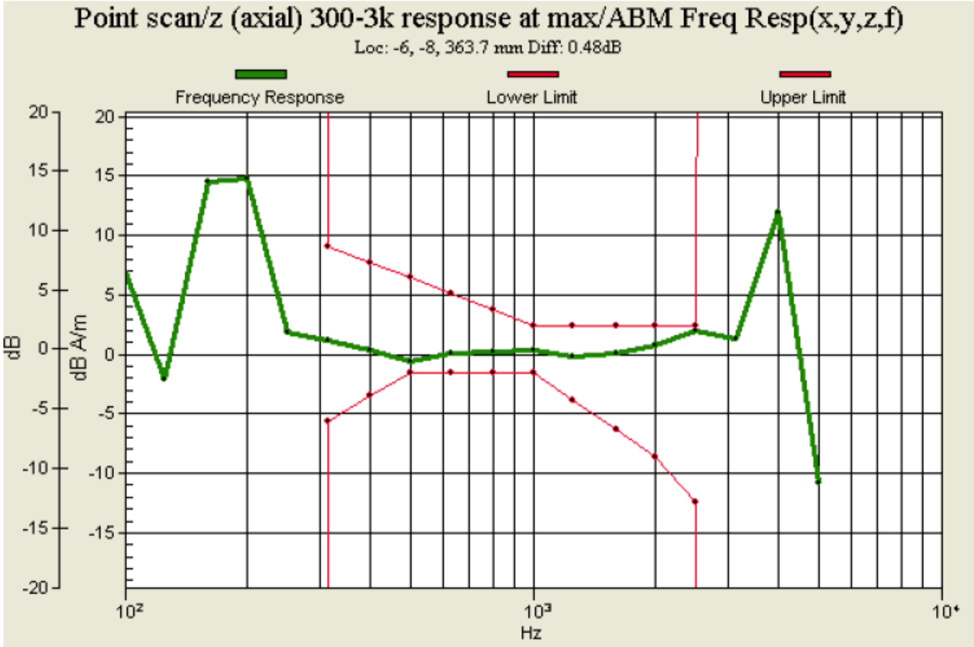



**Fig 9.1: Frequency Response of CDMA2000 Cellular for Ch1013**

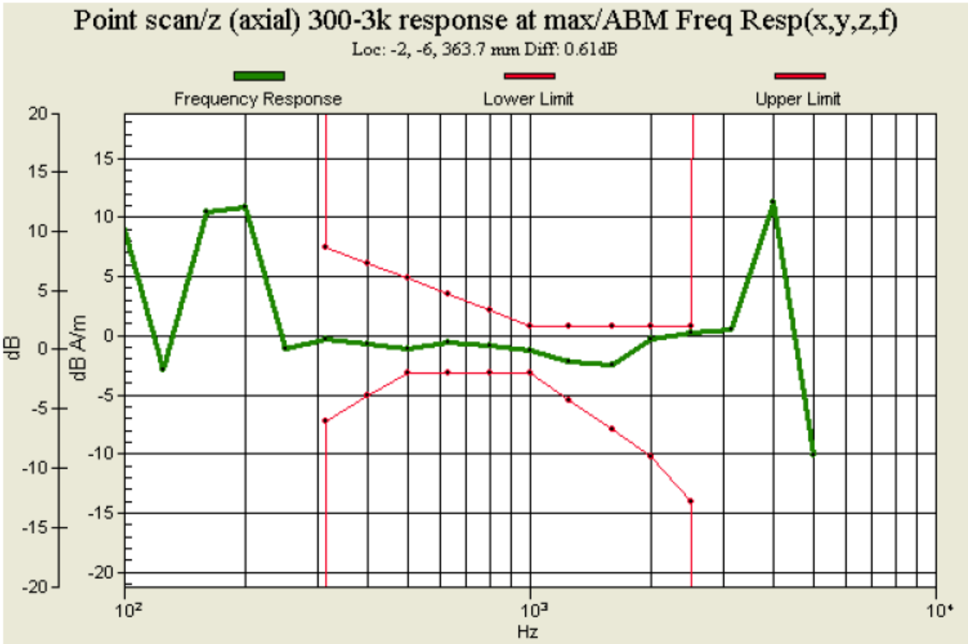



**Fig 9.1: Frequency Response of CDMA2000 Cellular for Ch384**

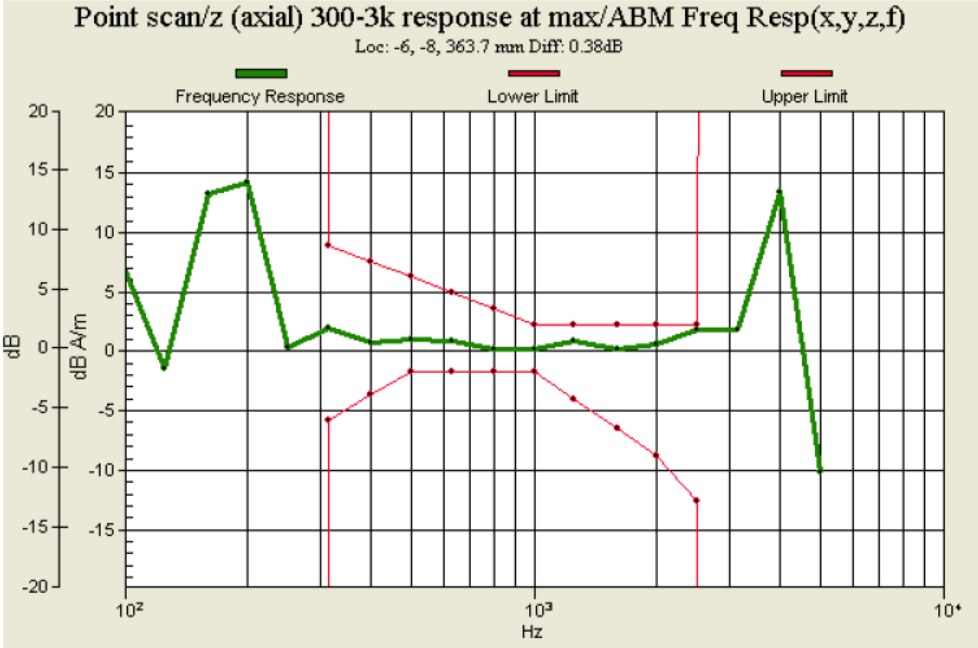



**Fig 9.1: Frequency Response of CDMA2000 Cellular for Ch777**

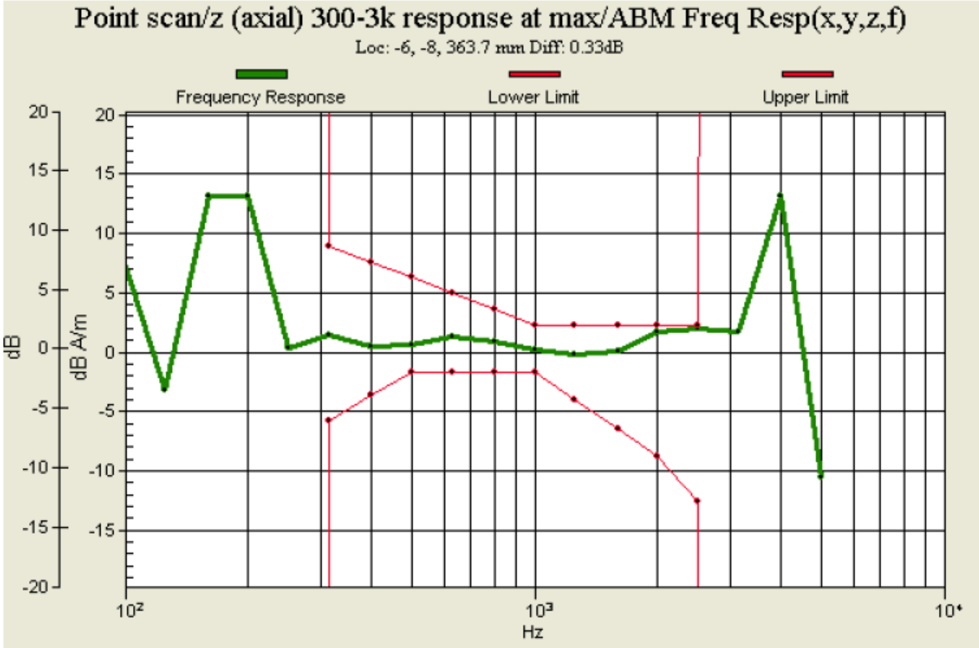



**Fig 9.3: Frequency Response of CDMA2000 PCS for Ch25**

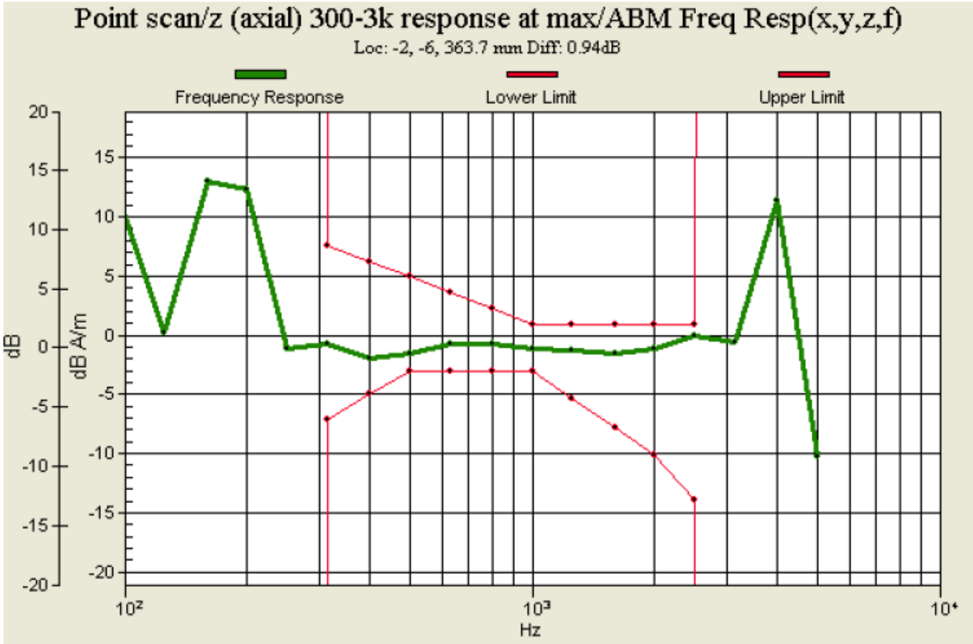



**Fig 9.3: Frequency Response of CDMA2000 PCS for Ch600**

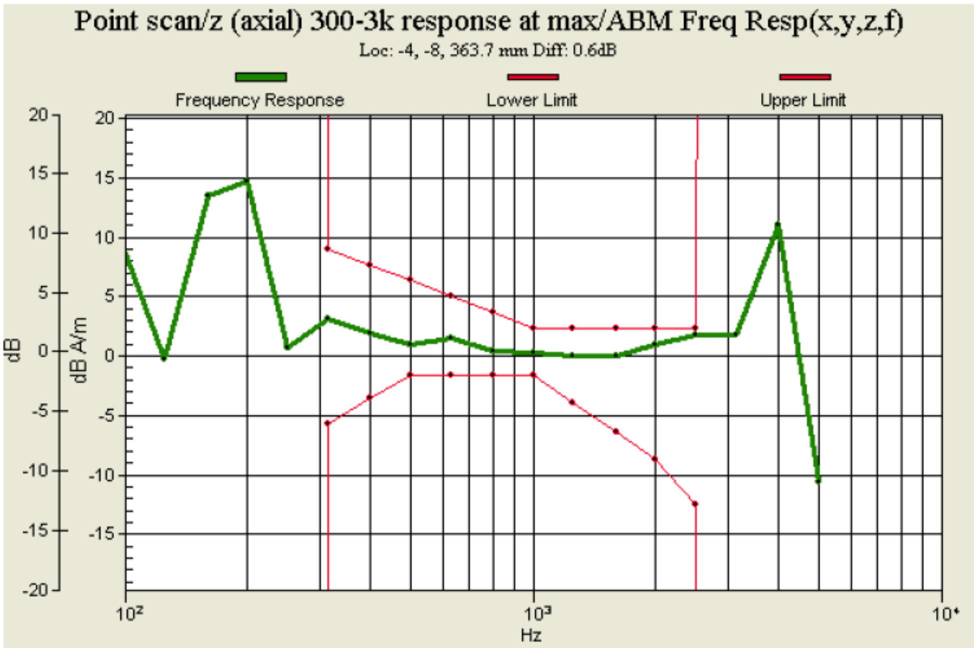



**Fig 9.3: Frequency Response of CDMA2000 PCS for Ch1175**

## 9.2 T-Coil Coupling Field Intensity

### 9.2.1 Axial Field Intensity

| Cell Phone Mode | Minimum limit (dB A/m) | Result (dB A/m) | Verdict |
|---|---|---|---|
| CDMA2000 Cellular | -13 | -1.13 | **Pass** |
| CDMA2000 PCS | -13 | -2.84 | **Pass** |

### 9.2.2 Radial Field Intensity

| Cell Phone Mode | Minimum limit (dB A/m) | Result (dB A/m) | Verdict |
|---|---|---|---|
| CDMA2000 Cellular | -18 | -12.6 | **Pass** |
| CDMA2000 PCS | -18 | -13.2 | **Pass** |

### 9.2.3 Frequency Response at Axial Measurement Point

| Cell Phone Mode | Verdict |
|---|---|
| CDMA2000 Cellular | **Pass** |
| CDMA2000 PCS | **Pass** |

### 9.2.4 Signal Quality

| Cell Phone Mode | Minimum limit (dB) | | | | Minimum Result (dB) | Verdict |
|---|---|---|---|---|---|---|
| | T1 | T2 | T3 | T4 | | |
| CDMA2000 Cellular | -20 | -10 | 0 | 10 | 31.4 | **T4** |
| CDMA2000 PCS | -20 | -10 | 0 | 10 | 27.7 | **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) $\kappa$ 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 DASY5 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-PC 63.19 D3.12, “American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids”, January 10, 2006
[2] DASY5 System Hand book.
[3] SAR Measurement Procedures for 3G Devices CDMA 2000/Ev-Do/WCDMA/HSDPA, June 2006 Laboratory Division Office of Engineering and Technology Federal Communications Commission
[4] 3.1.2.3.4 Maximum RF Output Power 3GPP2 C.S0033-0 Version 2.0, Date: 12 December 2003 Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Terminal
[5] May 9, 2006 Preliminary Guidance for Reviewing Applications for Certification of 3G Devices.

# Appendix A – HAC Measurement Data

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch1013_Radial 1**

**DUT: 810601**

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.229971 dB
Device Reference Point: 0, 0, 353.7 mm

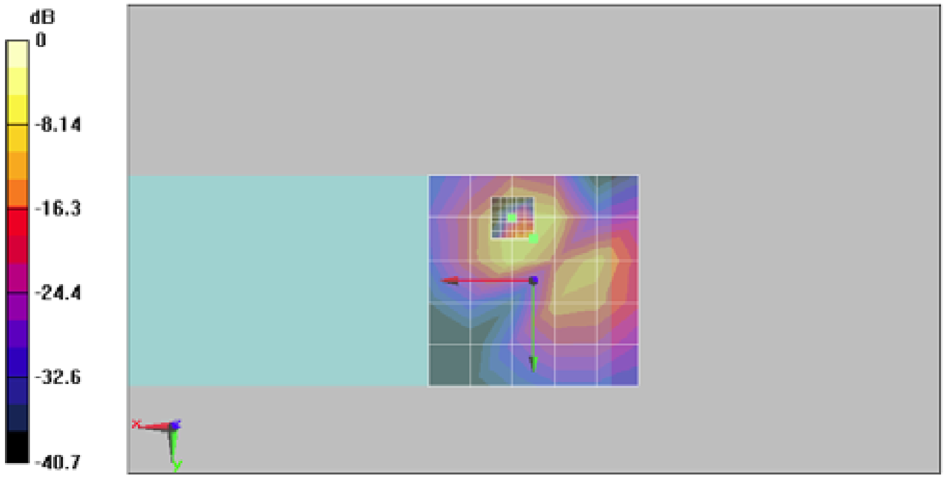
**Cursor:**
ABM1 comp = -7.58 dB A/m
BWC Factor = 0.229971 dB
Location: 5, -15, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.230986 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -3.89 dB A/m
BWC Factor = 0.230986 dB
Location: 0, -10, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.229971 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 37.5 dB
ABM1 comp = -4.45 dB A/m
BWC Factor = 0.229971 dB
Location: 0, -10, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch384_Radial 1**

**DUT: 810601**

Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 20.7 ℃

DASY5 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.177962 dB
Device Reference Point: 0, 0, 353.7 mm

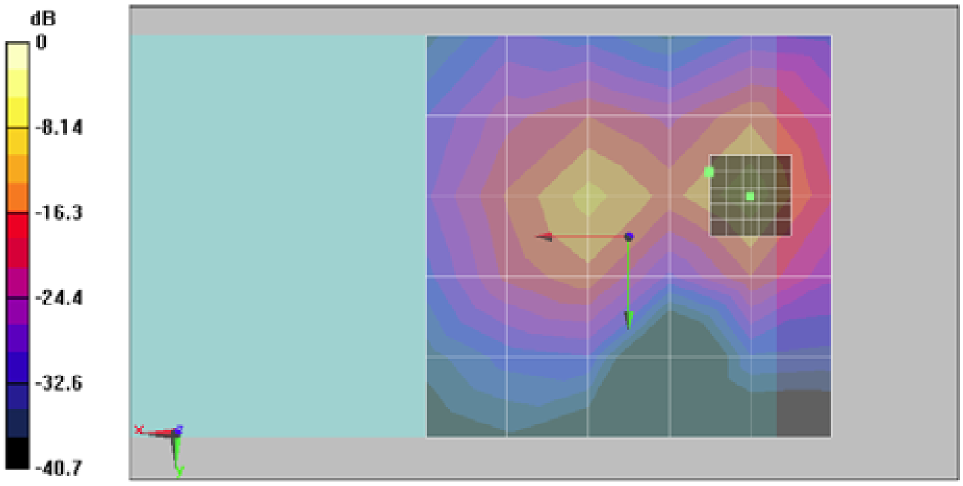
**Cursor:**
ABM1 comp = -11.2 dB A/m
BWC Factor = 0.177962 dB
Location: -15, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.199041 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -9.39 dB A/m
BWC Factor = 0.199041 dB
Location: -10, -8, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.199975 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 31.7 dB
ABM1 comp = -10.5 dB A/m
BWC Factor = 0.199975 dB
Location: -10, -8, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch777_Radial 1**

**DUT: 810601**

Communication System: CDMA ; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.5 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.223032 dB
Device Reference Point: 0, 0, 353.7 mm

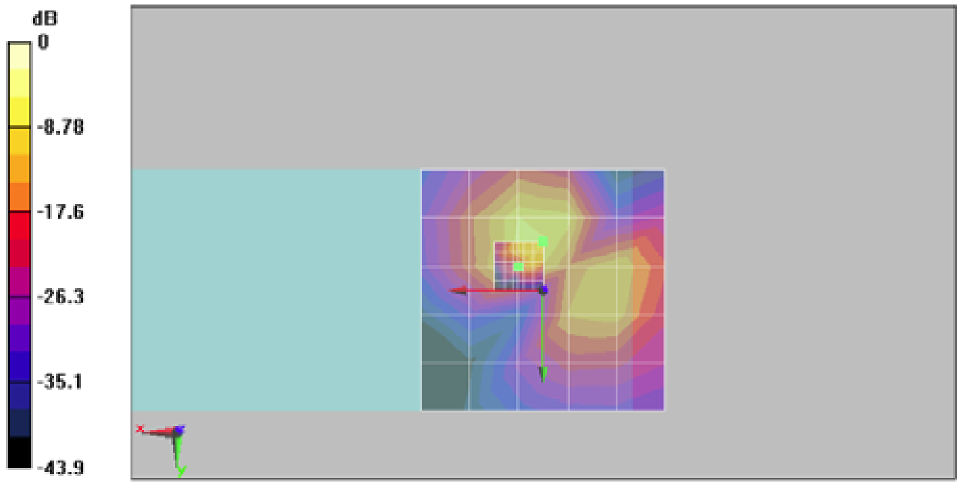
**Cursor:**
ABM1 comp = -6.8 dB A/m
BWC Factor = 0.223032 dB
Location: 5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.232001 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -3.81 dB A/m
BWC Factor = 0.232001 dB
Location: 0, -10, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.230986 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 38.5 dB
ABM1 comp = -3.45 dB A/m
BWC Factor = 0.230986 dB
Location: 0, -10, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch1013_Radial 2**

**DUT: 810601**

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.229971 dB
Device Reference Point: 0, 0, 353.7 mm

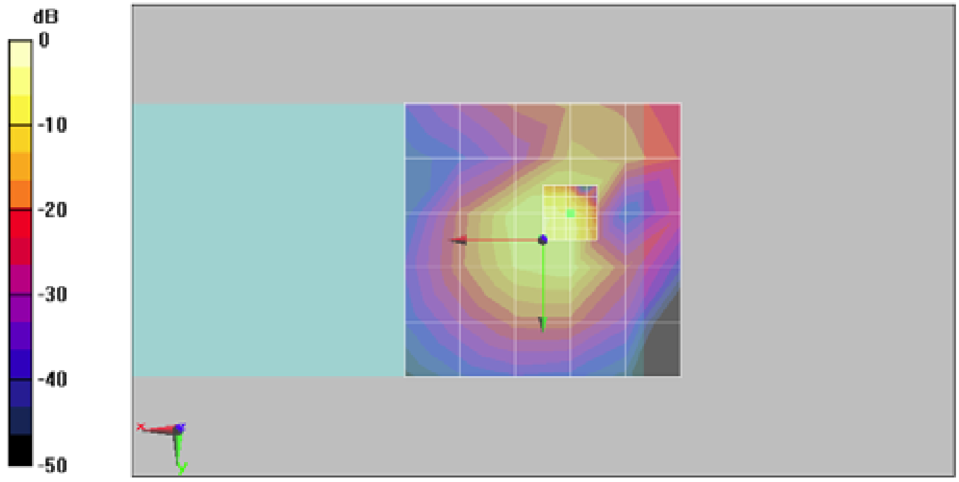
**Cursor:**
ABM1 comp = -6.52 dB A/m
BWC Factor = 0.229971 dB
Location: -5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.230986 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -1.66 dB A/m
BWC Factor = 0.230986 dB
Location: 0, 0, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.229971 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 38.7 dB
ABM1 comp = -3.06 dB A/m
BWC Factor = 0.229971 dB
Location: 0, 0, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab    Date: 2008/1/16

**T-Coil_Cellular Ch384_Radial 2**

**DUT: 810601**

Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature：20.7 ℃

DASY5 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.177962 dB
Device Reference Point: 0, 0, 353.7 mm

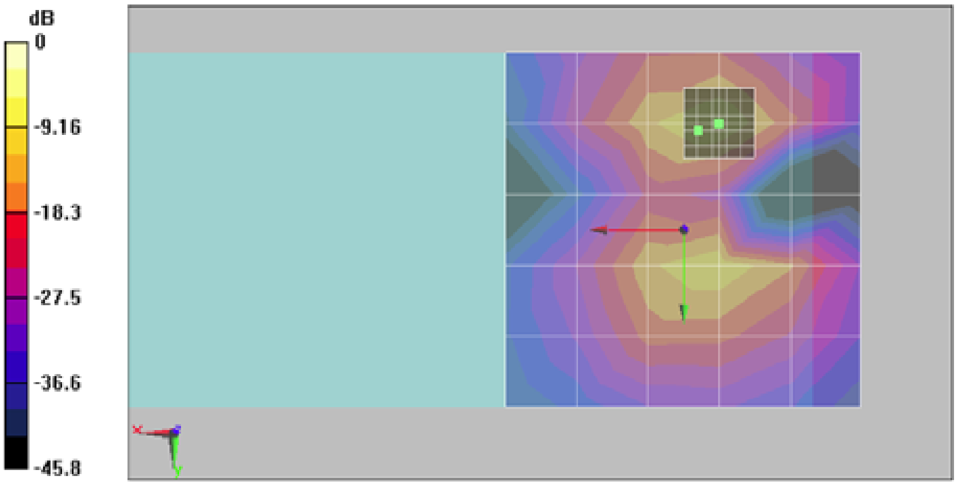
**Cursor:**
ABM1 comp = -11.5 dB A/m
BWC Factor = 0.177962 dB
Location: -5, -15, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.199041 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -9.18 dB A/m
BWC Factor = 0.199041 dB
Location: -2, -14, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.199975 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 31.4 dB
ABM1 comp = -12.6 dB A/m
BWC Factor = 0.199975 dB
Location: -2, -14, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch777_Radial 2**

**DUT: 810601**

Communication System: CDMA ; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.4 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.223032 dB
Device Reference Point: 0, 0, 353.7 mm

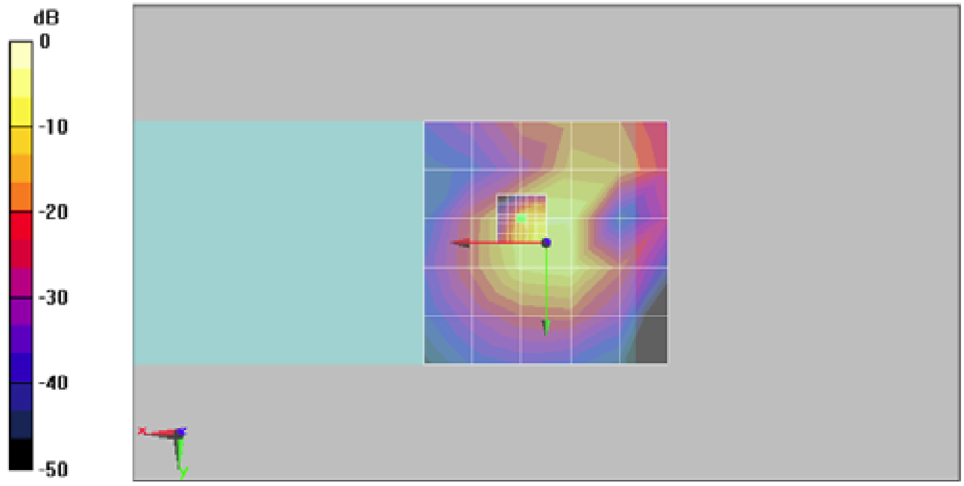
**Cursor:**
ABM1 comp = -5.94 dB A/m
BWC Factor = 0.223032 dB
Location: 5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.232001 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -1.74 dB A/m
BWC Factor = 0.232001 dB
Location: 0, 0, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.230986 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 39.5 dB
ABM1 comp = -2.84 dB A/m
BWC Factor = 0.230986 dB
Location: 0, 0, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch1013_Axial**

**DUT: 810601**

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.229971 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -1.14 dB A/m
BWC Factor = 0.229971 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.230986 dB
Device Reference Point: 0, 0, 353.7 mm

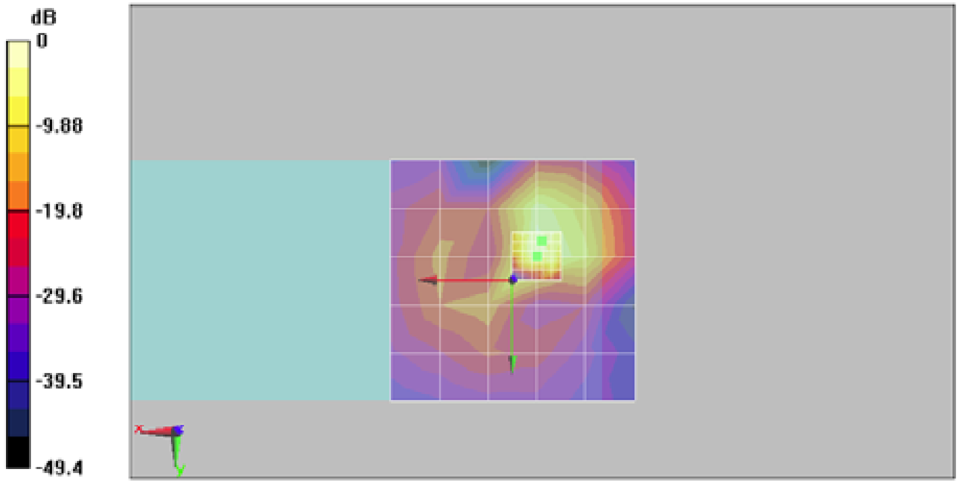
**Cursor:**
ABM1 comp = 1.04 dB A/m
BWC Factor = 0.230986 dB
Location: -6, -8, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.229971 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 43 dB
ABM1 comp = 0.575 dB A/m
BWC Factor = 0.229971 dB
Location: -6, -8, 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: 53.752
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.9 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
Diff = 0.479 dB
BWC Factor = 10.9 dB
Location: -6, -8, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch384_Axial**

**DUT: 810601**

Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 20.7 ℃

DASY5 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.177962 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -4.42 dB A/m
BWC Factor = 0.177962 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.199041 dB
Device Reference Point: 0, 0, 353.7 mm

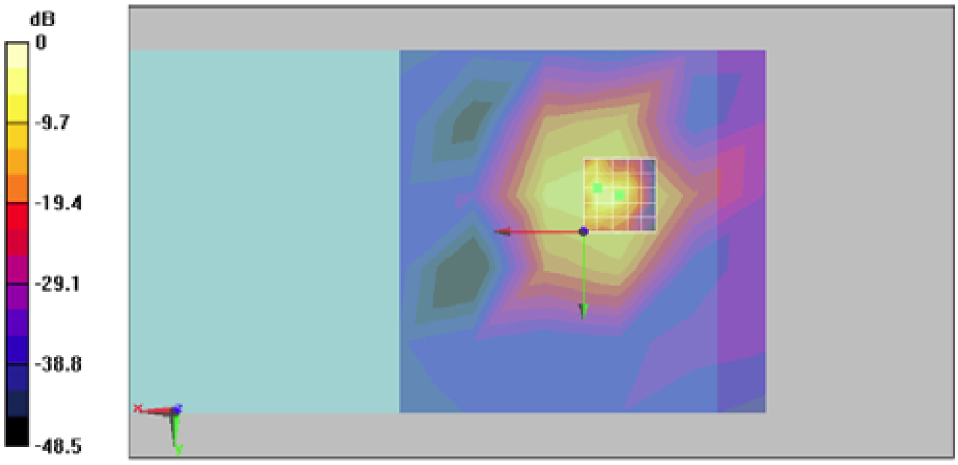
**Cursor:**
ABM1 comp = -0.486 dB A/m
BWC Factor = 0.199041 dB
Location: -2, -6, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.199975 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 48 dB
ABM1 comp = -1.13 dB A/m
BWC Factor = 0.199975 dB
Location: -2, -6, 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: 53.752
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.8 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
Diff = 0.613 dB
BWC Factor = 10.8 dB
Location: -2, -6, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_Cellular Ch777_Axial**

**DUT: 810601**

Communication System: CDMA ; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature：21.2 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.223032 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -0.581 dB A/m
BWC Factor = 0.223032 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.232001 dB
Device Reference Point: 0, 0, 353.7 mm

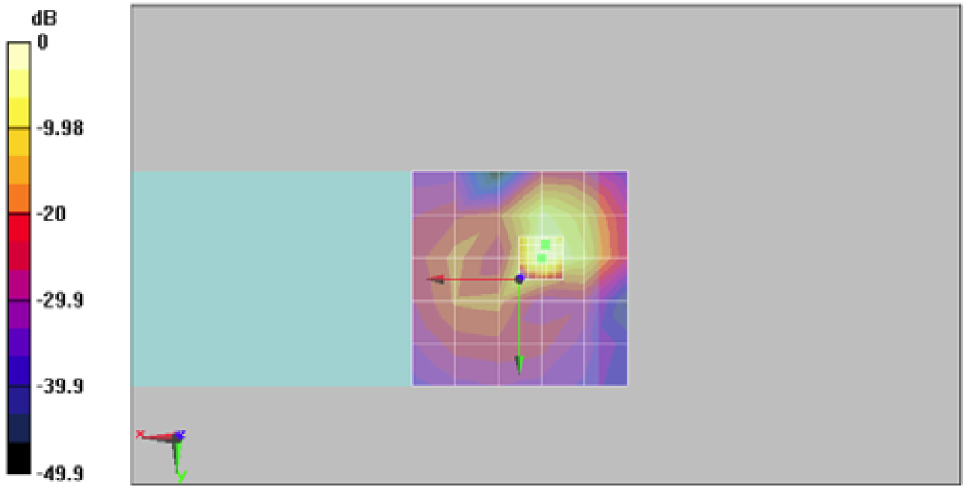
**Cursor:**
ABM1 comp = 0.443 dB A/m
BWC Factor = 0.232001 dB
Location: -6, -8, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.230986 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 44.7 dB
ABM1 comp = 0.874 dB A/m
BWC Factor = 0.230986 dB
Location: -6, -8, 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: 53.752
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.9 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
Diff = 0.385 dB
BWC Factor = 10.9 dB
Location: -6, -8, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch25_Radial 1**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.4 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.217019 dB
Device Reference Point: 0, 0, 353.7 mm

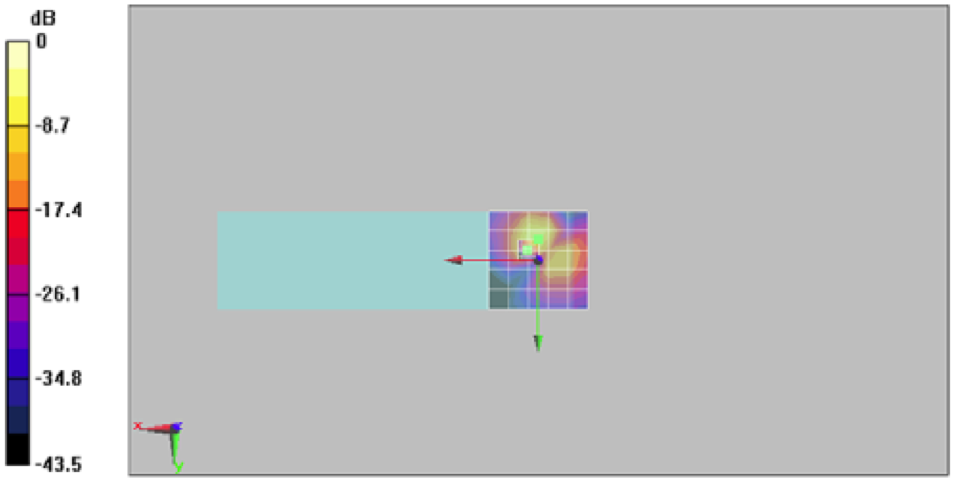
**Cursor:**
ABM1 comp = -6.77 dB A/m
BWC Factor = 0.217019 dB
Location: 5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.219984 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -3.8 dB A/m
BWC Factor = 0.219984 dB
Location: 0, -10, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.222016 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 37.2 dB
ABM1 comp = -4.01 dB A/m
BWC Factor = 0.222016 dB
Location: 0, -10, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

## T-Coil_PCS Ch600_Radial 1

**DUT: 810601**

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature：20.7 ℃

DASY5 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.144967 dB
Device Reference Point: 0, 0, 353.7 mm

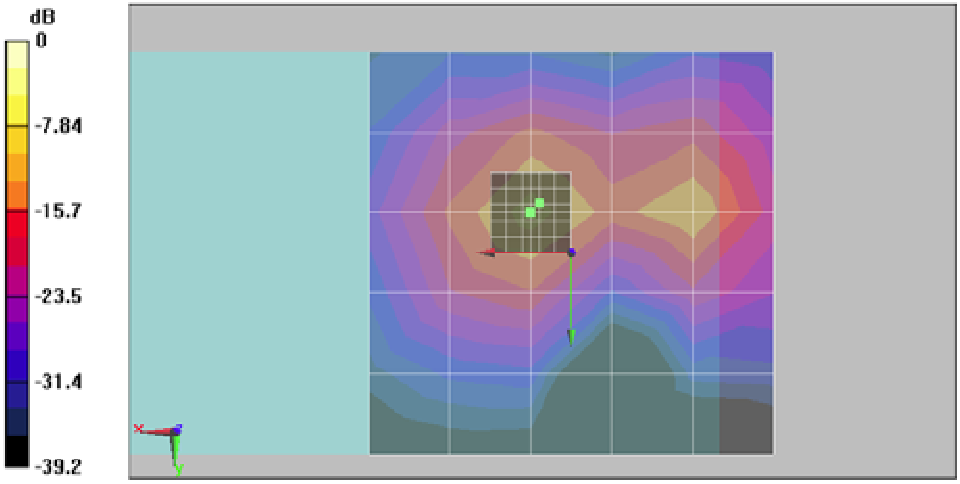
**Cursor:**
ABM1 comp = -11.5 dB A/m
BWC Factor = 0.144967 dB
Location: 5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.161011 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -10.4 dB A/m
BWC Factor = 0.161011 dB
Location: 4, -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
Signal Type: Audio File (.wav) 48k_voice_1kHz_1s.wav
Output Gain: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.172003 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 27.7 dB
ABM1 comp = -13.2 dB A/m
BWC Factor = 0.172003 dB
Location: 4, -6, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch1175_Radial 1**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.218036 dB
Device Reference Point: 0, 0, 353.7 mm

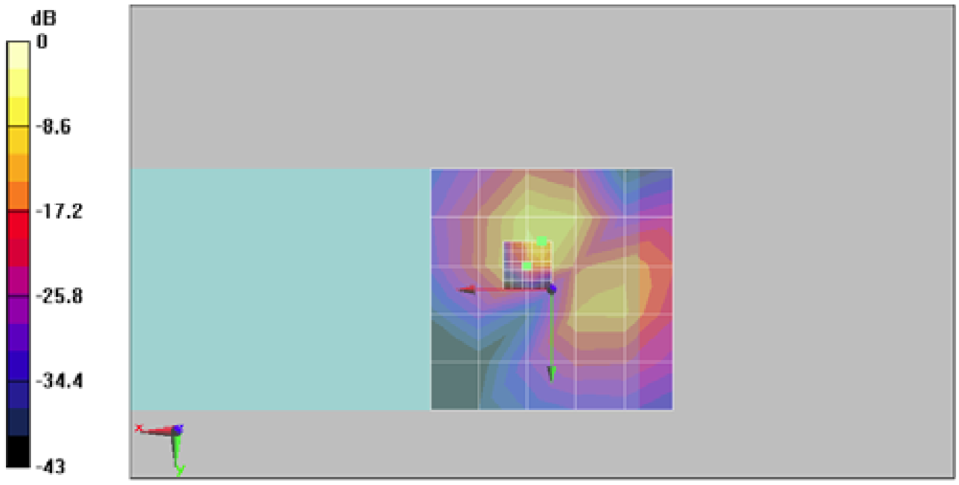
**Cursor:**
ABM1 comp = -7.58 dB A/m
BWC Factor = 0.218036 dB
Location: 5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.218036 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -3.82 dB A/m
BWC Factor = 0.218036 dB
Location: 2, -10, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.219984 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 39.2 dB
ABM1 comp = -3.34 dB A/m
BWC Factor = 0.219984 dB
Location: 2, -10, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch25_Radial 2**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.217019 dB
Device Reference Point: 0, 0, 353.7 mm

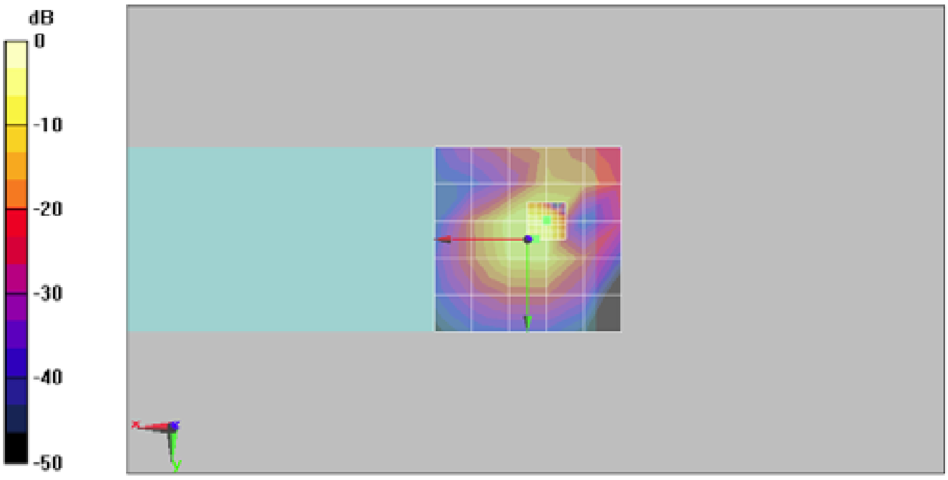
**Cursor:**
ABM1 comp = -6.06 dB A/m
BWC Factor = 0.217019 dB
Location: -5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.219984 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -2.05 dB A/m
BWC Factor = 0.219984 dB
Location: -2, 0, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.222016 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 41.2 dB
ABM1 comp = -2.23 dB A/m
BWC Factor = 0.222016 dB
Location: -2, 0, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch600_Radial 2**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature：20.7 ℃

DASY5 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.144967 dB
Device Reference Point: 0, 0, 353.7 mm

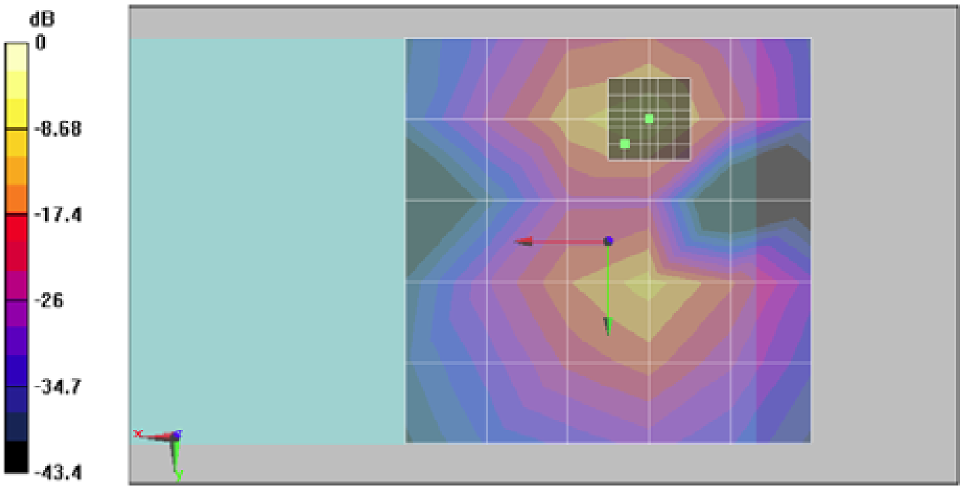
**Cursor:**
ABM1 comp = -11.4 dB A/m
BWC Factor = 0.144967 dB
Location: -5, -15, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.161011 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -9.35 dB A/m
BWC Factor = 0.161011 dB
Location: -2, -12, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.172003 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 34.7 dB
ABM1 comp = -10.7 dB A/m
BWC Factor = 0.172003 dB
Location: -2, -12, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch1175_Radial 2**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature：21.2 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.218036 dB
Device Reference Point: 0, 0, 353.7 mm

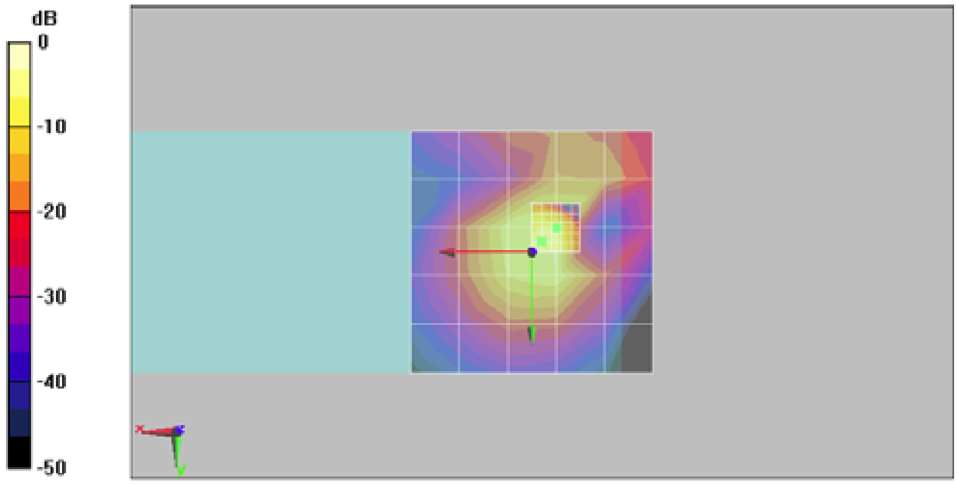
**Cursor:**
ABM1 comp = -5.78 dB A/m
BWC Factor = 0.218036 dB
Location: -5, -5, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.218036 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -1.7 dB A/m
BWC Factor = 0.218036 dB
Location: -2, -2, 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.219984 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 41.7 dB
ABM1 comp = -3.38 dB A/m
BWC Factor = 0.219984 dB
Location: -2, -2, 363.7 mm



0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch25_Axial**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.5 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.217019 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -0.579 dB A/m
BWC Factor = 0.217019 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.219984 dB
Device Reference Point: 0, 0, 353.7 mm

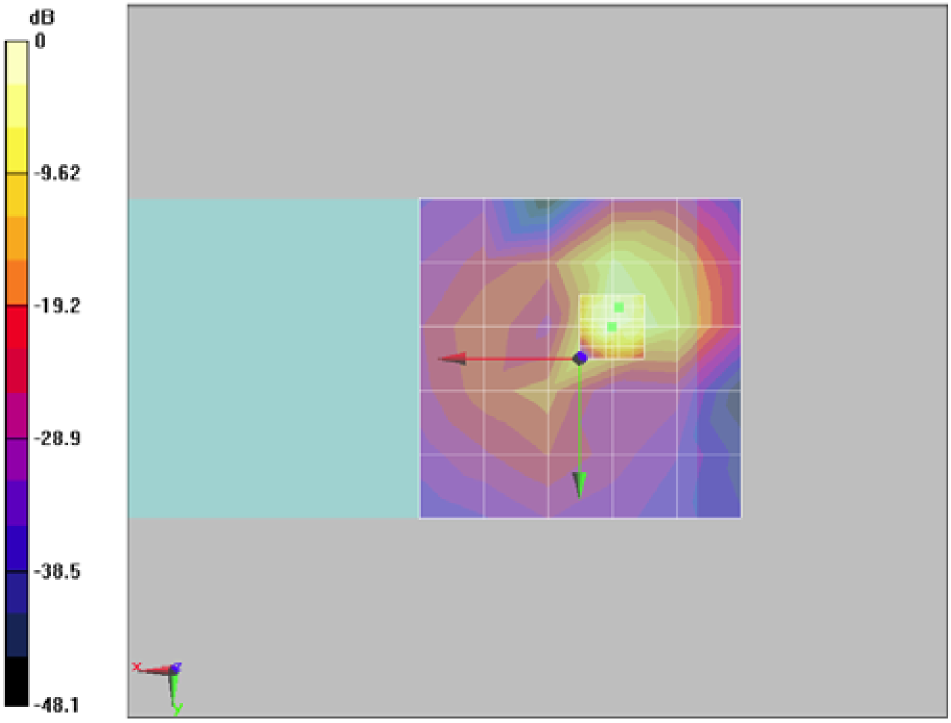
**Cursor:**
ABM1 comp = 1.64 dB A/m
BWC Factor = 0.219984 dB
Location: -6, -8, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.222016 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 44.6 dB
ABM1 comp = 1.41 dB A/m
BWC Factor = 0.222016 dB
Location: -6, -8, 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: 53.752
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.9 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
Diff = 0.326 dB
BWC Factor = 10.9 dB
Location: -6, -8, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch600_Axial**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 20.7 ℃

DASY5 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.144967 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -2.38 dB A/m
BWC Factor = 0.144967 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.161011 dB
Device Reference Point: 0, 0, 353.7 mm

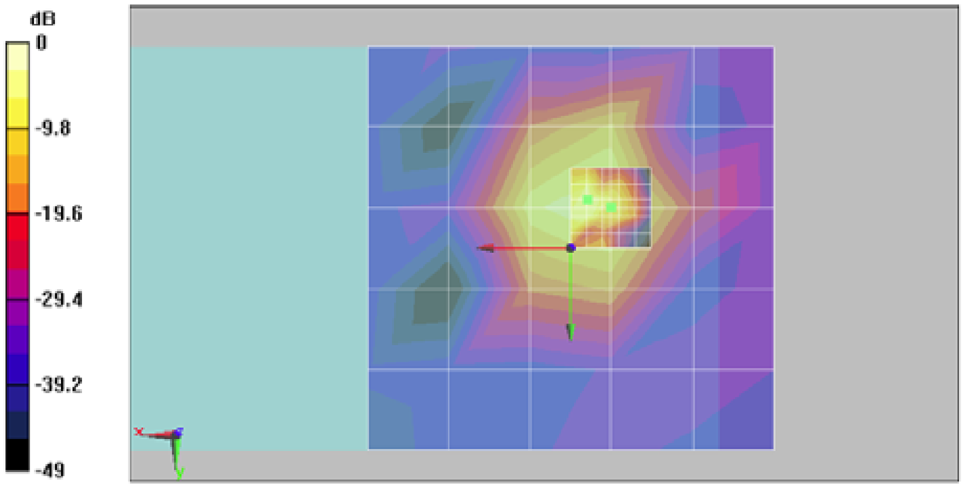
**Cursor:**
ABM1 comp = -0.568 dB A/m
BWC Factor = 0.161011 dB
Location: -2, -6, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.172003 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 45.7 dB
ABM1 comp = -2.84 dB A/m
BWC Factor = 0.172003 dB
Location: -2, -6, 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: 53.752
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.8 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
Diff = 0.936 dB
BWC Factor = 10.8 dB
Location: -2, -6, 363.7 mm




0 dB = 1A/m

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2008/1/16

**T-Coil_PCS Ch1175_Axial**

**DUT: 810601**

Communication System: CDMA ; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m$^3$
Ambient Temperature : 21.3 ℃

DASY4 Configuration:
- Probe: AM1DV2 - 1030; Calibrated: 2007/2/16
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn577; Calibrated: 2007/11/16
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA
- Measurement SW: DASY5, V5.0 Build 87; SEMCAD X Version 12.4 Build 52

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.218036 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1 comp = -0.034 dB A/m
BWC Factor = 0.218036 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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.218036 dB
Device Reference Point: 0, 0, 353.7 mm

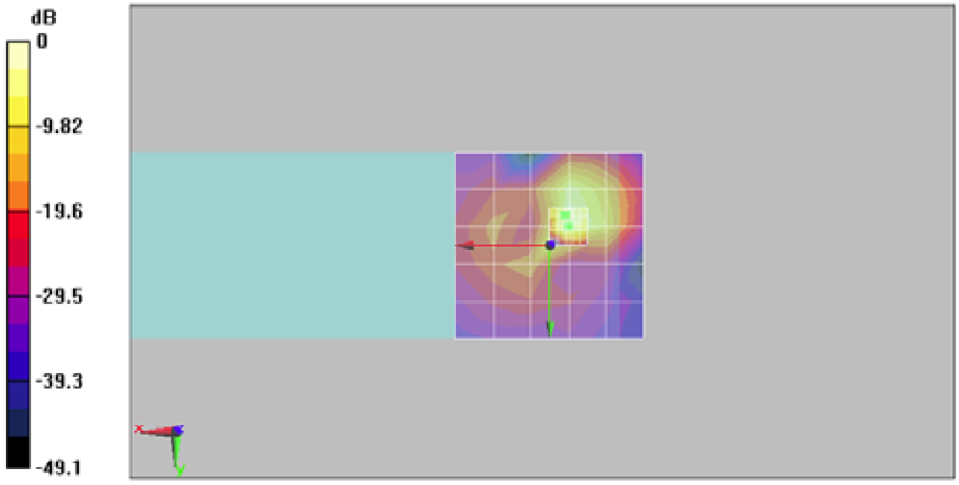
**Cursor:**
ABM1 comp = 0.495 dB A/m
BWC Factor = 0.218036 dB
Location: -4, -8, 363.7 mm

**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: 27.446
Measure Window Start: 0ms
Measure Window Length: 1000ms
BWC applied: 0.219984 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
ABM1/ABM2 = 44.2 dB
ABM1 comp = 1.34 dB A/m
BWC Factor = 0.219984 dB
Location: -4, -8, 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: 53.752
Measure Window Start: 2000ms
Measure Window Length: 2000ms
BWC applied: 10.9 dB
Device Reference Point: 0, 0, 353.7 mm

**Cursor:**
Diff = 0.605 dB
BWC Factor = 10.9 dB
Location: -4, -8, 363.7 mm



0 dB = 1A/m

# Appendix B – Calibration Data

Schmid & Partner Engineering AG

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info@speag.com, http://www.speag.com

**Client** Auden-Sporton

## Certificate of test and configuration

| | |
|---|---|
| Item | **AM1DV2** Audio Magnetic 1D Field Probe |
| Type No | SP AM1 001 AF |
| Series No | **1038** |
| Manufacturer / Origin | Schmid & Partner Engineering AG, Zürich, 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 and Sensor angle stated below.
The probe is fully RF shielded when operated with the matching signal cable (shielded) and allows measurement of audio magnetic fields in the close vicinity of RF emitting wireless devices according to [1] without additional shielding.

**Handling of the item**

The probe is manufactured from stainless steel. In order to maintain the performance and calibration of the probe, it must not be opened. The probe is designed for operation in air and shall not be exposed to humidity or liquids. For proper operation of the surface detection and emergency stop functions in the DASY4 system, the probe must be operated with the special probe cup provided (larger diameter).

**Functional test, configuration data and sensitivity**

The probe configuration data were evaluated after a functional test including noise level and RF immunity. Connector rotation, sensor angle and sensitivity are specific for this probe.

**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 | 38.6 | ° |
| Sensor angle | | 2.35 | ° |
| Sensitivity | at 1 kHz | 0.06551 | V / (A/m) |

**Standards**

[1] ANSI-C63.19-2006

**Test date** 18.01.2007

**Issue date** 30.01.2007

**Signature** F. Bomholt

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info@speag.com, http://www.speag.com

## Certificate of conformity

| | |
|---|---|
| Item | Audio Magnetic 1D Field Probe AM1DV2 |
| Type No | **SP AM1 001 A** |
| Series No | 1001 ff. |
| Manufacturer / Origin | Schmid & Partner Engineering AG Zurich, Switzerland |

**Description of the item**
The Audio Magnetic Field Probe AM1DV2 is a fully RF shielded magnetic field probe for the frequency range from 100 Hz to 20 kHz. The signal from the pickup coil is amplified in a symmetric 40dB low noise amplifier and fed to a 3 pin connector at the side. Power is supplied via the same and monitored via the LED near the connector. The single sensor in the probe is arranged in a tilt angle allowing measurement of 3 orthogonal field components by rotating the probe around its axis.

**Handling of the item**
The probe is manufactured and designed for operation in air and shall not be exposed to humidity or liquids. In order to keep the performance and alignment, the probe must not be disassembled. The full performance can only be achieved using the SPEAG provided accessories and following the corresponding manual.

**Tests**

| Test | Requirement | Details | Units tested |
|---|---|---|---|
| Sensor angle | Probe configuration data for alignment with field | see corresponding probe certificate | all |
| Dimensions | according to corresponding probe certificate | verified at delivery / light beam alignment prior to measurement usage | all / in setup by user |
| Frequency response | within +/- 0.5 dB of ideal differentiator from 100 Hz to 10 kHz | Coil current of AMCC measured with R&S UPL, probe including amplifier and AMMI ADC input | First article |
| Dynamic range | max. + 21 dB A/m @ 1 kHz<br>Noise level typ. -70 dB A/m @ 1 kHz<br>ABM2 typ. -60 dB A/m | with AMMI | Samples / all |
| Linearity | within < 0.1 dB from 5 dB below limitation to 16 dB above noise level | tested betwen +15 dB A/m @ 1 kHz, to -70 dB A/m @ 10 kHz | Samples |
| Sensitivity | typ. -24 dBV / A/m @ 1 kHz at probe output | verified at delivery / calibrated in setup prior to measurement usage | all / in setup by user |
| RF shielding | Immunity to AM modulated RF signal | 1 kHz 80 % AM | all |

**Standards**
[1] ANSI PC63.19-2006 Draft 3.12

**Conformity**
Based on the tests above, we certify that this item is in compliance with the requirements of [1].

| | | |
|---|---|---|
| **Date** | 22.5.2006 | s p e a g<br>Schmid & Partner Engineering AG<br>Zeughausstrasse 43, 8004 Zurich, Switzerland<br>Phone +41 1 245 9700, Fax +41 1 245 9779<br>info@speag.com, http://www.speag.com |
| **Stamp / Signature** | | |

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## Certificate of conformity

| | |
|---|---|
| Item | Audio Magnetic Calibration Coil AMCC |
| Type No | **SD HAC P02 A** |
| Series No | 1001 ff. |
| Manufacturer / Origin | Schmid & Partner Engineering AG Zurich, Switzerland |

**Description of the item**
The Audio Magnetic Calibration coil (AMCC) is a Helmholtz Coil designed according to standard [1], section D.9 for calibration of the AM1D probe. Two horizontal coils are positioned above a non-metallic base plate and generate a homogeneous magnetic field in the z direction (normal to it).

**Configuration**
The AMCC consists of two parallel coils of 20 turns with radius 143 mm connected in parallel in a distance of 143 mm. With this design, a current of 10 mA produces a field of 1 A/m.
The DC input resistance at the input BNC socket is adjusted by a series resistor to a DC resistance of approximately 50 Ohm. The voltage required to produce a field of 1 A/m is consequently approx. 500 mV.
To current through the coil is monitored via a shunt resistor of 10 Ohm +/- 1%. The voltage is available on a BNO socket with 100 mV corresponding to 1 A/m.

**Handling of the item**
The coil shall be positioned in a non-metallic environment to avoid distortion of the magnetic field.

**Tests**

| Test | Requirement | Details | Units tested |
|---|---|---|---|
| Number of turns | N = 20 per coil | Resistance measurment | all |
| Orientation of coils | parallel coils with same direction of windings | Magnetic field variation in the AMCC axis | all |
| Coil radius | r = 143 mm | mechanical dimension | First article |
| Coil distance | d = 143 mm distance between coil centers | mechanical dimension | First article |
| Input resistance | 51.7 +/- 2 Ohm | DC resistance at BNC input connector | all |
| Shunt resistance | R = 10.0 Ohm +/- 1 % | DC resistance at BNO output connector | all |
| Shunt sensitivity | Hc = 1 A/m per 100 mV according to formula Hc = (U / R) * N / r / (1.25^1.5) | Field measurement compared with Narda ELT400 + BN2300/90.10 | First article |

**Standards**

[1] ANSI PC63.19-2006 Draft 3.12

**Conformity**
Based on the tests above, we certify that this item is in compliance with the requirements of [1].

**Date** 22.5.2006

**Stamp / Signature**

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