



# A Test Lab Techno Corp.

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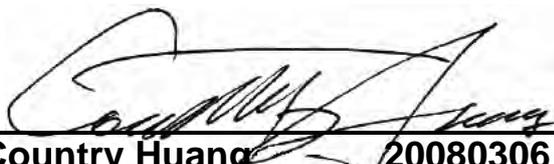
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## HAC T-Coil Test Report



<b>Test Report No.</b>	<b>: 0802FS19</b>
<b>Applicant</b>	<b>: Hewlett-Packard Company</b>
<b>Trade Name</b>	<b>: Hewlett-Packard</b>
<b>Model Name</b>	<b>: HSTNH-I18C</b>
<b>FCC ID</b>	<b>: B94HHI18C</b>
<b>EUT Type</b>	<b>: PDA Phone</b>
<b>Dates of Test</b>	<b>: Feb. 29, 2008</b>
<b>Test Environment</b>	<b>: Ambient Temperature : 22 ± 3 °C</b> <b>Relative Humidity : 40 - 70 %</b>
<b>Test Lab</b>	<b>: Changan Lab</b>
<b>HAC T-Coil Standard</b>	<b>: ANSI C63.19-2006</b>
<b>C63.19 T-Coil Rated Category</b>	<b>: T4 (Audio Band Magnetic)</b>
<b>Statement of Compliance</b>	<b>: FCC 47 CFR §20.19. The measurements were performed to ensure compliance to the ANSI C63.19-2006 standard. It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices.</b>

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
3. The measurement report has to be written approval of A Test Lab Techno Corp. It may only be reproduced or published in full.

  
**Country Huang** 20080306  
Testing Center Manager

  
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Testing Engineer



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## 1. Description of Equipment Under Test (EUT)

**Applicant :**

**Hewlett-Packard Company**  
**3000 Hanover Street, Palo Alto, California 94304, U.S.A.**

**Manufacturer** : Inventec Appliances Co., LTD.  
**Manufacturer Address** : No.37 Wugong 5th Rd. Wugu Shiong,  
Taipei, Taiwan  
**EUT Type** : PDA Phone  
**Trade Name** : Hewlett-Packard  
**Model Name** : HSTNH-I18C  
**FCC ID** : B94HHI18C  
**Hardware Version** : EVT3.2  
**Software Version** : E2-0.33.00  
**Antenna type** : Internal Type  
**EUT Type** : Production Unit

## 2. Description of the Test Procedure

### 2.1 Test Arch and Device Holder

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

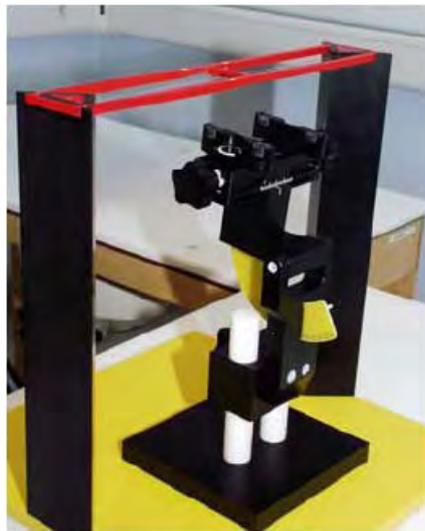


Figure 1. WD Holder

### 2.2 Test Positions

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



Figure 2. Photo of a typical device positioned under Test Arch and coordinate system



## **2.3 T-coil Scan Procedures**

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

## **2.4 Measurement procedure and used test signals**

During measurements signal is fed to WD via communication tester. Proper gain setting is used in software to ensure correct signal level fed to communication tester speech input.

Measurement software compares fed signal and signal from measurement probe and applies proper filtering and integration procedures.

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

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

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

## **2.5 T-coil Requirements and Category Limits**

### **RF Emissions**

The radial components of the magnetic field shall be  $\geq -18\text{dB}$  (A/m) at 1 kHz, in 1/3 octave band filter for all orientations.



### Frequency Response

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

Frequency response is between 300 Hz and 3000 Hz.

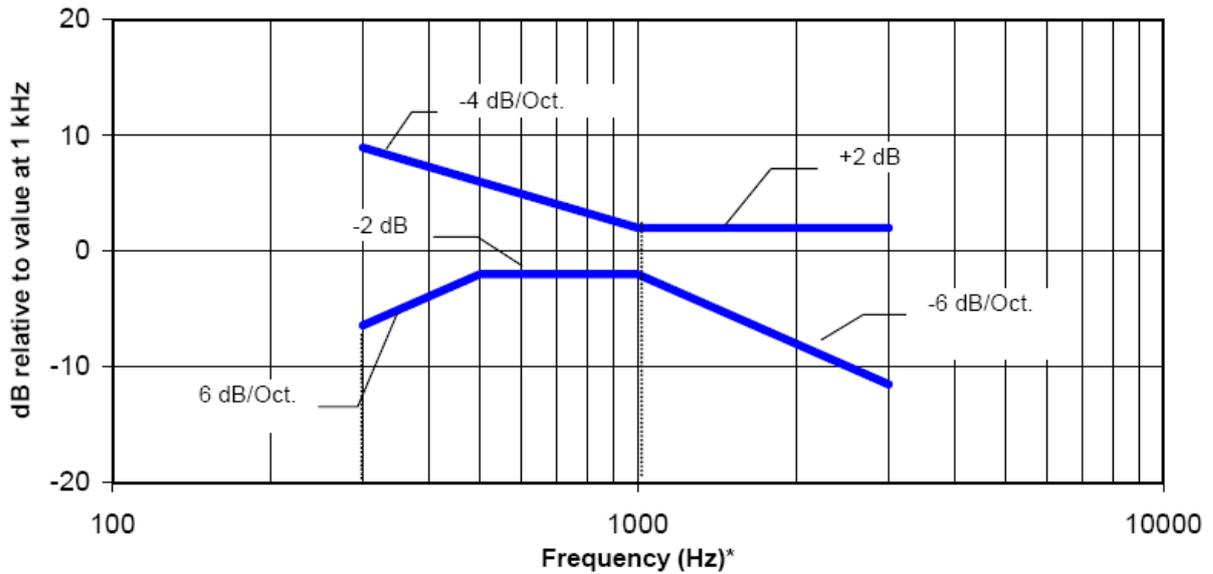


Figure 3. Magnetic field frequency response for WDs with a field  $\leq -15$  dB (A/m) at 1 kHz

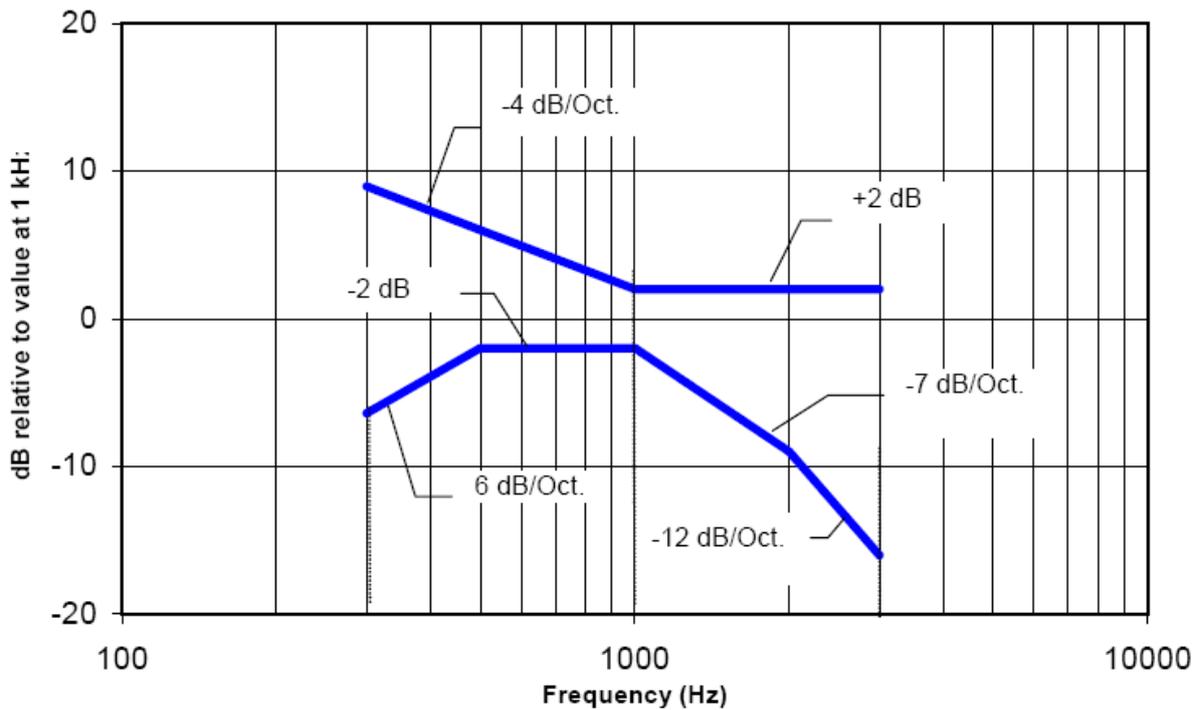


Figure 4. Magnetic field frequency response for WDs with a field that exceeds  $-15$  dB(A/m) at 1 kHz



### Signal Quality

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

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

**Table 1. T-Coil signal quality categories**

## 2.6 Measurement Uncertainty

Measurement uncertainty budget presented in Appendix B.

### 3. Description of The Test Equipment

#### 3.1 Measurement system and components

The measurements were performed using an automated near-field scanning system, DASY5 software version 5.0, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland.

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

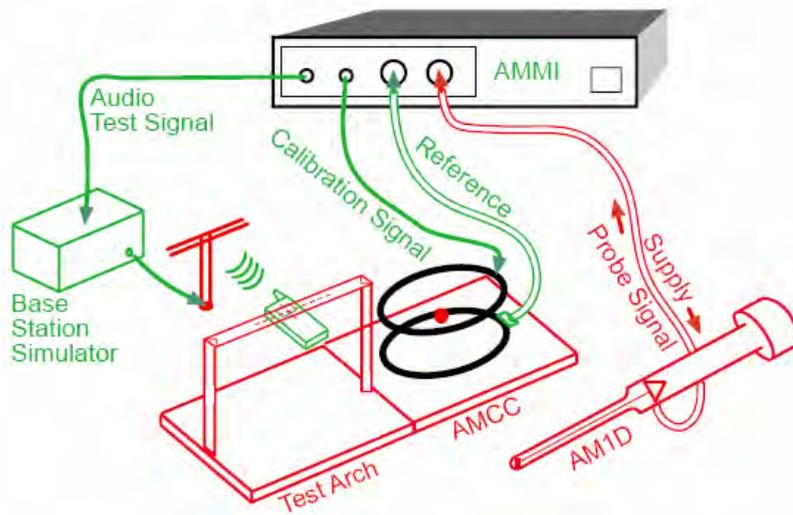


Figure 5. T-Coil Measurement system



The following table lists calibration dates of measurement equipment :

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Data Acquisition Electronics	DAE4	779	Nov. 30, 2007	Nov. 30, 2008
SPEAG	Audio Magnetic 1D Field Probe AM1DV2	SP AM1 001 AF	1017	May. 23, 2007	May. 23, 2008
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	AMCC	SD HAC P02 AB	1011	NCR	NCR
SPEAG	AMMI	SE UMS 010AA	1001	NCR	NCR
SPEAG	Software	DASY5 V5.0 Build 91	N/A	NCR	NCR
SPEAG	Software	SEMCAD X V12.4 Build 52	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 011 AA	1025	NCR	NCR
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	112387	Apr. 02, 2007	Apr. 02, 2008
Brüel & Kjær	Frequency Analyzer	2144	2102727	Mar. 04, 2007	Mar. 04, 2008

**Table 2. Equipment List**



### 3.1.1 Audio Magnetic Probe AM1DV2

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

### 3.1.2 Audio Magnetic Measurement Instrument AMMI

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

### 3.1.3 Audio Magnetic Calibration Coil AMCC

<b>Dimensions</b>	370 x 370 x 196 mm (ANSI-C63.19 compliant)
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### 3.1.4 WD position

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

The SPEAG device holder (see Section 2.1) was used to position the test device in all tests.

### 3.1.5 Verification of the System

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



## 4. Test Conditions

### 4.1 Temperature and Humidity

Ambient temperature (°C):	19 to 25
Ambient humidity (RH %):	40 to 70

Table 3. Temperature and Humidity

### 4.2 WD Control

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

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

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

### 4.3 WD Parameters

HAC mode was switched on from the WD user interface, volume setting was 1/10 and microphone was muted.

### 4.4 Audio Band Magnetic

The purpose of the HAC T-Coil Extension is to add the capability of Audio Band Magnetic (ABM) measurements according to standard ANSI-C63.19 [1]. Together with the HAC RF extension, it allows complete characterization of the emissions of a wireless device (WD). The signals measured during these tests represent the field picked up by the T-Coil of a hearing aid. This application note describes the measurements required for the Wireless device T-Coil signal test that is described in ANSI-C63.19



## 4.5 System Specifications

### Active Audio Magnetic Field Probe (AM1DV2) Description

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 angle of sensor when mounted on the DAE. The probe supports mechanical detection of the surface. The single sensor in the probe is arranged in a tilt angle allowing measurement of 3 orthogonal field components when rotating the probe by 120 ° Around its axis. It is aligned with the perpendicular component of the field, if the probe axis is tilted 35.3 above the measurement plane, using the connector rotation below.



**Figure 6.**  
**Audio Magnetic Field Probe**

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.



## 5. Summary of HAC T-Coil Signal Test Report

### 5.1 Summary of T-Coil Test Results

#### 5.1.1 Results

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

Axial measurement location was defined by the manufacturer of the device.

#### GSM

Mode	Radial 1 (longitudinal)		Radial 2 (transversal)		Axial	
	GSM 850	PCS 1900	GSM 850	PCS 1900	GSM 850	PCS 1900
Measurement position (x,y) [mm]	-6,6	-6,0	2,-6	2,-6	2,2	2,0
Signal strength [dB A/m]	1.19	-0.349	2.87	3.08	11.9	11.8
Ambient back round noise ABM [dB A/m]	-56.97	-57.75	-47.75	-48.4	-54.17	-54.44
ABM2 [dB A/m]	-34.57	-43.7	-38.59	-43.05	-32.55	-35.44
Signal quality [dB]	35.8	43.3	41.5	46.1	44.4	47.3

#### WCDMA

Mode	Radial 1 (longitudinal)		Radial 2 (transversal)		Axial	
	Band V	Band II	Band V	Band II	Band V	Band II
Measurement position (x,y) [mm]	-8, 4	-6, 6	2, -6	2, -6	2, 0	2, 2
Signal strength [dB A/m]	1.22	1.29	3.08	3.08	11.9	11.9
Ambient back round noise ABM [dB A/m]	-57.11	-57.85	-48.78	-47.61	-53.85	-53.3
ABM2 [dB A/m]	-48.34	-48.26	-45.49	-45	-38.19	-38.23
Signal quality [dB]	49.6	49.5	48.6	48.1	50.1	50.2

Table 4. Test Results

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



Frequency Responses:

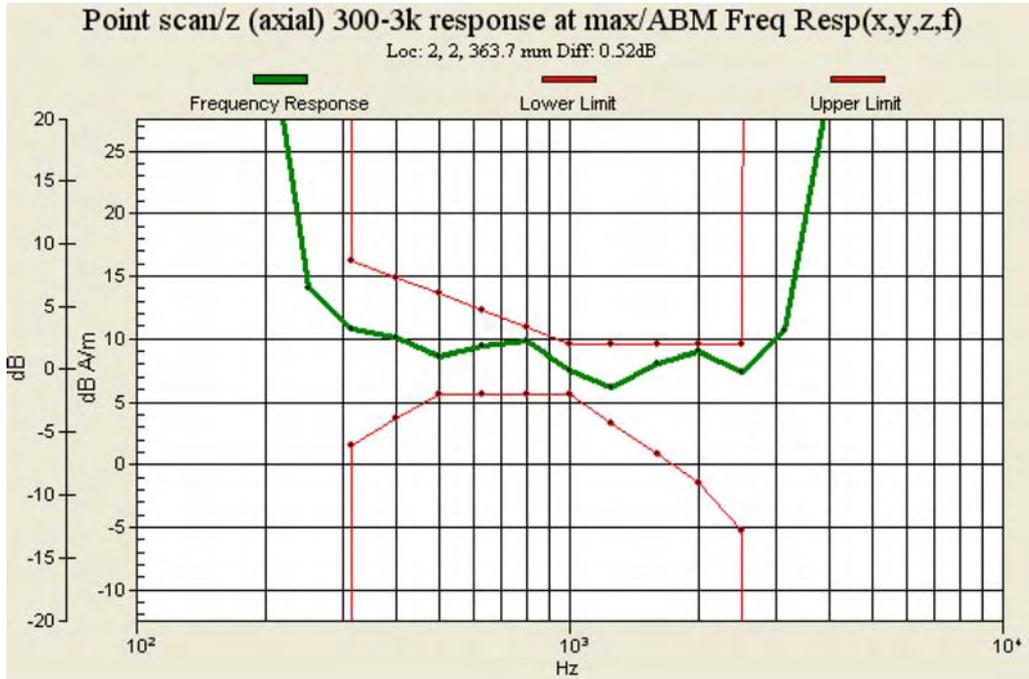


Figure 7. Frequency Response in GSM 850

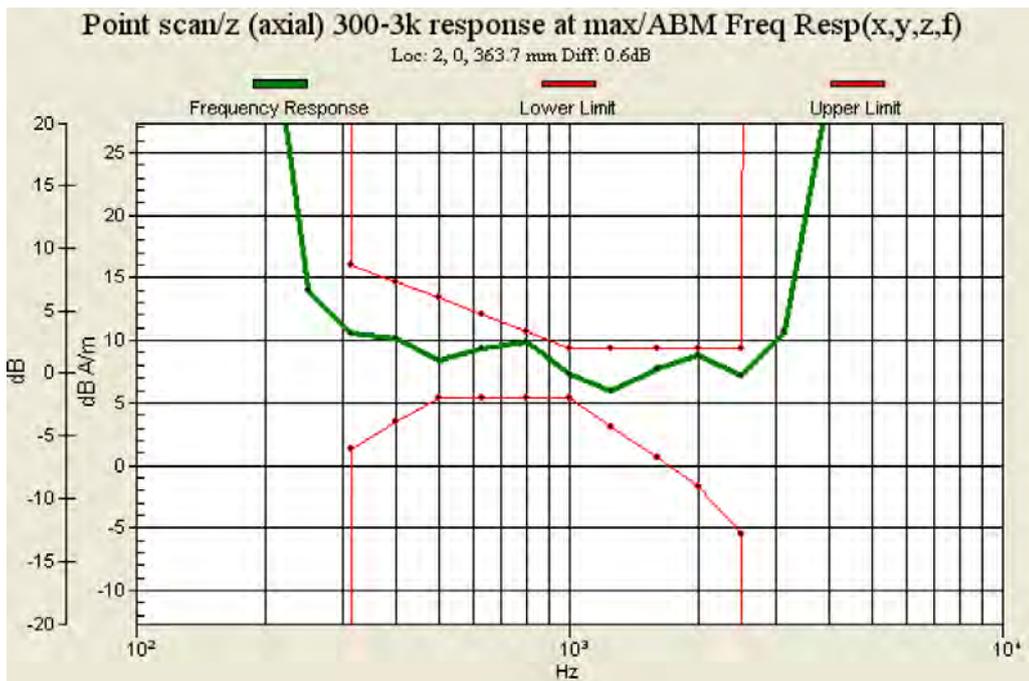


Figure 8. Frequency Response in PCS 1900

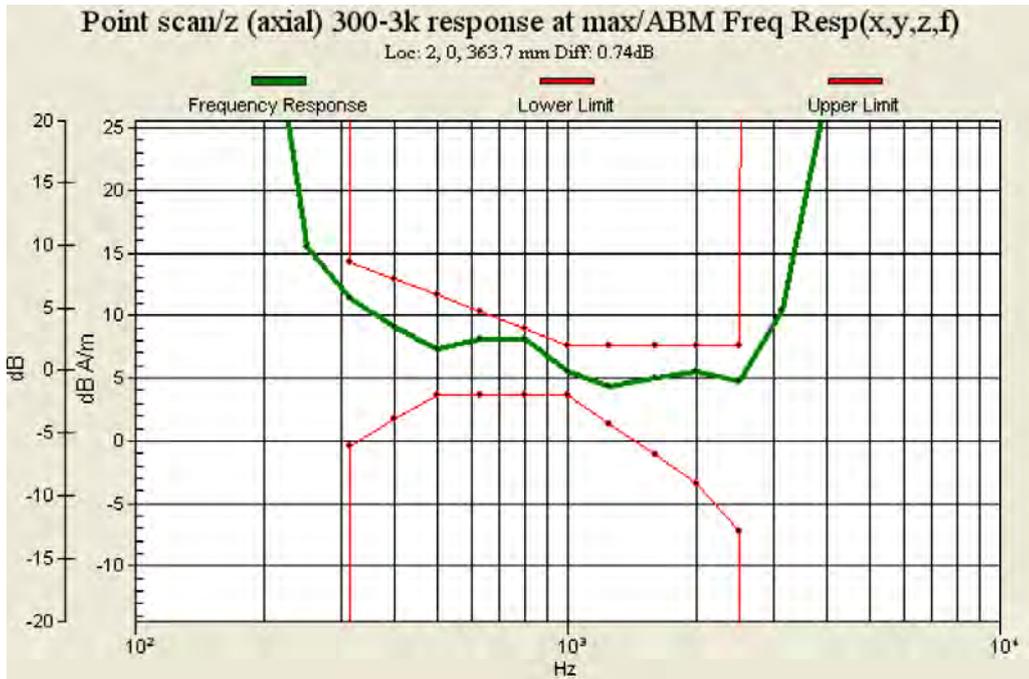


Figure 9. Frequency Response in WCDMA Band V

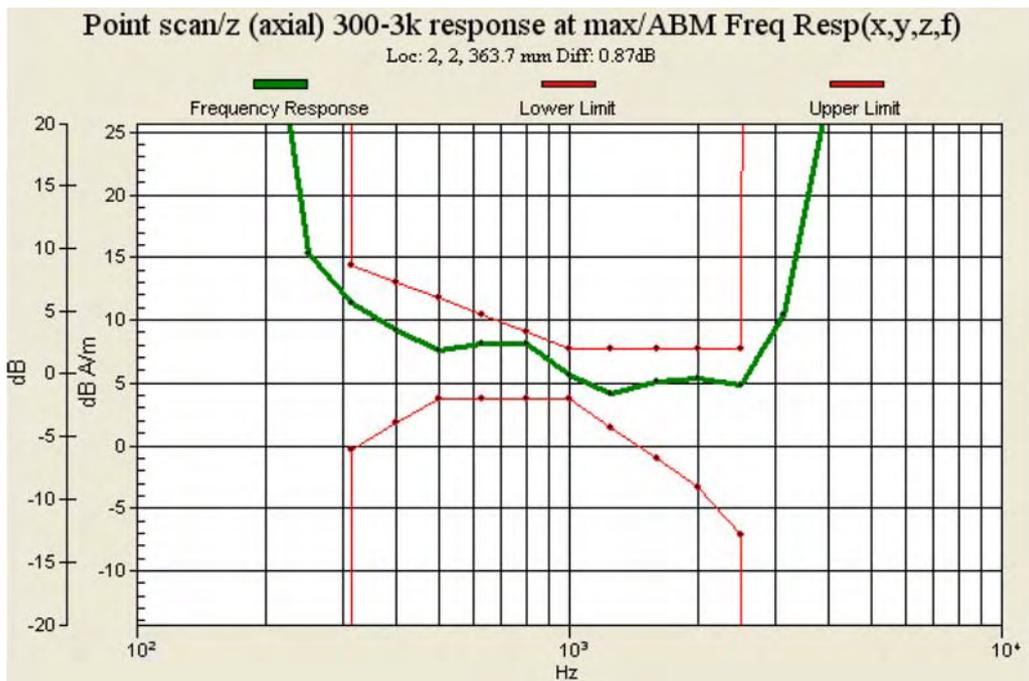


Figure 10. Frequency Response in WCDMA Band II



## 5.1.2 T-Coil Coupling Field Intensity

### 5.1.2.1 Axial Field Intensity

Cell Phone Mode	Minimum limit [dB (A/m)]	Result [dB (A/m)]	Verdict
GSM 850	-18	11.9	Pass
PCS 1900	-18	11.8	Pass
WCDMA Band V	-18	11.9	Pass
WCDMA Band II	-18	11.9	Pass

### 5.1.2.2 Radial Field Intensity

Cell Phone Mode	Minimum limit [dB (A/m)]	Result [dB (A/m)]	Verdict
GSM 850	-18	1.190	Pass
PCS 1900	-18	-0.349	Pass
WCDMA Band V	-18	1.220	Pass
WCDMA Band II	-18	1.290	Pass

## 5.1.3 Frequency Response at Axial Measurement Point

Cell Phone Mode	Verdict
GSM 850	Pass
PCS 1900	Pass
WCDMA Band V	Pass
WCDMA Band II	Pass



### 5.1.4 Signal Quality

Cell Phone Mode	Minimum Limit [dB]				Minimum Result [dB]	Category
	T1	T2	T3	T4		
GSM 850	0 to 10	10 to 20	20 to 30	>30	35.8	T4
PCS 1900	0 to 10	10 to 20	20 to 30	>30	43.3	T4
WCDMA Band V	0 to 10	10 to 20	20 to 30	>30	48.6	T4
WCDMA Band II	0 to 10	10 to 20	20 to 30	>30	48.1	T4

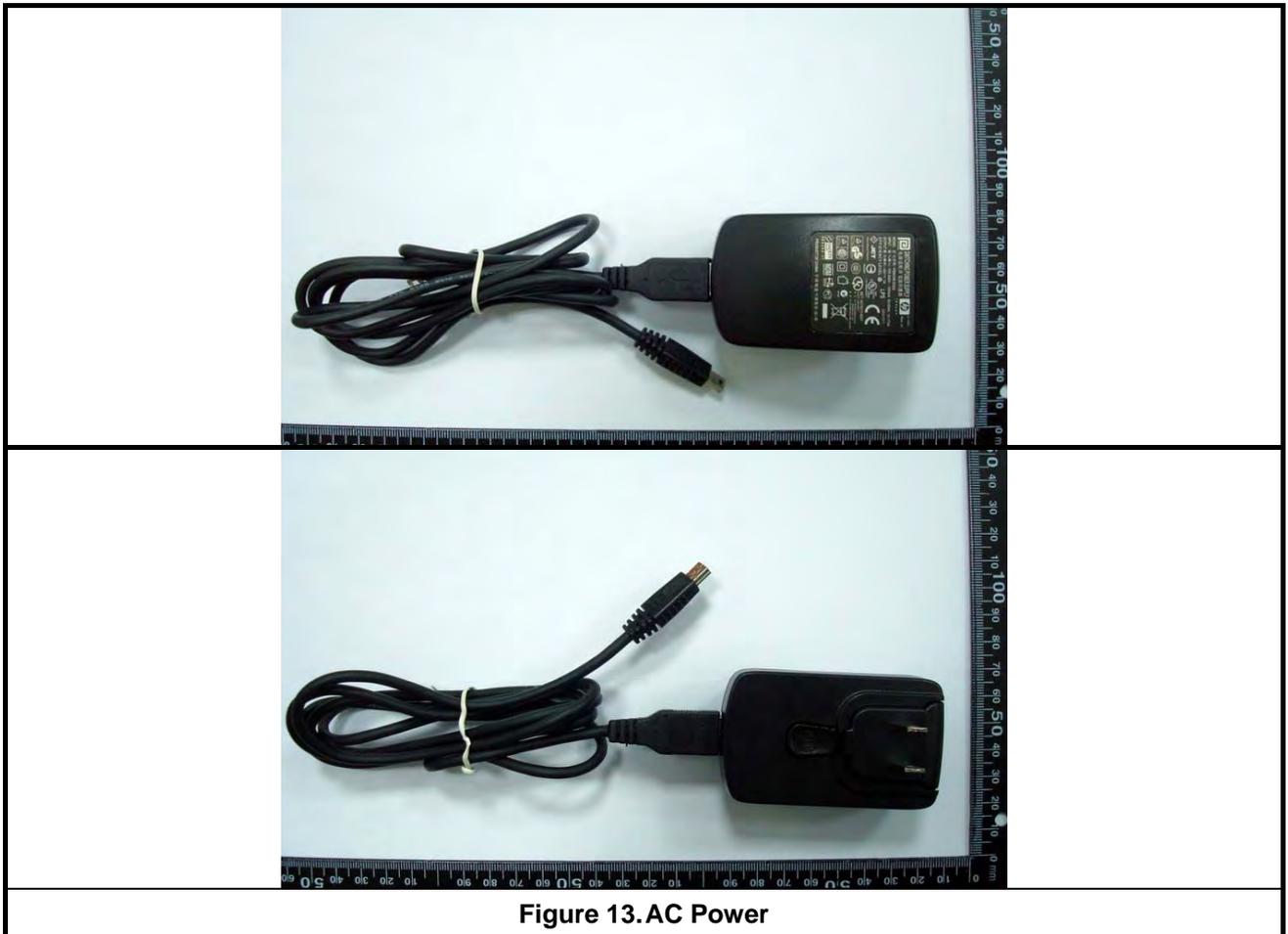
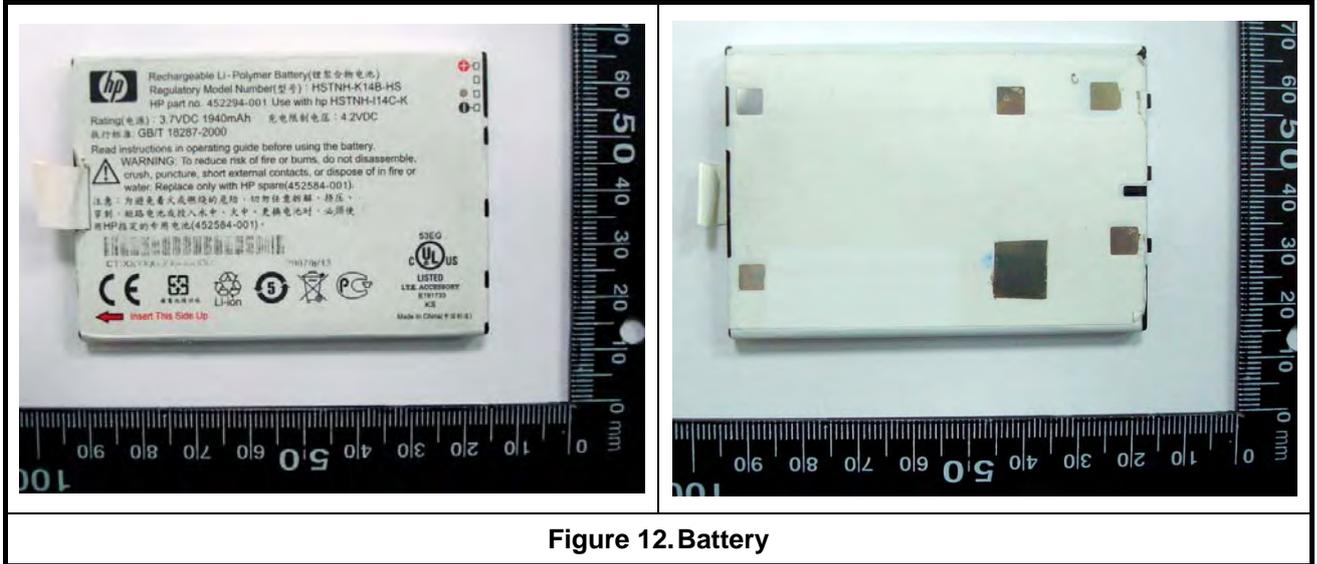
### 5.2 Description of the Device under Test (DUT)

Modes and Bands of Operation	GSM 850	PCS 1900	WCDMA Band V	WCDMA Band II
Modulation Mode	GMSK	GMSK	QPSK	QPSK
Duty Cycle	1/8.3	1/8.3	1/1	1/1
Transmitter Frequency Range (MHz)	824.2 - 848.8	1850.2 - 1909.8	826.4 - 846.6	1852.4 - 1907.6

### 5.2.1 Picture of Device



## 5.2.2 Picture of Accessories



### 5.2.3 Test Setup Photo

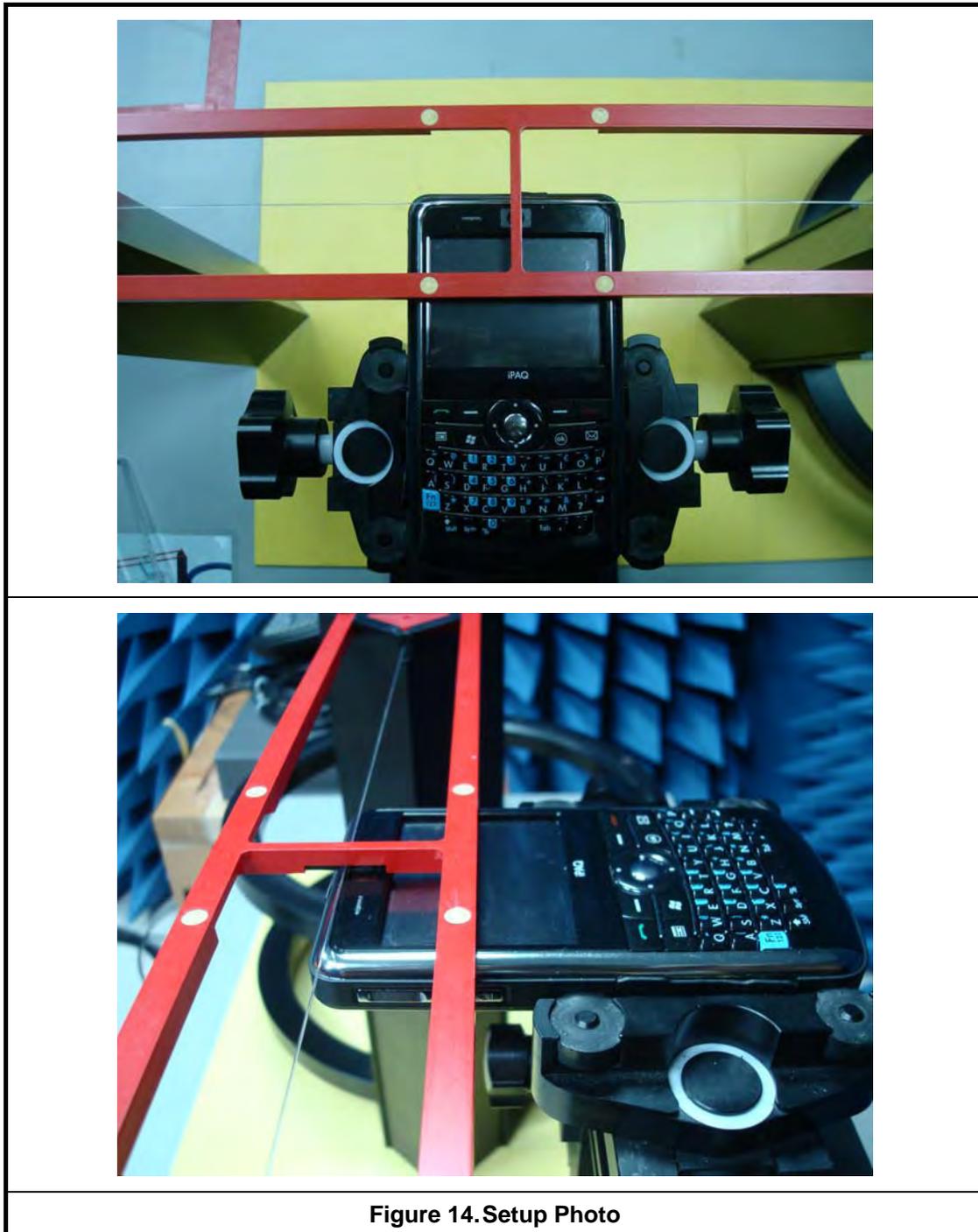


Figure 14. Setup Photo



## ***Appendix A - Measurement Scans***

See following Attached Pages for measurement scans.



Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 6:43:25 PM Date/Time: 2/29/2008 7:04:20 PM

### T-Coil\_GSM 850 CH190\_x (longitudinal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 2.52 dB A/m

BWC Factor = 0.151969 dB

Location: -5, 5, 363.7 mm

### Fine scan/x (transversal) scan 10 x 10 (grid 2) with noise 2/ABM Signal(x,y,z) (6x6x1):

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

**Cursor:**

ABM1 comp = 1.35 dB A/m

BWC Factor = 0.154017 dB

Location: -6, 6, 363.7 mm

### Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):

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

**Cursor:**

ABM1/ABM2 = 35.8 dB

ABM1 comp = 1.19 dB A/m

BWC Factor = 0.155041 dB

Location: -6, 6, 363.7 mm

### Point scan/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

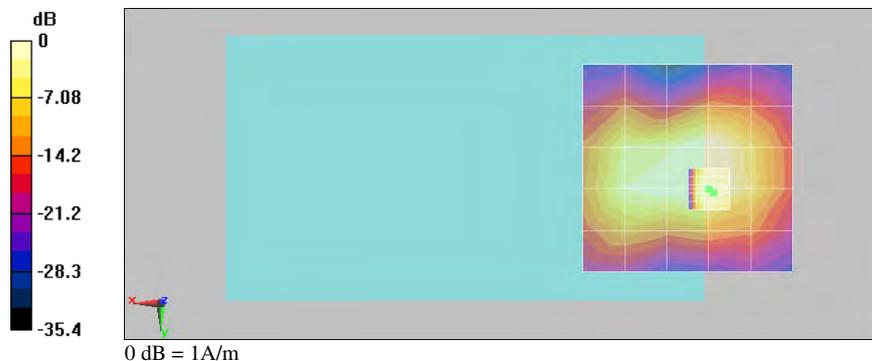
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 1.19 dB A/m

BWC Factor = 0.155041 dB

Location: -6, 6, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 6:44:49 PM Date/Time: 2/29/2008 7:05:09 PM

### T-Coil\_GSM 850 CH190\_y (transversal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS5 (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS5, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 2.38 dB A/m

BWC Factor = 0.151969 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

**Cursor:**

ABM1 comp = 2.92 dB A/m

BWC Factor = 0.154017 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

**Cursor:**

ABM1/ABM2 = 41.5 dB

ABM1 comp = 2.87 dB A/m

BWC Factor = 0.155041 dB

Location: 2, -6, 363.7 mm

#### Point scan/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

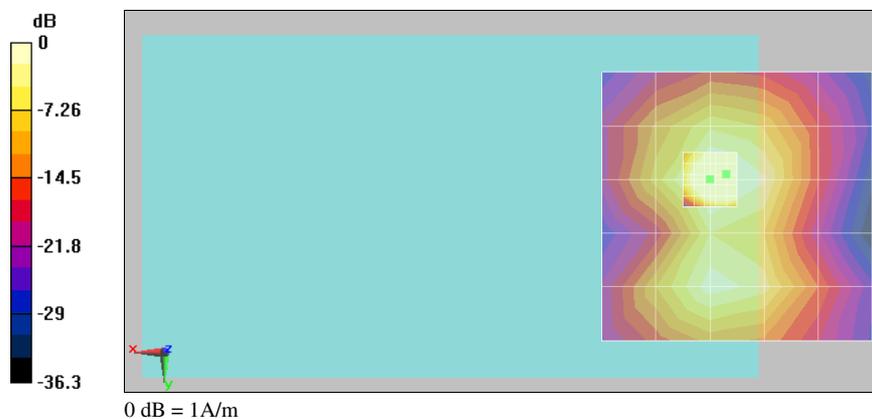
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 2.87 dB A/m

BWC Factor = 0.155041 dB

Location: 2, -6, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 6:41:55 PM  
Date/Time: 2/29/2008 7:03:26  
PMDate/Time: 2/29/2008 7:02:39 PM

**T-Coil\_GSM 850 CH190\_z (axial)**

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASY5, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 10.1 dB A/m

BWC Factor = 0.151969 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

**Cursor:**

ABM1 comp = 11.9 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

**Cursor:**

Diff = 0.117 dB

BWC Factor = 10.8 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

**Cursor:**

ABM1/ABM2 = 44.4 dB

ABM1 comp = 11.9 dB A/m

BWC Factor = 0.155041 dB

Location: 2, 2, 363.7 mm

**Point scan/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):**

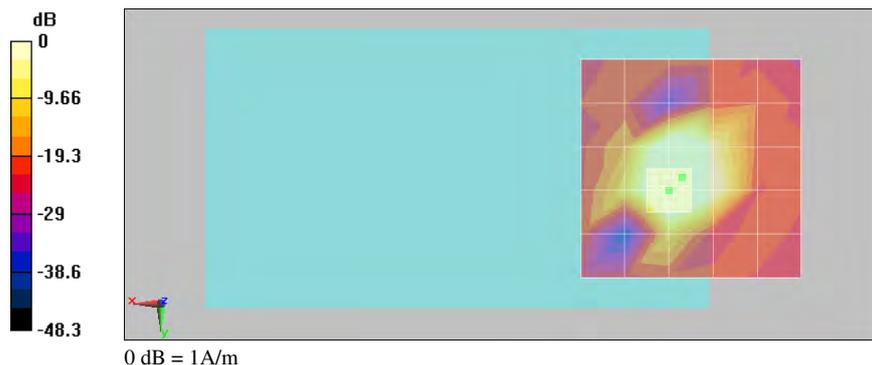
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 11.9 dB A/m

BWC Factor = 0.155041 dB

Location: 2, 2, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 7:23:23 PM Date/Time: 2/29/2008 7:42:22 PM

### T-Coil\_PCS CH 661\_x (longitudinal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 1.79 dB A/m

BWC Factor = 0.151969 dB

Location: -5, -5, 363.7 mm

### Fine scan/x (transversal) scan 10 x 10 (grid 2) with noise 2/ABM Signal(x,y,z) (6x6x1):

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

**Cursor:**

ABM1 comp = -0.363 dB A/m

BWC Factor = 0.152993 dB

Location: -6, 0, 363.7 mm

### Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):

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

**Cursor:**

ABM1/ABM2 = 43.3 dB

ABM1 comp = -0.349 dB A/m

BWC Factor = 0.145992 dB

Location: -6, 0, 363.7 mm

### Point scan/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

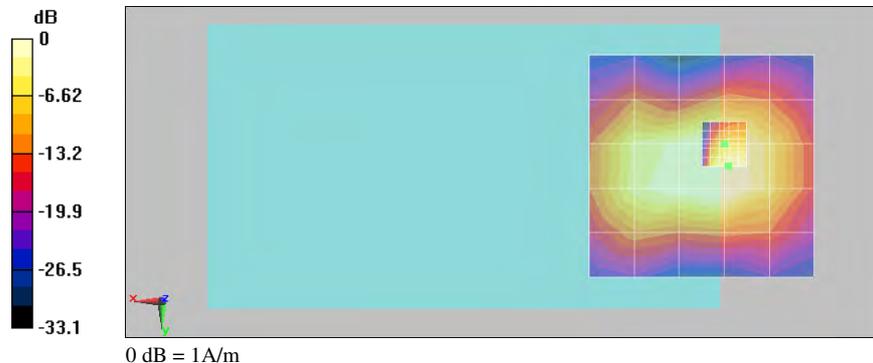
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = -0.349 dB A/m

BWC Factor = 0.145992 dB

Location: -6, 0, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 7:24:48 PM Date/Time: 2/29/2008 7:43:12 PM

### T-Coil\_PCS CH 661\_y (transversal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS5 (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS5, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 2.04 dB A/m

BWC Factor = 0.151969 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

**Cursor:**

ABM1 comp = 3.11 dB A/m

BWC Factor = 0.152993 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

**Cursor:**

ABM1/ABM2 = 46.1 dB

ABM1 comp = 3.08 dB A/m

BWC Factor = 0.145992 dB

Location: 2, -6, 363.7 mm

### Point scan/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

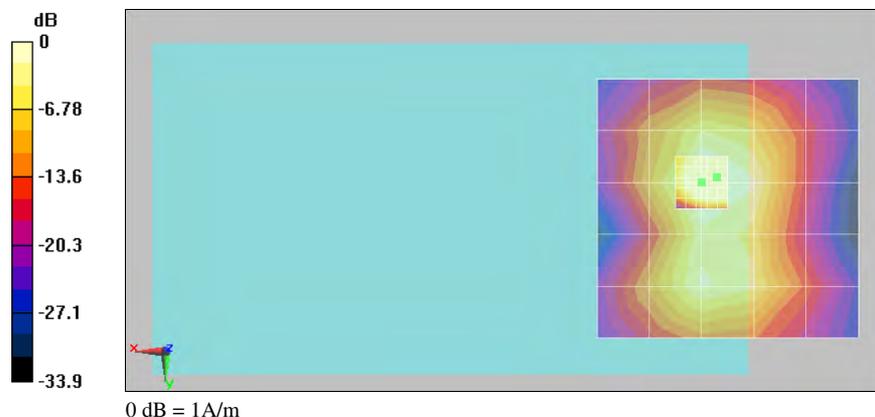
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 3.08 dB A/m

BWC Factor = 0.145992 dB

Location: 2, -6, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 7:21:54 PM  
Date/Time: 2/29/2008 7:41:29  
Date/Time: 2/29/2008 7:40:42 PM

**T-Coil\_PCS CH 661\_z (axial)**

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS5 (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS5, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 8.88 dB A/m

BWC Factor = 0.151969 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

**Cursor:**

ABM1 comp = 11.9 dB A/m

BWC Factor = 0.152993 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

**Cursor:**

Diff = 0.196 dB

BWC Factor = 10.8 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

**Cursor:**

ABM1/ABM2 = 47.3 dB

ABM1 comp = 11.8 dB A/m

BWC Factor = 0.145992 dB

Location: 2, 0, 363.7 mm

**Point scan/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):**

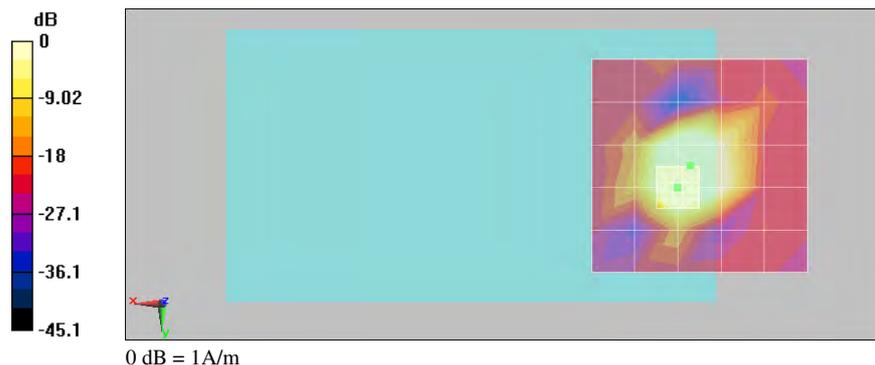
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 11.8 dB A/m

BWC Factor = 0.145992 dB

Location: 2, 0, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 5:41:40 PM Date/Time: 2/29/2008 5:59:03 PM

### T-Coil\_WCDMA Band V CH4180\_x (longitudinal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: WCDMA Band V; Frequency: 836 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS5 (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS5, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 1.92 dB A/m

BWC Factor = 0.148042 dB

Location: -5, 5, 363.7 mm

#### Fine scan/x (transversal) scan 10 x 10 (grid 2) with noise 2/ABM Signal(x,y,z) (6x6x1):

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

**Cursor:**

ABM1 comp = 1.27 dB A/m

BWC Factor = 0.152993 dB

Location: -8, 4, 363.7 mm

#### Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):

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

**Cursor:**

ABM1/ABM2 = 49.6 dB

ABM1 comp = 1.22 dB A/m

BWC Factor = 0.150005 dB

Location: -8, 4, 363.7 mm

#### Point scan/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

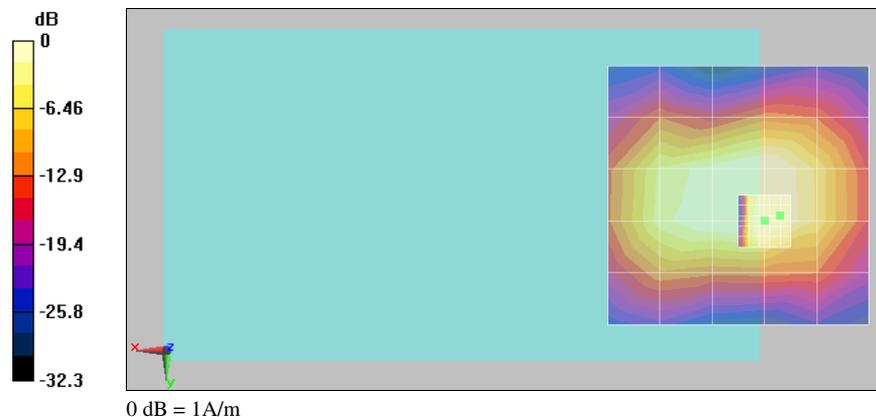
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 1.22 dB A/m

BWC Factor = 0.150005 dB

Location: -8, 4, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 5:43:05 PM Date/Time: 2/29/2008 5:59:52 PM

### T-Coil\_WCDMA Band V CH4180\_y (transversal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: WCDMA Band V; Frequency: 836 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS, V5.0 Build 91; 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

##### Cursor:

ABM1 comp = 1.97 dB A/m

BWC Factor = 0.148042 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

##### Cursor:

ABM1 comp = 3.18 dB A/m

BWC Factor = 0.152993 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

##### Cursor:

ABM1/ABM2 = 48.6 dB

ABM1 comp = 3.08 dB A/m

BWC Factor = 0.150005 dB

Location: 2, -6, 363.7 mm

#### Point scan/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

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

##### Cursor:

ABM1 comp = 3.08 dB A/m

BWC Factor = 0.150005 dB

Location: 2, -6, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 5:40:11 PM Date/Time: 2/29/2008 5:57:22 PM

### T-Coil\_WCDMA Band V CH4180\_z (axial)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: WCDMA Band V; Frequency: 836 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS5 (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS5, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 8.9 dB A/m

BWC Factor = 0.148042 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

**Cursor:**

ABM1 comp = 12 dB A/m

BWC Factor = 0.152993 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

**Cursor:**

Diff = 0.137 dB

BWC Factor = 10.8 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

**Cursor:**

ABM1/ABM2 = 50.1 dB

ABM1 comp = 11.9 dB A/m

BWC Factor = 0.150005 dB

Location: 2, 0, 363.7 mm

### Point scan/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

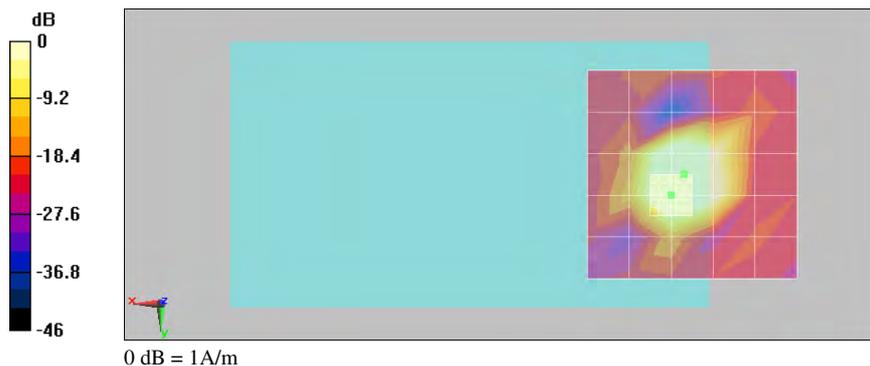
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 11.9 dB A/m

BWC Factor = 0.150005 dB

Location: 2, 0, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 4:51:44 PM Date/Time: 2/29/2008 5:09:43 PM

### T-Coil\_WCDMA Band II CH9400\_x (longitudinal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: WCDMA Band II; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS, V5.0 Build 91; 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

##### Cursor:

ABM1 comp = 2.19 dB A/m

BWC Factor = 0.155041 dB

Location: -5, 5, 363.7 mm

#### Fine scan/x (transversal) scan 10 x 10 (grid 2) with noise 2/ABM Signal(x,y,z) (6x6x1):

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

##### Cursor:

ABM1 comp = 1.45 dB A/m

BWC Factor = 0.155041 dB

Location: -6, 6, 363.7 mm

#### Point scan/x (longitudinal) scan at point with noise/ABM SNR(x,y,z) (1x1x1):

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

##### Cursor:

ABM1/ABM2 = 49.5 dB

ABM1 comp = 1.29 dB A/m

BWC Factor = 0.155041 dB

Location: -6, 6, 363.7 mm

#### Point scan/x (longitudinal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

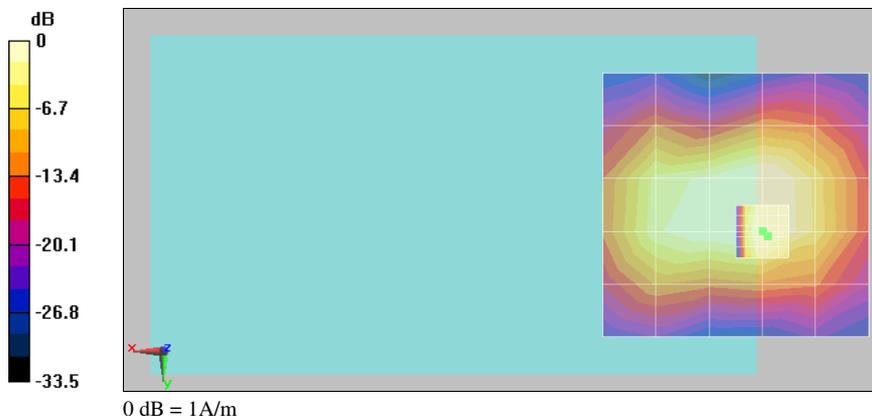
Measurement grid: dx=10mm, dy=10mm

##### Cursor:

ABM1 comp = 1.29 dB A/m

BWC Factor = 0.155041 dB

Location: -6, 6, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 4:53:09 PM Date/Time: 2/29/2008 5:10:32 PM

### T-Coil\_WCDMA Band II CH9400\_y (transversal)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: WCDMA Band II; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 2.27 dB A/m

BWC Factor = 0.155041 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

**Cursor:**

ABM1 comp = 3.16 dB A/m

BWC Factor = 0.155041 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

**Cursor:**

ABM1/ABM2 = 48.1 dB

ABM1 comp = 3.08 dB A/m

BWC Factor = 0.155041 dB

Location: 2, -6, 363.7 mm

#### Point scan/y (transversal) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

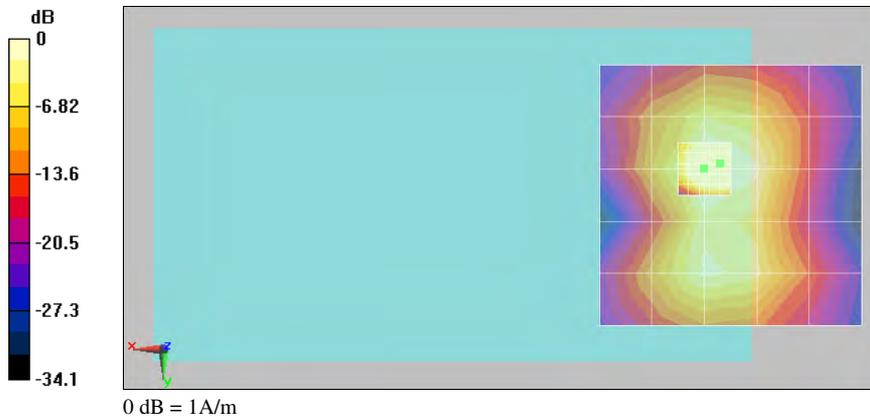
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 3.08 dB A/m

BWC Factor = 0.155041 dB

Location: 2, -6, 363.7 mm





Test Laboratory: A Test Lab Techno Corp.

Date/Time: 2/29/2008 4:50:15 PM Date/Time: 2/29/2008 5:08:02 PM

### T-Coil\_WCDMA Band II CH9400\_z (axial)

**DUT: HSTNH-I18C; Type: PDA Phone; Serial: 356719012004508**

Communication System: WCDMA Band II; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>

Phantom section: AMB with Coil Section

Measurement Standard: DASYS5 (IEEE/IEC)

DASY5 Configuration:

- Probe: AM1DV2 - 1017; ; Calibrated: 5/23/2007
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn779; Calibrated: 11/30/2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1038
- Measurement SW: DASYS5, V5.0 Build 91; 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

**Cursor:**

ABM1 comp = 9.39 dB A/m

BWC Factor = 0.155041 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

**Cursor:**

ABM1 comp = 12 dB A/m

BWC Factor = 0.155041 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

**Cursor:**

Diff = 0.171 dB

BWC Factor = 10.8 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

**Cursor:**

ABM1/ABM2 = 50.2 dB

ABM1 comp = 11.9 dB A/m

BWC Factor = 0.155041 dB

Location: 2, 2, 363.7 mm

### Point scan/z (axial) scan at point with noise/ABM Signal(x,y,z) (1x1x1):

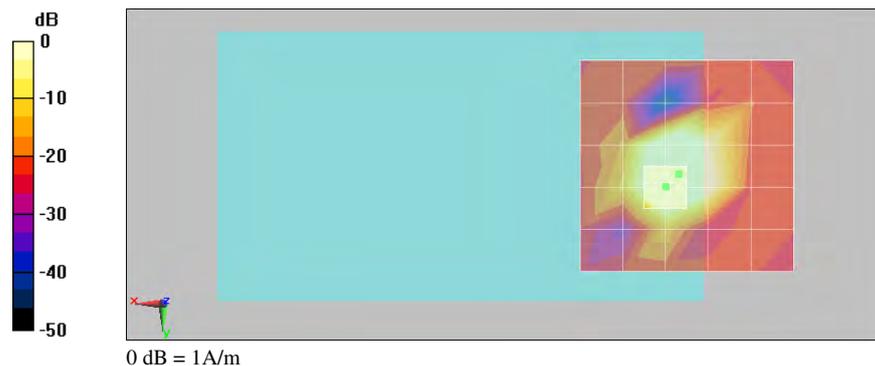
Measurement grid: dx=10mm, dy=10mm

**Cursor:**

ABM1 comp = 11.9 dB A/m

BWC Factor = 0.155041 dB

Location: 2, 2, 363.7 mm





**Appendix B - Measurement Uncertainty**

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

**Table 5. Draft T-Coil Uncertainty Budget, provided by SPEAG Jun. 07, 2006**