



# ANSI C63.19

# TEST REPORT

<b>Product Name</b>	cdma2000 Digital Mobile Phone
<b>Model</b>	HUAWEI M660, M660
<b>FCC ID</b>	QISM660
<b>Client</b>	Huawei Technologies Co., Ltd.

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**Test Report**

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**GENERAL SUMMARY**

<b>Product Name</b>	cdma2000 Digital Mobile Phone	<b>Model</b>	HUAWEI M660, M660
<b>FCC ID</b>	QISM660	<b>Report No.</b>	RHA1204-0001HAC01R1
<b>Client</b>	Huawei Technologies Co., Ltd.		
<b>Manufacturer</b>	Huawei Technologies Co., Ltd.		
<b>Reference Standard(s)</b>	<b>ANSI C63.19-2007:</b> American National Standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.		
<b>Conclusion</b>	<p>This portable wireless equipment has been measured in all cases requested by the relevant standards.</p> <p>General Judgment: <b>M4 (RF Emission)</b></p> <div style="text-align: right;">               (Stamp)              Date of issue: April 28<sup>th</sup>, 2012         </div>		
<b>Comment</b>	The test result only responds to the measured sample.		

Approved by 初伟中  
Director

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SAR Manager

Performed by 张先金  
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## 1. General Information

### 1.1. Notes of the Test Report

**TA Technology (Shanghai) Co., Ltd.** guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

**TA Technology (Shanghai) Co., Ltd.** is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

If the electrical report is inconsistent with the printed one, it should be subject to the latter.

### 1.2. Testing Laboratory

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### 1.3. Applicant Information

Company: Huawei Technologies Co., Ltd.  
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City: Shenzhen  
Postal Code: 518129  
Country: P.R. China  
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### 1.4. Manufacturer Information

Company: Huawei Technologies Co., Ltd.  
Address: Bantian, Longgang District  
City: Shenzhen  
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Country: P.R. China  
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### 1.5. Information of EUT

#### General Information

Device Type:	Portable Device		
State of Sample:	Prototype Unit		
Product Name:	cdma2000 Digital Mobile Phone		
MEID:	268435461106959389		
Hardware Version:	HC1M660M		
Software Version:	M660V100R001C153B811SP01		
Antenna Type:	Internal Antenna		
Device Operating Configurations:			
Supporting Mode(s):	CDMA Cellular/CDMA PCS/CDMA AWS; (tested)		
	WiFi (802.11b/g/n); (untested)		
	Bluetooth; (untested)		
Test Modulation:	QPSK		
Operating Frequency Range(s):	Mode	Tx (MHz)	Rx (MHz)
	CDMA Cellular	824.7 ~ 848.31	869.7 ~ 893.31
	CDMA PCS	1851.25 ~ 1908.75	1931.25 ~ 1988.75
	CDMA AWS	1711.25 ~ 1752.5	2111.25 ~ 2152.5
Test Channel: (Low - Middle - High)	1013 - 384 - 777	(CDMA Cellular)	(tested)
	25 - 600 - 1175	(CDMA PCS)	(tested)
	25 - 450 - 850	(CDMA AWS)	(tested)
Power Class:	CDMA Cellular: Tested with Power Control All up bits		
	CDMA PCS: Tested with Power Control All up bits		
	CDMA AWS: Tested with Power Control All up bits		

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### Auxiliary Equipment Details

#### AE1:Battery

Model: HB5N1H  
Manufacturer: Huawei Technologies Co., Ltd.  
S/N: MLCBC16997500230

#### AE2:Battery

Model: HB5N1H  
Manufacturer: Huawei Technologies Co., Ltd.  
S/N: UBDC302X97501087

Equipment Under Test (EUT) is a cdma2000 Digital Mobile Phone. The detail about Mobile phone and Lithium Battery is in chapter 1.5 in this report. The EUT has a CDMA antenna that is used for Tx/Rx, and the other is BT/WIFI antenna that is used for Tx/Rx. HAC RF emission is tested for CDMA Cellular, CDMA PCS and CDMA AWS in this report. WiFi and Bluetooth modes don't have voice capability, and do not operate in the held to ear mode for providing handset service.

The EUT has Personal Wireless Routers (hot spots) function and Proximity Sensor function.

The proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. When it is activated, it will not influence the transmit power

When Personal Wireless Routers (hot spots) function is activated, Power Values of CDMA Cellular, CDMA PCS and CDMA AWS are reduced. However, it is closed during the test.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

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Air-Interface	Band (MHz)	Type	C63.1 9/ tested	Simultaneous Transmissions Note: Not to be tested	Concurrent single transmission	Reduced power 20.19(c)(1)	Voice Over Digital Transport (Data)
CDMA	800	VO	Yes	Yes BT , Wifi	Yes:EVDO.0/A, Wifi,BT Not rated	Yes	NA
	1700	VO	Yes				
	1900	VO	Yes				
	EVDO.0/A	DT	NA	NA	Yes	NA	NA
Wifi	2400	DT	NA	Yes CDMA,BT	NA	NA	NA
Bluetooth (BT)	2400	DT	NA	Yes CDMA,Wifi	NA	NA	NA

VO Voice CMRS/PSTN Service only  
V/D Voice CMRS/PSTN and Data Service  
DT Digital Transport

\*HAC Rating was based on concurrent voice and data modes, Non current mode was found to represent worst case rating for both M and T rating

### 1.6. The Ambient Conditions during Test

Temperature	Min. = 18°C, Max. = 28 °C
Relative humidity	Min. = 0%, Max. = 80%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

### 1.7. The Total M-rating of each tested band

Band	Rating
CDMA Cellular	<b>M4</b>
CDMA PCS	<b>M4</b>
CDMA AWS	<b>M4</b>

### 1.8. Test Date

The test performed from April 10, 2012 to April 27, 2012.

## 2. Test Information

### 2.1. Operational Conditions during Test

#### 2.1.1. General Description of Test Procedures

The phone was tested in all normal configurations for the ear use. The EUT is mounted in the device holder equivalent as for classic dosimeter measurements. The acoustic output of the EUT shall coincide with the center point of the area formed by the dielectric wire and the middle bar of the arch's top frame. The EUT shall be moved vertically upwards until it touches the frame. The fine adjustment is possible by sliding the complete. The EUT holder is on the yellow base plate of the Test Arch phantom. These test configurations are tested at the high, middle and low frequency channels of each applicable operating mode; for example, GSM, WCDMA (UMTS), CDMA and TDMA.

#### 2.1.2. CDMA Test Configuration

A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) are allocated to 1013, 384 and 777 respectively in the case of CDMA Cellular, allocated to 25, 600 and 1175 respectively in the case of CDMA PCS, allocated to 25, 450 and 850 respectively in the case of CDMA AWS, The EUT is commanded to operate at maximum transmitting power.

Test Parameter setup for maximum RF output power according to section 4.4.5 of 3GPP2.

Parameter	Units	Value
I or	dBm/1.23MHz	-104
PilotE c /I or	dB	-7
TrafficE c /I or	dB	-7.4

## 2.2. HAC RF Measurements System Configuration

### 2.2.1. HAC Measurement Set-up

These measurements are performed using the DASY5 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Stäubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor. The robot is a six-axis industrial robot performing precise movements. Cell controller systems contain the power supply, robot controller, teach pendant (Joystick) and remote control, and are used to drive the robot motors. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification; signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

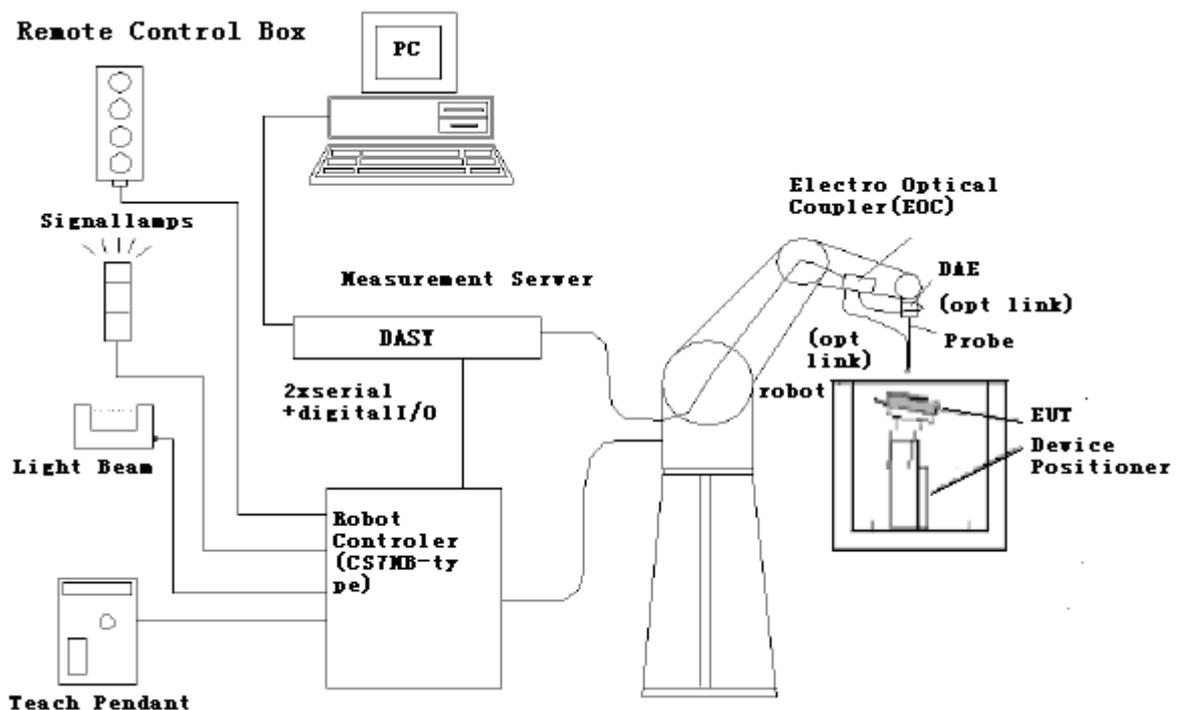


Figure 1 HAC Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

### 2.2.2. Probe System

The HAC measurements were conducted with the E-Field Probe ER3DV6 and the H-Field Probe H3DV6 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

#### E-Field Probe Description

Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges PEEK enclosure material
Calibration	In air from 100 MHz to 3.0 GHz (absolute accuracy $\pm 6.0\%$ , $k=2$ )
Frequency	40 MHz to > 6 GHz (can be extended to < 20 MHz) Linearity: $\pm 0.2$ dB (100 MHz to 3 GHz)
Directivity	$\pm 0.2$ dB in air (rotation around probe axis) $\pm 0.4$ dB in air (rotation normal to probe axis)
Dynamic Range	2 V/m to > 1000 V/m; Linearity: $\pm 0.2$ dB
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm
Application	General near-field measurements up to 6 GHz Field component measurements Fast automatic scanning in phantoms



**Figure 2 ER3DV6 E-field Probe**

#### H-Field Probe Description

Construction	Three concentric loop sensors with 3.8 mm loop diameters Resistively loaded detector diodes for linear response Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
Frequency	200 MHz to 3 GHz (absolute accuracy $\pm 6.0\%$ , $k=2$ ); Output linearized
Directivity	$\pm 0.2$ dB (spherical isotropy error)
Dynamic Range	10 mA/m to 2 A/m at 1 GHz
E-Field Interference	< 10% at 3 GHz (for plane wave)
Dimensions	Overall length: 330 mm (Tip: 40 mm) Tip diameter: 6 mm (Body: 12 mm) Distance from probe tip to dipole centers: 3 mm



**Figure 3 H3DV6 H-field Probe**

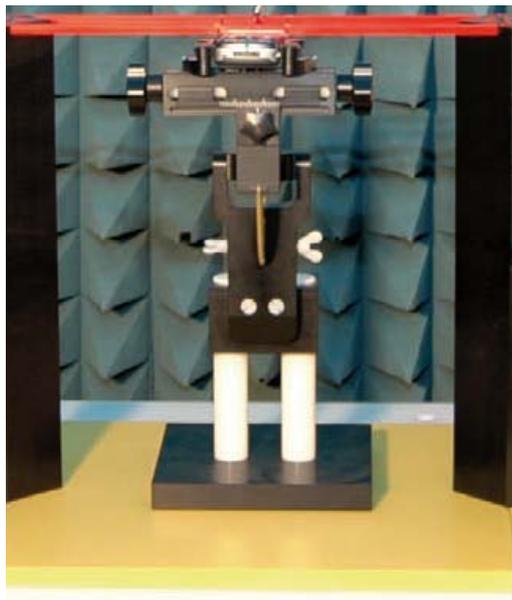
Application            General magnetic near-field measurements up to 3  
                              GHz (in air or liquids)  
                              Field component measurements  
                              Surface current measurements  
                              Low interaction with the measured field

**2.2.3. Test Arch Phantom & Phone Positioner**

The Test Arch phantom should be positioned horizontally on a stable surface. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. It 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).

The Device reference point is set for the EUT at 6.3 mm, the Grid reference point is on the upper surface at the origin of the coordinates, and the “user point \Height Check 0.5 mm” is 0.5mm above the center, allowing verification of the gap of 0.5mm while the probe is positioned there.

The Phone Positioner supports accurate and reliable positioning of any phone with effect on near field  $<\pm 0.5$  dB.



**Figure 4 HAC Phantom & Device Holder**

### **2.3. RF Test Procedures**

**The evaluation was performed with the following procedure:**

1. Confirm proper operation of the field probe, probe measurement system and other instrumentation and the positioning system.
2. Position the WD in its intended test position. The gauge block can simplify this positioning. Note that a separate E-field and H-field gauge block will be needed if the center of the probe sensor elements is at different distances from the tip of the probe.
3. Configure the WD normal operation for maximum rated RF output power, at the desired channel and other operating parameters (e.g., test mode), as intended for the test.
4. The center sub-grid shall center on the center of the axial measurement point or the acoustic output, as appropriate. Locate the field probe at the initial test position in the 50 mm by 50 mm grid, which is contained in the measurement plane. If the field alignment method is used, align the probe for maximum field reception.
5. Record the reading.
6. Scan the entire 50 mm by 50 mm region in equally spaced increments and record the reading at each measurement point. The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids. The distance between measurement points shall be sufficient to assure the identification of the maximum reading.
7. Identify the five contiguous sub-grids around the center sub-grid with the lowest maximum field strength readings. Thus the six areas to be used to determine the WD's highest emissions are identified and outlined for the final manual scan. Please note that a maximum of five blocks can be excluded for both E-field and H-field measurements for the WD output being measured. Stated another way, the center sub-grid and three others must be common to both the E-field and H-field measurements.
8. Identify the maximum field reading within the non-excluded sub-grids identified in Step 7.
9. Convert the maximum field strength reading identified in Step 8 to V/m or A/m, as appropriate. For probes which require a probe modulation factor, this conversion shall be done using the appropriate probe modulation factor and the calibration.
10. Repeat Step 1 through Step 10 for both the E-field and H-field measurements.
11. Compare this reading to the categories in ANSI C63.19 Clause 7 and record the resulting category. The lowest category number listed in 7.2, Table 7.4, or Table 7.5 obtained in Step 10 for either E- or H-field determines the M category for the audio coupling mode assessment. Record the WD category rating.



Figure 5 WD reference and plane for RF emission measurements

## 2.4. System Check

### Validation Procedure

Place a dipole antenna meeting the requirements given in ANSI C63.19 D.5 in the position normally occupied by the WD. The dipole antenna serves as a known source for an electrical and magnetic output. Position the E-field and H-field probes so that:

The probes and their cables are parallel to the coaxial feed of the dipole antenna.

The probe cables and the coaxial feed of the dipole antenna approach the measurement area from opposite directions.

The center point of the probe element(s) are 10 mm from the closest surface of the dipole elements. Validation was performed to verify that measured E-field and H-field values are within +/-25% from the target reference values provided by the manufacturer. "Values within +/-25% are acceptable. Of which 12% is deviation and 13% is measurement uncertainty."

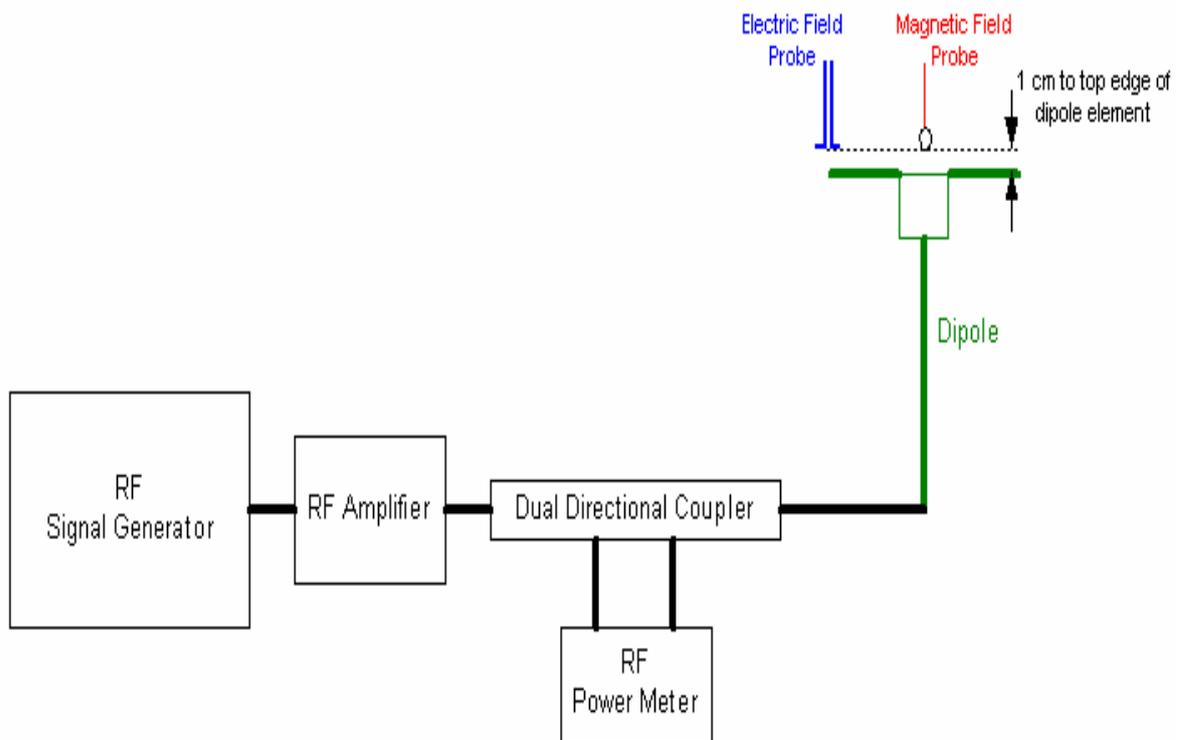


Figure 6 Dipole Validation Setup

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**Dipole Measurement Summary**

<b>E-Field Scan</b>					
<b>Mode</b>	<b>Frequency (MHz)</b>	<b>Input Power (mW)</b>	<b>Value</b>		<b>Test Date</b>
CW	835	100	Target <sup>1</sup> Value(V/m)	161.4	February 21,2012
			Measured <sup>2</sup> Value(V/m)	159.0	April 12, 2012
			Deviation <sup>3</sup> (%)	1.49	/
			Measured <sup>2</sup> Value(V/m)	163.9	April 27, 2012
			Deviation <sup>3</sup> (%)	-1.55	/
CW	1880	100	Target <sup>1</sup> Value(V/m)	143.4	February 21,2012
			Measured <sup>2</sup> Value(V/m)	138.1	April 12, 2012
			Deviation <sup>3</sup> (%)	3.70	/
			Measured <sup>2</sup> Value(V/m)	139.4	April 27, 2012
			Deviation <sup>3</sup> (%)	2.79	/
<b>H-Field Scan</b>					
<b>Mode</b>	<b>Frequency (MHz)</b>	<b>Input Power (mW)</b>	<b>Value</b>		<b>Test Date</b>
CW	835	100	Target <sup>1</sup> Value(A/m)	0.460	February 21,2012
			Measured <sup>2</sup> Value(A/m)	0.455	April 10, 2012
			Deviation <sup>3</sup> (%)	1.09	/
			Measured <sup>2</sup> Value(A/m)	0.47	April 27, 2012
			Deviation <sup>3</sup> (%)	-2.17	/
CW	1880	100	Target <sup>1</sup> Value(A/m)	0.470	February 21,2012
			Measured <sup>2</sup> Value(A/m)	0.462	April 10, 2012
			Deviation <sup>3</sup> (%)	1.70	/
			Measured <sup>2</sup> Value(A/m)	0.447	April 27, 2012
			Deviation <sup>3</sup> (%)	4.89	/
<p>Notes: 1. Target value is provided by SPEAD in the calibration certificate of specific dipoles.                  2. Please refer to the attachment for detailed measurement data and plot.                  3. Deviation (%) = 100 * (Target value minus Measured value) divided by Target value.</p>					

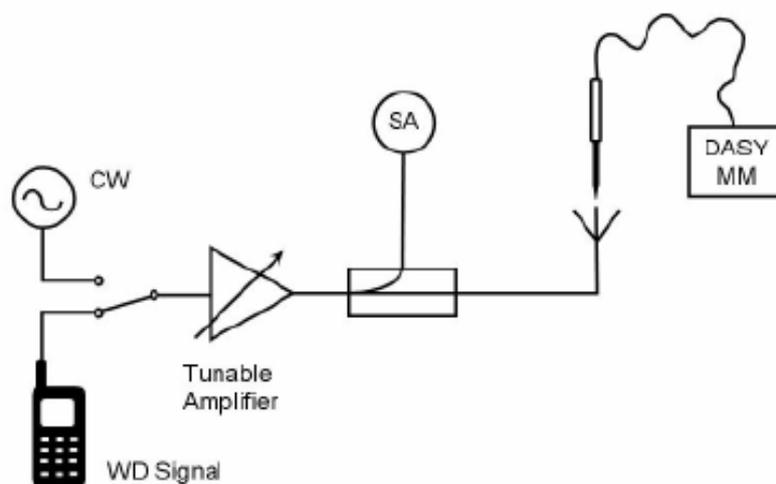
## 2.5. Probe Modulation Factor

The Probe Modulation Factor (PMF) is defined as the ratio of the field readings for a CW and a modulated signal with the equivalent Field Envelope Peak as defined in ANSI C63.19 (Chapter C.3.1). Calibration shall be made of the modulation response of the probe and its instrumentation chain. This Calibration shall be performed with the field probe, attached to the instrumentation that is to be used with it during the measurement. The response of the probe system to a CW field at the frequency(s) of interest is compared to its response to a modulated signal with equal peak amplitude. The field level of the test signals shall be more than 10dB above the ambient level and the noise floor of the instrumentation being used. The ratio of the CW reading to that taken with a modulated field shall be applied to the readings taken of modulated fields of the specified type.

### Modulation Factor Test Procedure

This may be done using the following procedure:

1. Fix the field probe in a set location relative to a field generating device, such as the reference dipole antenna.
2. Illuminate the probe using the wireless device connected to the reference dipole with a test signal at the intended measurement frequency, Ensure there is sufficient field coupling between the probe and the antenna so the resulting reading is greater than 10 dB above the probe system noise floor but within the systems operating range.
3. Record the amplitude applied to the antenna during transmission and the field strength measured by the E-field probe located near the tip of the dipole antenna
4. Replace the wireless device with an RF signal generator producing an unmodulated CW signal and set to the wireless device operating frequency.
5. Set the amplitude of the unmodulated signal to equal that recorded from the wireless device.
6. Record the reading of the probe measurement system of the unmodulated signal.
7. The ratio, in linear units, of the probe reading in Step 6 to the reading in Step 3 is the E-field modulation factor.  $PMF_E = E_{CW} / E_{mod}$  ( $PMF_H = H_{CW} / H_{mod}$ )
8. Repeat the previous steps using the H-field probe, except locate the probe at the center of the dipole.



**Figure Figure 7 Probe Modulation Factor Test Setup**

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**PMF**

<b>Band</b>	<b>E-Field Probe Modulation Factor</b>	<b>H-Field Probe Modulation Factor</b>
CDMA Cellular	1.05	1.01
CDMA PCS	1.02	1.00
CDMA AWS	1.02	1.00

## 2.6. Conducted Output Power Measurement

### Summary

The DUT is tested using an E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted power. Conducted output power was measured using an integrated RF connector and attached RF cable. This result contains conducted output power for the EUT.

### Conducted Power Results

CDMA Cellular	Conducted Power (dBm)		
	Channel 1013	Channel 384	Channel 777
RC3	24.41	24.59	24.67
RC1	24.41	24.47	24.7
CDMA PCS	Conducted Power (dBm)		
	Channel 25	Channel 600	Channel 1175
RC3	24.42	24.47	24.39
RC1	24.43	24.39	24.37
CDMA AWS	Conducted Power (dBm)		
	Channel 25	Channel 450	Channel 850
RC3	24.62	24.43	24.82
RC1	24.58	24.44	24.78

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### 3. Test Results

#### 3.1. ANSI C63.19-2007 Limits

Category		Telephone RF parameters < 960 MHz			
Near field	AWF	E-field emissions		H-field emissions	
Category M1/T1	0	631.0 to 1122.0	V/m	1.91 to 3.39	A/m
	-5	473.2 to 841.4	V/m	1.43 to 2.54	A/m
Category M2/T2	0	354.8 to 631.0	V/m	1.07 to 1.91	A/m
	-5	266.1 to 473.2	V/m	0.80 to 1.43	A/m
Category M3/T3	0	199.5 to 354.8	V/m	0.60 to 1.07	A/m
	-5	149.6 to 266.1	V/m	0.45 to 0.80	A/m
Category M4/T4	0	< 199.5	V/m	< 0.60	A/m
	-5	< 149.6	V/m	< 0.45	A/m
Category		Telephone RF parameters > 960 MHz			
Near field	AWF	E-field emissions		H-field emissions	
Category M1/T1	0	199.5 to 354.8	V/m	0.60 to 1.07	A/m
	-5	149.6 to 266.1	V/m	0.45 to 0.80	A/m
Category M2/T2	0	112.2 to 199.5	V/m	0.34 to 0.60	A/m
	-5	84.1 to 149.6	V/m	0.25 to 0.45	A/m
Category M3/T3	0	63.1 to 112.2	V/m	0.19 to 0.34	A/m
	-5	47.3 to 84.1	V/m	0.14 to 0.25	A/m
Category M4/T4	0	< 63.1	V/m	< 0.19	A/m
	-5	< 47.3	V/m	< 0.14	A/m

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**3.2. Summary Test Results**

**CDMA Cellular Results**

<b>E-Field with Battery (SN: MLCBC16997500230)</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Field (V/m)</b>	<b>Power Drift (dB)</b>	<b>Rating</b>	<b>Graph Results</b>
777	848.31	82.7	-0.132	M4	Figure 16
384	836.52	87.8	-0.135	M4	Figure 17
1013	824.70	87.7	-0.029	M4	Figure 18
<b>E-Field with Battery (SN: UBDC302X97501087)</b>					
384	836.52	84	-0.176	M4	Figure 19
<b>H-Field with Battery (SN: MLCBC16997500230)</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Field (A/m)</b>	<b>Power Drift (dB)</b>	<b>Rating</b>	<b>Graph Results</b>
777	848.31	0.116	-0.039	M4	Figure 20
384	836.52	0.122	-0.139	M4	Figure 21
1013	824.70	0.123	-0.056	M4	Figure 22
<b>H-Field with Battery (SN: UBDC302X97501087)</b>					
1013	824.70	0.119	0.025	M4	Figure 23

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**CDMA PCS Results**

<b>E-Field with Battery (SN: MLCBC16997500230)</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Field (V/m)</b>	<b>Power Drift (dB)</b>	<b>Rating</b>	<b>Graph Results</b>
1175	1908.75	15.5	-0.113	M4	Figure 24
600	1880.00	15.4	0.095	M4	Figure 25
25	1851.25	17.8	0.092	M4	Figure 26
<b>E-Field with Battery (SN: UBDC302X97501087)</b>					
25	1851.25	17.1	-0.120	M4	Figure 27
<b>H-Field with Battery (SN: MLCBC16997500230)</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Field (A/m)</b>	<b>Power Drift (dB)</b>	<b>Rating</b>	<b>Graph Results</b>
1175	1908.75	0.035	-0.007	M4	Figure 28
600	1880.00	0.034	0.004	M4	Figure 29
25	1851.25	0.041	0.085	M4	Figure 30
<b>H-Field with Battery (SN: UBDC302X97501087)</b>					
25	1851.25	0.039	0.069	M4	Figure 31

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**CDMA AWS Results**

<b>E-Field with Battery (SN: MLCBC16997500230)</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Field (V/m)</b>	<b>Power Drift (dB)</b>	<b>Rating</b>	<b>Graph Results</b>
850	1752.50	27.8	-0.063	M4	Figure 32
450	1732.50	27.7	-0.007	M4	Figure 33
25	1711.25	29.1	-0.133	M4	Figure 34
<b>E-Field with Battery (SN: UBDC302X97501087)</b>					
25	1711.25	29.6	-0.025	M4	Figure 35
<b>H-Field with Battery (SN: MLCBC16997500230)</b>					
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Field (A/m)</b>	<b>Power Drift (dB)</b>	<b>Rating</b>	<b>Graph Results</b>
850	1752.50	0.069	0.151	M4	Figure 36
450	1732.50	0.064	-0.100	M4	Figure 37
25	1711.25	0.070	0.152	M4	Figure 38
<b>H-Field with Battery (SN: UBDC302X97501087)</b>					
25	1711.25	0.073	0.041	M4	Figure 39

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**4. Measurement Uncertainty**

No.	Error source	Type	Uncertainty Value (%)	Prob. Dist.	k	$c_{iE}$	$c_{iH}$	Standard Uncertainty (%) $u_i$ (%) E	Standard Uncertainty (%) $u_i$ (%) H	Degree of freedom $V_{eff}$ or $v_i$
<b>Measurement System</b>										
1	Probe Calibration	B	5.1	N	1	1	1	5.1	5.1	$\infty$
2	Axial Isotropy	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
3	Sensor Displacement	B	16.5	R	$\sqrt{3}$	1	0.145	9.5	1.4	$\infty$
4	Boundary Effects	B	2.4	R	$\sqrt{3}$	1	1	1.4	1.4	$\infty$
5	Test Arch	B	7.2	R	$\sqrt{3}$	1	0	4.1	0	$\infty$
6	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
7	Scaling to Peak Envelope Power	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	$\infty$
8	System Detection Limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
9	Readout Electronics	B	0.3	N	1	1	1	0.3	0.3	$\infty$
10	Response Time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
11	Integration Time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
12	RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
13	RF Reflections	B	12.0	R	$\sqrt{3}$	1	1	6.9	6.9	$\infty$
14	Probe Positioner	B	1.2	R	$\sqrt{3}$	1	0.67	0.7	0.5	$\infty$
15	Probe Positioning	A	4.7	R	$\sqrt{3}$	1	0.67	2.7	1.8	$\infty$
16	Extra. And Interpolation	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
<b>Test Sample Related</b>										
17	Device Positioning Vertical	B	4.7	R	$\sqrt{3}$	1	0.67	2.7	1.8	$\infty$
18	Device Positioning Lateral	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$

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19	Device Holder and Phantom	B	2.4	R	$\sqrt{3}$	1	1	1.4	1.4	$\infty$
20	Power Drift	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	$\infty$
<b>Phantom and Setup related</b>										
21	Phantom Thickness	B	2.4	R	$\sqrt{3}$	1	0.67	1.4	0.9	$\infty$
Combined standard uncertainty (%)								15.19	10.82	
Expanded Std. uncertainty on power (K=2)								30.38	21.65	
Expanded Std. uncertainty on field (K=2)								15.19	10.82	

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**5. Main Test Instruments**

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Power meter	Agilent E4417A	GB41291714	March 11, 2012	One year
02	Power sensor	Agilent N8481H	MY50350004	September 25, 2011	One year
03	Signal Generator	HP 8341B	2730A00804	September 12, 2011	One year
04	Amplifier	IXA-020	0401	No Calibration Requested	
05	BTS	E5515C	MY48360988	December 2, 2011	One year
06	E-Field Probe	ER3DV6	2303	February 21, 2012	One year
07	H-Field Probe	H3DV6	6138	February 21, 2012	One year
08	DAE	DAE4	871	November 22, 2011	One year
09	Validation Kit 835MHz	CD835V3	1133	February 21, 2012	One year
10	Validation Kit 1880MHz	CD1880V3	1115	February 21, 2012	One year
11	Hygrothermograph	WS-1	64591	September 28, 2011	One year

\*\*\*\*\*END OF REPORT BODY\*\*\*\*\*

## ANNEX A: System Check Results

### HAC\_System Performance Check at 835MHz\_E

**DUT: Dipole 835 MHz; Type: CD835V3; SN:1133**

Date/Time: 4/12/2012 3:16:32 PM

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**E Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 159.0 V/m

Probe Modulation Factor = 1.00

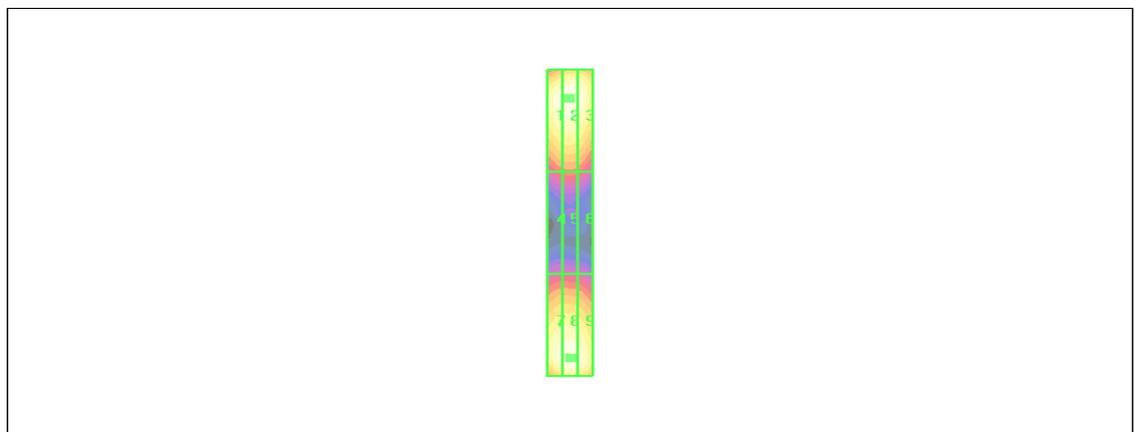
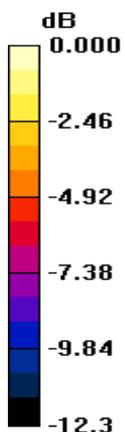
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 105.5 V/m; Power Drift = -0.026 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>158.1 M4</b>	<b>161.0 M4</b>	<b>156.3 M4</b>
Grid 4	Grid 5	Grid 6
<b>86.9 M4</b>	<b>89.2 M4</b>	<b>85.8 M4</b>
Grid 7	Grid 8	Grid 9
<b>155.0 M4</b>	<b>159.0 M4</b>	<b>154.2 M4</b>



0 dB = 161.0V/m

**Figure 8 System Performance Check 835MHz\_E**

# TA Technology (Shanghai) Co., Ltd. Test Report

**HAC\_System Performance Check at 835MHz\_E**

**DUT: Dipole 835 MHz; Type: CD835V3; SN:1133**

Date/Time: 4/27/2012 8:15:12 AM

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**E Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 163.9 V/m

Probe Modulation Factor = 1.00

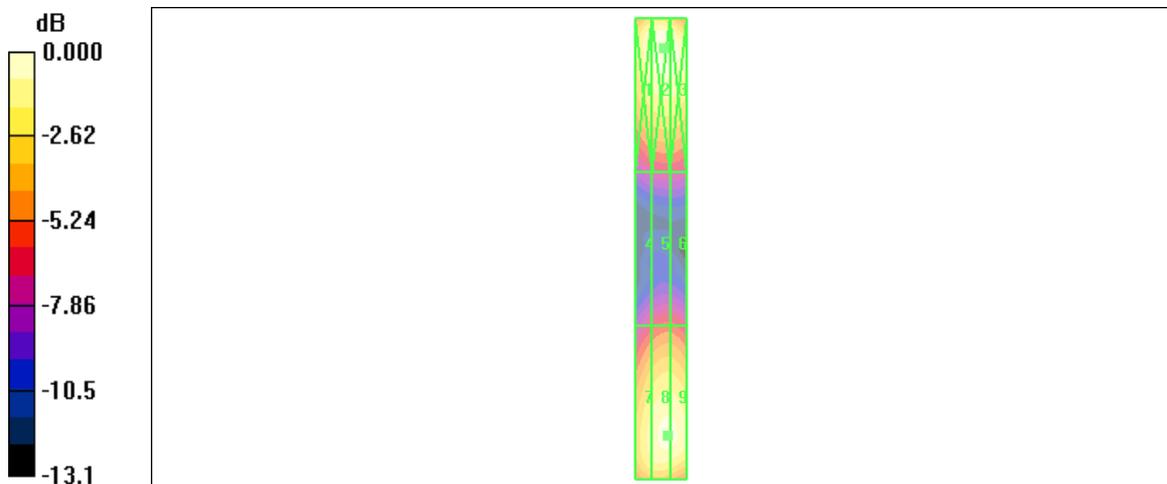
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 123.1 V/m; Power Drift = -0.009 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>165.0 M4</b>	<b>175.2 M4</b>	<b>172.9 M4</b>
Grid 4	Grid 5	Grid 6
<b>83.7 M4</b>	<b>90.6 M4</b>	<b>90.4 M4</b>
Grid 7	Grid 8	Grid 9
<b>151.8 M4</b>	<b>163.9 M4</b>	<b>163.7 M4</b>



0 dB = 175.2V/m

**Figure 9 System Performance Check 835MHz\_E**

# TA Technology (Shanghai) Co., Ltd. Test Report

**HAC\_System Performance Check at 835MHz\_H**

**DUT: Dipole 835 MHz; Type: CD835V3; SN: 1133**

Date/Time: 4/10/2012 11:18:58 AM

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**H Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.455 A/m

Probe Modulation Factor = 1.00

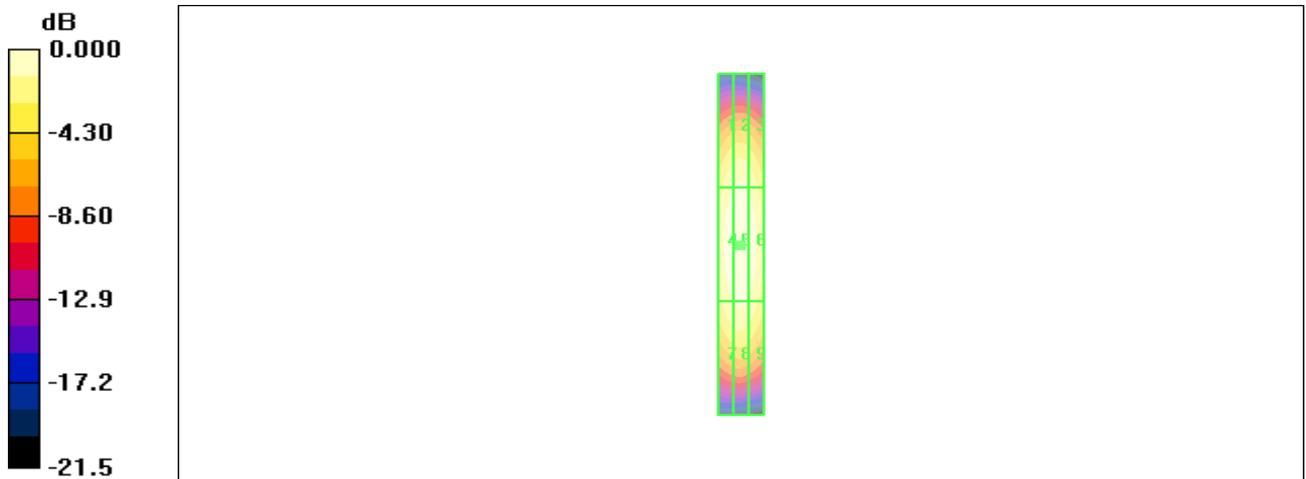
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.485 A/m; Power Drift = -0.005 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.383 M4</b>	Grid 2 <b>0.401 M4</b>	Grid 3 <b>0.376 M4</b>
Grid 4 <b>0.437 M4</b>	Grid 5 <b>0.455 M4</b>	Grid 6 <b>0.429 M4</b>
Grid 7 <b>0.386 M4</b>	Grid 8 <b>0.401 M4</b>	Grid 9 <b>0.377 M4</b>



0 dB = 0.455A/m

**Figure 10 System Performance Check 835MHz\_H**

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## HAC\_System Performance Check at 835MHz\_H

**DUT: Dipole 835 MHz; Type: CD835V3; SN: 1133**

Date/Time: 4/27/2012 7:16:52 AM

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**H Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x381x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.470 A/m

Probe Modulation Factor = 1.00

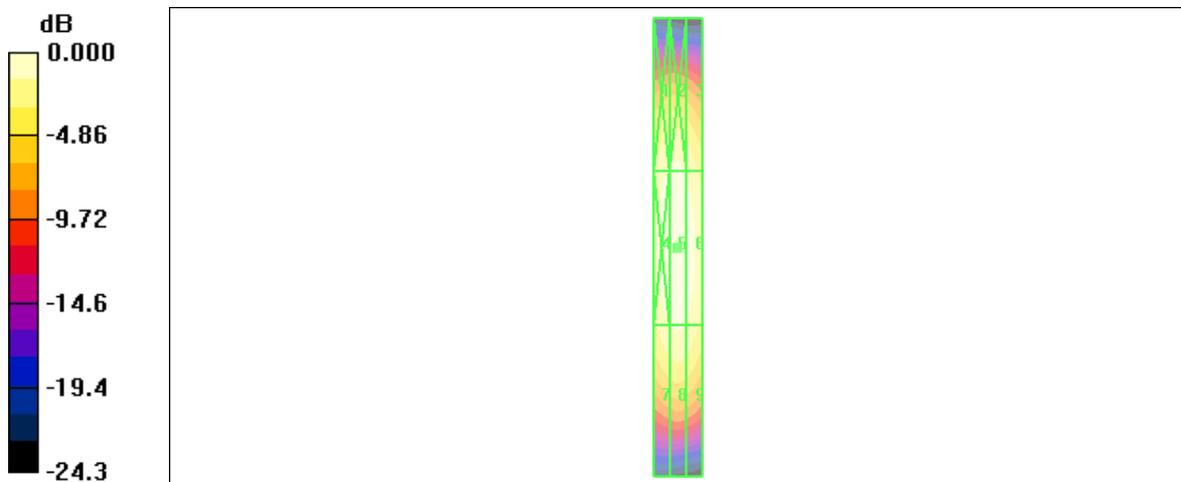
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.498 A/m; Power Drift = 0.001 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
<b>0.400 M4</b>	<b>0.410 M4</b>	<b>0.381 M4</b>
Grid 4	Grid 5	Grid 6
<b>0.454 M4</b>	<b>0.470 M4</b>	<b>0.442 M4</b>
Grid 7	Grid 8	Grid 9
<b>0.387 M4</b>	<b>0.405 M4</b>	<b>0.385 M4</b>



0 dB = 0.470A/m

**Figure 11 System Performance Check 835MHz\_H**

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**HAC\_System Performance Check at 1880MHz\_E**

**DUT: Dipole 1880 MHz; Type: CD1880V3; SN: 1115**

Date/Time: 4/12/2012 1:46:34 PM

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**E Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility Test (41x181x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 138.1 V/m

Probe Modulation Factor = 1.00

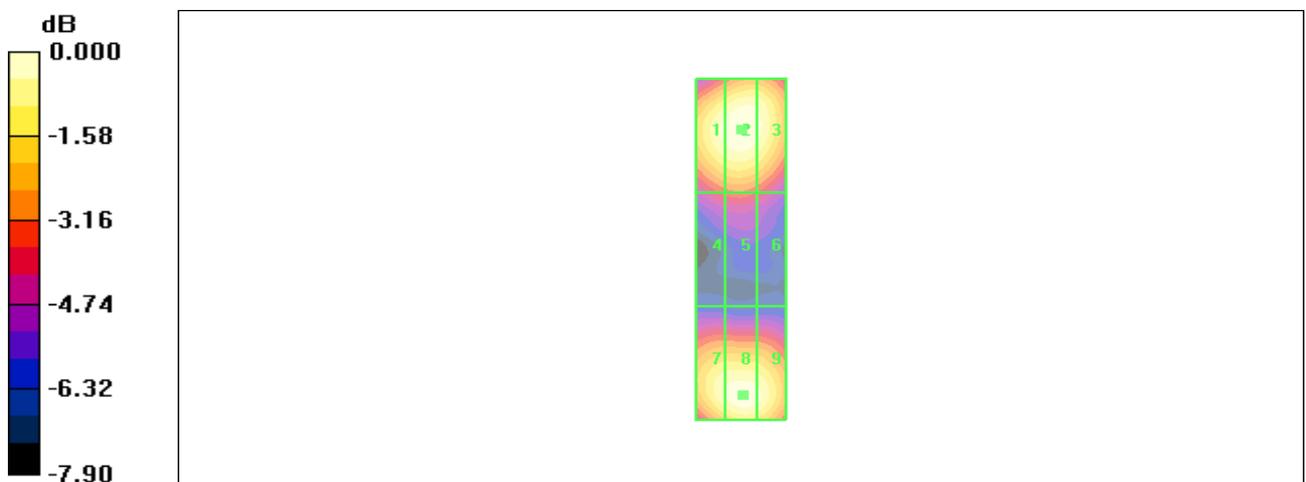
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 156.5 V/m; Power Drift = -0.007 dB

**Hearing Aid Near-Field Category: M2 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 <b>134.9 M2</b>	Grid 2 <b>139.3 M2</b>	Grid 3 <b>135.0 M2</b>
Grid 4 <b>93.7 M3</b>	Grid 5 <b>96.0 M3</b>	Grid 6 <b>91.5 M3</b>
Grid 7 <b>132.3 M2</b>	Grid 8 <b>138.1 M2</b>	Grid 9 <b>134.6 M2</b>



0 dB = 139.3V/m

**Figure 12 System Performance Check 1880MHz\_E**

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## HAC\_System Performance Check at 1880MHz\_E

**DUT: Dipole 1880 MHz; Type: CD1880V3; SN: 1115**

Date/Time: 4/27/2012 6:17:25 AM

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**E Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility Test (41x181x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 139.4 V/m

Probe Modulation Factor = 1.00

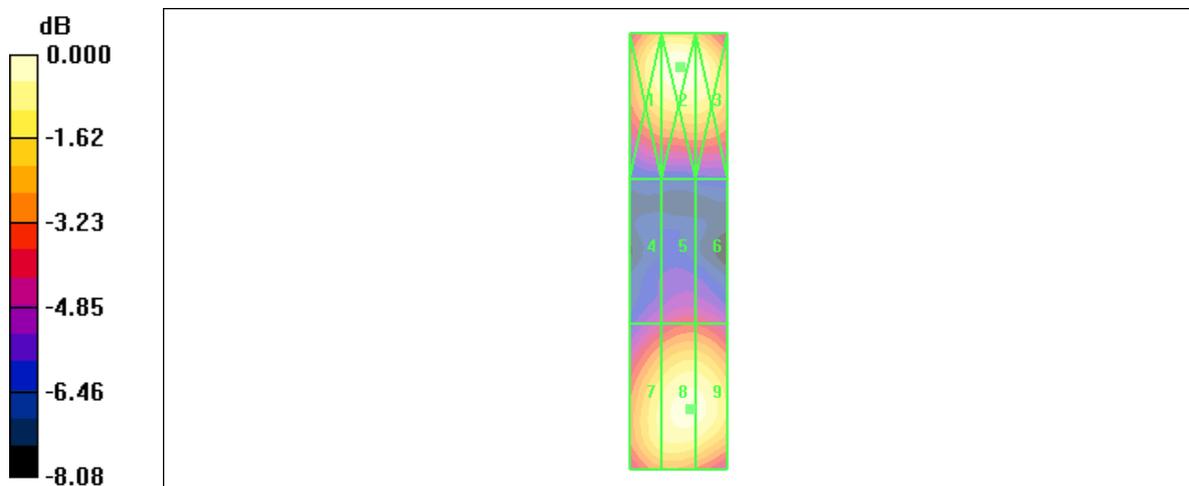
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 142.0 V/m; Power Drift = 0.031 dB

**Hearing Aid Near-Field Category: M2 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>136.9 M2</b>	<b>143.7 M2</b>	<b>139.1 M2</b>
Grid 4	Grid 5	Grid 6
<b>85.8 M3</b>	<b>92.8 M3</b>	<b>92.6 M3</b>
Grid 7	Grid 8	Grid 9
<b>130.6 M2</b>	<b>139.4 M2</b>	<b>138.9 M2</b>



0 dB = 143.7V/m

**Figure 13 System Performance Check 1880MHz\_E**

# TA Technology (Shanghai) Co., Ltd.

## Test Report

**HAC\_System Performance Check at 1880MHz\_H**

**DUT: Dipole 1880 MHz; Type: CD1880V3; SN: 1115**

Date/Time: 4/10/2012 9:48:22 AM

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**H Scan - measurement distance from the probe sensor center to Dipole = 10mm/Hearing Aid**

**Compatibility Test (41x181x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.462 A/m

Probe Modulation Factor = 1.00

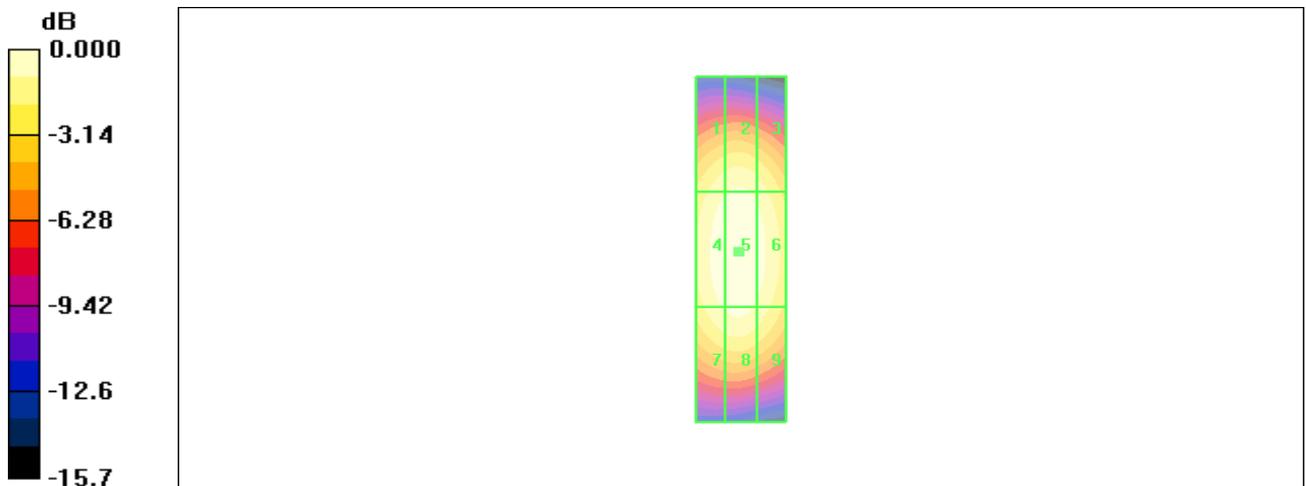
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.489 A/m; Power Drift = 0.040 dB

**Hearing Aid Near-Field Category: M2 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.405 M2</b>	Grid 2 <b>0.419 M2</b>	Grid 3 <b>0.394 M2</b>
Grid 4 <b>0.448 M2</b>	Grid 5 <b>0.462 M2</b>	Grid 6 <b>0.435 M2</b>
Grid 7 <b>0.414 M2</b>	Grid 8 <b>0.427 M2</b>	Grid 9 <b>0.400 M2</b>



0 dB = 0.462A/m

**Figure 14 System Performance Check 1880MHz\_H**

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## HAC\_System Performance Check at 1880MHz\_H

**DUT: Dipole 1880 MHz; Type: CD1880V3; SN: 1115**

Date/Time: 4/27/2012 5:18:37 AM

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

## H Scan - measurement distance from the probe sensor center to Dipole = 10mm/Hearing Aid

**Compatibility Test (41x181x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.447 A/m

Probe Modulation Factor = 1.00

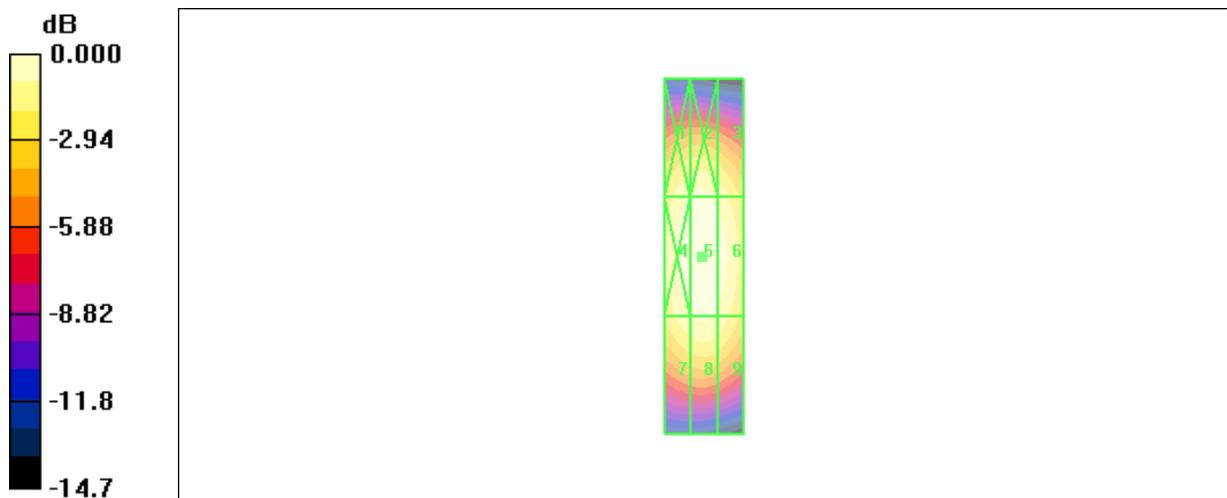
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.465 A/m; Power Drift = 0.099 dB

**Hearing Aid Near-Field Category: M2 (AWF 0 dB)**

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
<b>0.400 M2</b>	<b>0.411 M2</b>	<b>0.385 M2</b>
Grid 4	Grid 5	Grid 6
<b>0.434 M2</b>	<b>0.447 M2</b>	<b>0.424 M2</b>
Grid 7	Grid 8	Grid 9
<b>0.395 M2</b>	<b>0.410 M2</b>	<b>0.387 M2</b>



0 dB = 0.447A/m

**Figure 15 System Performance Check 1880MHz\_H**

## ANNEX B: Graph Results

### HAC RF E-Field CDMA Cellular High (SN: MLCBC16997500230)

Date/Time: 4/12/2012 4:52:25 PM

Communication System: CDMA ; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

### M660 CDMA Cellular HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device High/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 82.7 V/m

Probe Modulation Factor = 1.05

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 103.1 V/m; Power Drift = -0.132 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
74.8 M4	82.1 M4	79.9 M4
Grid 4	Grid 5	Grid 6
74.5 M4	82.7 M4	80.3 M4
Grid 7	Grid 8	Grid 9
70.5 M4	78.2 M4	76 M4

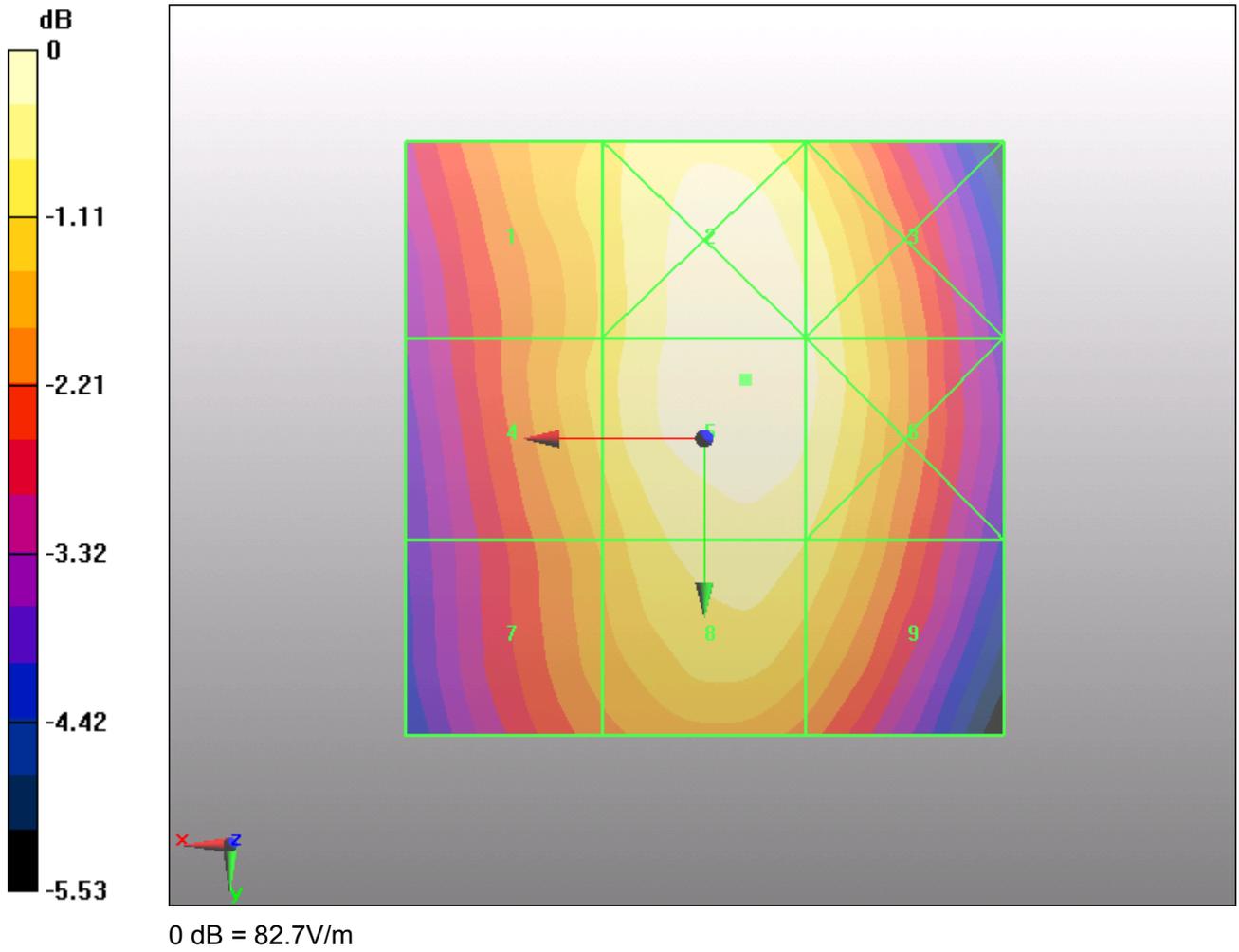


Figure 16 HAC RF E-Field CDMA Cellular Channel 777

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**HAC RF E-Field CDMA Cellular Middle (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 4:46:47 PM

Communication System: CDMA ; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA Cellular HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Middle/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 87.8 V/m

Probe Modulation Factor = 1.05

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 109.6 V/m; Power Drift = -0.135 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>78.7 M4</b>	<b>87.1 M4</b>	<b>84.1 M4</b>
Grid 4	Grid 5	Grid 6
<b>78.5 M4</b>	<b>87.8 M4</b>	<b>84.4 M4</b>
Grid 7	Grid 8	Grid 9
<b>75 M4</b>	<b>84 M4</b>	<b>80.6 M4</b>

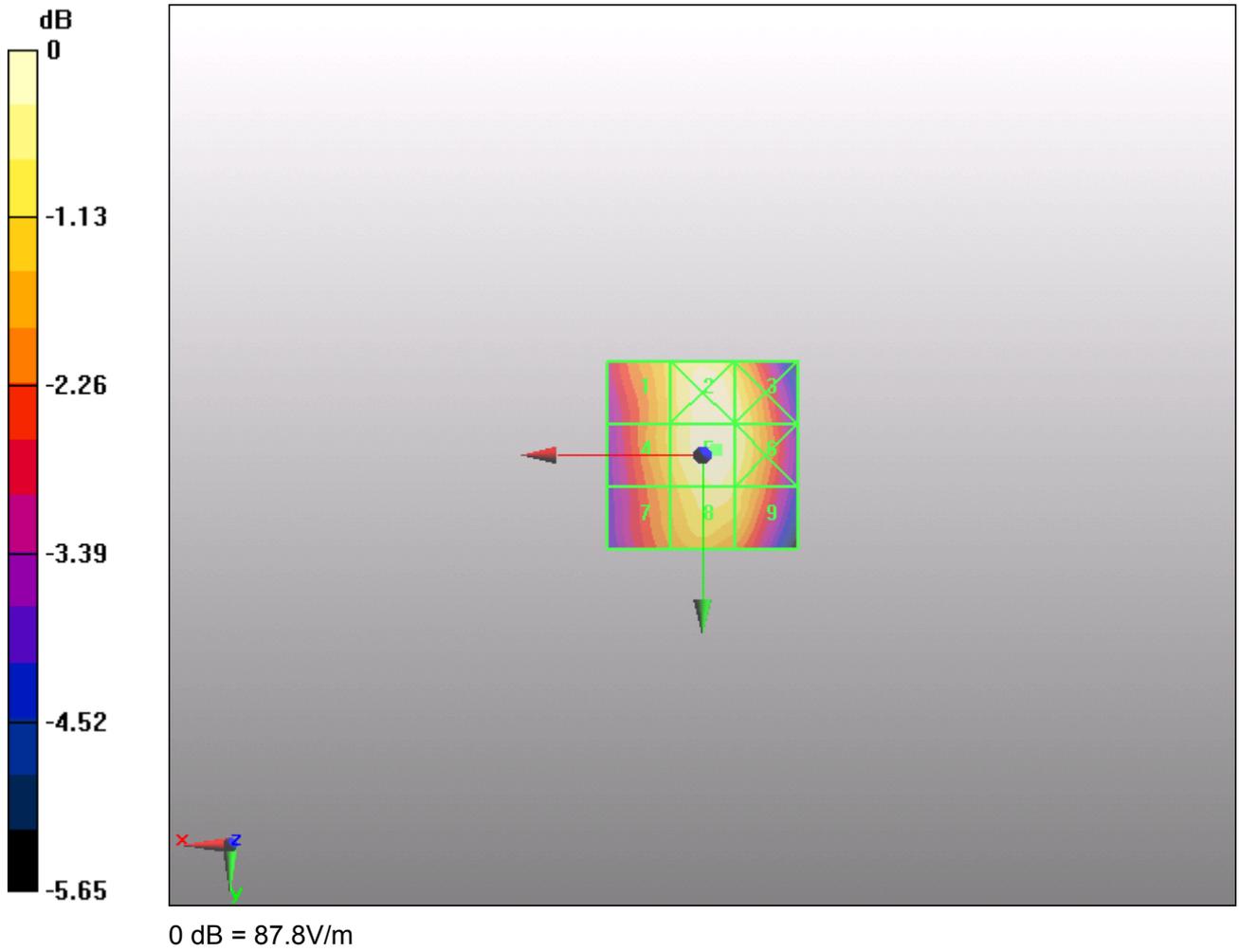


Figure 17 HAC RF E-Field CDMA Cellular Channel 384

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**HAC RF E-Field CDMA Cellular Low (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 4:57:57 PM

Communication System: CDMA ; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA Cellular HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 87.7 V/m

Probe Modulation Factor = 1.05

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 109.8 V/m; Power Drift = -0.029 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>79.1 M4</b>	<b>87.1 M4</b>	<b>84.3 M4</b>
Grid 4	Grid 5	Grid 6
<b>78.9 M4</b>	<b>87.7 M4</b>	<b>85.2 M4</b>
Grid 7	Grid 8	Grid 9
<b>75.1 M4</b>	<b>83.5 M4</b>	<b>81.1 M4</b>

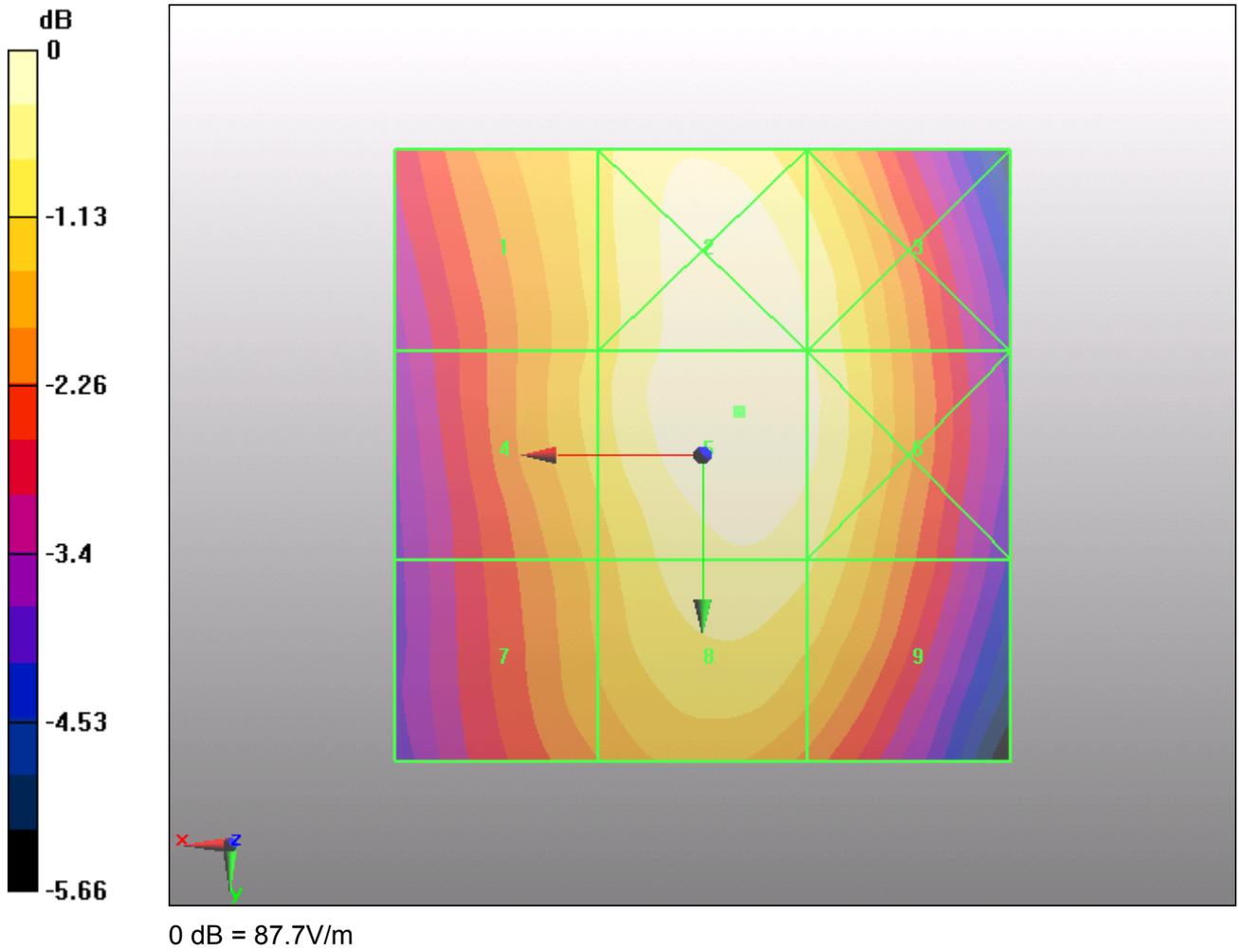


Figure 18 HAC RF E-Field CDMA Cellular Channel 1013

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**HAC RF E-Field CDMA Cellular Middle (SN: UBDC302X97501087)**

Date/Time: 4/27/2012 9:15:43 AM

Communication System: CDMA ; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 With Battery UBDC302 CDMA Cellular HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Middle/Hearing Aid Compatibility Test (101x101x1):**

Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 84 V/m

Probe Modulation Factor = 1.05

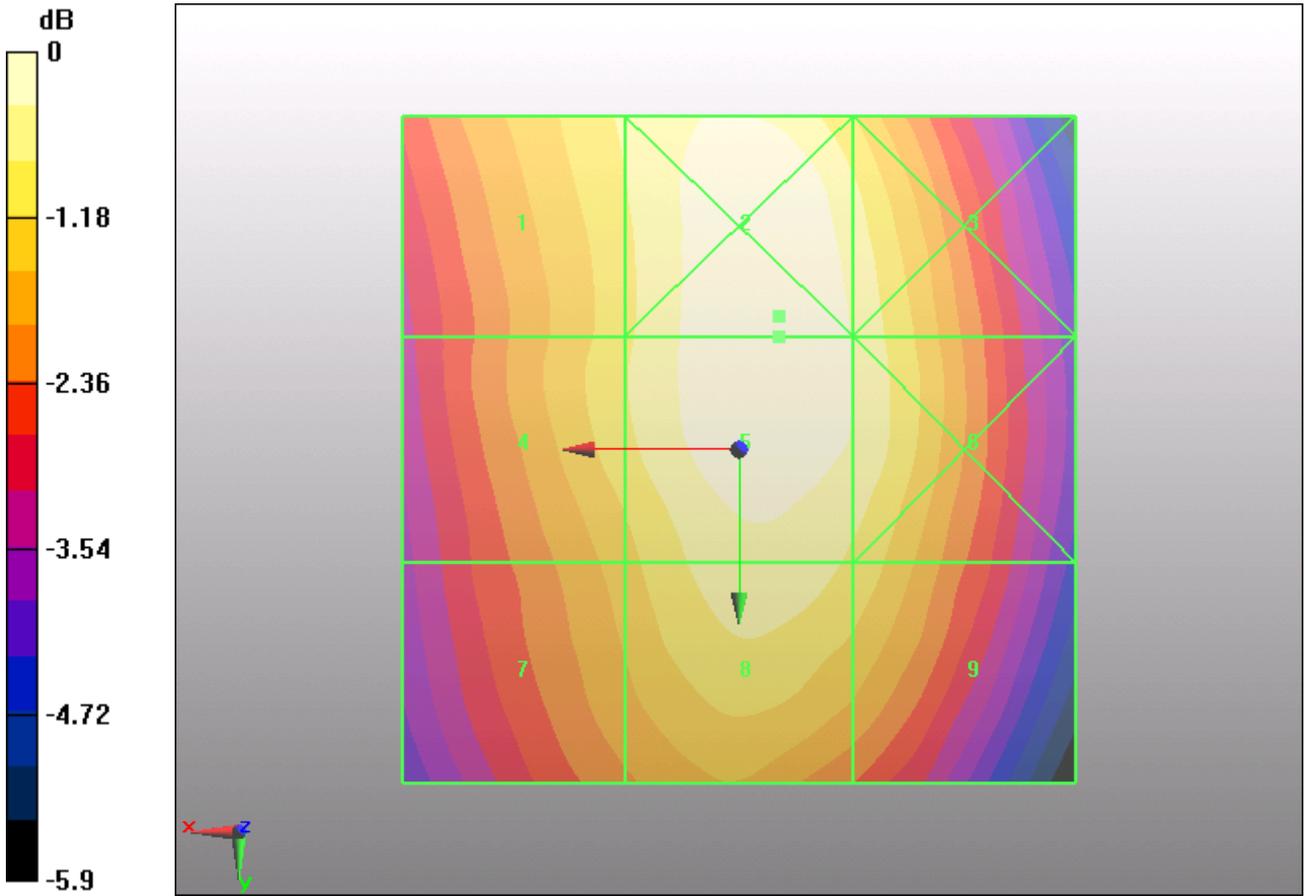
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 103.8 V/m; Power Drift = -0.176 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 <b>77.4 M4</b>	Grid 2 <b>84.1 M4</b>	Grid 3 <b>80.1 M4</b>
Grid 4 <b>76.6 M4</b>	Grid 5 <b>84 M4</b>	Grid 6 <b>80.4 M4</b>
Grid 7 <b>72.1 M4</b>	Grid 8 <b>79.2 M4</b>	Grid 9 <b>76.1 M4</b>



0 dB = 84.1V/m

Figure 19 HAC RF E-Field CDMA Cellular Channel 384

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**HAC RF H-Field CDMA Cellular High (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 12:53:56 PM

Communication System: CDMA ; Frequency: 848.31 MHz;Duty Cycle: 1:1

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

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA Cellular HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device High/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.116 A/m

Probe Modulation Factor = 1.01

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.082 A/m; Power Drift = -0.039 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.146 M4</b>	Grid 2 <b>0.101 M4</b>	Grid 3 <b>0.057 M4</b>
Grid 4 <b>0.143 M4</b>	Grid 5 <b>0.104 M4</b>	Grid 6 <b>0.066 M4</b>
Grid 7 <b>0.160 M4</b>	Grid 8 <b>0.116 M4</b>	Grid 9 <b>0.074 M4</b>

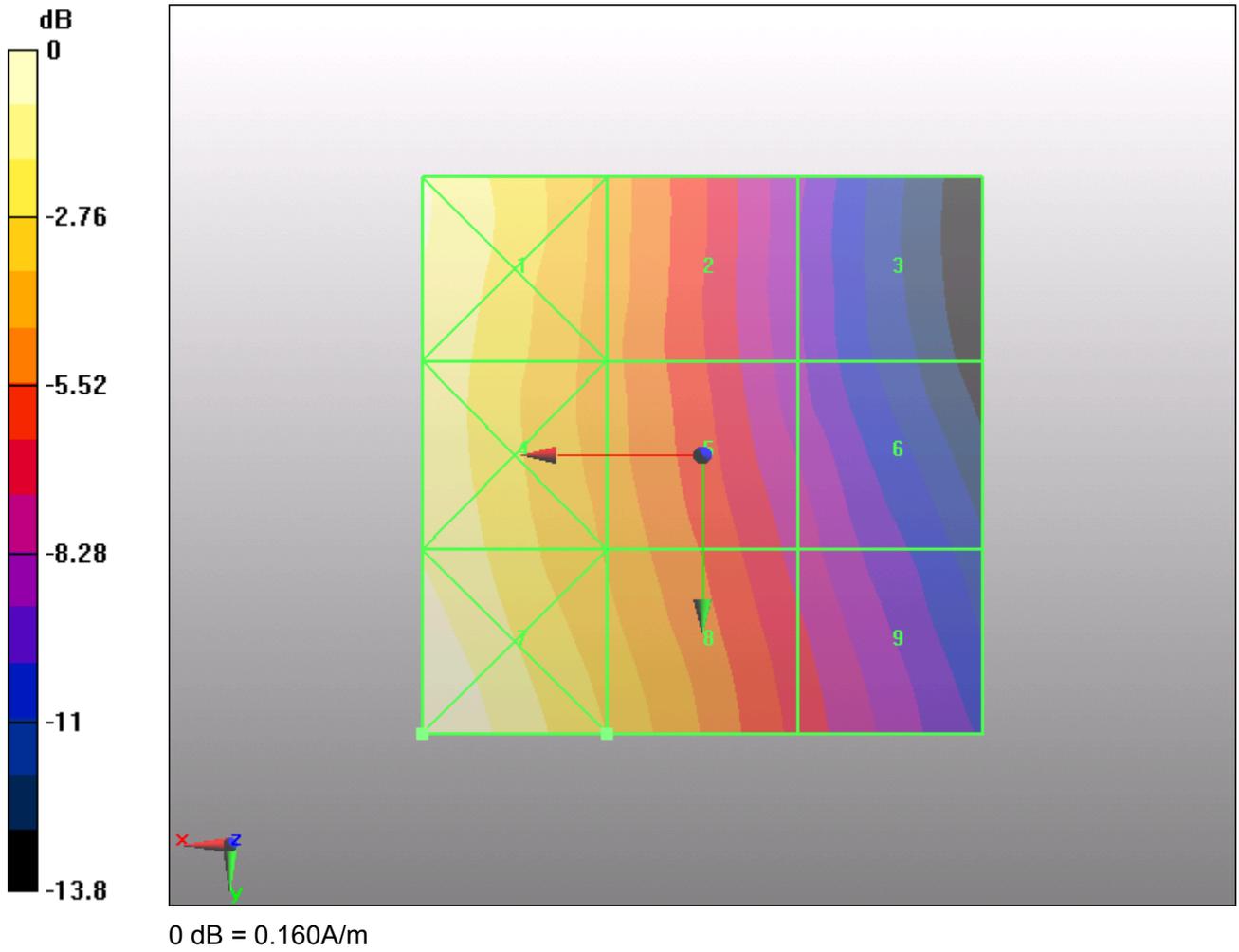


Figure 20 HAC RF H-Field CDMA Cellular Channel 777

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**HAC RF H-Field CDMA Cellular Middle (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 12:48:27 PM

Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1

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

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA Cellular HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Middle/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.122 A/m

Probe Modulation Factor = 1.01

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.086 A/m; Power Drift = -0.139 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.156 M4</b>	Grid 2 <b>0.108 M4</b>	Grid 3 <b>0.061 M4</b>
Grid 4 <b>0.152 M4</b>	Grid 5 <b>0.109 M4</b>	Grid 6 <b>0.069 M4</b>
Grid 7 <b>0.171 M4</b>	Grid 8 <b>0.122 M4</b>	Grid 9 <b>0.077 M4</b>

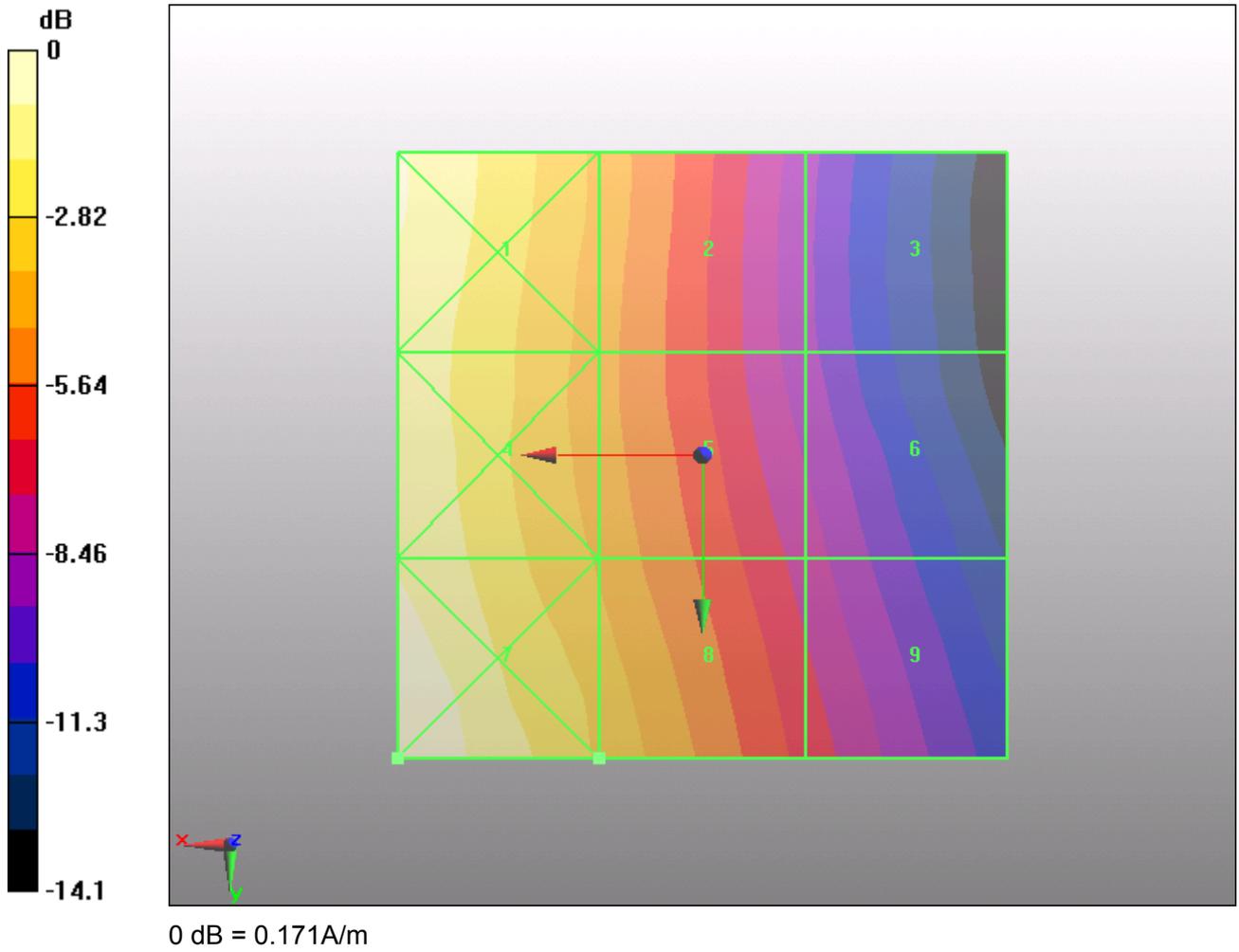


Figure 21 HAC RF H-Field CDMA Cellular Channel 384

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**HAC RF H-Field CDMA Cellular Low (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 12:59:33 PM

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1

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

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA Cellular HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.123 A/m

Probe Modulation Factor = 1.01

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.085 A/m; Power Drift = -0.056 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.154 M4</b>	Grid 2 <b>0.107 M4</b>	Grid 3 <b>0.060 M4</b>
Grid 4 <b>0.150 M4</b>	Grid 5 <b>0.110 M4</b>	Grid 6 <b>0.069 M4</b>
Grid 7 <b>0.169 M4</b>	Grid 8 <b>0.123 M4</b>	Grid 9 <b>0.077 M4</b>

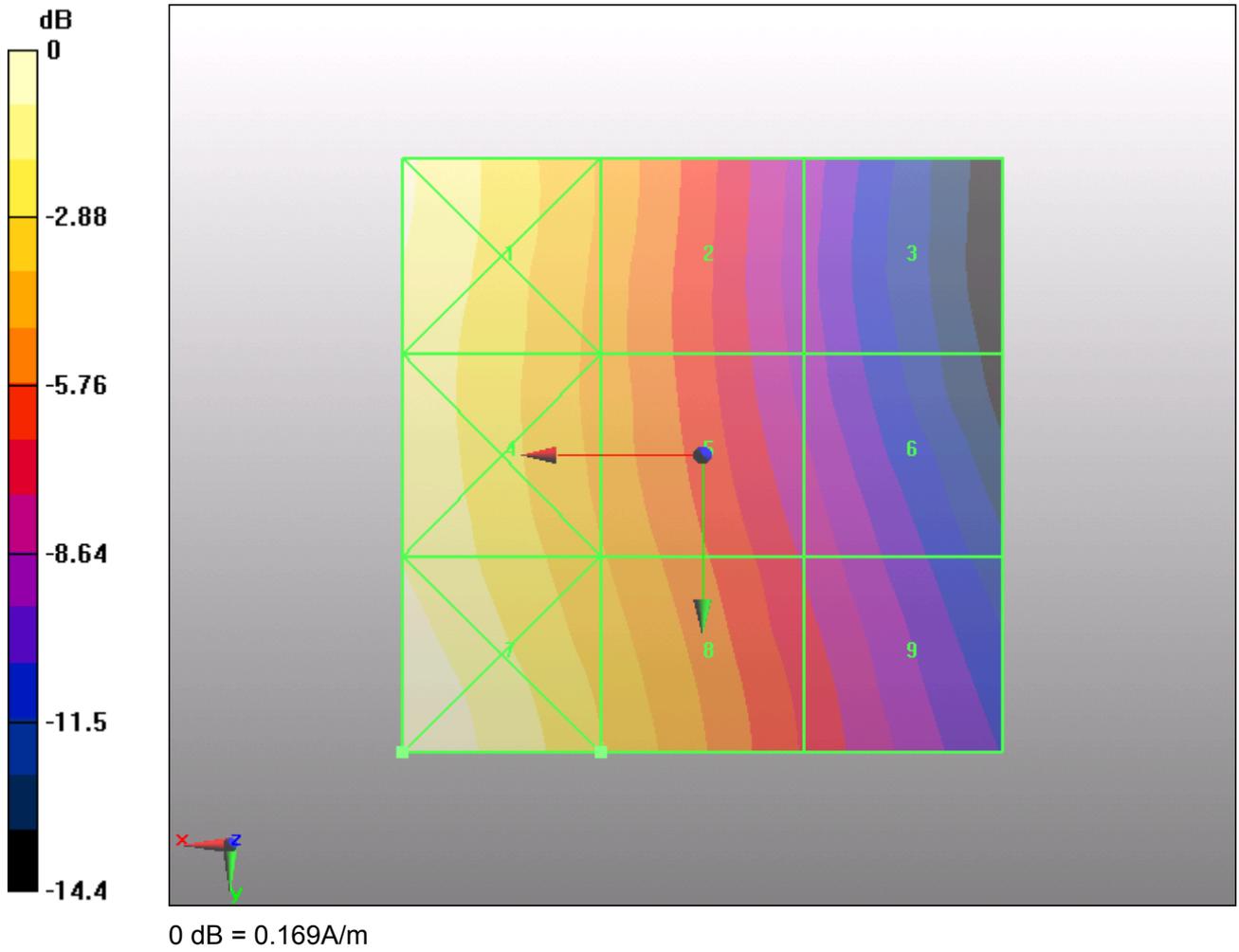


Figure 22 HAC RF H-Field CDMA Cellular Channel 1013

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**HAC RF H-Field CDMA Cellular Low (SN: UBDC302X97501087)**

Date/Time: 4/27/2012 9:55:42 AM

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1

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

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA Cellular HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.119 A/m

Probe Modulation Factor = 1.01

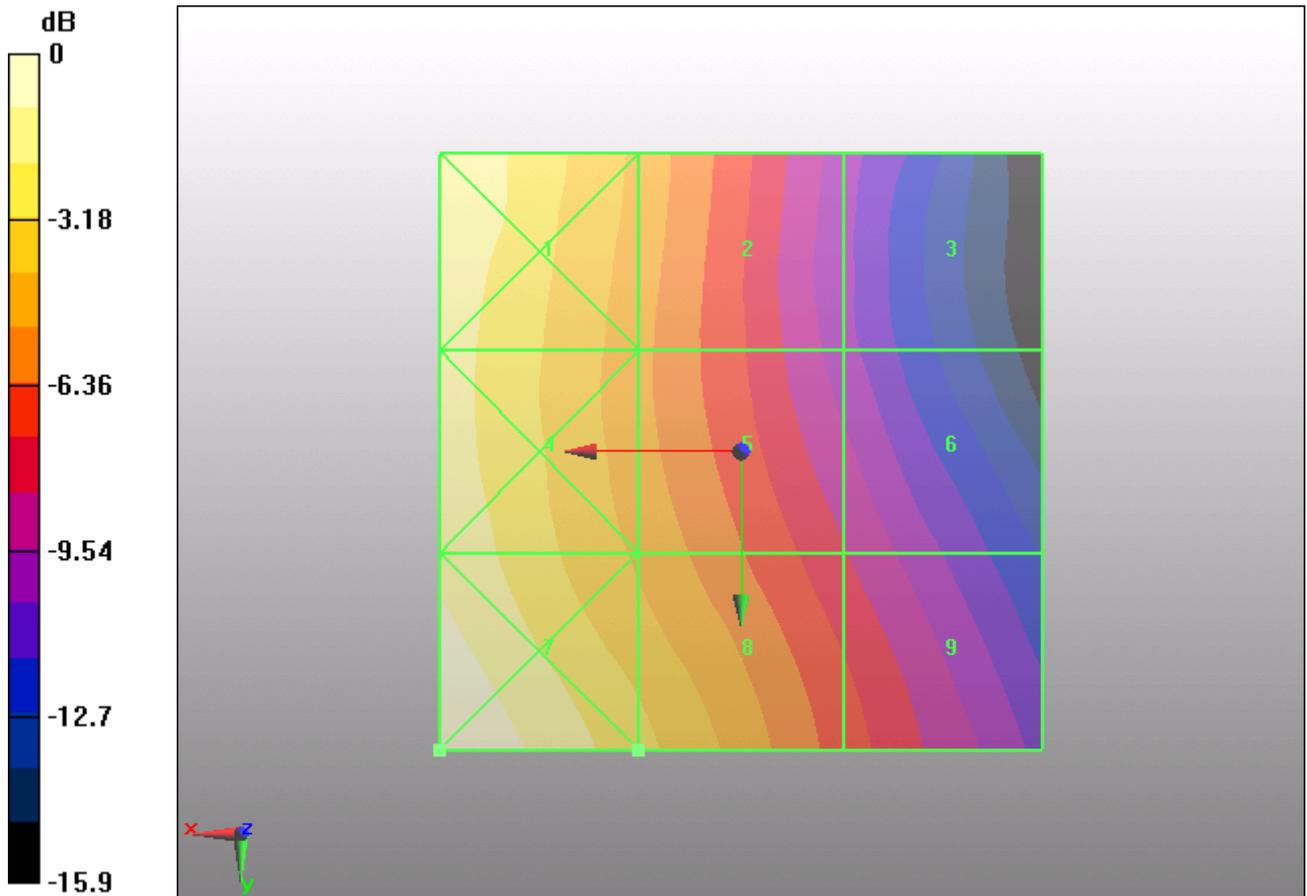
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.075 A/m; Power Drift = 0.025 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.146 M4</b>	Grid 2 <b>0.098 M4</b>	Grid 3 <b>0.052 M4</b>
Grid 4 <b>0.141 M4</b>	Grid 5 <b>0.099 M4</b>	Grid 6 <b>0.063 M4</b>
Grid 7 <b>0.164 M4</b>	Grid 8 <b>0.119 M4</b>	Grid 9 <b>0.075 M4</b>



0 dB = 0.164A/m

Figure 23 HAC RF H-Field CDMA Cellular Channel 1013

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**HAC RF E-Field CDMA PCS High (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 6:04:08 PM

Communication System: CDMA ; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA PCS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device High/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 15.5 V/m

Probe Modulation Factor = 1.02

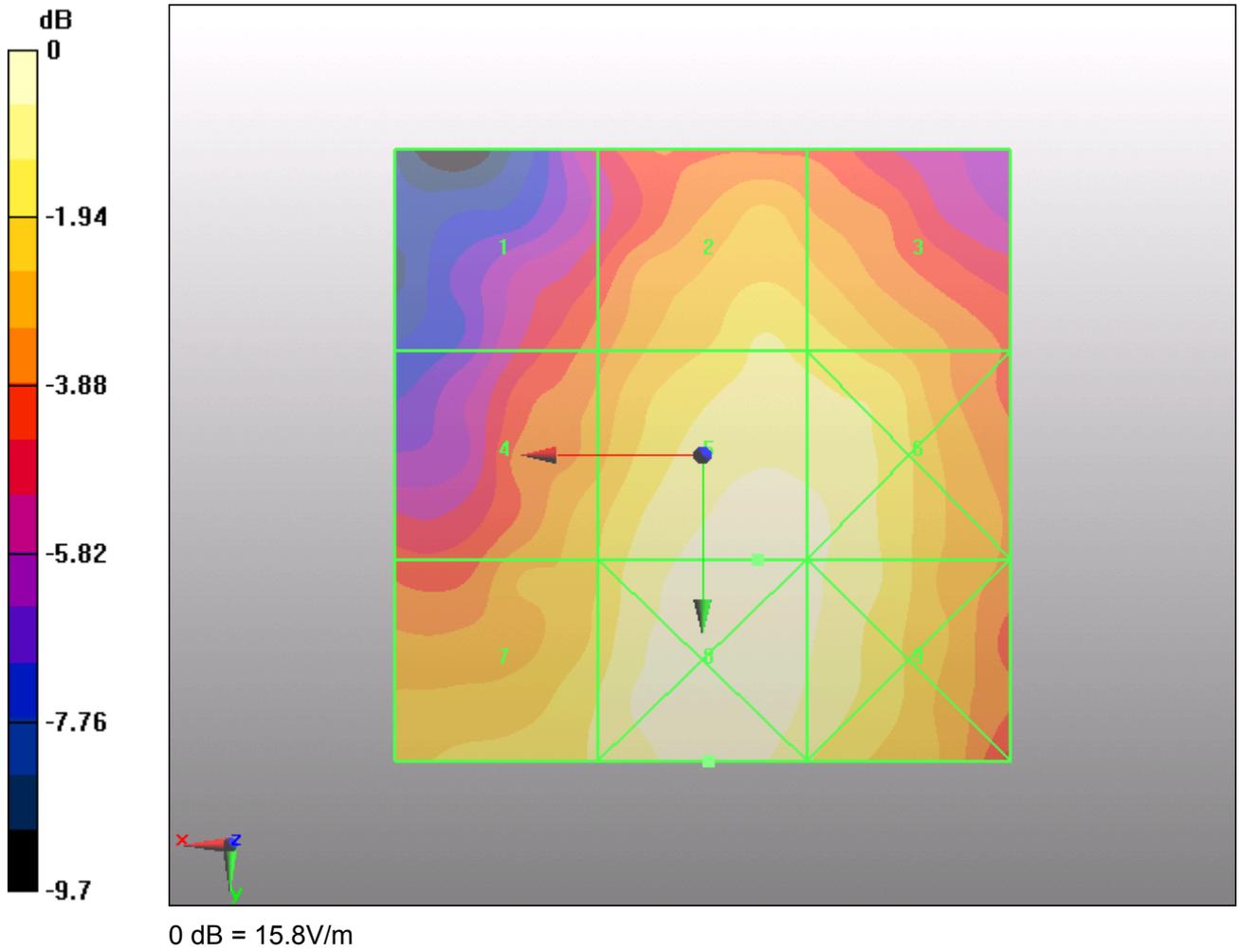
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 18.1 V/m; Power Drift = -0.113 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>10.6 M4</b>	<b>13.8 M4</b>	<b>13.3 M4</b>
Grid 4	Grid 5	Grid 6
<b>12.6 M4</b>	<b>15.5 M4</b>	<b>15 M4</b>
Grid 7	Grid 8	Grid 9
<b>13.8 M4</b>	<b>15.8 M4</b>	<b>15 M4</b>



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**HAC RF E-Field CDMA PCS Middle (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 5:48:52 PM

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA PCS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Middle/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 15.4 V/m

Probe Modulation Factor = 1.02

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 17.7 V/m; Power Drift = 0.095 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 <b>10.5 M4</b>	Grid 2 <b>14 M4</b>	Grid 3 <b>13.2 M4</b>
Grid 4 <b>12.5 M4</b>	Grid 5 <b>15.4 M4</b>	Grid 6 <b>15.3 M4</b>
Grid 7 <b>13.2 M4</b>	Grid 8 <b>15.9 M4</b>	Grid 9 <b>15.7 M4</b>

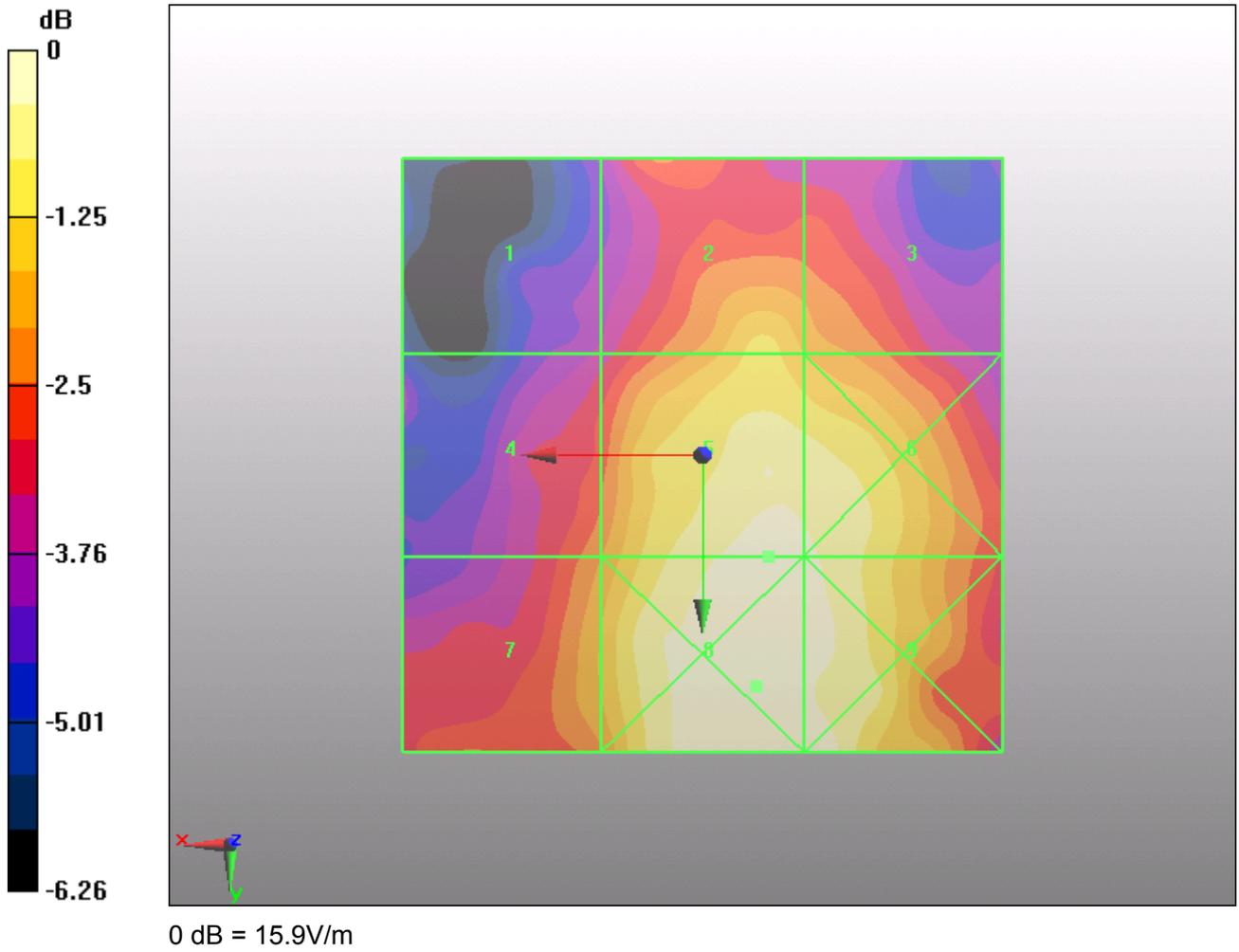


Figure 25 HAC RF E-Field CDMA PCS Channel 600

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**HAC RF E-Field CDMA PCS Low (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 6:09:35 PM

Communication System: CDMA ; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA PCS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 17.8 V/m

Probe Modulation Factor = 1.02

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 19.5 V/m; Power Drift = 0.092 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>11.8 M4</b>	<b>14.4 M4</b>	<b>14.1 M4</b>
Grid 4	Grid 5	Grid 6
<b>13.8 M4</b>	<b>17.8 M4</b>	<b>17.6 M4</b>
Grid 7	Grid 8	Grid 9
<b>16.9 M4</b>	<b>18.8 M4</b>	<b>18.6 M4</b>

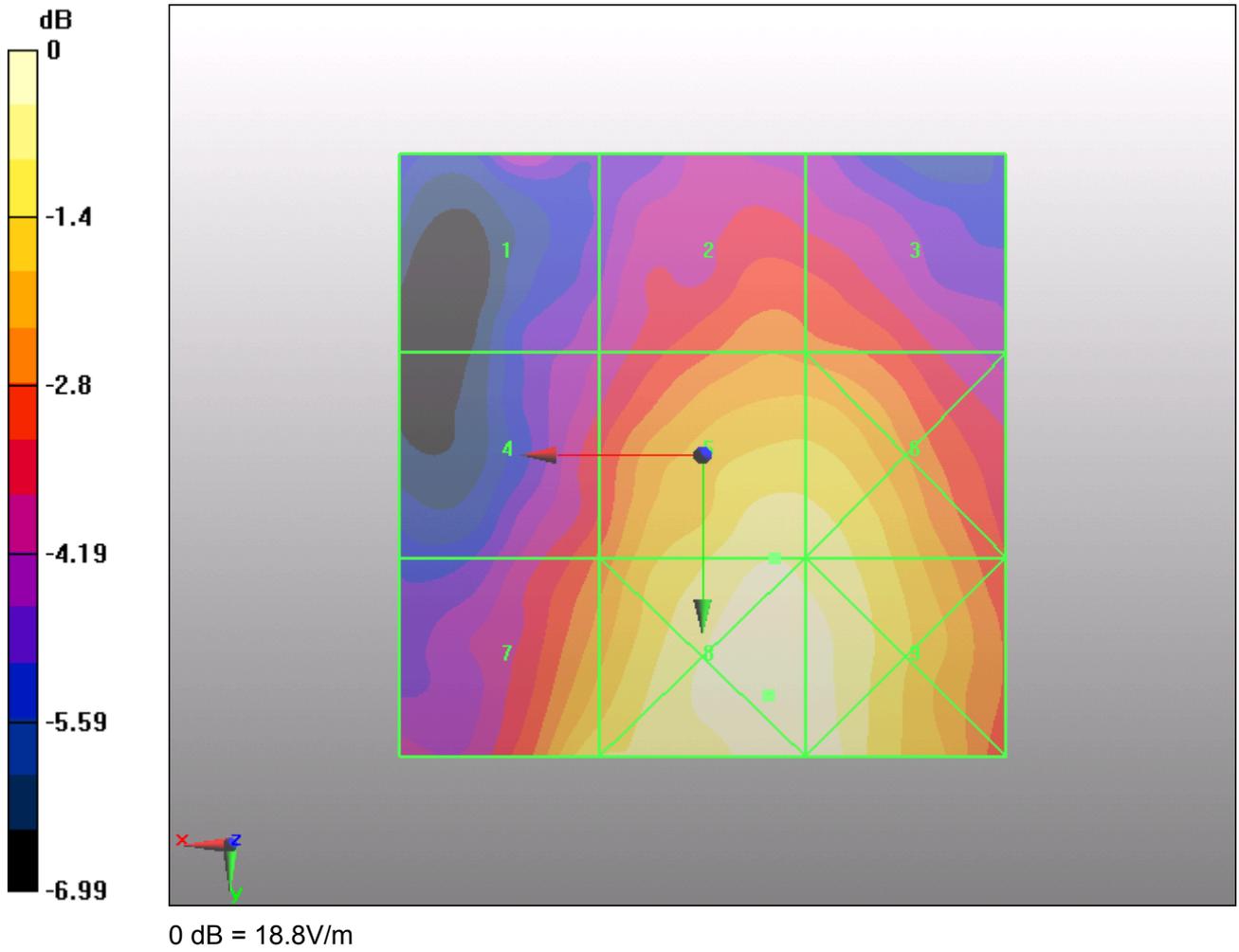


Figure 26 HAC RF E-Field CDMA PCS Channel 25

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**HAC RF E-Field CDMA PCS Low (SN: UBDC302X97501087)**

Date/Time: 4/27/2012 9:31:03 AM

Communication System: CDMA ; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 With Battery UBDC302 CDMA PCS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 17.1 V/m

Probe Modulation Factor = 1.02

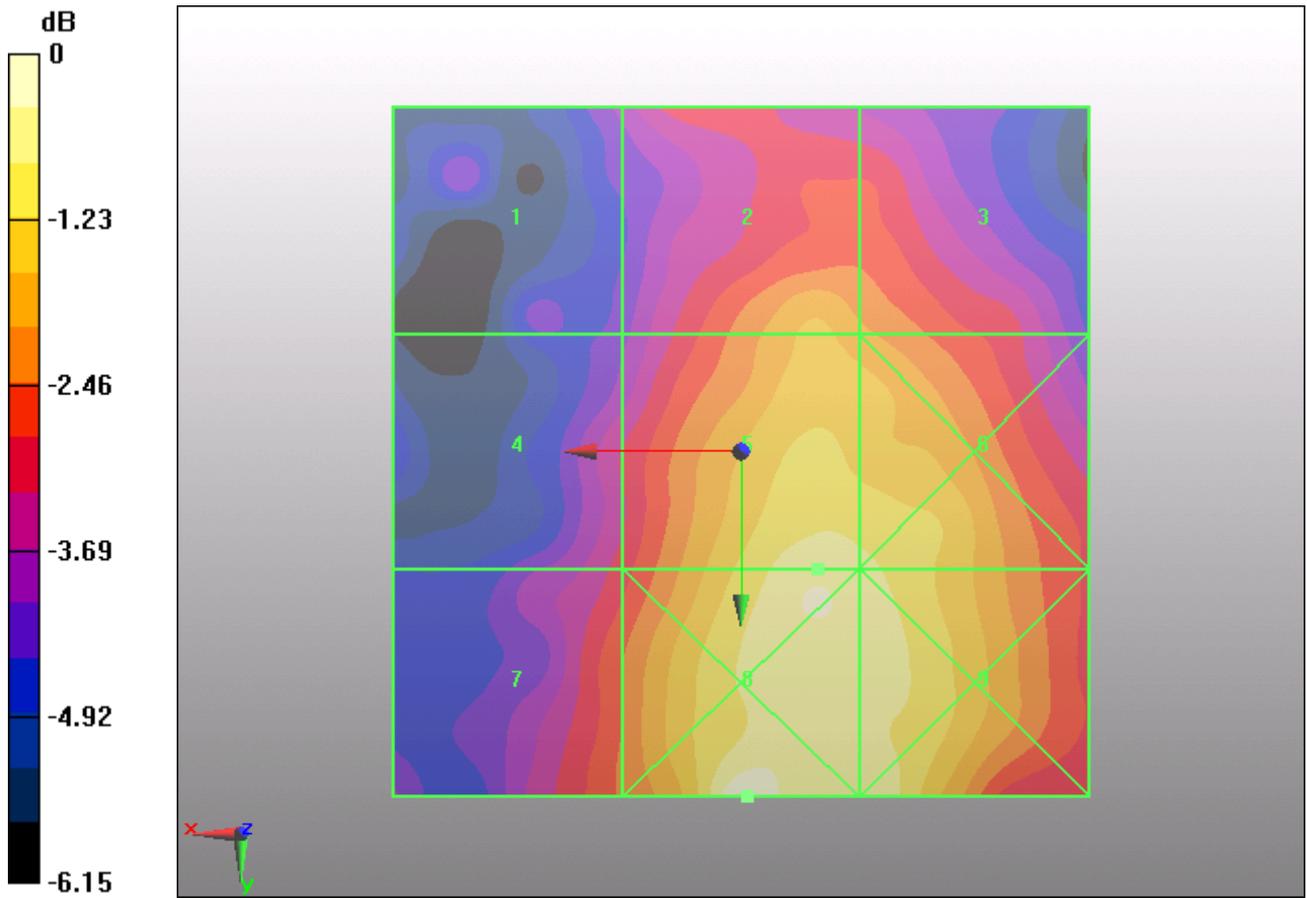
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 19.1 V/m; Power Drift = -0.120 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 <b>11.6 M4</b>	Grid 2 <b>15.1 M4</b>	Grid 3 <b>14.5 M4</b>
Grid 4 <b>12.8 M4</b>	Grid 5 <b>17.1 M4</b>	Grid 6 <b>16.7 M4</b>
Grid 7 <b>13.8 M4</b>	Grid 8 <b>18.1 M4</b>	Grid 9 <b>17.2 M4</b>



0 dB = 18.1V/m

Figure 27 HAC RF E-Field CDMA PCS Channel 25

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**HAC RF H-Field CDMA PCS High (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 1:17:12 PM

Communication System: CDMA ; Frequency: 1908.75 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA PCS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device High/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.035 A/m

Probe Modulation Factor = 1

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.027 A/m; Power Drift = -0.007 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
<b>0.034 M4</b>	<b>0.030 M4</b>	<b>0.025 M4</b>
Grid 4	Grid 5	Grid 6
<b>0.043 M4</b>	<b>0.035 M4</b>	<b>0.023 M4</b>
Grid 7	Grid 8	Grid 9
<b>0.052 M4</b>	<b>0.041 M4</b>	<b>0.028 M4</b>

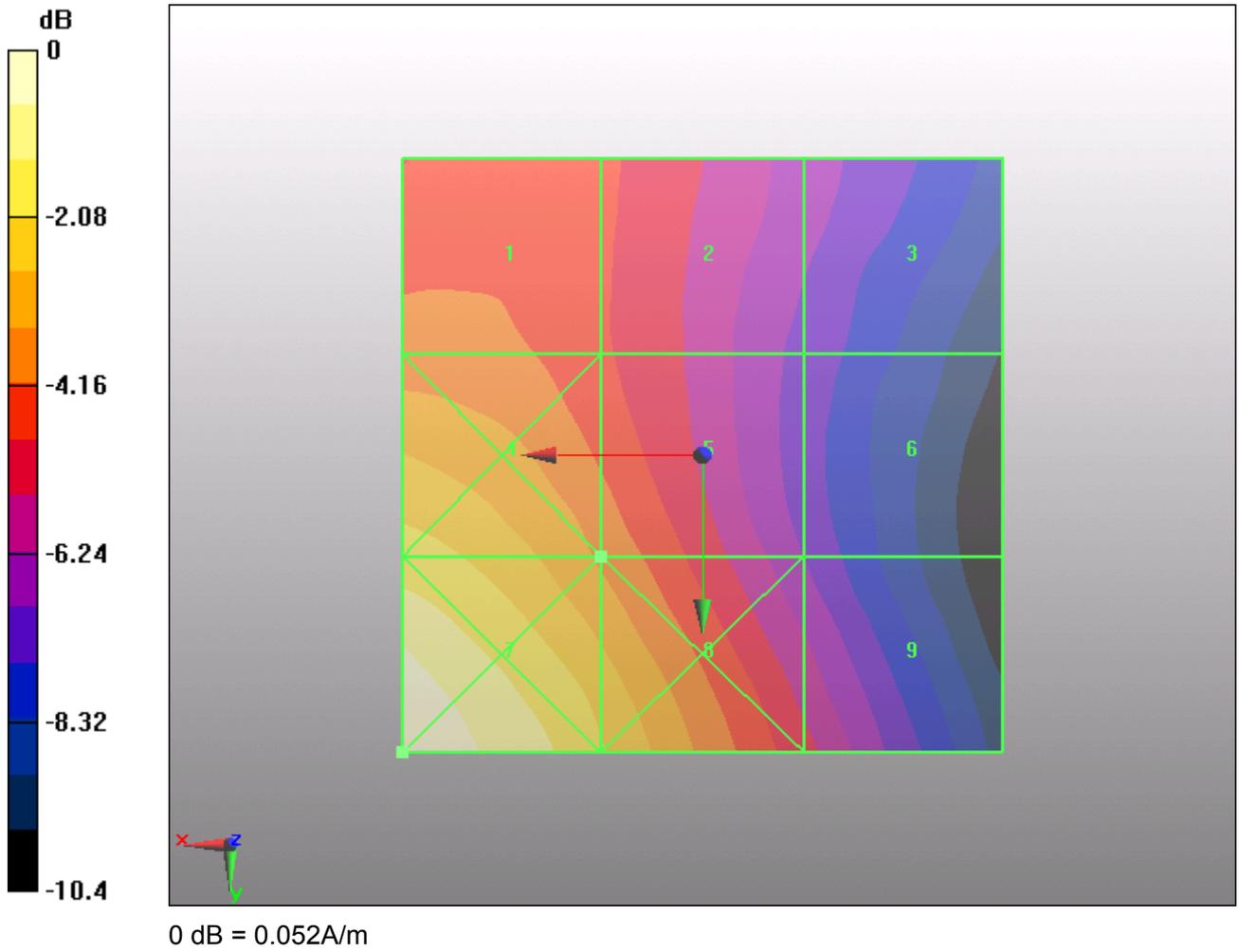


Figure 28 HAC RF H-Field CDMA PCS Channel 1175

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**HAC RF H-Field CDMA PCS Middle (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 1:11:42 PM

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1

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

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA PCS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Middle/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.034 A/m

Probe Modulation Factor = 1

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.026 A/m; Power Drift = 0.004 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.034 M4</b>	Grid 2 <b>0.030 M4</b>	Grid 3 <b>0.023 M4</b>
Grid 4 <b>0.042 M4</b>	Grid 5 <b>0.034 M4</b>	Grid 6 <b>0.022 M4</b>
Grid 7 <b>0.051 M4</b>	Grid 8 <b>0.041 M4</b>	Grid 9 <b>0.028 M4</b>

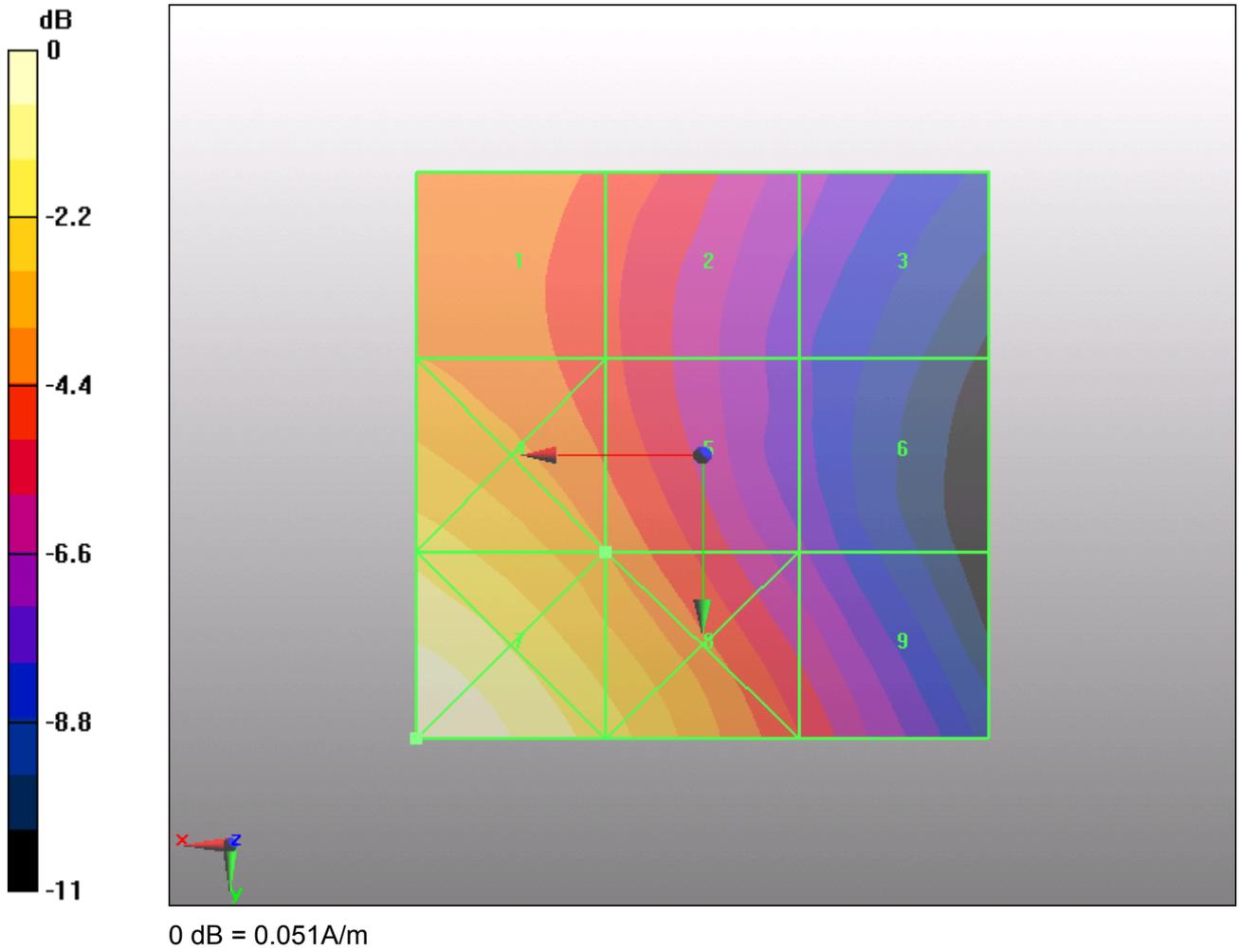


Figure 29 HAC RF H-Field CDMA PCS Channel 600

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**HAC RF H-Field CDMA PCS Low (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 1:22:46 PM

Communication System: CDMA ; Frequency: 1851.25 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA PCS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.041 A/m

Probe Modulation Factor = 1

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.033 A/m; Power Drift = 0.085 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
<b>0.041 M4</b>	<b>0.036 M4</b>	<b>0.027 M4</b>
Grid 4	Grid 5	Grid 6
<b>0.048 M4</b>	<b>0.039 M4</b>	<b>0.027 M4</b>
Grid 7	Grid 8	Grid 9
<b>0.059 M4</b>	<b>0.047 M4</b>	<b>0.030 M4</b>

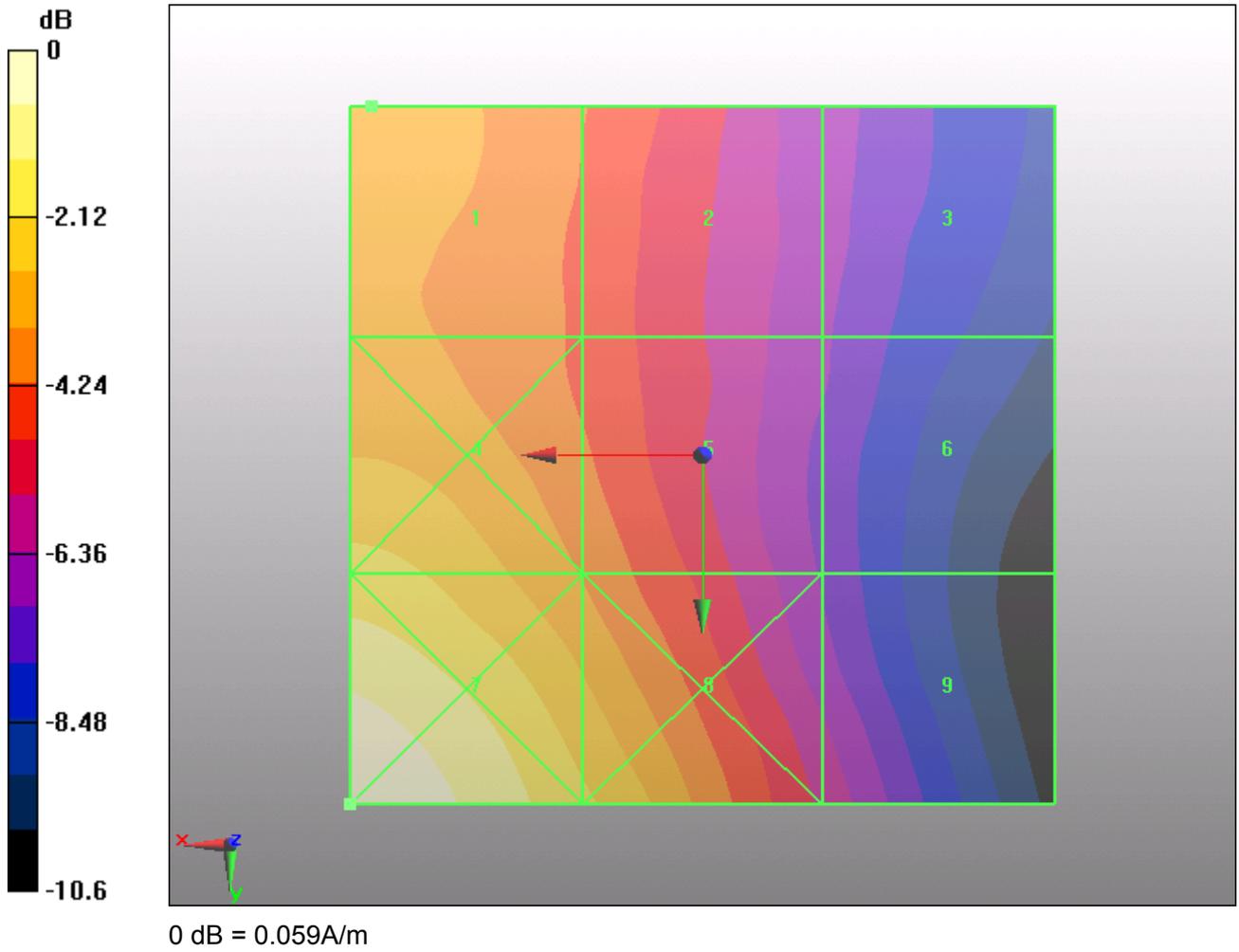


Figure 30 HAC RF H-Field CDMA PCS Channel 25

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**HAC RF H-Field CDMA PCS Low (SN: UBDC302X97501087)**

Date/Time: 4/27/2012 9:44:41 AM

Communication System: CDMA ; Frequency: 1851.25 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA PCS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.039 A/m

Probe Modulation Factor = 1

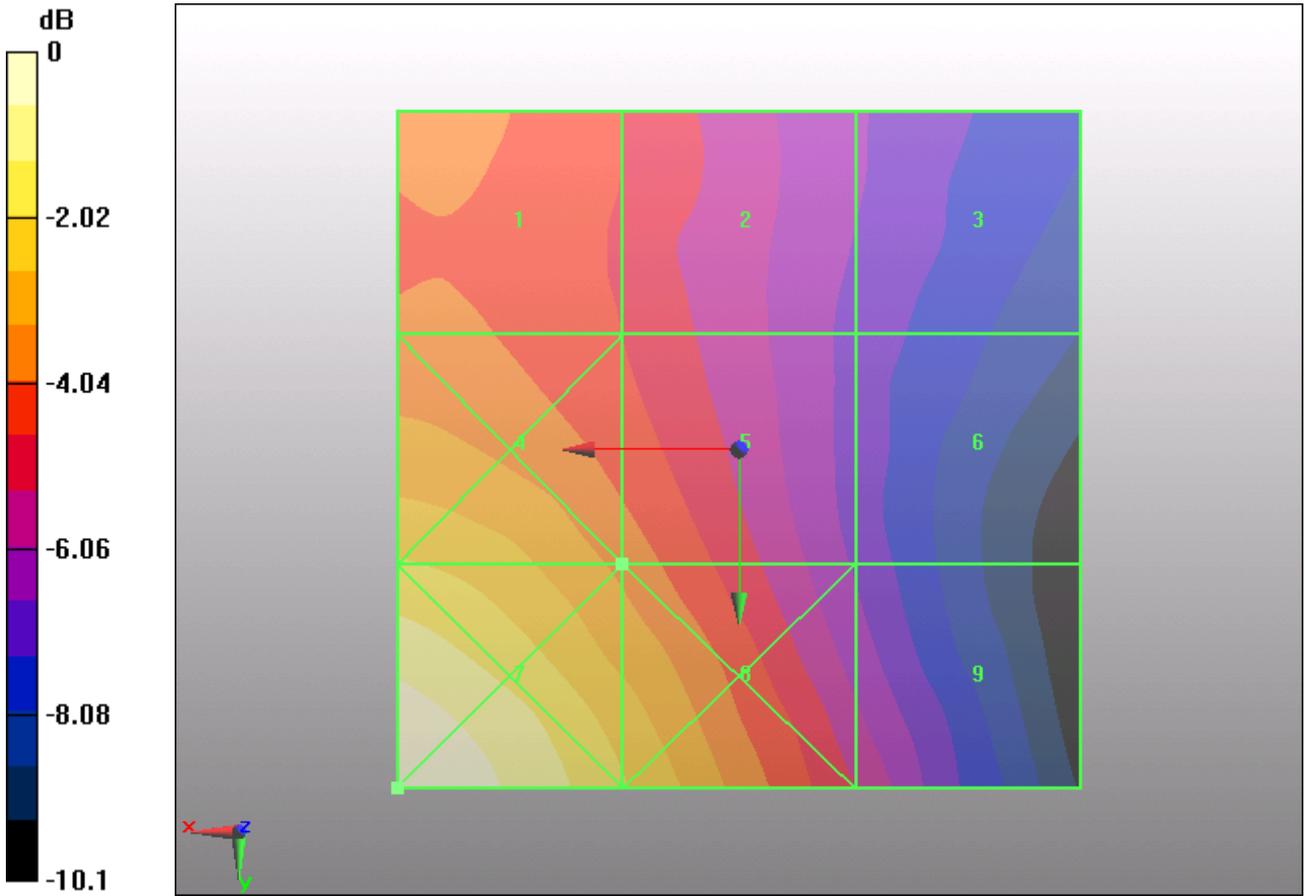
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.032 A/m; Power Drift = 0.069 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.038 M4</b>	Grid 2 <b>0.034 M4</b>	Grid 3 <b>0.028 M4</b>
Grid 4 <b>0.047 M4</b>	Grid 5 <b>0.039 M4</b>	Grid 6 <b>0.027 M4</b>
Grid 7 <b>0.059 M4</b>	Grid 8 <b>0.047 M4</b>	Grid 9 <b>0.032 M4</b>



0 dB = 0.059A/m

Figure 31 HAC RF H-Field CDMA PCS Channel 25

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**HAC RF E-Field CDMA AWS High (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 5:37:19 PM

Communication System: CDMA ; Frequency: 1752.5 MHz;Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA AWS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device High/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 27.8 V/m

Probe Modulation Factor = 1.02

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 26.2 V/m; Power Drift = -0.063 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>18.8 M4</b>	<b>17.3 M4</b>	<b>17.7 M4</b>
Grid 4	Grid 5	Grid 6
<b>21 M4</b>	<b>27.8 M4</b>	<b>27.8 M4</b>
Grid 7	Grid 8	Grid 9
<b>28.9 M4</b>	<b>33 M4</b>	<b>31.9 M4</b>

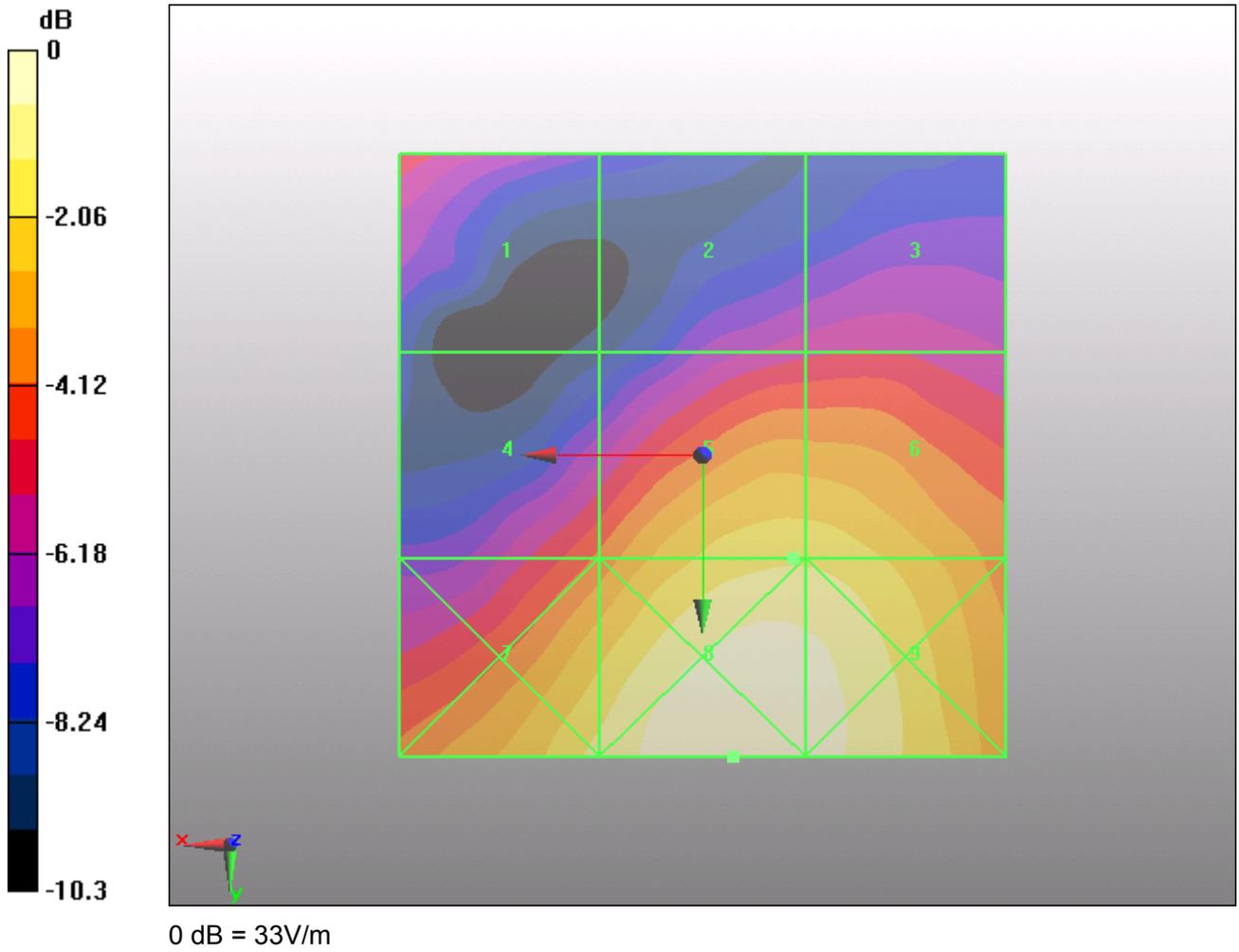


Figure 32 HAC RF E-Field CDMA AWS Channel 850

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**HAC RF E-Field CDMA AWS Middle (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 5:15:09 PM

Communication System: CDMA ; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA AWS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Middle/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 27.7 V/m

Probe Modulation Factor = 1.02

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 27.1 V/m; Power Drift = -0.007 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 <b>17.6 M4</b>	Grid 2 <b>18.2 M4</b>	Grid 3 <b>18.6 M4</b>
Grid 4 <b>21 M4</b>	Grid 5 <b>27.7 M4</b>	Grid 6 <b>27.7 M4</b>
Grid 7 <b>28.5 M4</b>	Grid 8 <b>31.9 M4</b>	Grid 9 <b>31.2 M4</b>

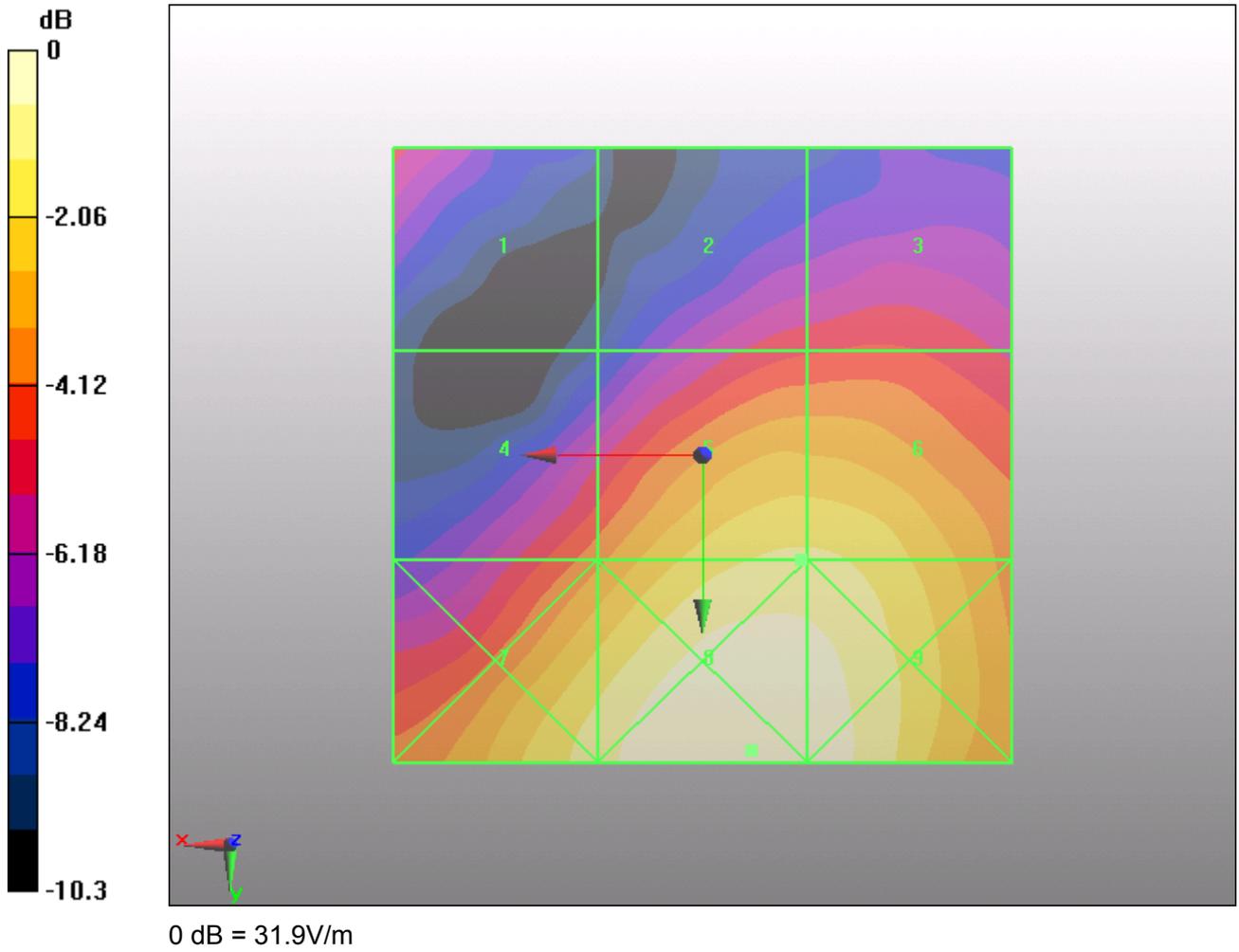


Figure 33 HAC RF E-Field CDMA AWS Channel 450

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**HAC RF E-Field CDMA AWS Low (SN: MLCBC16997500230)**

Date/Time: 4/12/2012 5:42:56 PM

Communication System: CDMA ; Frequency: 1711.25 MHz; Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA AWS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 29.1 V/m

Probe Modulation Factor = 1.02

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 29.5 V/m; Power Drift = -0.133 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
<b>16.9 M4</b>	<b>19.6 M4</b>	<b>19.5 M4</b>
Grid 4	Grid 5	Grid 6
<b>22.6 M4</b>	<b>29.1 M4</b>	<b>28.8 M4</b>
Grid 7	Grid 8	Grid 9
<b>31.4 M4</b>	<b>33.6 M4</b>	<b>31.8 M4</b>

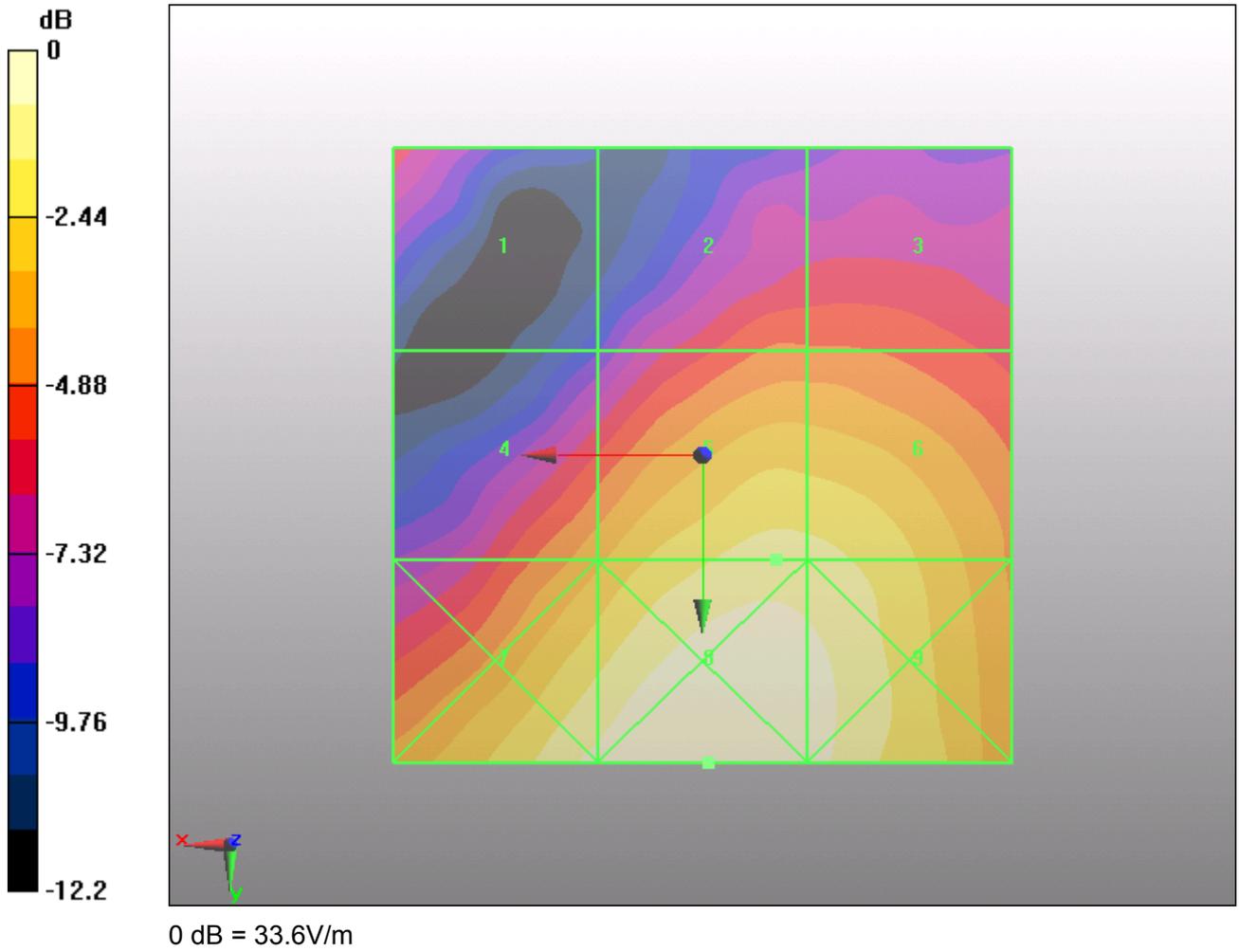


Figure 34 HAC RF E-Field CDMA AWS Channel 25

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**HAC RF E-Field CDMA AWS Low (SN: UBDC302X97501087)**

Date/Time: 4/27/2012 9:21:39 AM

Communication System: CDMA ; Frequency: 1711.25 MHz;Duty Cycle: 1:1

Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: ER3DV6 - SN2303; ConvF(1, 1, 1); Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 With Battery UBDC302 CDMA AWS HAC RF E-Field/E Scan - ER3D - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 29.6 V/m

Probe Modulation Factor = 1.02

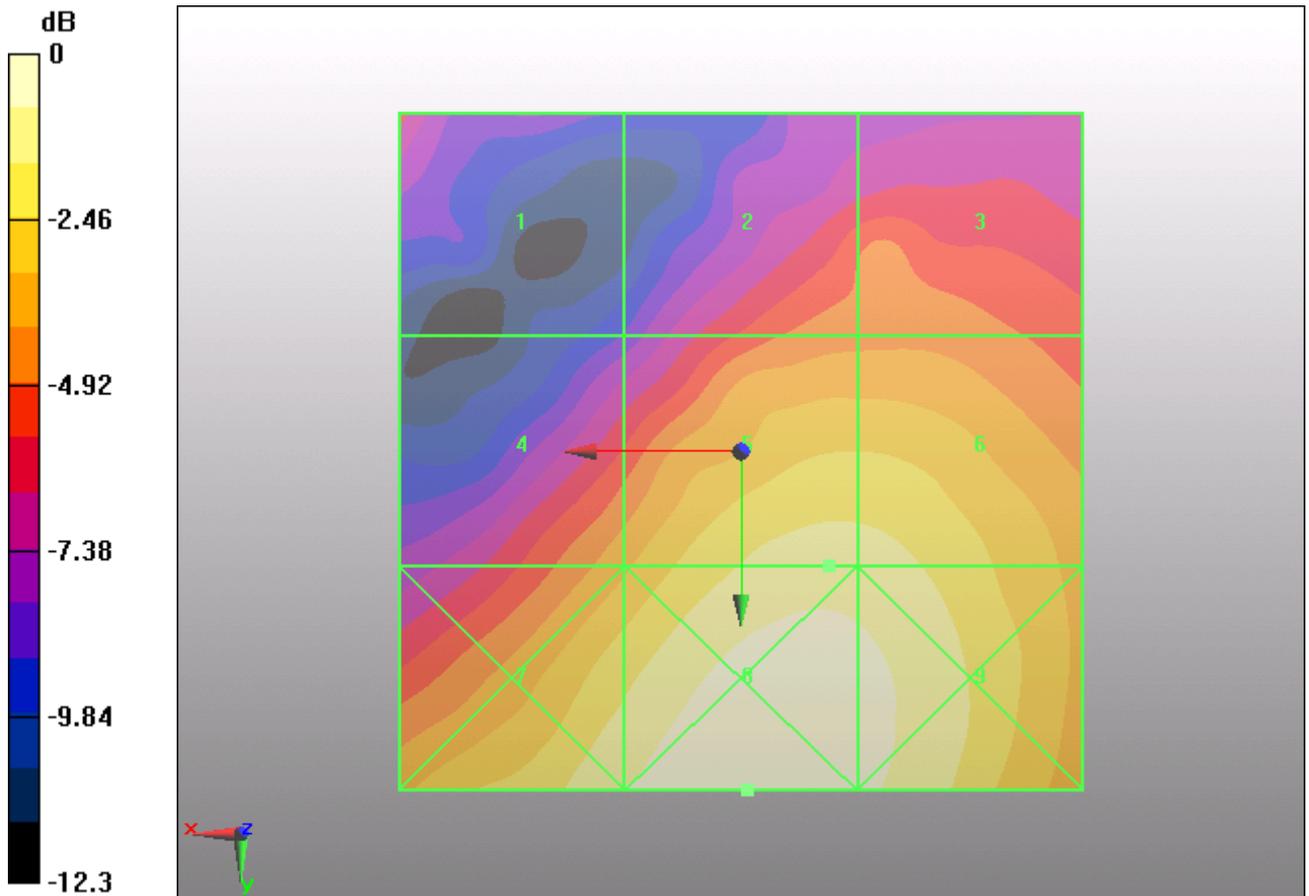
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 29.8 V/m; Power Drift = -0.025 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak E-field in V/m

Grid 1 <b>16.8 M4</b>	Grid 2 <b>20.5 M4</b>	Grid 3 <b>20.7 M4</b>
Grid 4 <b>22.8 M4</b>	Grid 5 <b>29.6 M4</b>	Grid 6 <b>29.4 M4</b>
Grid 7 <b>30.9 M4</b>	Grid 8 <b>33.8 M4</b>	Grid 9 <b>31.8 M4</b>



0 dB = 33.8V/m

Figure 35 HAC RF E-Field CDMA AWS Channel 25

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**HAC RF H-Field CDMA AWS High (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 1:39:39 PM

Communication System: CDMA ; Frequency: 1752.5 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA AWS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device High/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.069 A/m

Probe Modulation Factor = 1

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.070 A/m; Power Drift = 0.151 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.060 M4</b>	Grid 2 <b>0.061 M4</b>	Grid 3 <b>0.058 M4</b>
Grid 4 <b>0.073 M4</b>	Grid 5 <b>0.069 M4</b>	Grid 6 <b>0.058 M4</b>
Grid 7 <b>0.096 M4</b>	Grid 8 <b>0.082 M4</b>	Grid 9 <b>0.055 M4</b>

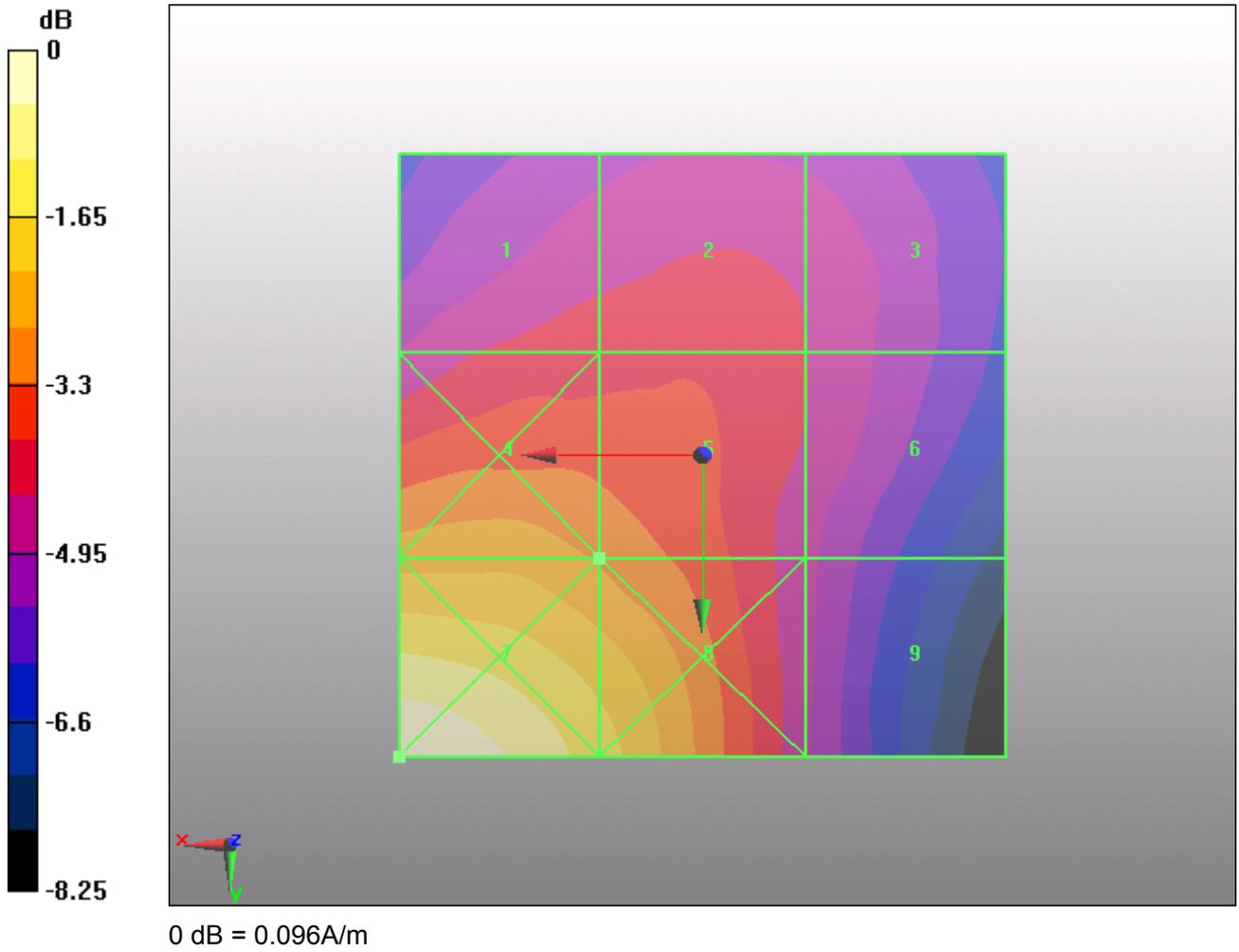


Figure 36 HAC RF H-Field CDMA AWS Channel 850

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**HAC RF H-Field CDMA AWS Middle (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 1:34:06 PM

Communication System: CDMA ; Frequency: 1732.5 MHz;Duty Cycle: 1:1

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

Ambient Temperature:22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA AWS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Middle/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.064 A/m

Probe Modulation Factor = 1

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.064 A/m; Power Drift = -0.100 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.055 M4</b>	Grid 2 <b>0.056 M4</b>	Grid 3 <b>0.053 M4</b>
Grid 4 <b>0.070 M4</b>	Grid 5 <b>0.064 M4</b>	Grid 6 <b>0.053 M4</b>
Grid 7 <b>0.091 M4</b>	Grid 8 <b>0.075 M4</b>	Grid 9 <b>0.050 M4</b>

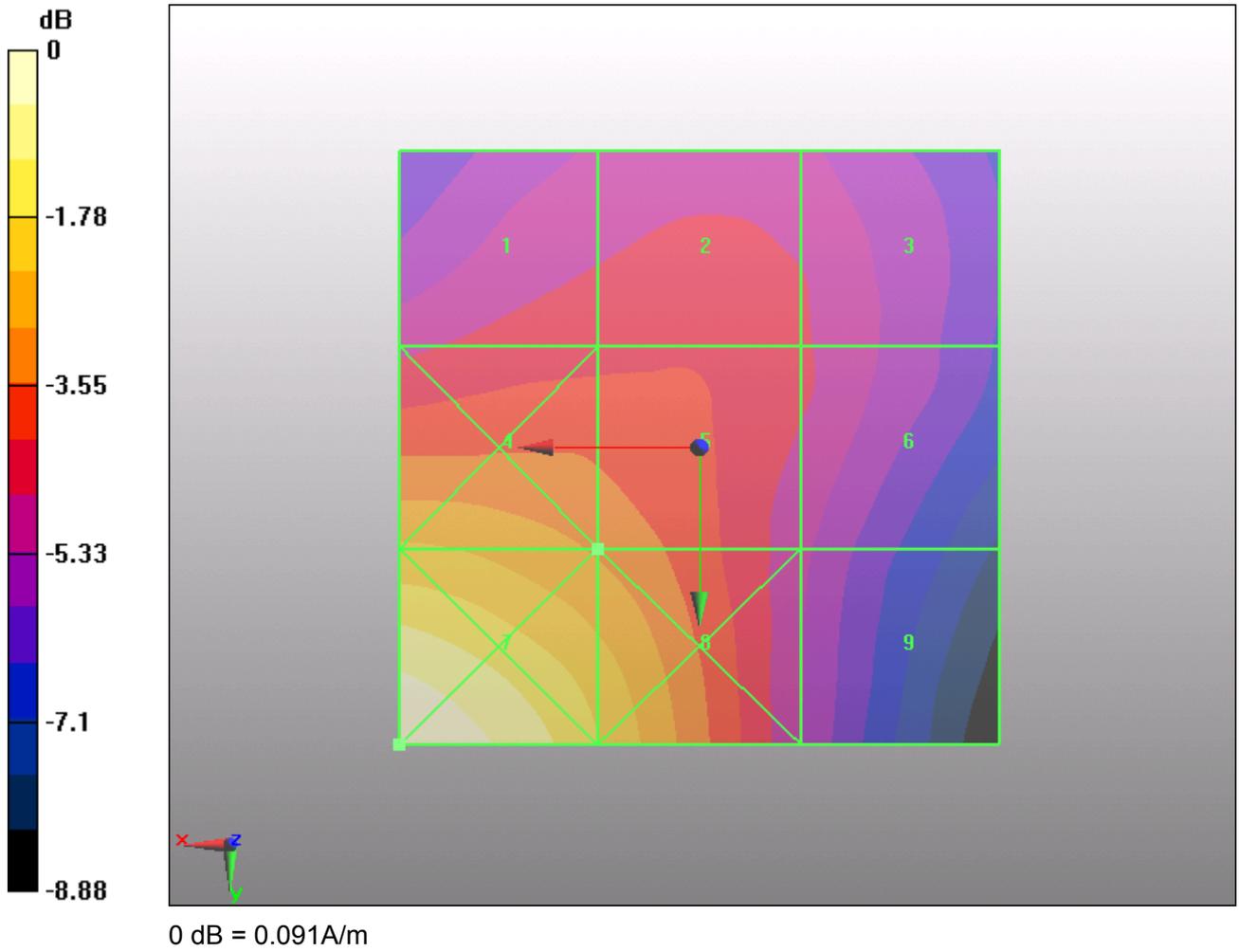


Figure 37 HAC RF H-Field CDMA AWS Channel 450

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**HAC RF H-Field CDMA AWS Low (SN: MLCBC16997500230)**

Date/Time: 4/10/2012 1:45:03 PM

Communication System: CDMA ; Frequency: 1711.25 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA AWS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.070 A/m

Probe Modulation Factor = 1

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.071 A/m; Power Drift = 0.152 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1 <b>0.063 M4</b>	Grid 2 <b>0.063 M4</b>	Grid 3 <b>0.059 M4</b>
Grid 4 <b>0.077 M4</b>	Grid 5 <b>0.070 M4</b>	Grid 6 <b>0.059 M4</b>
Grid 7 <b>0.095 M4</b>	Grid 8 <b>0.078 M4</b>	Grid 9 <b>0.055 M4</b>

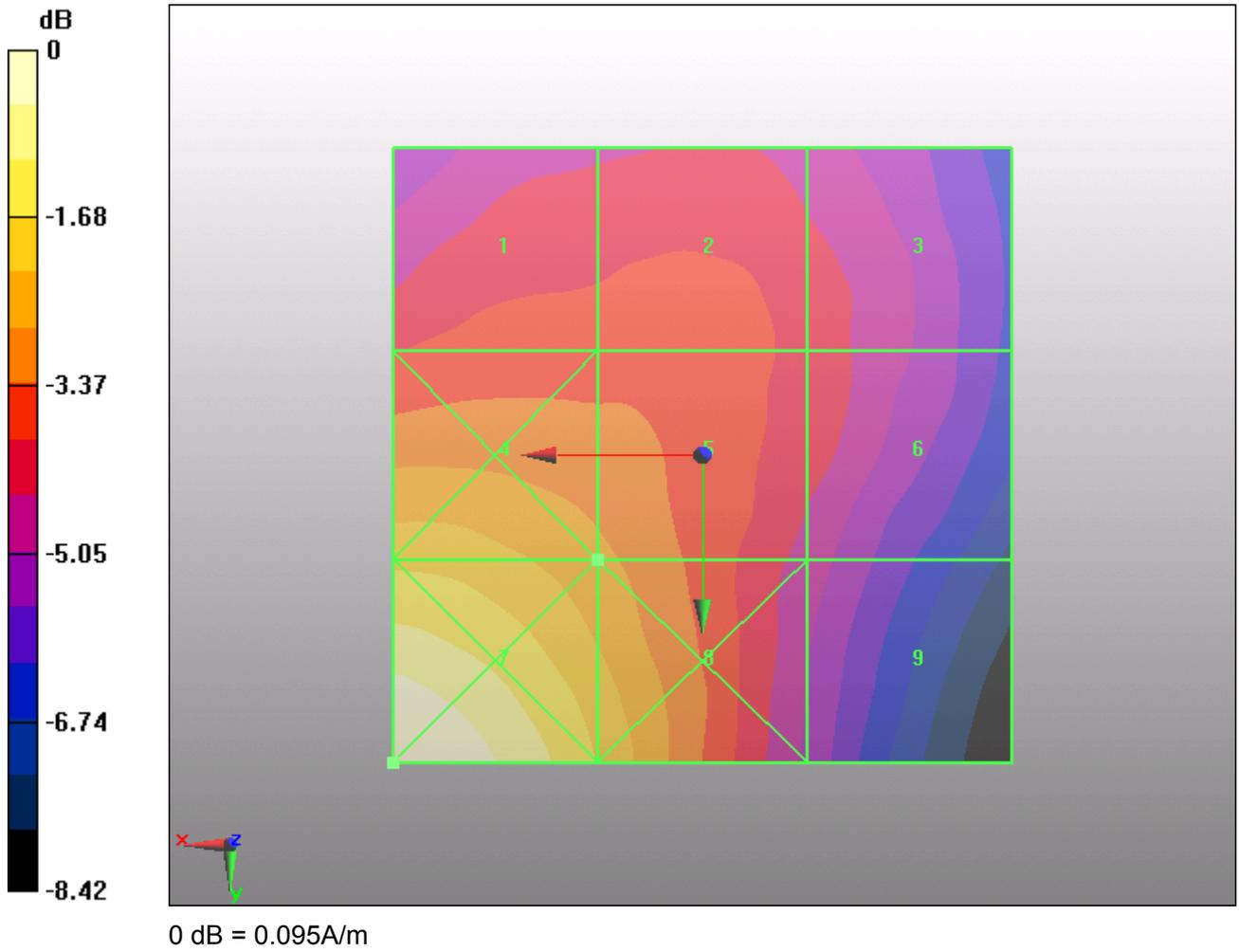


Figure 38 HAC RF H-Field CDMA AWS Channel 25

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**HAC RF H-Field CDMA AWS Low (SN: UBDC302X97501087)**

Date/Time: 4/27/2012 10:01:13 AM

Communication System: CDMA ; Frequency: 1711.25 MHz; Duty Cycle: 1:1

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

Ambient Temperature: 22.3 °C

Phantom section: RF Section

DASY5 Configuration:

Probe: H3DV6 - SN6138; ; Calibrated: 2/21/2012

Electronics: DAE4 Sn871; Calibrated: 11/22/2011

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA

Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 59

**M660 CDMA AWS HAC RF H-Field/H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device Low/Hearing Aid Compatibility Test (101x101x1):** Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.073 A/m

Probe Modulation Factor = 1

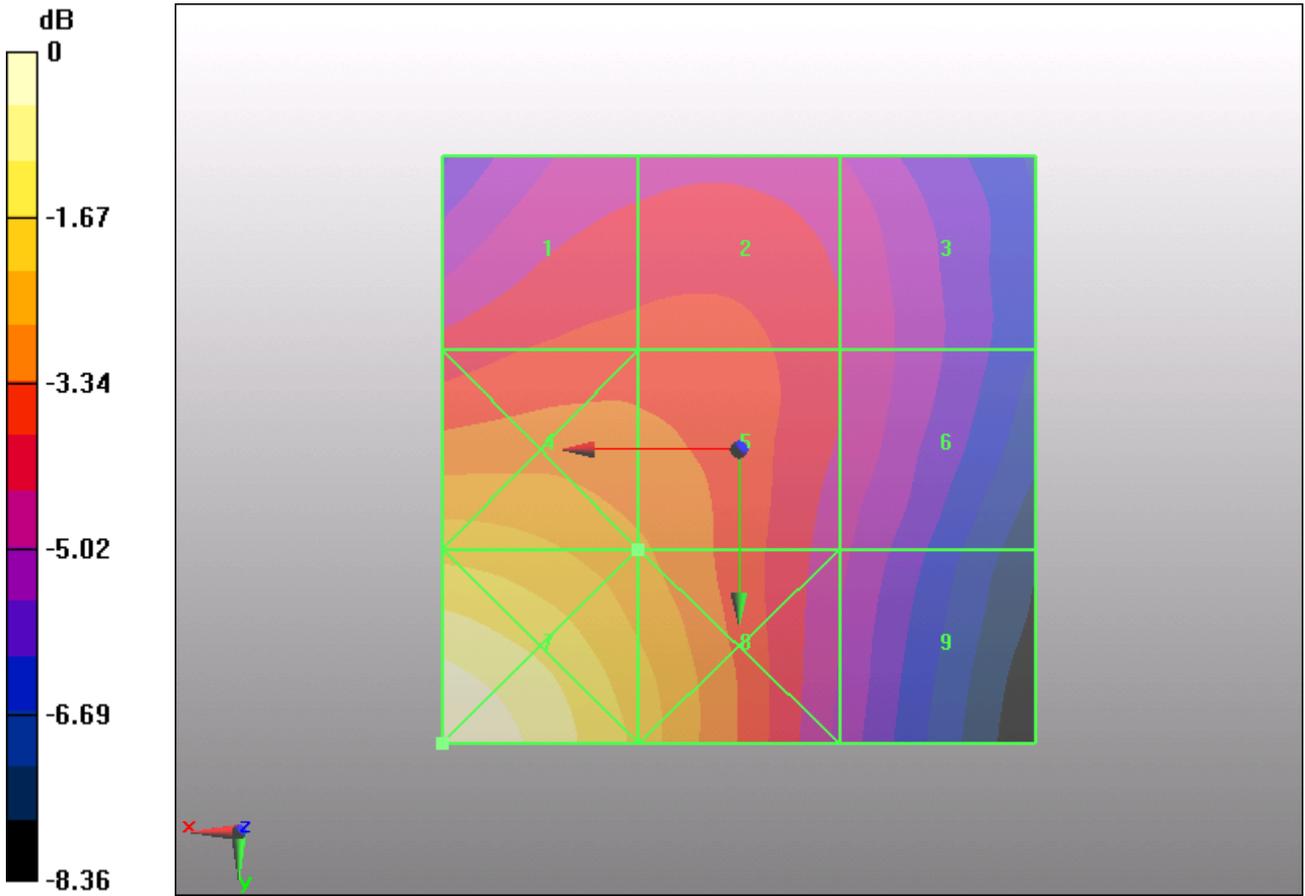
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.072 A/m; Power Drift = 0.041 dB

**Hearing Aid Near-Field Category: M4 (AWF 0 dB)**

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
<b>0.065 M4</b>	<b>0.065 M4</b>	<b>0.060 M4</b>
Grid 4	Grid 5	Grid 6
<b>0.080 M4</b>	<b>0.073 M4</b>	<b>0.060 M4</b>
Grid 7	Grid 8	Grid 9
<b>0.099 M4</b>	<b>0.080 M4</b>	<b>0.057 M4</b>



0 dB = 0.099A/m

Figure 39 HAC RF H-Field CDMA AWS Channel 25

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### ANNEX C: E-Probe Calibration Certificate

**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TA Shanghai (Auden)**

Certificate No: **ER3-2303\_Feb12**

#### CALIBRATION CERTIFICATE

Object: **ER3DV6 - SN:2303**

Calibration procedure(s): **QA CAL-02.v6, QA CAL-25.v4  
Calibration procedure for E-field probes optimized for close near field  
evaluations in air**

Calibration date: **February 21, 2012**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3°C and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41496087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ER3DV6	SN: 2328	11-Oct-11 (No. ER3-2328_Oct11)	Oct-12
DAE4	SN: 789	30-Jan-12 (No. DAE4-789_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700 *	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390565	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by:	Name <b>Claudio Leubler</b>	Function Laboratory Technician	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Technical Manager	

Issued: February 22, 2012

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# TA Technology (Shanghai) Co., Ltd.

## Test Report

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**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

### Glossary:

NORM <sub>x,y,z</sub>	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

### Calibration is Performed According to the Following Standards:

- IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  for XY sensors and  $\vartheta = 90$  for Z sensor ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart).
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- Spherical isotropy (3D deviation from isotropy)**: in a locally homogeneous field realized using an open waveguide setup.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe-tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

ER3DV6 – SN:2303

February 21, 2012

# Probe ER3DV6

## SN:2303

Manufactured: November 6, 2002  
Calibrated: February 21, 2012

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# TA Technology (Shanghai) Co., Ltd.

## Test Report

ER3DV6- SN:2303

February 21, 2012

### DASY/EASY - Parameters of Probe: ER3DV6 - SN:2303

#### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ )	1.40	1.42	1.43	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	100.7	99.2	104.7	

#### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	111.4	$\pm 3.0\%$
			Y	0.00	0.00	1.00	139.9	
			Z	0.00	0.00	1.00	133.1	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

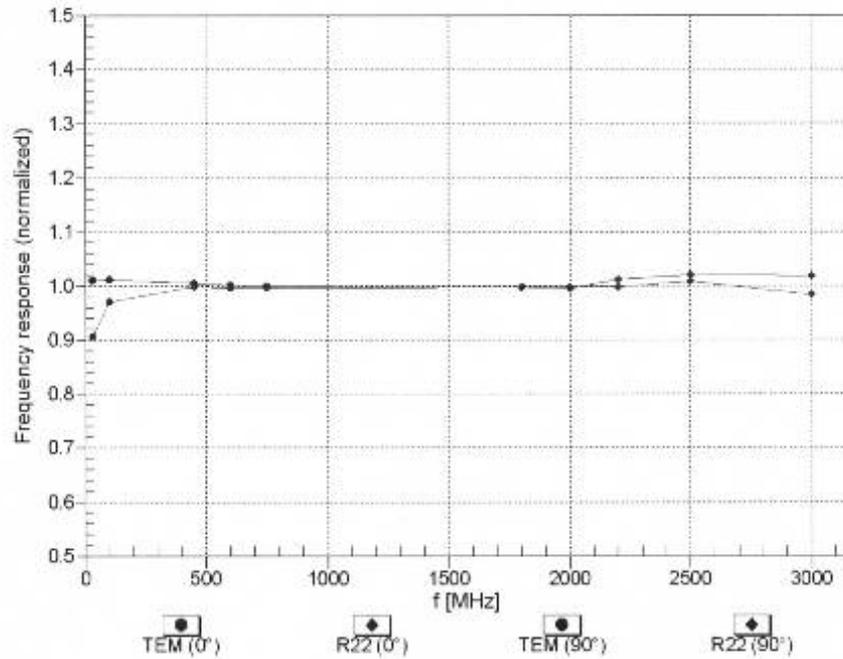
<sup>A</sup> Numerical linearization parameter; uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

ER3DV6-SN:2303

February 21, 2012

**Frequency Response of E-Field**  
(TEM-Cell:ifi110 EXX, Waveguide: R22)



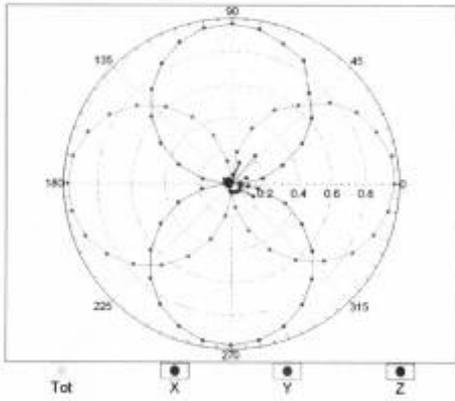
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

ER3DV6- SN:2303

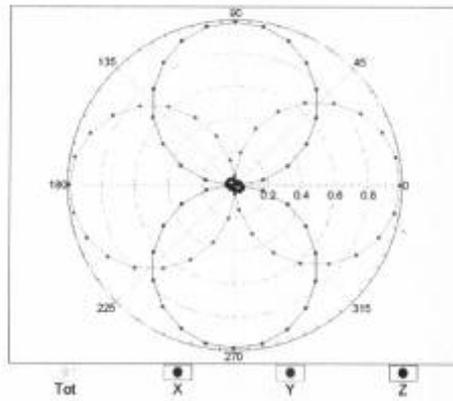
February 21, 2012

Receiving Pattern ( $\phi$ ),  $\vartheta = 0^\circ$

f=600 MHz, TEM,  $0^\circ$

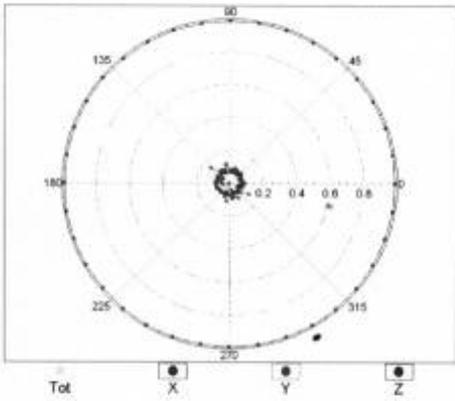


f=2500 MHz, R22,  $0^\circ$

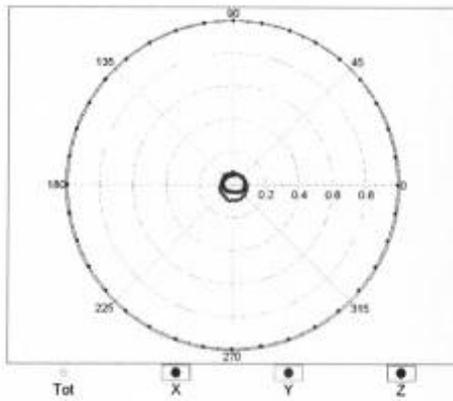


Receiving Pattern ( $\phi$ ),  $\vartheta = 90^\circ$

f=600 MHz, TEM,  $90^\circ$



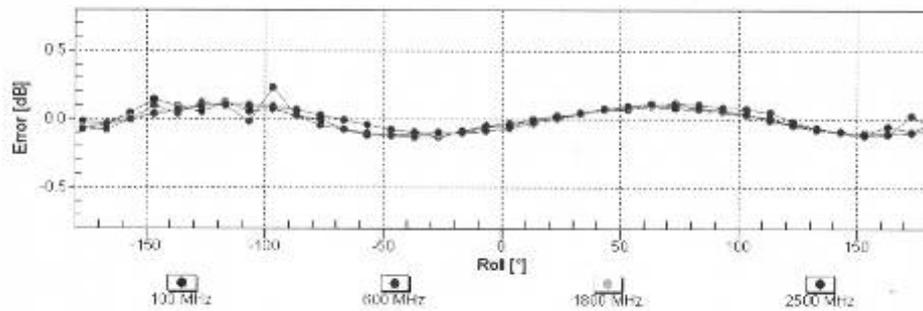
f=2500 MHz, R22,  $90^\circ$



ER3DV6- SN:2303

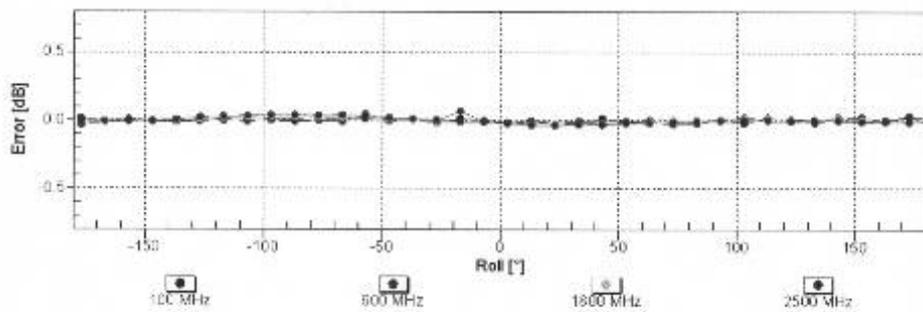
February 21, 2012

### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

### Receiving Pattern ( $\phi$ ), $\theta = 90^\circ$

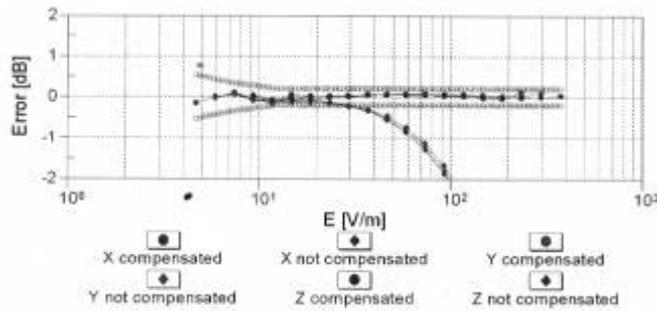
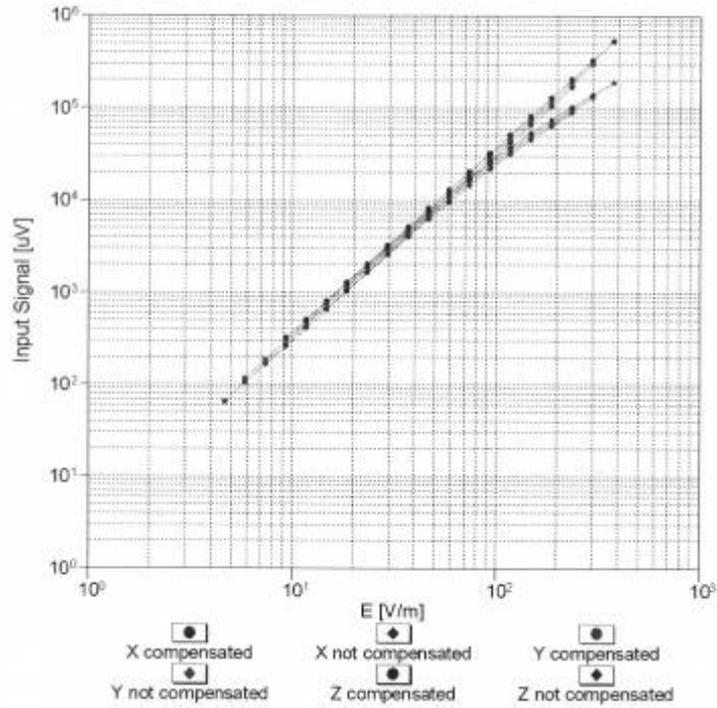


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

ER3DV6- SN:2303

February 21, 2012

**Dynamic Range f(E-field)**  
 (TEM cell , f = 900 MHz)

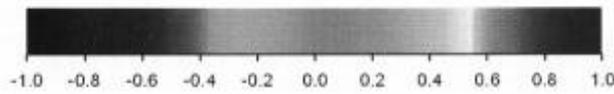
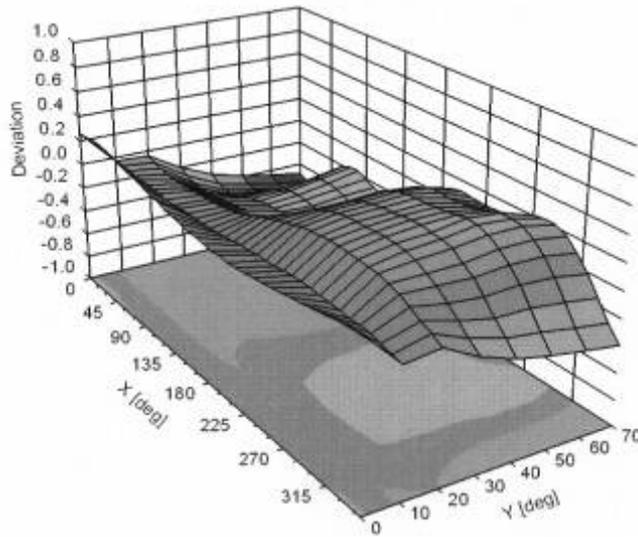


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ER3DV6- SN:2303

February 21, 2012

**Deviation from Isotropy in Air**  
Error ( $\phi, \theta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )

ER3DV6- SN:2303

February 21, 2012

### DASY/EASY - Parameters of Probe: ER3DV6 - SN:2303

#### Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-156.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	8 mm
Probe Tip to Sensor X Calibration Point	2.5 mm
Probe Tip to Sensor Y Calibration Point	2.5 mm
Probe Tip to Sensor Z Calibration Point	2.5 mm

# TA Technology (Shanghai) Co., Ltd.

## Test Report

Report No. RHA1204-0001HAC01R1

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### ANNEX D: H-Probe Calibration Certificate

**Calibration Laboratory of  
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Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TA Shanghai (Auden)**

Certificate No: **H3-6138\_Feb12**

#### CALIBRATION CERTIFICATE

Object: **H3DV6 - SN:6138**

Calibration procedure(s): **QA CAL-03.v6, QA CAL-25.v4  
Calibration procedure for H-field probes optimized for close near field  
evaluations in air**

Calibration date: **February 21, 2012**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe H3DV6	SN: 6182	11-Oct-11 (No. H3-6182_Oct11)	Oct-12
DAE4	SN: 789	30-Jan-12 (No. DAE4-789_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by:	Name <b>Claudio Leubler</b>	Function Laboratory Technician	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Technical Manager	

Issued: February 23, 2012

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# TA Technology (Shanghai) Co., Ltd.

## Test Report

Report No. RHA1204-0001HAC01R1

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**Calibration Laboratory of**  
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Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### Glossary:

NORM <sub>x,y,z</sub>	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

### Calibration is Performed According to the Following Standards:

- IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  for XY sensors and  $\vartheta = 90$  for Z sensor ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide).
- X, Y, Z(f)\_a0a1a2**:  $X, Y, Z\_a0a1a2 \cdot \text{frequency\_response}$  (see Frequency Response Chart).
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>; A, B, C** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- Spherical isotropy (3D deviation from isotropy)**: in a locally homogeneous field realized using an open waveguide setup.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the  $X\_a0a1a2$  (no uncertainty required).

H3DV6 - SN:6138

February 21, 2012

# Probe H3DV6

## SN:6138

Manufactured: July 3, 2002  
Calibrated: February 21, 2012

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# TA Technology (Shanghai) Co., Ltd.

## Test Report

H3DV6- SN:6138

February 21, 2012

### DASY/EASY - Parameters of Probe: H3DV6 - SN:6138

#### Basic Calibration Parameters

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / $\sqrt{\text{mV}}$ )	a0	2.73E-003	2.93E-003	3.18E-003	$\pm 5.1 \%$
Norm (A/m / $\sqrt{\text{mV}}$ )	a1	-5.89E-005	-2.38E-004	-2.18E-004	$\pm 5.1 \%$
Norm (A/m / $\sqrt{\text{mV}}$ )	a2	-5.50E-006	-3.95E-006	-8.28E-007	$\pm 5.1 \%$
DCP (mV) <sup>b</sup>		93.5	92.1	94.8	

#### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>c</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	130.7	$\pm 3.3 \%$
			Y	0.00	0.00	1.00	125.5	
			Z	0.00	0.00	1.00	133.0	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

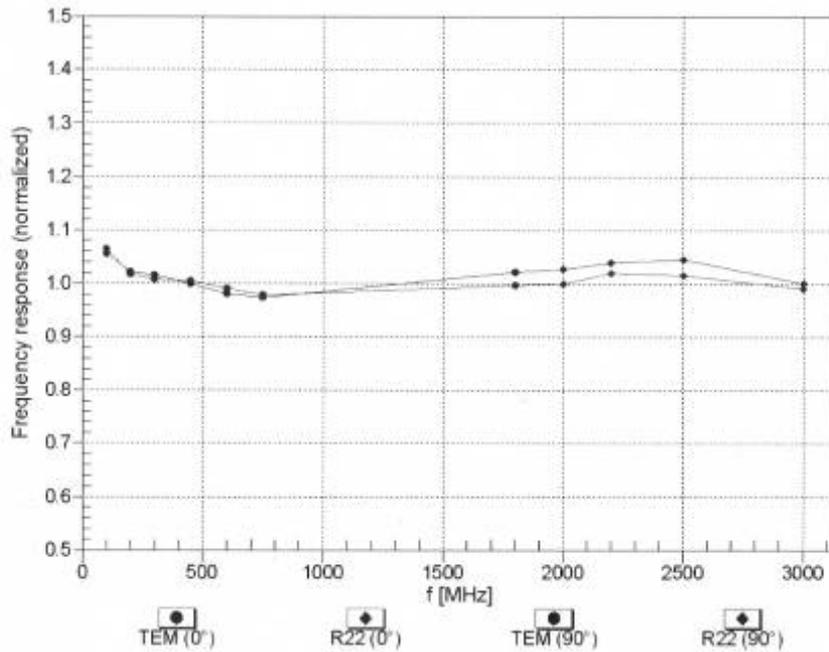
<sup>b</sup> Numerical linearization parameter: uncertainty not required.

<sup>c</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

H3DV6-SN:6138

February 21, 2012

### Frequency Response of H-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



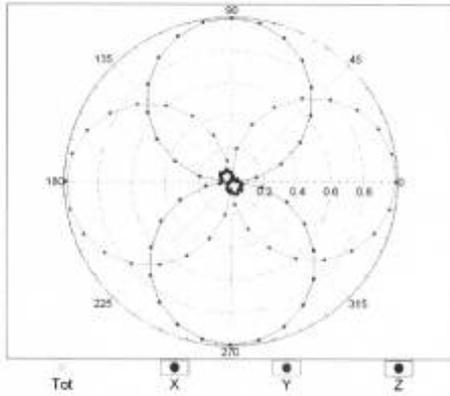
Uncertainty of Frequency Response of H-field:  $\pm 6.3\%$  (k=2)

H3DV6-SN:6138

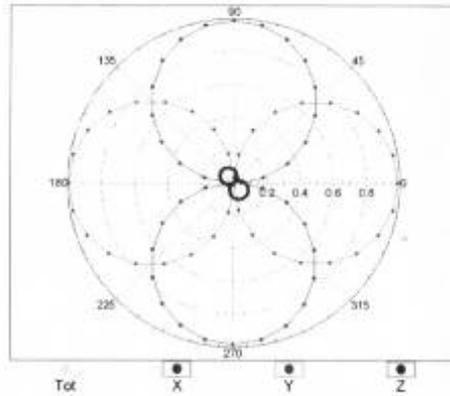
February 21, 2012

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$

f=600 MHz, TEM,  $0^\circ$

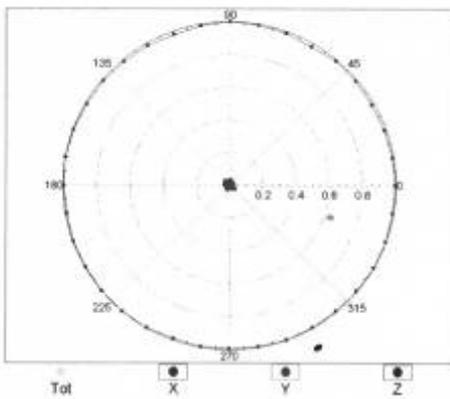


f=2500 MHz, R22,  $0^\circ$

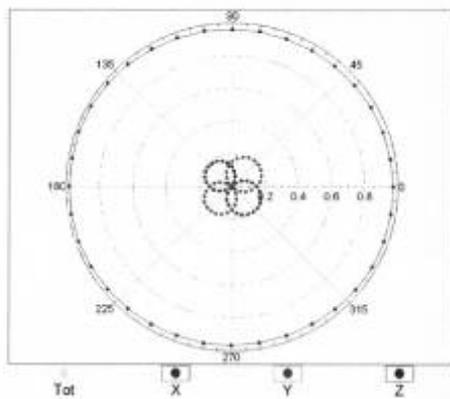


Receiving Pattern ( $\phi$ ),  $\theta = 90^\circ$

f=600 MHz, TEM,  $90^\circ$



f=2500 MHz, R22,  $90^\circ$

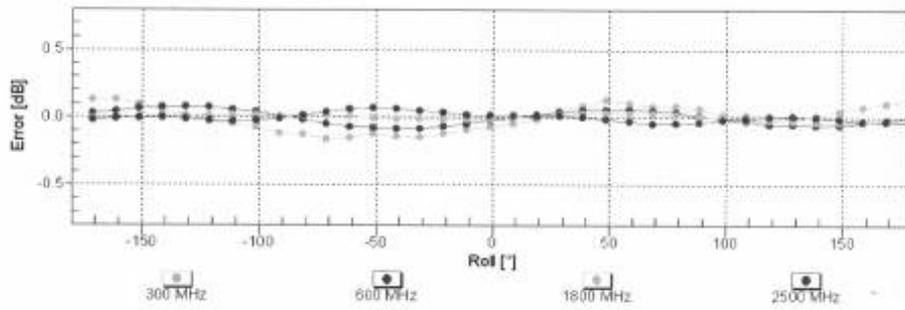


# TA Technology (Shanghai) Co., Ltd. Test Report

H3DV6- SN:6138

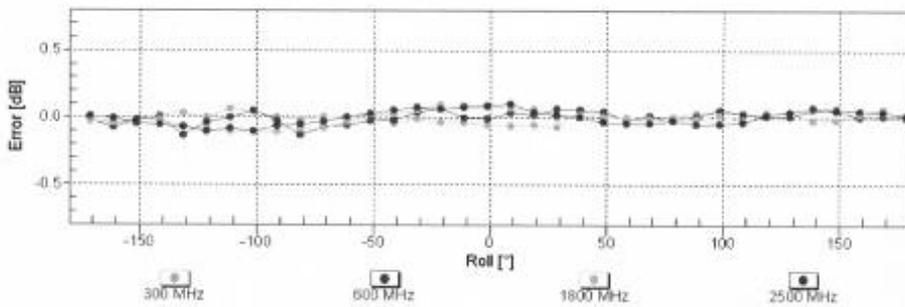
February 21, 2012

## Receiving Pattern ( $\phi$ ), $\vartheta = 0^\circ$



Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\vartheta = 90^\circ$

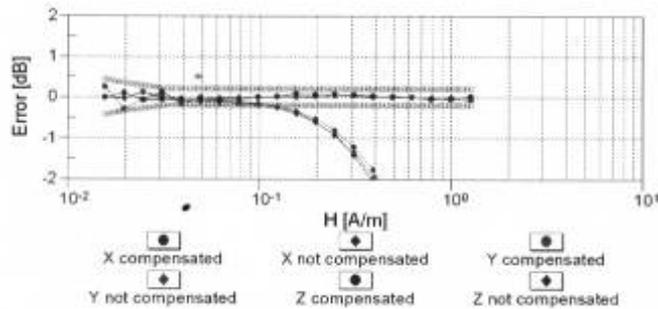
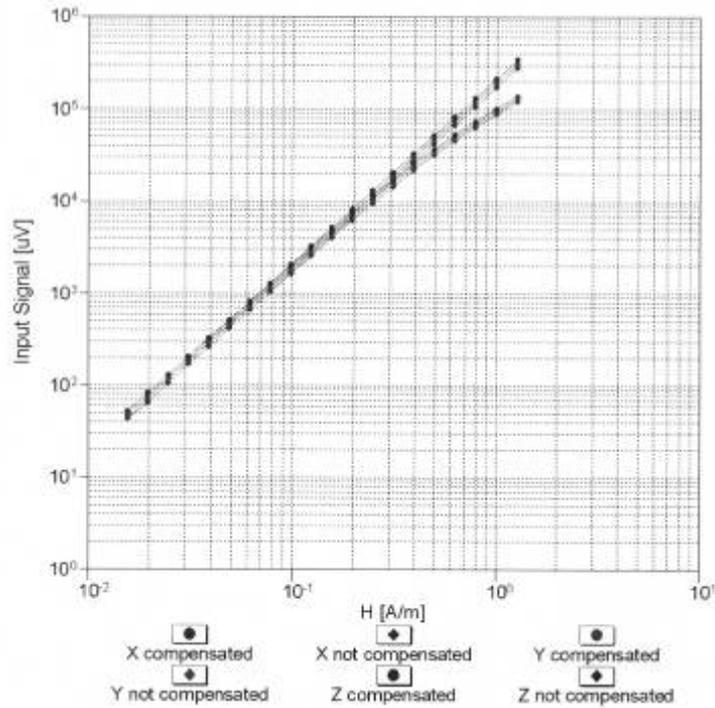


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

H3DV6- SN:6138

February 21, 2012

**Dynamic Range f(H-field)**  
 (TEM cell, f = 900 MHz)

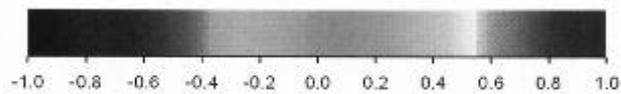
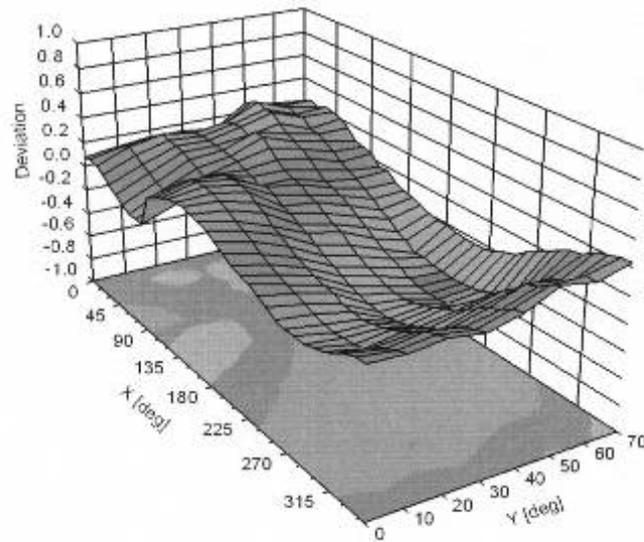


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

H3DV6- SN:6138

February 21, 2012

**Deviation from Isotropy in Air**  
Error ( $\phi, \theta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )

**TA Technology (Shanghai) Co., Ltd.**  
**Test Report**

H3DV6- SN:6138

February 21, 2012

**DASY/EASY - Parameters of Probe: H3DV6 - SN:6138**

**Other Probe Parameters**

Sensor Arrangement	Rectangular
Connector Angle (°)	168.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	20 mm
Tip Diameter	6 mm
Probe Tip to Sensor X Calibration Point	3 mm
Probe Tip to Sensor Y Calibration Point	3 mm
Probe Tip to Sensor Z Calibration Point	3 mm

# TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RHA1204-0001HAC01R1

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## ANNEX E: CD835V3 Dipole Calibration Certificate

**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client **TA Shanghai (Auden)**

Certificate No: **CD835V3-1133\_Feb12**

### CALIBRATION CERTIFICATE

Object **CD835V3 - SN: 1133**

Calibration procedure(s) **QA CAL-20.v6  
Calibration procedure for dipoles in air**

Calibration date: **February 21, 2012**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP B481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Probe ER3DV6	SN: 2336	29-Dec-11 (No. ER3-2336_Dec11)	Dec-12
Probe H3DV6	SN: 6065	29-Dec-11 (No. H3-6065_Dec11)	Dec-12
DAE4	SN: 781	20-Apr-11 (No. DAE4-781_Apr11)	Apr-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP B482H	SN: 3318A09450	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP B482A	SN: US37295597	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-11)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Dirnce Iliev	Laboratory Technician	

	Name	Function	
Approved by:	Fin Bomholt	R&D Director	

Issued: February 22, 2012

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## Test Report

Report No. RHA1204-0001HAC01R1

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**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### References

- [1] ANSI-C63.19-2007  
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

### Methods Applied and Interpretation of Parameters:

- **Coordinate System:** y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the top edge of the dipole arms.
- **Measurement Conditions:** Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- **Antenna Positioning:** The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- **Feed Point Impedance and Return Loss:** These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- **E-field distribution:** E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (in z) above the top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, 10mm above the dipole surface.
- **H-field distribution:** H-field is measured with an isotropic H-field probe with 100mW forward power to the antenna feed point, in the x-y-plane. The scan area and sensor distance is equivalent to the E-field scan. The maximum of the field is available at the center (subgrid 5) above the feed point. The H-field value stated as calibration value represents the maximum of the interpolated H-field, 10mm above the dipole surface at the feed point.

# TA Technology (Shanghai) Co., Ltd.

## Test Report

### Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	10mm	
Scan resolution	dx, dy = 5 mm	
Frequency	835MHz $\pm$ 1 MHz	
Input power drift	< 0.05 dB	

### Maximum Field values

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW input power	<b>0.456 A / m <math>\pm</math> 8.2 % (k=2)</b>

E-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured above high end	100 mW input power	161.4 V / m
Maximum measured above low end	100 mW input power	160.0 V / m
Averaged maximum above arm	100 mW input power	<b>160.7 V / m <math>\pm</math> 12.8 % (k=2)</b>

### Appendix

#### Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	15.7 dB	42.6 $\Omega$ - 13.5 j $\Omega$
835 MHz	25.2 dB	47.3 $\Omega$ + 4.7 j $\Omega$
900 MHz	17.9 dB	52.9 $\Omega$ - 12.8 j $\Omega$
950 MHz	20.7 dB	46.3 $\Omega$ + 8.2 j $\Omega$
960 MHz	15.5 dB	52.8 $\Omega$ + 17.3 j $\Omega$

#### 3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

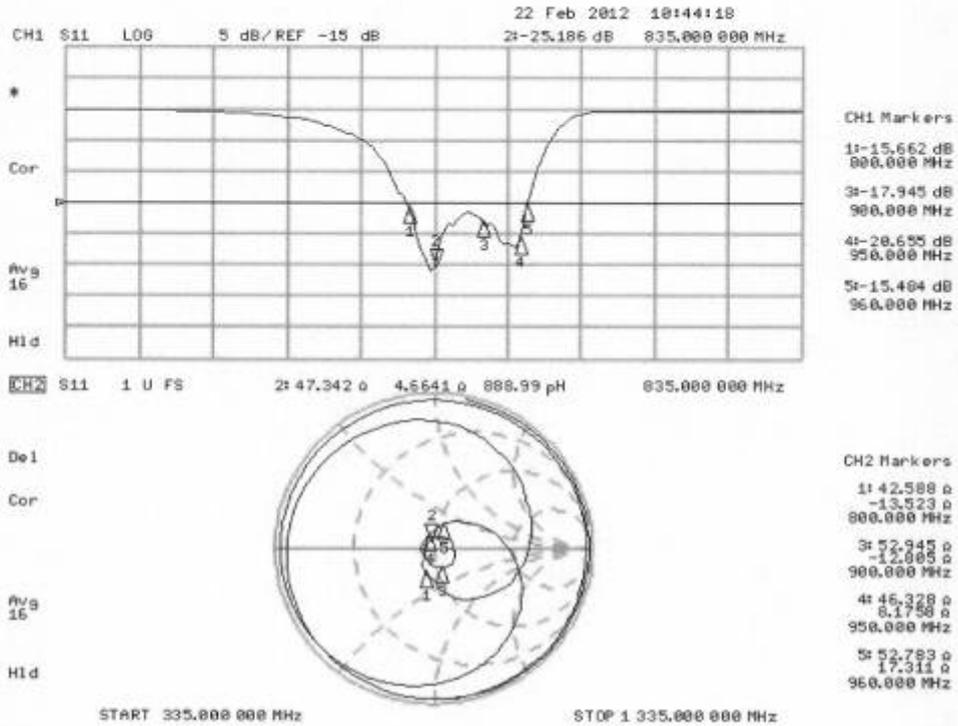
After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

# TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RHA1204-0001HAC01R1

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## Impedance Measurement Plot



**DASY5 H-field Result**

Date: 21.02.2012

Test Laboratory: SPEAG Lab2

**DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1133**

Communication System: CW; Frequency: 835 MHz  
 Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>  
 Phantom section: RF Section  
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

**DASY52 Configuration:**

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

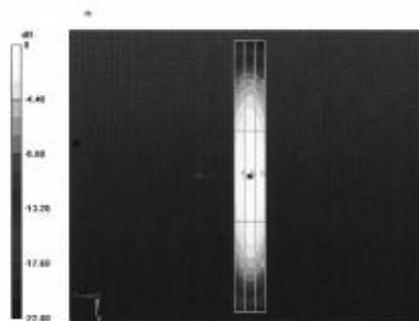
**Dipole H-Field measurement @ 835MHz/H-Scan - 835MHz d=10mm/Hearing Aid Compatibility Test (41x361x1):** Measurement grid: dx=5mm, dy=5mm

Device Reference Point: 0, 0, -6.3 mm  
 Reference Value = 0.49 V/m; Power Drift = 0.00 dB  
 PMR not calibrated. PMF = 1.000 is applied.  
 H-field emissions = 0.46 A/m

**Near-field category: M4 (AWF 0 dB)**

PMF scaled H-field

Grid 1 <b>M4</b> <b>0.38 A/m</b>	Grid 2 <b>M4</b> <b>0.40 A/m</b>	Grid 3 <b>M4</b> <b>0.39 A/m</b>
Grid 4 <b>M4</b> <b>0.43 A/m</b>	Grid 5 <b>M4</b> <b>0.46 A/m</b>	Grid 6 <b>M4</b> <b>0.44 A/m</b>
Grid 7 <b>M4</b> <b>0.37 A/m</b>	Grid 8 <b>M4</b> <b>0.40 A/m</b>	Grid 9 <b>M4</b> <b>0.39 A/m</b>



0 dB = 0.46A/m = -6.74 dB A/m

**DASY5 E-field Result**

Date: 21.02.2012

Test Laboratory: SPEAG Lab2

**DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1133**

Communication System: CW; Frequency: 835 MHz  
 Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: RF Section  
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

**DASY52 Configuration:**

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

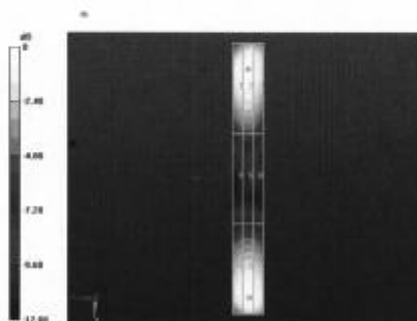
**Dipole E-Field measurement @ 835MHz/E-Scan - 835MHz d=10mm/Hearing Aid Compatibility Test (41x361x1):** Measurement grid: dx=5mm, dy=5mm

Device Reference Point: 0, 0, -6.3 mm  
 Reference Value = 104.5 V/m; Power Drift = 0.00 dB  
 PMR not calibrated. PMF = 1.000 is applied.  
 E-field emissions = 161.4 V/m

**Near-field category: M4 (AWF 0 dB)**

PMF scaled E-field

Grid 1 <b>M4</b> <b>156.3 V/m</b>	Grid 2 <b>M4</b> <b>161.4 V/m</b>	Grid 3 <b>M4</b> <b>157.3 V/m</b>
Grid 4 <b>M4</b> <b>86.05 V/m</b>	Grid 5 <b>M4</b> <b>88.80 V/m</b>	Grid 6 <b>M4</b> <b>86.30 V/m</b>
Grid 7 <b>M4</b> <b>151.4 V/m</b>	Grid 8 <b>M4</b> <b>160.0 V/m</b>	Grid 9 <b>M4</b> <b>157.8 V/m</b>



0 dB = 161.4V/m = 44.16 dB V/m

# TA Technology (Shanghai) Co., Ltd.

## Test Report

Report No. RHA1204-0001HAC01R1

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### ANNEX F: CD1880V3 Dipole Calibration Certificate

**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TA Shanghai (Auden)**

Certificate No: **CD1880V3-1115\_Feb12**

#### CALIBRATION CERTIFICATE

Object: **CD1880V3 - SN: 1115**

Calibration procedure(s): **QA CAL-20.v6  
Calibration procedure for dipoles in air**

Calibration date: **February 21, 2012**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Probe ER3DV6	SN: 2336	29-Dec-11 (No. ER3-2336_Dec11)	Dec-12
Probe H3DV6	SN: 6065	29-Dec-11 (No. H3-6065_Dec11)	Dec-12
DAE4	SN: 781	20-Apr-11 (No. DAE4-781_Apr11)	Apr-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-11)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	<b>Dimce Iliev</b>	Laboratory Technician	
Approved by:	<b>Fin Bornholt</b>	R&D Director	

Issued: February 22, 2012

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Calibration Laboratory of  
Schmid & Partner  
Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst  
C Service suisse d'étalonnage  
S Servizio svizzero di taratura  
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

#### References

- [1] ANSI-C63.19-2007  
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

#### Methods Applied and Interpretation of Parameters:

- **Coordinate System:** y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the top edge of the dipole arms.
- **Measurement Conditions:** Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- **Antenna Positioning:** The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- **Feed Point Impedance and Return Loss:** These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminated by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- **E-field distribution:** E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (in z) above the top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, 10mm above the dipole surface.
- **H-field distribution:** H-field is measured with an isotropic H-field probe with 100mW forward power to the antenna feed point, in the x-y-plane. The scan area and sensor distance is equivalent to the E-field scan. The maximum of the field is available at the center (subgrid 5) above the feed point. The H-field value stated as calibration value represents the maximum of the interpolated H-field, 10mm above the dipole surface at the feed point.

# TA Technology (Shanghai) Co., Ltd.

## Test Report

### Measurement Conditions

DASY system configuration, as far as not given on page 1.

<b>DASY Version</b>	DASY5	V52.8.0
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	HAC Test Arch	
<b>Distance Dipole Top - Probe Center</b>	10mm	
<b>Scan resolution</b>	dx, dy = 5 mm	
<b>Frequency</b>	1880MHz ± 1 MHz	
<b>Input power drift</b>	< 0.05 dB	

### Maximum Field values

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW input power	<b>0.473 A / m ± 8.2 % (k=2)</b>

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	143.4 V / m
Maximum measured above low end	100 mW input power	139.6 V / m
Averaged maximum above arm	100 mW input power	<b>141.5 V / m ± 12.8 % (k=2)</b>

### Appendix

#### Antenna Parameters

Frequency	Return Loss	Impedance
1730 MHz	30.5 dB	52.6 Ω + 1.5 jΩ
1880 MHz	21.7 dB	46.1 Ω + 6.9 jΩ
1900 MHz	22.0 dB	47.6 Ω + 7.4 jΩ
1950 MHz	29.8 dB	49.9 Ω + 3.2 jΩ
2000 MHz	18.9 dB	41.3 Ω + 5.6 jΩ

#### 3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

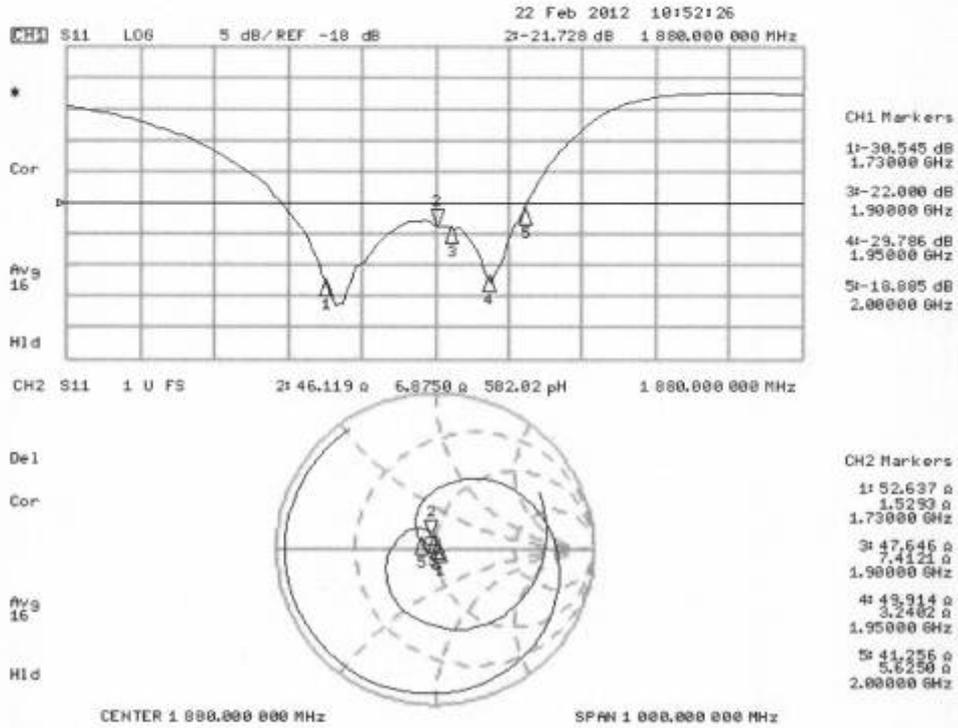
After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

# TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RHA1204-0001HAC01R1

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## Impedance Measurement Plot



**DASY5 H-field Result**

Date: 21.02.2012

Test Laboratory: SPEAG Lab2

**DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: CD1880V3 - SN: 1115**

Communication System: CW; Frequency: 1880 MHz  
 Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup>  
 Phantom section: RF Section  
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

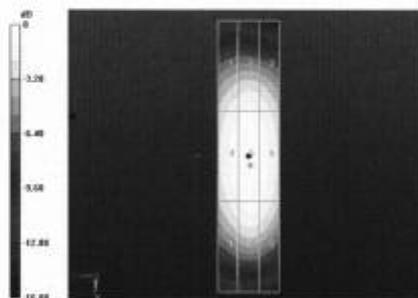
**DASY52 Configuration:**

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

**Dipole H-Field measurement @ 1880MHz/H-Scan - 1880MHz d=10mm/Hearing Aid Compatibility Test (41x181x1):** Measurement grid: dx=5mm, dy=5mm  
 Device Reference Point: 0, 0, -6.3 mm  
 Reference Value = 0.50 V/m; Power Drift = -0.01 dB  
 PMR not calibrated. PMF = 1.000 is applied.  
 H-field emissions = 0.47 A/m  
**Near-field category: M2 (AWF 0 dB)**

PMF scaled H-field

Grid 1 <b>M2</b> <b>0.40 A/m</b>	Grid 2 <b>M2</b> <b>0.43 A/m</b>	Grid 3 <b>M2</b> <b>0.41 A/m</b>
Grid 4 <b>M2</b> <b>0.45 A/m</b>	Grid 5 <b>M2</b> <b>0.47 A/m</b>	Grid 6 <b>M2</b> <b>0.46 A/m</b>
Grid 7 <b>M2</b> <b>0.41 A/m</b>	Grid 8 <b>M2</b> <b>0.44 A/m</b>	Grid 9 <b>M2</b> <b>0.42 A/m</b>



0 dB = 0.47A/m = -6.56 dB A/m

# TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RHA1204-0001HAC01R1

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## DASY5 E-field Result

Date: 21.02.2012

Test Laboratory: SPEAG Lab2

**DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: CD1880V3 - SN: 1115**

Communication System: CW; Frequency: 1880 MHz  
Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: RF Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

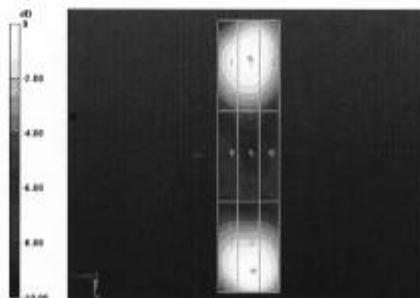
- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.04.2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

### Dipole E-Field measurement @ 1880MHz/E-Scan - 1880MHz d=10mm/Hearing Aid Compatibility Test (41x181x1); Measurement grid: dx=5mm, dy=5mm

Device Reference Point: 0, 0, -6.3 mm  
Reference Value = 161.1 V/m; Power Drift = -0.01 dB  
PMR not calibrated. PMF = 1.000 is applied.  
E-field emissions = 143.4 V/m  
**Near-field category: M2 (AWF 0 dB)**

PMF scaled E-field

Grid 1 M2 134.3 V/m	Grid 2 M2 139.6 V/m	Grid 3 M2 136.5 V/m
Grid 4 M3 90.34 V/m	Grid 5 M3 93.17 V/m	Grid 6 M3 89.93 V/m
Grid 7 M2 134.3 V/m	Grid 8 M2 143.4 V/m	Grid 9 M2 141.8 V/m



0 dB = 143.4V/m = 43.13 dB V/m

# TA Technology (Shanghai) Co., Ltd.

## Test Report

Report No. RHA1204-0001HAC01R1

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### ANNEX G: DAE4 Calibration Certificate

**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TA-SH (Auden)**

Certificate No: **DAE4-871\_Nov11**

CALIBRATION CERTIFICATE																			
Object	DAE4 - SD 000 D04 BJ - SN: 871																		
Calibration procedure(s)	QA CAL-06.v23 Calibration procedure for the data acquisition electronics (DAE)																		
Calibration date:	November 22, 2011																		
<p>This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility; environment temperature (22 ± 3)°C and humidity &lt; 70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Primary Standards</th> <th style="width: 15%;">ID #</th> <th style="width: 30%;">Cal Date (Certificate No.)</th> <th style="width: 25%;">Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Keithley Multimeter Type 2001</td> <td>SN: 0810278</td> <td>28-Sep-11 (No:11450)</td> <td>Sep-12</td> </tr> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> <tr> <td>Calibrator Box V1.1</td> <td>SE UMS 006 AB 1004</td> <td>08-Jun-11 (in house check)</td> <td>In house check: Jun-12</td> </tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration																
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12																
Secondary Standards	ID #	Check Date (in house)	Scheduled Check																
Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12																
Calibrated by:	Name <b>Andrea Gunti</b>	Function <b>Technician</b>	Signature 																
Approved by:	<b>Fin Bornholt</b>	<b>R&amp;D Director</b>																	
			Issued: November 22, 2011																
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.																			

# TA Technology (Shanghai) Co., Ltd.

## Test Report

Report No. RHA1204-0001HAC01R1

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**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### Glossary

DAE data acquisition electronics  
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

### Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
  - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
  - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
  - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
  - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
  - **Power consumption:** Typical value for information. Supply currents in various operating modes.

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**DC Voltage Measurement**

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.749 $\pm$ 0.1% (k=2)	404.733 $\pm$ 0.1% (k=2)	405.174 $\pm$ 0.1% (k=2)
Low Range	3.98175 $\pm$ 0.7% (k=2)	3.93601 $\pm$ 0.7% (k=2)	3.96830 $\pm$ 0.7% (k=2)

**Connector Angle**

Connector Angle to be used in DASY system	90.0 $\pm$ 1 $^{\circ}$
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### Appendix

#### 1. DC Voltage Linearity

High Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	199991.9	-0.91	-0.00
Channel X + Input	20000.28	0.48	0.00
Channel X - Input	-19998.51	0.59	-0.00
Channel Y + Input	200003.0	1.24	0.00
Channel Y + Input	19999.67	0.17	0.00
Channel Y - Input	-20000.04	-0.34	0.00
Channel Z + Input	200010.1	-0.11	-0.00
Channel Z + Input	19999.33	-0.07	-0.00
Channel Z - Input	-20001.45	-0.85	0.00

Low Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2000.0	0.05	0.00
Channel X + Input	199.81	-0.09	-0.04
Channel X - Input	-199.63	0.37	-0.19
Channel Y + Input	1999.9	-0.22	-0.01
Channel Y + Input	198.81	-1.19	-0.59
Channel Y - Input	-201.62	-1.72	0.86
Channel Z + Input	2000.4	0.48	0.02
Channel Z + Input	199.30	-0.70	-0.35
Channel Z - Input	-200.86	-1.06	0.53

#### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading ( $\mu\text{V}$ )	Low Range Average Reading ( $\mu\text{V}$ )
Channel X	200	14.43	13.13
	-200	-12.22	-13.72
Channel Y	200	-10.07	-9.78
	-200	9.61	8.66
Channel Z	200	-0.56	-0.83
	-200	-0.01	0.11

#### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X ( $\mu\text{V}$ )	Channel Y ( $\mu\text{V}$ )	Channel Z ( $\mu\text{V}$ )
Channel X	200	-	3.08	0.09
Channel Y	200	3.19	-	4.59
Channel Z	200	0.90	-0.06	-

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#### 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15920	15519
Channel Y	16179	17567
Channel Z	15791	15270

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M $\Omega$

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	0.03	-1.16	2.66	0.46
Channel Y	-0.63	-3.22	0.29	0.46
Channel Z	-0.87	-2.03	0.28	0.46

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

#### 8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

#### 9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9