Re: FCC ID:BEJVX3300
Correspondence Number: 21037
731 Confirmation Number: TC676202

Subject: Request for additional information

A) Please explain any differences in power from the HAC, SAR and EMC reports.

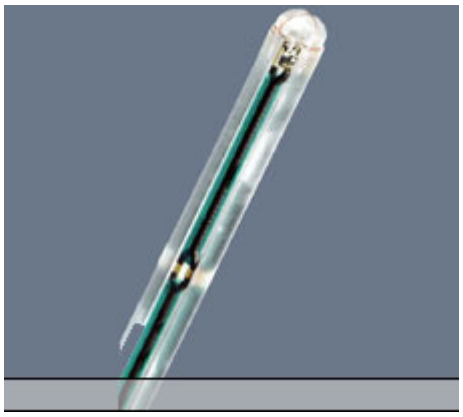
Please see below powers between HAC, SAR and EMC reports. All powers are within laboratory measurement uncertainty.

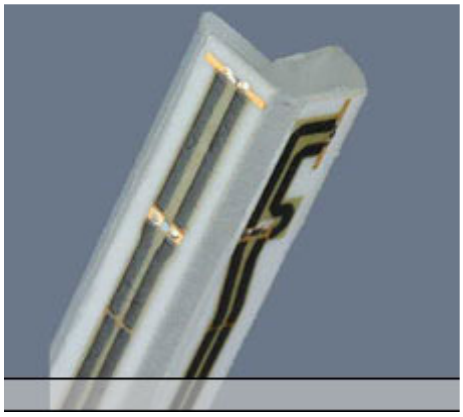
Conducted Power	EMC (dBm)	SAR (dBm)	HAC (dBm)
CDMA			
1013	24	24	23.7
363	24	24	23.7
777	24	24	23.9
PCS			
25	24	24	23.9
600	24	24	23.8
1175	24	24	24.0

B) Please detail how drift was measured.
The DASY4 system first moves to the reference location to measure the field and at the end of the HAC evaluation, moves back to this reference location to measure the change in field due to drifts. These field drifts are included in the test report.

C) Please describe the test sample to include the stage in production it is from.
Please find attached letter from the manufacturer regarding the stage of production of the test sample.

D) Please justify probe measurement at the center of the sensor. C63.19 recommends measurement at the nearest element point. Please include additional illustrations of the probe/elements showing more detail of the probe tip area.





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

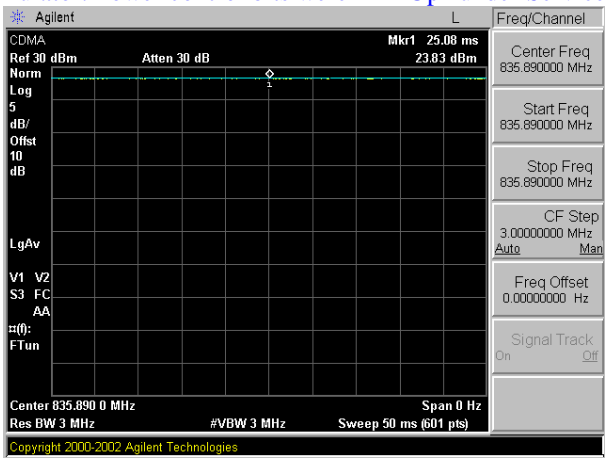
Magnetic field sensors are measuring the integral of the H-field across their sensor area surrounded by the loop. They are calibrated in a precise, homogeneous field. When measuring a gradient field, the result will be very close to the field in the center of the loop which is equivalent to the value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

Re: FCC ID:BEJVX3300
Correspondence Number: 21037
731 Confirmation Number: TC676202

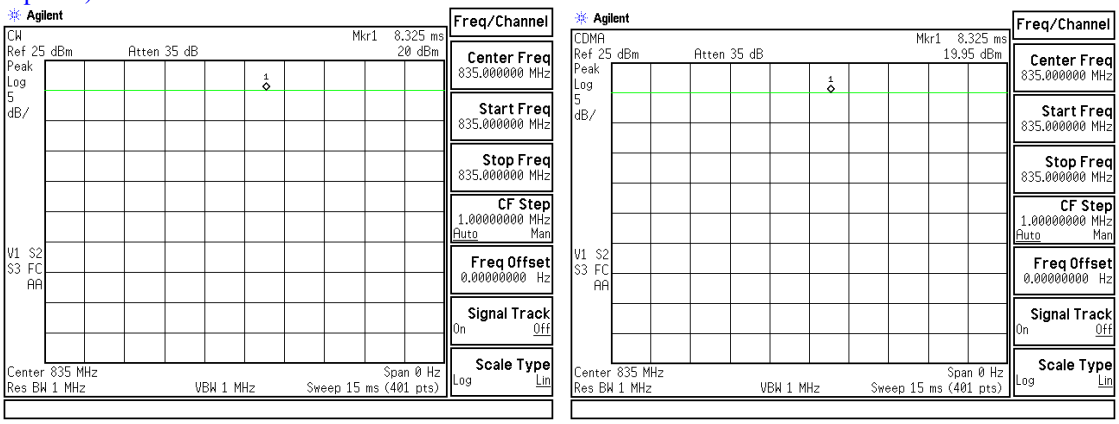
Consequently, two sensors with different loop diameters - both calibrated ideally - would give different results when measuring as specified in the present draft of the standard. The behavior for electrically small E-field sensors is equivalent.
The magnetic field loops of our H3D probes are concentric, with the center 3mm from the tip for H3DV6. Their radius is 1.9mm.
The electric field probes have a more irregular internal geometry because it is physically not possible to have the 3 orthogonal sensors situated with the same center. The effect of the different sensor centers is accounted for in our HAC uncertainty budget ("sensor displacement"). Their geometric center is at 2.5mm from the tip, and the element ends are 1.1mm closer to the tip.

E) Please provide details of the WD's signal. Include wideband and 0 span spectrum analyzer plots. How was the signal set up and controlled? What settings were used i.e. power control modes, and radio service mode.

Please see below for wideband and spectrum analyzer plots. The signal was setup and controlled by CMU200 Base Station Simulator. Power control bits were “All Up” under Service Option 2.



F) Please provide additional details justifying the conversion to peak; particularly the procedure used to measure power. Provide 0 span spectrum plots or power meter details if applicable.
Power was measured using a spectrum analyzer at 0 span (see below plots). The peak level was determined and the trace was set on “VIEW”. Next, a WD type signal at the same frequency was substituted and adjusted in amplitude to match the peak level of the CW signal. Both the WD type signal and CW signal with matching peak levels were applied to the dipole, and measured with the field probes. The ratio of the modulated to the CW measurement was factor used to convert the WD results to peak (per frequency band, per probe).



Re: FCC ID:BEJVX3300
Correspondence Number: 21037
731 Confirmation Number: TC676202

G) Please provide details of how the user can turn off the back light to reflect the measurement condition.
MENU -> 6 (Settings) -> 2 (Display) -> 2 (Backlight) -> 1 (Main LCD) -> 2 (Timer) -> "Always Off".
Please note that the unit is HAC compliant in both back-light on and off conditions.

I) Please provide system verification for all three signal types recommended by C63.19. For the WD signal please detail the source for the WD signal for system verification and how it compares to the actual signal from the WD.

Please find attached system verification for all three signal types recommended by C63.19. Please see below for results:

Frequency (MHz)	Signal Type	Peak Input Power (W)	E-field Result (V/m)	Target Field (A/m)	% Deviation
835	CW	0.100	187.1	**185.1**	**1.1%**
835	80% AM	0.100	137.9		
835	CDMA	0.100	189.4		
1880	CW	0.100	158.9	**145.8**	**9.0%**
1880	80% AM	0.100	115.5		
1880	CDMA	0.100	151.9		
Frequency (MHz)	**Signal Type**	**Peak Input Power (W)**	**H-field Result (A/m)**	**Target Field (A/m)**	**% Deviation**
835	CW	0.100	0.471	**0.470**	**0.2%**
835	80% AM	0.100	0.342		
835	CDMA	0.100	0.463		
1880	CW	0.100	0.466	**0.450**	**3.6%**
1880	80% AM	0.100	0.336		
1880	CDMA	0.100	0.456		

The WD signal was emulated using an Agilent ESG-D Series RF signal Generator. Please see below Spectrum analyzer screen image showing its signal correlation to the actual signal from the WD-BSS signal.

Re: FCC ID:BEJVX3300
Correspondence Number: 21037
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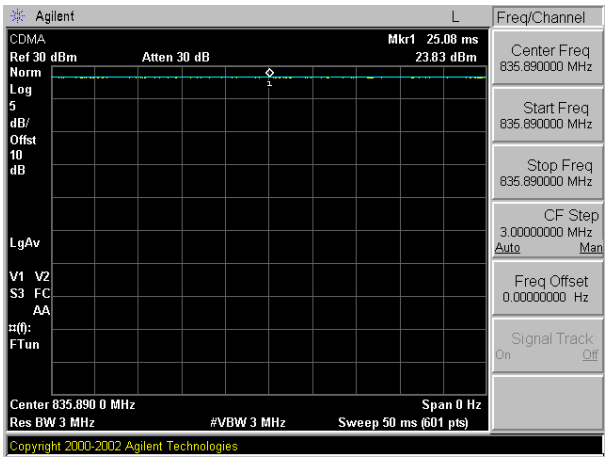


J) Regarding 1309 probe calibration. How was the low, middle and high channel recommendation handled? How were the differences between E and H field recommendations handled?

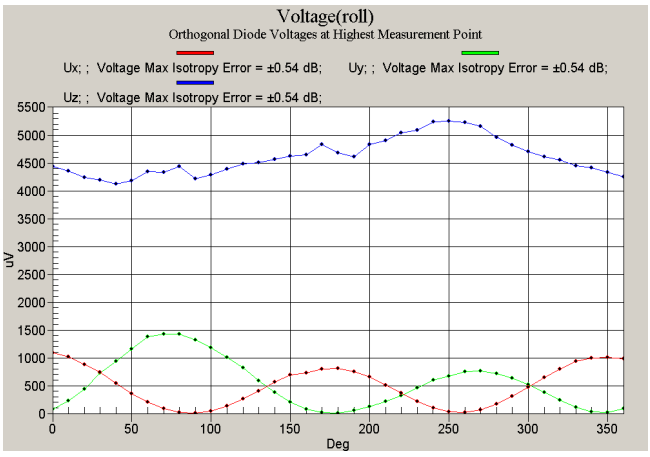
The E-field sensors have inherently a very flat frequency response. They are calibrated with a number of frequencies resulting in a common calibration factor, with the frequency behavior documented in the calibration certificate.

H-field sensors have a frequency dependent sensitivity which is evaluated for a series of frequencies also visible in the specific certificate. The calibration factors result from a fitting algorithm. The proper conversion is calculated by the DASY4 software depending on the frequency setting in the procedure.

K) To help clarify dynamic range issues, if possible, please state the highest measured voltage at the diode compared to its compression point.

The calibration certificate of the probe indicates the compression point to be ~ 95mV. (See below figure for diode compression values for field probe). The highest measured voltage at each diode at the worst-case configuration of the HAC evaluation is less than 5.5mV. (See below Voltage plot for each diode at highest point of the HAC evaluation about azimuth).

Diode Compression[A]	
DCP X	95 mV
DCP Y	95 mV
DCP Z	97 mV



L) Please describe the processing chain from diode output, to raw measurement, and conversion to final peak value. Please include a discussion of averaging and measurement time windows and similar.

The following response is from the system manufacturer users manual.

Re: FCC ID:BEJVX3300
Correspondence Number: 21037
731 Confirmation Number: TC676202

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i} \qquad (20.1)$$

with	V_i	= compensated signal of channel i	(i = x, y, z)
	U_i	= input signal of channel i	(i = x, y, z)
	cf	= crest factor of exciting field	(DASY parameter)
	dcp_i	= diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\text{E} - \text{fieldprobes}: \qquad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\text{H} - \text{fieldprobes}: \qquad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

with	V_i	= compensated signal of channel i	(i = x, y, z)
	$Norm_i$	= sensor sensitivity of channel i $\mu V/(V/m)^2$ for E-field Probes	(i = x, y, z)
	$ConvF$	= sensitivity enhancement in solution	
	a_{ij}	= sensor sensitivity factors for H-field probes	
	f	= carrier frequency [GHz]	
	E_i	= electric field strength of channel i in V/m	
	H_i	= magnetic field strength of channel i in A/m	

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2} \qquad (20.2)$$

The primary field data are used to calculate the derived field units.

The measurement/integration time per point, as specified by the system manufacturer is >500 ms.

The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/off switch of the power source with an integration time of 500 ms and a probe response time of <5 ms. In the current implementation, DASY4 waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization. The tolerances for the different systems had the worst-case of 2.6%.

M) Regarding your statement about "multiple antennas" the pre-scan data you mentioned could not be located. Please provide. We note that a permissive change was submitted to the FCC for this device adding an antenna. Please address how this filing represents all final device configurations.

Please see attached at the end of this document, the pre-scan data. All final device configurations are taken into consideration; both configurations were evaluated and the worst-case was reported.

N) Please demonstrate that 5 mm step size is sufficient for verification. One means might be though use of a two dimensional plot of field strength versus distance in a direction perpendicular to the length of the dipole. Was any interpolation used?

SPEAG uses 2D interpolation algorithms between the measured points. Please see below two dimensional plots showing that the interpolated values interpolate smoothly between 5mm steps for the free-space RF dipole:

Re: FCC ID:BEJVX3300
Correspondence Number: 21037
731 Confirmation Number: TC676202

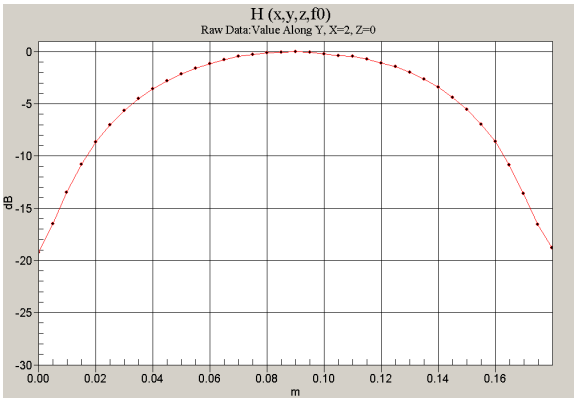


Figure 1 Raw Data points

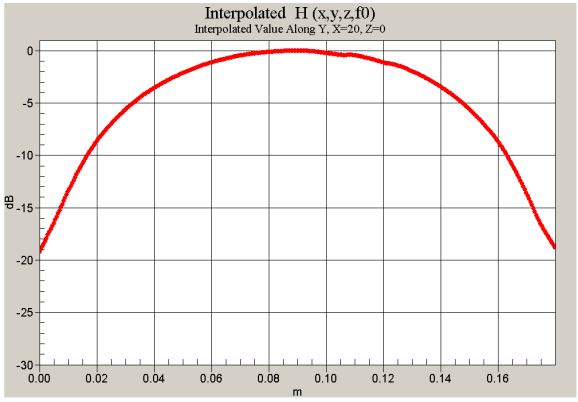


Figure 2 Interpolated points

O) Regarding your answer to question 2 the detailed field contours within the exclusion blocks could not be located. Please provide.

Please find attached raw data taken by the HAC measurement system to determine the sub-grid maxima, to determine the exclusion blocks. Please note that the final results are identical to the results of that without the use of exclusion blocks.

P) Regarding your answer to question 3 please clarify in your validation section any differences between this peak and peak in the device result section. One appears to be equivalent RF sinusoid peak calculated from an RMS field measurement while the device peak field seems to be based on a measured RMS field adjusted by the PMF which relates to a condition of PEP. Also, please further justify the procedure to average the two field values for the E field. Related to this please explain the large variation in field values between the dipole tips. The standard suggests that dipole imbalance should be limited to approximately 3%.

Please note in response to question I, dipole manufacturer's targets were used.

The peak in the device result section refers to PEP, measured using test equipment. The device result section uses the raw data multiplied by the PMF to obtain the peak reading.

Please find attached manufacturer dipole certificates. According to the certificates (Page 2), "the average of these two maxima is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement (See page 2 of dipole certificates). The dipole imbalance is less than 3% (See dipole certificate).

Date: 4/11/2005

PCTEST Hearing-Aid Compatability Facility

DUT: LG-VX3300

Type: Tri-Mode
Serial: 172
Backlight off
Duty Cycle: 1:1
Communication System: Cellular CDMA; Frequency: 848.31 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2332; Calibrated: 1/31/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

High Channel-ACE/Hearing Aid Compatibility Test (261x261x1): Measurement grid: dx=2mm, dy=2mm
Maximum value of Total field (slot averaged) = 51.4 V/m
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E in V/m (Time averaged)

Grid 1 **43.1**	Grid 2 **47.1**	Grid 3 **45.6**
Grid 4 **46.1**	Grid 5 **51.4**	Grid 6 **50.3**
Grid 7 **40.9**	Grid 8 **46.4**	Grid 9 **44.7**

E in V/m (Slot averaged)

Grid 1 **43.1**	Grid 2 **47.1**	Grid 3 **45.6**
Grid 4 **46.1**	Grid 5 **51.4**	Grid 6 **50.3**
Grid 7 **40.9**	Grid 8 **46.4**	Grid 9 **44.7**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15

0 dB = 51.4V/m

Date: 4/11/2005

PCTEST Hearing-Aid Compatability Facility

DUT: LG-VX3300

Type: Tri-Mode Phone
Serial: 172
Backlight off
Duty Cycle: 1:1

Communication System: PCS CDMA; Frequency: 1880.00 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2332; Calibrated: 1/31/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

Mid Channel-ACE/Hearing Aid Compatibility Test (261x261x1): Measurement grid: dx=2mm, dy=2mm
Maximum value of Total field (slot averaged) = 28.1 V/m
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

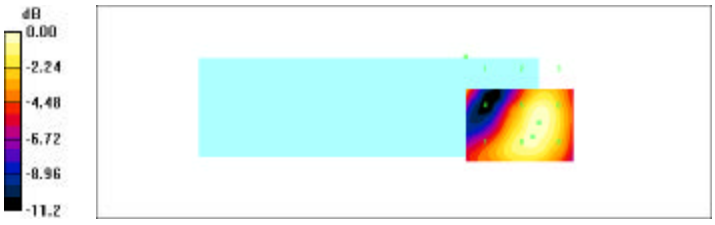
E in V/m (Time averaged)

Grid 1 **28.8**	Grid 2 **20.7**	Grid 3 **21.6**
Grid 4 **19.8**	Grid 5 **28.1**	Grid 6 **28.1**
Grid 7 **21.6**	Grid 8 **28.1**	Grid 9 **28.1**

E in V/m (Slot averaged)

Grid 1 **28.8**	Grid 2 **20.7**	Grid 3 **21.6**
Grid 4 **19.8**	Grid 5 **28.1**	Grid 6 **28.1**
Grid 7 **21.6**	Grid 8 **28.1**	Grid 9 **28.1**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 28.8V/m

LGE
LG Electronics Inc.

459-9, Kasan-dong, Kemchun-ku
Seoul 153-023, Korea

Tel : 82-2-850-3850
Fax : 82-2-850-3855
espark@lge.com

June 28. 2005

Federal Communication Commission
Equipment Authorization Branch
7435 Oakland Mills Road
Columbia, MD 21046

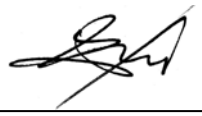
SUBJECT: LG Electronics Inc.
FCC ID: BEJVX3300
Class II Permissive Change - HAC

Gentlemen:

We, LG Electronics, hereby declare the samples evaluated in this application are equivalent to production samples. Thus, the only change in this permissive change application is the addition of the HAC compliance designation.

Should you have any questions or comments concerning the above, please contact the undersigned.

Sincerely,



E.S.Park
Chief Research Engineer
Mobile Handset Lab.
LG Electronics Inc.

Date: 5/11/2005

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 835 MHz

Type: CD835V3
Serial: 1003
Duty Cycle: 1:2.02

Communication System: 80% AM; Frequency: 835 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2332; Calibrated: 1/31/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Main; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

80%AM/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 199.4 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

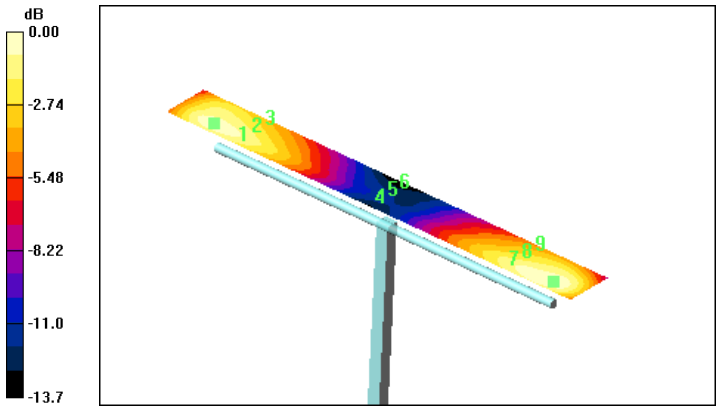
E in V/m (Time averaged)

Grid 1 **134.4**	Grid 2 **135.5**	Grid 3 **117.9**
Grid 4 **73.4**	Grid 5 **74.2**	Grid 6 **63.8**
Grid 7 **139.1**	Grid 8 **140.3**	Grid 9 **114.4**

E in V/m (Slot averaged)

Grid 1 **191.0**	Grid 2 **192.6**	Grid 3 **167.6**
Grid 4 **104.4**	Grid 5 **105.4**	Grid 6 **90.7**
Grid 7 **197.7**	Grid 8 **199.4**	Grid 9 **162.6**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 140.3V/m

Date: 5/11/2005

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 835 MHz

Type: CD835V3
Serial: 1003

Communication System: CDMA; Frequency: 835 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2332; Calibrated: 1/31/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

CDMA/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 193.3 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

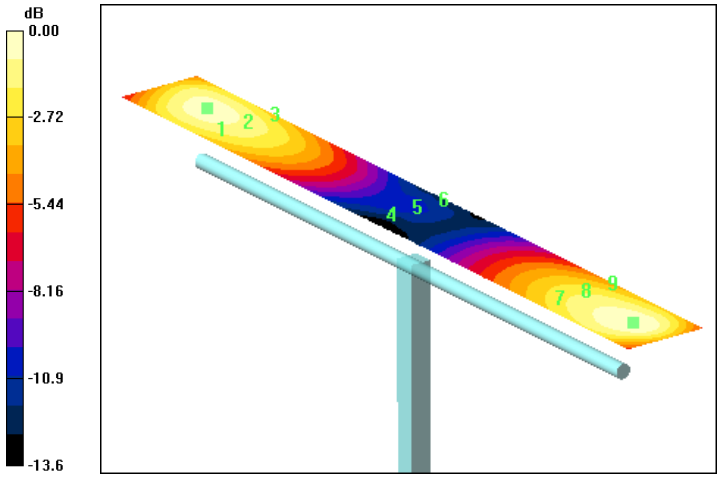
E in V/m (Time averaged)

Grid 1 **176.8**	Grid 2 **185.5**	Grid 3 **181.3**
Grid 4 **95.7**	Grid 5 **98.2**	Grid 6 **95.7**
Grid 7 **183.5**	Grid 8 **193.3**	Grid 9 **184.7**

E in V/m (Slot averaged)

Grid 1 **176.8**	Grid 2 **185.5**	Grid 3 **181.3**
Grid 4 **95.7**	Grid 5 **98.2**	Grid 6 **95.7**
Grid 7 **183.5**	Grid 8 **193.3**	Grid 9 **184.7**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 193.3V/m

Date: 4/12/2005

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 1900 MHz

Type: CD1880V3
Serial: 1002
Duty Cycle: 1:2.02

Communication System: 80% AM; Frequency: 1880 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2332; Calibrated: 1/31/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Main; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

1880MHz, 100mW/20dBm 80%AM/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 166.7 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

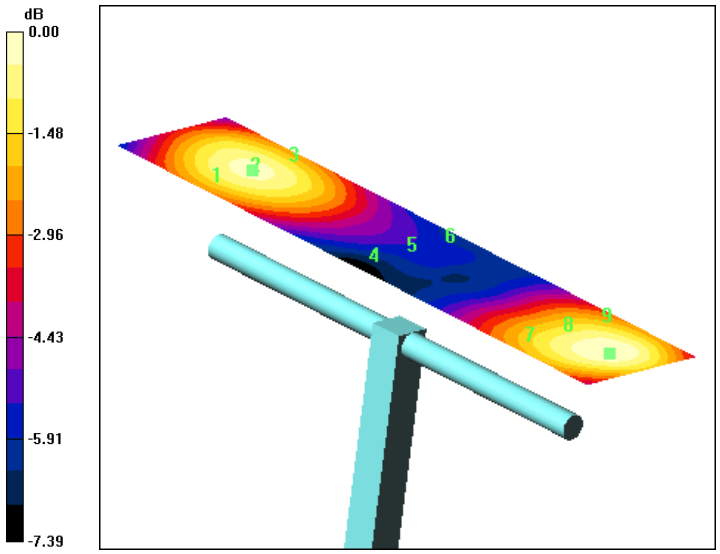
E in V/m (Time averaged)

Grid 1 **107.9**	Grid 2 **113.7**	Grid 3 **110.9**
Grid 4 **79.9**	Grid 5 **82.6**	Grid 6 **81.0**
Grid 7 **110.7**	Grid 8 **117.3**	Grid 9 **114.8**

E in V/m (Slot averaged)

Grid 1 **153.4**	Grid 2 **161.6**	Grid 3 **157.6**
Grid 4 **113.6**	Grid 5 **117.4**	Grid 6 **115.1**
Grid 7 **157.3**	Grid 8 **166.7**	Grid 9 **163.2**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 117.3V/m

Date: 4/12/2005

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 1900 MHz

Type: CD1880V3
Serial: 1002

Communication System: CDMA; Frequency: 1880 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2332; Calibrated: 1/31/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

CDMA/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 152.0 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

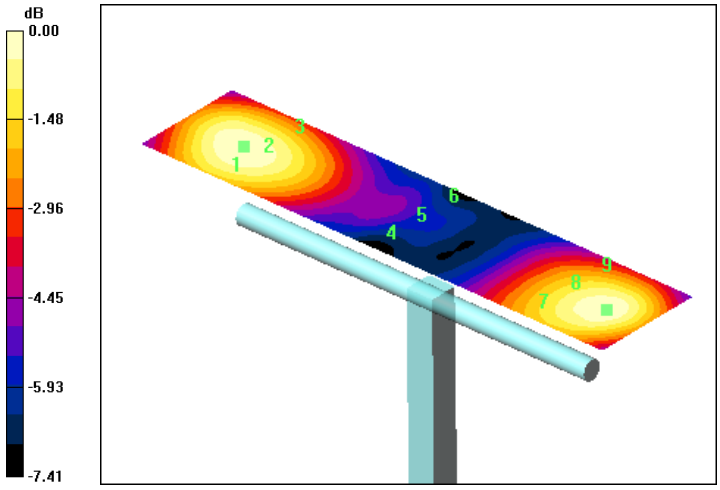
E in V/m (Time averaged)

Grid 1	Grid 2	Grid 3
148.9	**151.7**	**141.8**
Grid 4	Grid 5	Grid 6
100.6	**101.4**	**94.5**
Grid 7	Grid 8	Grid 9
147.0	**152.0**	**140.3**

E in V/m (Slot averaged)

Grid 1	Grid 2	Grid 3
148.9	**151.7**	**141.8**
Grid 4	Grid 5	Grid 6
100.6	**101.4**	**94.5**
Grid 7	Grid 8	Grid 9
147.0	**152.0**	**140.3**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 152.0V/m

Date: 4/12/2005

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 835 MHz

Type: CD835V3
Serial: 1003
Duty Cycle: 1:2.02

Communication System: 80% AM; Frequency: 835 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6180; Calibrated: 10/6/2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Main; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

835MHz, 100mW/20dBm 80%AM/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.486 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

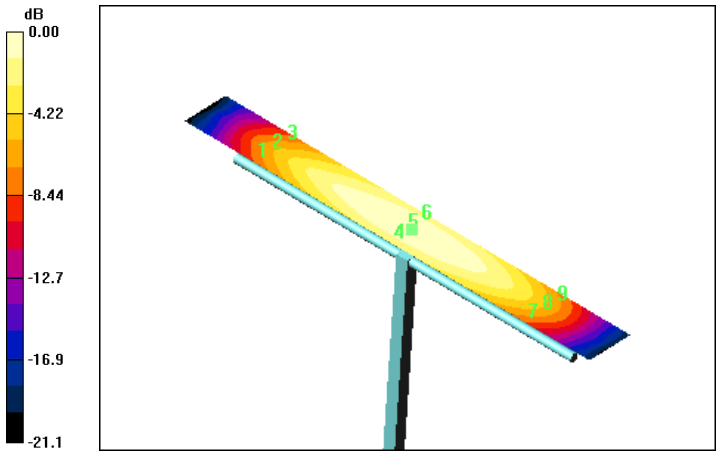
H in A/m (Time averaged)

Grid 1 **0.276**	Grid 2 **0.299**	Grid 3 **0.277**
Grid 4 **0.318**	Grid 5 **0.342**	Grid 6 **0.330**
Grid 7 **0.276**	Grid 8 **0.304**	Grid 9 **0.295**

H in A/m (Slot averaged)

Grid 1 **0.392**	Grid 2 **0.425**	Grid 3 **0.394**
Grid 4 **0.452**	Grid 5 **0.486**	Grid 6 **0.469**
Grid 7 **0.392**	Grid 8 **0.432**	Grid 9 **0.419**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 0.342A/m

Date: 4/12/2005

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 835 MHz

Type: CD8353V3
Serial: 1003
Duty Cycle: 1:1

Communication System: CDMA; Frequency: 835 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6180; Calibrated: 10/6/2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

CDMA/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.463 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

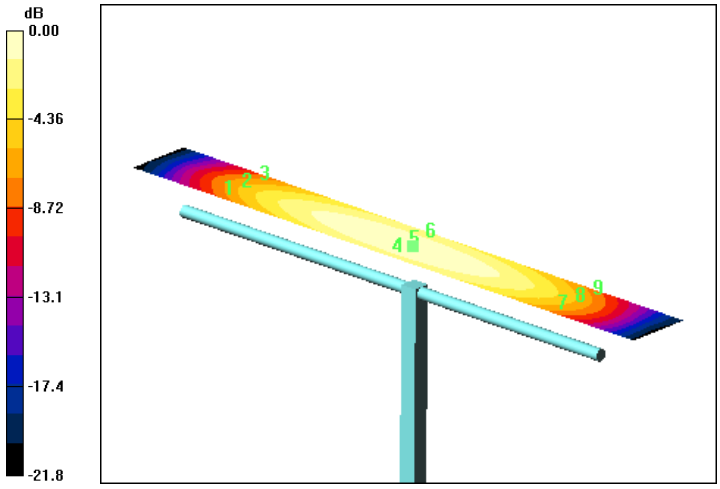
H in A/m (Time averaged)

Grid 1	Grid 2	Grid 3
0.386	**0.409**	**0.383**
Grid 4	Grid 5	Grid 6
0.444	**0.463**	**0.433**
Grid 7	Grid 8	Grid 9
0.389	**0.405**	**0.375**

H in A/m (Slot averaged)

Grid 1	Grid 2	Grid 3
0.386	**0.409**	**0.383**
Grid 4	Grid 5	Grid 6
0.444	**0.463**	**0.433**
Grid 7	Grid 8	Grid 9
0.389	**0.405**	**0.375**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 0.463A/m

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 1900 MHz

Type: CD1880V3
Serial: 1002
Duty Cycle: 1:2.02

Communication System: 80% AM; Frequency: 1880 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6180; Calibrated: 10/6/2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2005
- Phantom: HAC Main; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

1880MHz, 100mW/20dBm 80%AM/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.477 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

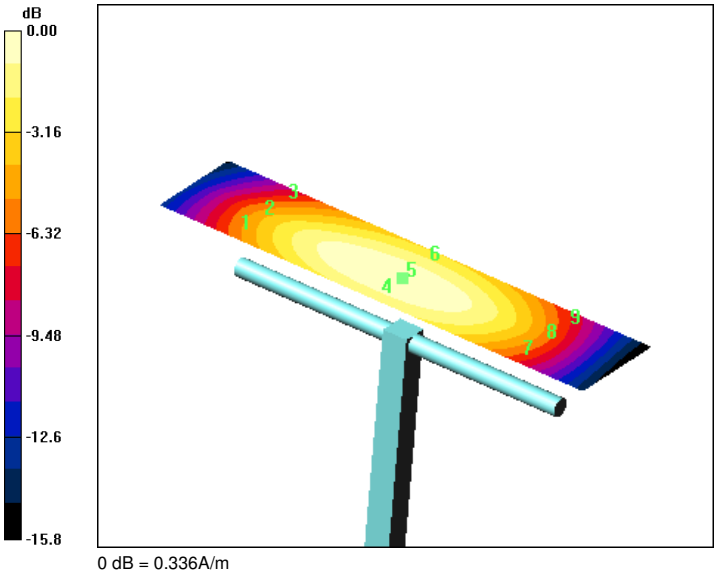
H in A/m (Time averaged)

Grid 1	Grid 2	Grid 3
0.299	**0.308**	**0.272**
Grid 4	Grid 5	Grid 6
0.324	**0.336**	**0.305**
Grid 7	Grid 8	Grid 9
0.288	**0.295**	**0.269**

H in A/m (Slot averaged)

Grid 1	Grid 2	Grid 3
0.424	**0.438**	**0.387**
Grid 4	Grid 5	Grid 6
0.460	**0.477**	**0.434**
Grid 7	Grid 8	Grid 9
0.409	**0.420**	**0.382**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 0.336A/m

Date: 4/22/2005

PCTEST Hearing-Aid Compatability Facility

DUT: HAC Dipole 1900 MHz

Type: CD1880V3
Serial: 1002
Duty Cycle: 1:1

Communication System: CDMA; Frequency: 1880 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6180; Calibrated: 10/6/2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn637; Calibrated: 9/22/2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19;

CDMA/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.456 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

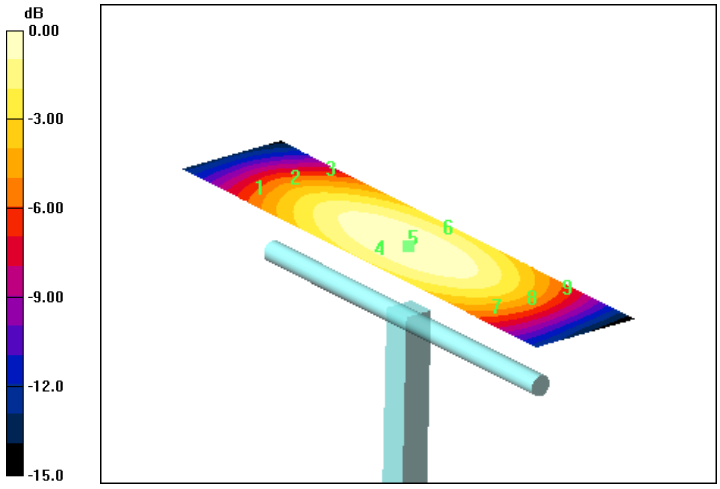
H in A/m (Time averaged)

Grid 1	Grid 2	Grid 3
0.388	**0.411**	**0.388**
Grid 4	Grid 5	Grid 6
0.434	**0.456**	**0.433**
Grid 7	Grid 8	Grid 9
0.396	**0.417**	**0.394**

H in A/m (Slot averaged)

Grid 1	Grid 2	Grid 3
0.388	**0.411**	**0.388**
Grid 4	Grid 5	Grid 6
0.434	**0.456**	**0.433**
Grid 7	Grid 8	Grid 9
0.396	**0.417**	**0.394**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 0.456A/m

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

Client PC TEST

Certificate No: CD835V3-1003_Feb05

CALIBRATION CERTIFICATE

Object	CD835V3 - SN: 1003
Calibration procedure(s)	QA CAL-20.v2 Calibration procedure for dipoles in air
Calibration date:	February, 23, 2005
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference Probe ER3DV6	SN 2328	06-Oct-04 (SPEAG, No. ER3-2328_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092312	10-Aug-03 (SPEAG, in house check Jan-04)	In house check: Oct-05
Power sensor HP 8481A	MY41093315	10-Aug-03 (SPEAG, in house check Jan-04)	In house check: Oct-05
RF generator Agilent E8251A	US41140111	4-Aug-03 (Agilent)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05
Probe H3DV6	SN: 6065	10-Oct-04 (SPEAG, No. H3-6065-Oct04)	Calibration, Oct-05

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Fin Bomholt	Technical Director	

Issued: February 27, 2005

This calibration certificate is issued as an intermediate solution until the specific calibration procedure is submitted and accepted in the frame of the accreditation of the Calibration Laboratory of Schmid & Partner Engineering AG (based on ISO/IEC 17025 International Standard)

References

[1] ANSI-PC63.19-2003 (Draft)
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 standard [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the 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 DASY4 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.

1 Measurement Conditions

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

DASY Version	DASY4	V4.5 B13
DASY PP Version	SEMCAD	V1.8 B144
Phantom	HAC Test Arch	SD HAC P01 BA, #1002
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 180 mm
Frequency	**835 MHz** ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2 Maximum Field values

H-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured	100 mW forward power	**0.470 A/m**

Uncertainty for H-field measurement: 19.5% (k=2)

E-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured above high end	100 mW forward power	187.0 V/m
Maximum measured above low end	100 mW forward power	183.2 V/m
Averaged maximum above arm	100 mW forward power	**185.1 V/m**

Uncertainty for E-field measurement: 21.7% (k=2)

3 Appendix

3.1 Antenna Parameters

Frequency	**Return Loss**	**Impedance**
800 MHz	16.6 dB	(40.5 - j9.6) Ohm
835 MHz	**25.2 dB**	**(55.3 + j2.4) Ohm**
900 MHz	16.6 dB	(52.7 - j15.2) Ohm
950 MHz	25.1 dB	(50.9 + j5.5) Ohm
960 MHz	17.2 dB	(61.0 + j10.9) Ohm

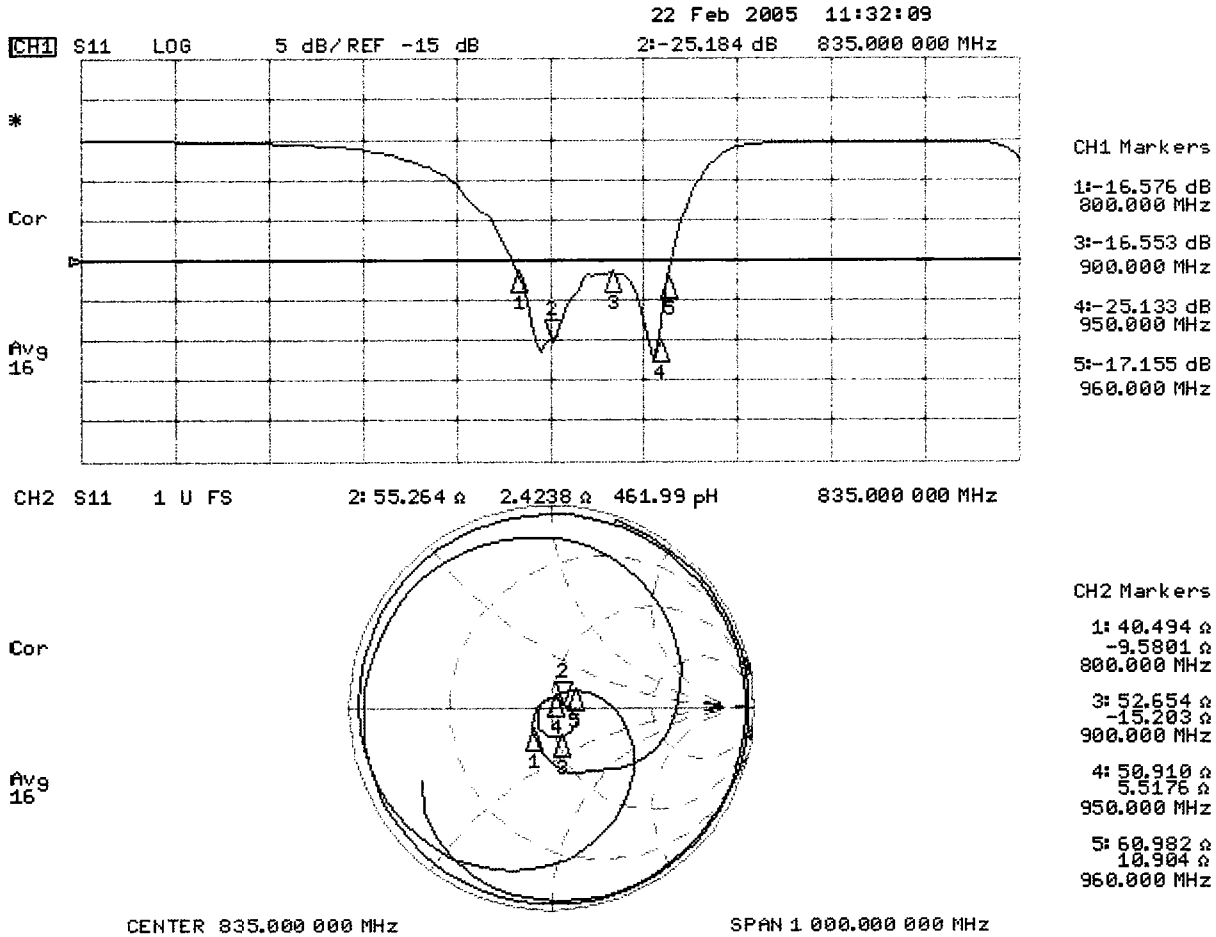
3.2 Antenna Design and Handling

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.

3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



3.3.2 DASY4 H-field result

See page 5

3.3.3 DASY4 E-Field result

See page 6

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: H_CD835_1003_050222.da4

DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1003
Program Name: HAC H Dipole

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: $\sigma = 0$; mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Phantom section: H Dipole Section

DASY4 Configuration:
- Probe: H3DV6 - SN6065; ; Calibrated: 10.12.2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn901; Calibrated: 29.06.2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA; Serial: 1002
- Measurement SW: DASY4, V4.5 Build 13; Postprocessing SW: SEMCAD, V1.8 Build 144

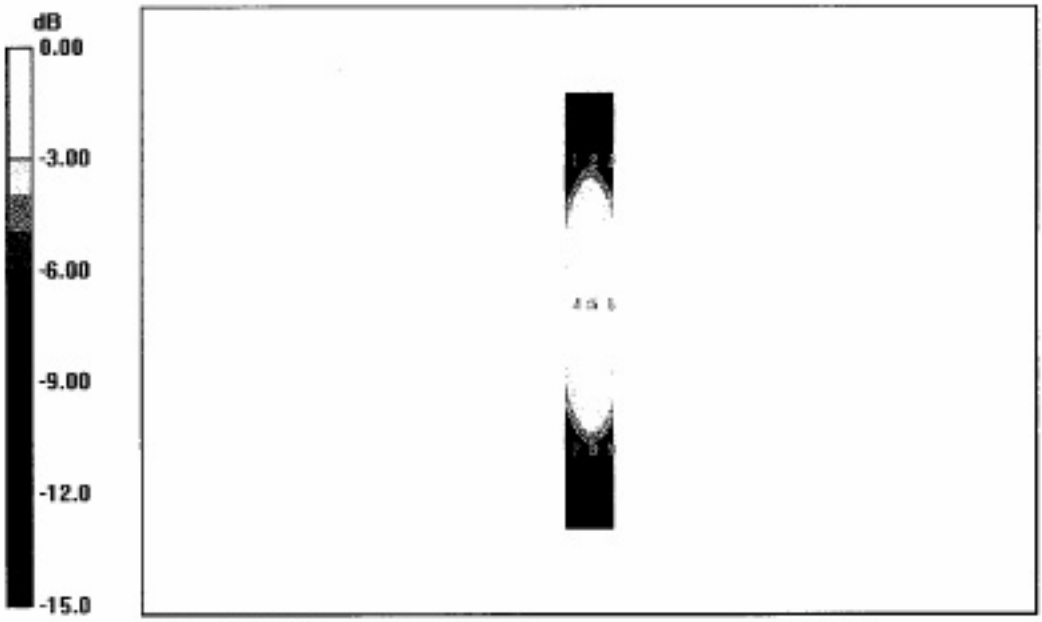
H Scan 10mm above CD 835 MHz/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm, dz=5.5555mm
Maximum value of Total field (slot averaged) = 0.470 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

H in A/m (Time averaged)

Grid 1	Grid 2	Grid 3
0.365	**0.397**	**0.380**
Grid 4	Grid 5	Grid 6
0.408	**0.470**	**0.425**
Grid 7	Grid 8	Grid 9
0.350	**0.380**	**0.368**

H in A/m (Slot averaged)

Grid 1	Grid 2	Grid 3
0.365	**0.397**	**0.380**
Grid 4	Grid 5	Grid 6
0.408	**0.470**	**0.425**
Grid 7	Grid 8	Grid 9
0.350	**0.380**	**0.368**



0 dB = 0.470 A/m

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: E_CD835_1003_050223.da4

DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1003
Program Name: HAC E Dipole

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: $\sigma = 0$; mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: E Dipole Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2328; ConvF(1, 1, 1); Calibrated: 06.10.2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn901; Calibrated: 29.06.2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA; Serial: 1002
- Measurement SW: DASY4, V4.5 Build 13; Postprocessing SW: SEMCAD, V1.8 Build 144

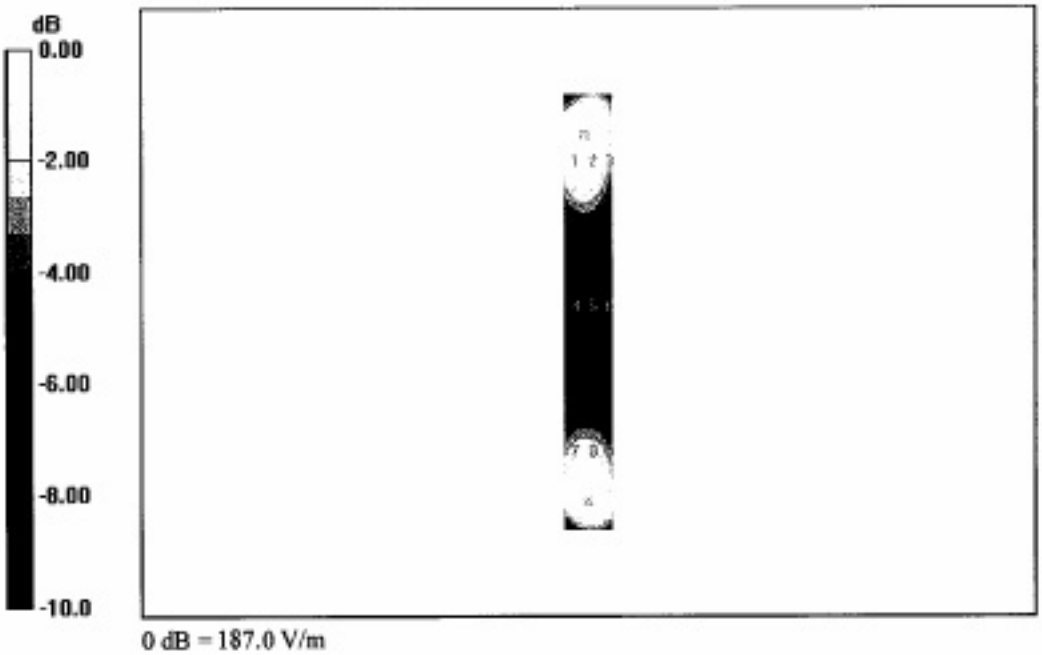
E Scan 10mm above CD 835 MHz/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm, dz=5.5555mm
Maximum value of Total field (slot averaged) = 187.0 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

E in V/m (Time averaged)

Grid 1	Grid 2	Grid 3
156.0	**187.0**	**150.1**
Grid 4	Grid 5	Grid 6
83.6	**84.8**	**80.4**
Grid 7	Grid 8	Grid 9
148.0	**183.2**	**149.5**

E in V/m (Slot averaged)

Grid 1	Grid 2	Grid 3
156.0	**187.0**	**150.1**
Grid 4	Grid 5	Grid 6
83.6	**84.8**	**80.4**
Grid 7	Grid 8	Grid 9
148.0	**183.2**	**149.5**



0 dB = 187.0 V/m

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

Client PC TEST

Certificate No: CD1880V3-1002_Feb05

CALIBRATION CERTIFICATE

Object	CD1880V3 - SN: 1002
Calibration procedure(s)	QA CAL-20.v2 Calibration procedure for dipoles in air
Calibration date:	February, 23, 2005
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference Probe ER3DV6	SN 2328	06-Oct-04 (SPEAG, No. ER3-2328_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092312	10-Aug-03 (SPEAG, in house check Jan-04)	In house check: Oct-05
Power sensor HP 8481A	MY41093315	10-Aug-03 (SPEAG, in house check Jan-04)	In house check: Oct-05
RF generator Agilent E8251A	US41140111	4-Aug-03 (Agilent)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05
Probe H3DV6	SN: 6065	10-Oct-04 (SPEAG, No. H3-6065-Oct04)	Calibration, Oct-05

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Fin Bomholt	Technical Director	

Issued: February 27, 2005

This calibration certificate is issued as an intermediate solution until the specific calibration procedure is submitted and accepted in the frame of the accreditation of the Calibration Laboratory of Schmid & Partner Engineering AG (based on ISO/IEC 17025 International Standard)

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

References

[1] ANSI-PC63.19-2003 (Draft)
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 standard [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the 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 DASY4 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.

1 Measurement Conditions

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

DASY Version	DASY4	V4.5 B13
DASY PP Version	SEMCAD	V1.8 B144
Phantom	HAC Test Arch	SD HAC P01 BA, #1002
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 90 mm
Frequency	**1880 MHz** ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2 Maximum Field values

H-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured	100 mW forward power	**0.450 A/m**

Uncertainty for H-field measurement: 19.5% (k=2)

E-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured above high end	100 mW forward power	146.0 V/m
Maximum measured above low end	100 mW forward power	145.6 V/m
Averaged maximum above arm	100 mW forward power	**145.8 V/m**

Uncertainty for E-field measurement: 21.7% (k=2)

3 Appendix

3.1 Antenna Parameters

Frequency	**Return Loss**	**Impedance**
1710 MHz	23.4 dB	(55.2 + j6.1) Ohm
1880 MHz	**21.4 dB**	**(53.9 + j7.4) Ohm**
1900 MHz	20.9 dB	(55.8 + j6.7) Ohm
1950 MHz	28.0 dB	(54.1 + j1.9) Ohm
2000 MHz	18.9 dB	(51.2 + j11.9) Ohm

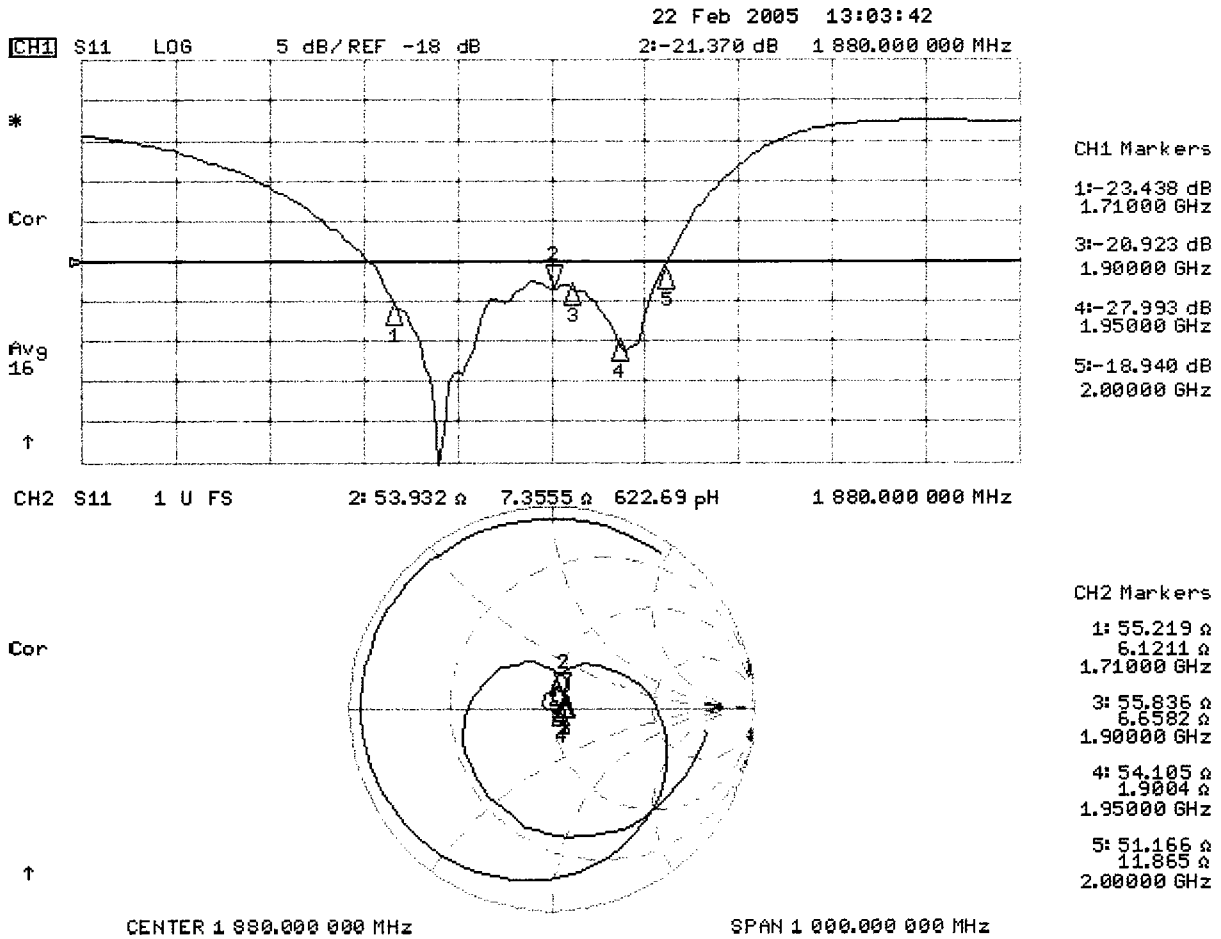
3.2 Antenna Design and Handling

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.

3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



3.3.2 DASY4 H-field result

See page 5

3.3.3 DASY4 E-Field result

See page 6

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: H_CD1880_1002_050223.da4

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1002
Program Name: HAC H Dipole

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: $\sigma = 0$; mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Phantom section: H Dipole Section

DASY4 Configuration:
- Probe: H3DV6 - SN6065; ; Calibrated: 10.12.2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn901; Calibrated: 29.06.2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 13; Postprocessing SW: SEMCAD, V1.8 Build 144

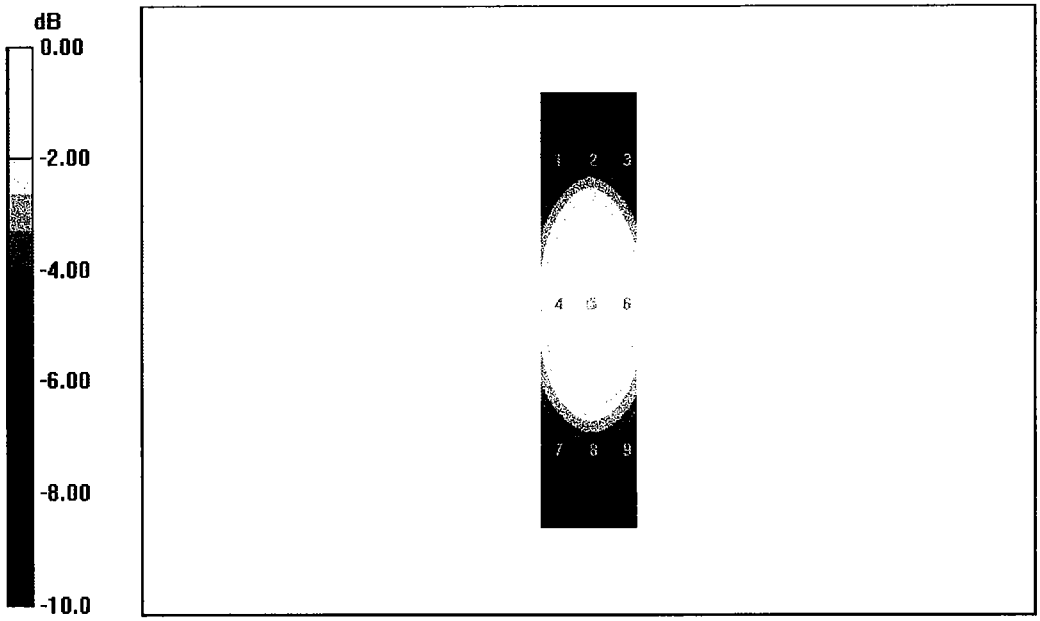
H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm, dz=5.5555mm
Maximum value of Total field (slot averaged) = 0.450 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

H in A/m (Time averaged)

Grid 1	Grid 2	Grid 3
0.385	**0.413**	**0.395**
Grid 4	Grid 5	Grid 6
0.421	**0.450**	**0.432**
Grid 7	Grid 8	Grid 9
0.376	**0.401**	**0.386**

H in A/m (Slot averaged)

Grid 1	Grid 2	Grid 3
0.385	**0.413**	**0.395**
Grid 4	Grid 5	Grid 6
0.421	**0.450**	**0.432**
Grid 7	Grid 8	Grid 9
0.376	**0.401**	**0.386**



0 dB = 0.450A/m

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: E_CD1880_1002_050223.da4

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1002
Program Name: HAC E Dipole

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: $\sigma = 0$; mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: E Dipole Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2328; ConvF(1, 1, 1); Calibrated: 06.10.2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn901; Calibrated: 29.06.2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 13; Postprocessing SW: SEMCAD, V1.8 Build 144

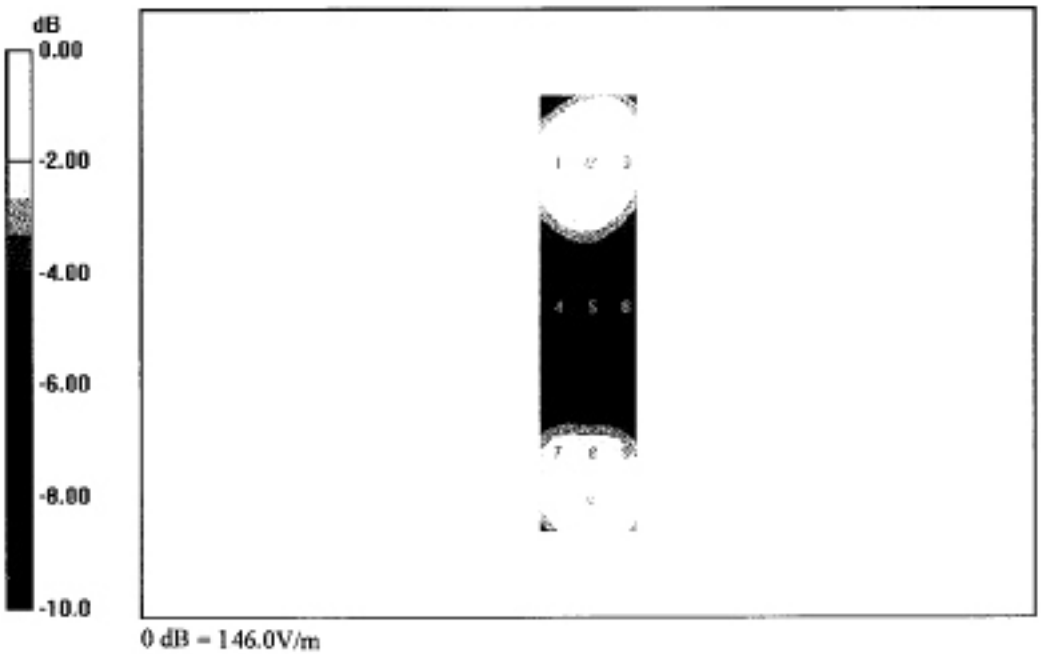
E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm, dz=5.5555mm
Maximum value of Total field (slot averaged) = 146.0 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

E in V/m (Time averaged)

Grid 1	Grid 2	Grid 3
128.7	**145.6**	**130.5**
Grid 4	Grid 5	Grid 6
90.1	**92.4**	**88.8**
Grid 7	Grid 8	Grid 9
126.7	**146.0**	**131.8**

E in V/m (Slot averaged)

Grid 1	Grid 2	Grid 3
128.7	**145.6**	**130.5**
Grid 4	Grid 5	Grid 6
90.1	**92.4**	**88.8**
Grid 7	Grid 8	Grid 9
126.7	**146.0**	**131.8**



0 dB = 146.0V/m