PCTEST

PCTEST ENGINEERING LABORATORY, INC.

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HEARING AID COMPATIBILITY

Applicant Name:

LG Electronics MobileComm U.S.A., Inc. 10101 Old Grove Road, San Diego, CA 92131 USA Date of Testing:
January 6-12, 2012
Test Site/Location:
PCTEST Lab, Columbia, MD, USA

Test Report Serial No.:

0Y1201030004.ZNF

FCC ID: ZNFLG530G

APPLICANT: LG ELECTRONICS MOBILECOMM U.S.A., INC.

Application Type: Certification

FCC Rule Part(s): § 20.19(b), §6.3(v), §7.3(v)

HAC Standard: ANSI C63.19-2007; EUT Type: Portable Handset Model(s): LG530G, LG530g

Test Device Serial No.: Pre-Production Sample [S/N: HAC RFE]

Band & Mode	Tx Frequency	C63.19-2007 HAC Category:
GSM/GPRS/EDGE Rx only 850	824.20 - 848.80 MHz	
WCDMA 850	826.40 - 846.60 MHz	M3 (RF EMISSIONS
GSM/GPRS/EDGE Rx only 1900	1850.20 - 1909.80 MHz	
WCDMA 1900	1852.4 - 1907.6 MHz	CATEGORY)
Bluetooth	2402 - 2480 MHz	

This wireless portable device has been shown to be hearing-aid compatible under the above rated category, specified in ANSI/IEEE Std. C63.19-2007 and had been tested in accordance with the specified measurement procedures. Hearing-Aid Compatibility is based on the assumption that all production units will be designed electrically identical to the device tested in this report. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.





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1. INTRODUCTION

On July 10, 2003, the Federal Communications Commission (FCC) adopted new rules requiring wireless manufacturers and service providers to provide digital wireless phones that are compatible with hearing aids. The FCC has modified the exemption for wireless phones under the Hearing Aid Compatibility Act of 1998 (HAC Act) in WT Docket 01-309 RM-8658¹ to extend the benefits of wireless telecommunications to individuals with hearing disabilities. These benefits encompass business, social and emergency communications, which increase the value of the wireless network for everyone. An estimated more than 10% of the population in the United States show signs of hearing impairment and of that fraction, almost 80% use hearing aids. Approximately 500 million people worldwide suffer from hearing loss.

Compatibility Tests Involved:

The standard calls for wireless communications devices to be measured for:

- RF Electric-field emissions
- RF Magnetic-field emissions
- T-coil mode, magnetic-signal strength in the audio band
- T-coil mode, magnetic-signal frequency response through the audio band
- T-coil mode, magnetic-signal and noise articulation index

The hearing aid must be measured for:

- RF immunity in microphone mode
- RF immunity in T-coil mode

In the following tests and results, this report includes the evaluation for a wireless communications device.



Figure 1-1 Hearing Aid in-vitu

¹ FCC Rule & Order, WT Docket 01-309 RM-8658

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2. TEST SITE LOCATION

2.1 INTRODUCTION

The map at the right shows the location of the PCTEST LABORATORY in Columbia, Maryland. It is in proximity to the FCC Laboratory, the Baltimore-Washington International (BWI) airport, the city of Baltimore and Washington, DC (See Figure 2).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49' 38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV



Figure 2-1
Map of the Greater Baltimore and Metropolitan
Washington, D.C. area

transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on January 27, 2006 and Industry Canada.

2.2 Test Facility / Accreditations:

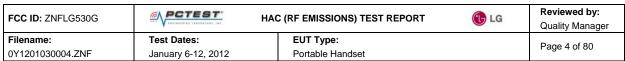
Measurements were performed at an independent accredited PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.



- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing-Aid Compatibility (HAC), CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC-2451).
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).



- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS and CDMA, and EvDO mobile phones.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for Over-the-Air (OTA)
 Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS
 (W-CDMA), CDMA 1xEVDO Data, CDMA 1xRTT Data.





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3. **EUT DESCRIPTION**



FCC ID: ZNFLG530G

Manufacturer: LG Electronics MobileComm U.S.A., Inc.

10101 Old Grove Road, San Diego, CA 92131

USA

Model(s): LG530G, LG530g

Serial Number: HAC RFE

Tx Frequencies: 824.20 - 848.80 MHz (GSM 850)

1850.20 - 1909.80 MHz (GSM 1900) 826.40 - 846.60 MHz (WCDMA850) 1852.4 - 1907.6 MHz (WCDMA1900)

Antenna Configurations: Internal Antenna

Maximum Tested Conducted Power 32.99 dBm (GSM 850), 29.43 dBm (GSM 1900),

(HAC):

22.86 dBm (WCDMA850), 22.49 dBm (WCDMA1900)

HAC Test Configurations: GSM 850, 128, 190, 251, BT Off

GSM 1900, 512, 661, 810, BT Off

WCDMA850, 4132, 4183, 4233, BT Off WCDMA1900, 9262, 9400, 9538, BT Off

EUT Type: Portable Handset

Air-Interface	Band (MHz)	Туре	C63.19-2007 tested	Simultaneous Transmissions Scenarios in voice modes (Not to be tested)	Reduced power 20.19 (c)(1)	VOIP
	850	Voice	Yes	Yes: BT	NA	N/A
	1900	Voice	Yes	Yes: BT	NA	N/A
GSM	GPRS/ EDGE Rx only	Data	NA	NA	NA	Yes
WCDMA	835	Voice	Yes	Yes: BT	NA	N/A
WCDIVIA	1900	Voice	163	1e3. D1	IVA	IN/A
ВТ	2450	Data	NA	Yes: GSM or WCDMA	NA	NA

NOTE: HAC Rating was not based on concurrent voice and data modes. Standalone mode was found to represent worst case rating for both M and T rating.

Table 3: ZNFLG530G Air Interfaces

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4. ANSI/IEEE C63.19 PERFORMANCE CATEGORIES

I. RF EMISSIONS

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

Category	Telephone RF Parameters				
Near field Category	E-field emissions CW CW CW dB(V/m) CW dB(A/m)				
	f < 960 MHz				
M1	56 to 61 + 0.5 x AWF	5.6 to 10.6 +0.5 x AWF			
M2	51 to 56 + 0.5 x AWF	0.6 to 5.6 +0.5 x AWF			
M3	46 to 51 + 0.5 x AWF	-4.4 to 0.6 +0.5 x AWF			
M4	< 46 + 0.5 x AWF	< -4.4 + 0.5 x AWF			
	f > 960 MHz				
M1	46 to 51 + 0.5 x AWF	-4.4 to 0.6 +0.5 x AWF			
M2	41 to 46 + 0.5 x AWF	−9.4 to −4.4 +0.5 x AWF			
M3	36 to 41 + 0.5 x AWF	-14.4 to -9.4 +0.5 x AWF			
M4	M4 < 36 + 0.5 x AWF < -14.4 + 0.5 x AWF				
Table 4-1 Hearing aid and WD near-field categories as defined in ANSI C63.19-2007 [2]					

II. ARTICULATION WEIGHTING FACTOR (AWF)

Standard	Technology	Articulation Weighing Factor (AWF)		
T1/T1P1/3GPP	UMTS (WCDMA)	0		
TIA/EIA/IS-2000	CDMA	0		
iDEN [™]	TDMA (22 and 11 Hz)	0		
J-STD-007 GSM (217 Hz) -5				
Table 4-2 Articulation Weighting Factors				

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5. SYSTEM SPECIFICATIONS

ER3DV6 E-Field Probe Description

Construction: One dipole parallel, two dipoles normal to probe axis

Built-in shielding against static charges

Calibration: In air from 100 MHz to 3.0 GHz

(absolute accuracy ±6.0%, k=2)

Frequency: 100 MHz to > 6 GHz;

Linearity: ± 0.2 dB (100 MHz to 3 GHz)

Directivity ± 0.2 dB in air (rotation around probe axis)

± 0.4 dB in air (rotation normal to probe axis)

Dynamic Range 2 V/m to > 1000 V/m

(M3 or better device readings fall well below diode

compression point)

Linearity: $\pm 0.2 \text{ dB}$

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



Figure 5-1
E-field Free-space
Probe

H3DV6 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

Frequency: 200 MHz to 3 GHz (absolute accuracy \pm 6.0%, k=2);

Output linearized

Directivity: ± 0.25 dB (spherical isotropy error)

Dynamic Range: 10 mA/m to 2 A/m at 1 GHz

(M3 or better device readings fall well below diode

compression point)

Dimensions: Overall length: 330 mm (Tip: 40 mm)

Tip diameter: 6 mm (Body: 12 mm)

Distance from probe tip to dipole centers: 3 mm

E-Field < 10% at 3 GHz (for plane wave)

Interference:



Figure 5-2 H-Field Free-space Probe

Probe Tip Description

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

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

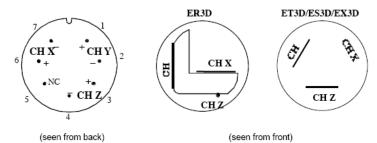
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Consequently, two sensors with different loop diameters - both calibrated ideally - would give different results when measuring from the edge of the probe sensor elements. The behavior for electrically small E-field sensors is equivalent.

The magnetic field loops of the 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 the 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.

Connector Plan



The antistatic shielding inside the probe is connected to the probe connector case.

Instrumentation Chain

Equation 1 Conversion of Connector Voltage u, to E-Field E,

$$E_i = \sqrt{\frac{u_i + (u_i^2 \cdot CF)/(DCP)}{Norm_i \cdot ConvF}}$$

whereby

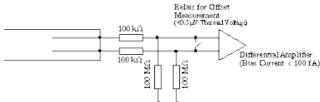
Ei: electric field in V/m

voltage of channel i at the connector in μV Цí. sensitivity of channel i in µV/(V/m)2 Normi

enhancement factor in liquid (ConvF=1 for Air) ConvF: DCP: diode compression point in uV

CF. signal crest factor (peak power/average power)

Conditions of Calibration



Please note:

- a lower input impedance of the amplifier will result in different sensitivity factors Norm, and DCP
- larger bias currents will cause higher offset

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Probe Response to Frequency

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 (See also below).

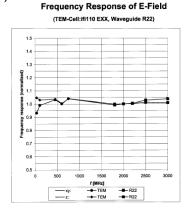


Figure 5-3 E-Field Probe Frequency Response

H-field sensors have a frequency dependent sensitivity which is evaluated for a series of frequencies also visible in the probe calibration 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. See below for H-field frequency response:

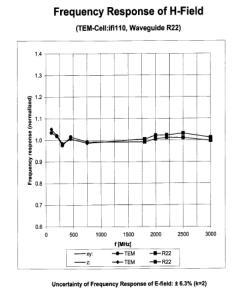


Figure 5-4 H-Field Probe Frequency Response

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Conversion to Peak

Peak is defined as Peak Envelope Power. All raw measurements from the HAC measurement system are RMS values. The DASY4 system incorporates the crest factor of the signal in the computation of the RMS values (See Equation 1). Although the software also has capability to estimate the peak field by applying a square root of crest factor value to the readings, the probe modulation factor was applied manually instead per C63.19 in the measurement tables in this report. The equation to convert the raw measurements in the data tables are:

Peak Field = 20·log (Raw · PMF)

Where:

Peak Field = Peak field (in dBV/m or dBA/m)

Raw = Raw field measurement from the measurement system (in V/m or A/m).

PMF = Probe Modulation Factor (in linear units).

SPEAG Robotic System

E-field and H-field measurements are performed using the DASY4 automated dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Pentium 4 computer, near-field probe, probe alignment sensor, and the HAC phantom. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF).



Figure 5-5 SPEAG Robotic System

System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the Gateway Pentium 4 2.53 GHz computer with Windows XP system and RF Measurement Software DASY4 v4.5 (with HAC Extension), A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that 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.

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System Electronics

The DAE 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.

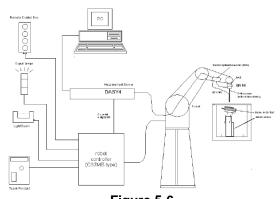


Figure 5-6 SPEAG Robotic System Diagram

DASY4 Instrumentation Chain

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:

$$\begin{aligned} V_i &= U_i + U_i^2 \cdot \frac{cf}{dcp_i} \\ \text{with} \quad V_i &= \text{compensated signal of channel i} & (i = x, y, z) \\ U_i &= \text{input signal of channel i} & (i = x, y, z) \\ cf &= \text{crest factor of exciting field} & (\text{DASY parameter}) \\ dcp_i &= \text{diode compression point} & (\text{DASY parameter}) \end{aligned}$$

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

E – field
probes :
$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

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

with
$$V_i$$
 = compensated signal of channel i (i = x, y, z)
 $Norm_i$ = sensor sensitivity of channel i (i = x, y, z)

 orm_i = sensor sensitivity of channel i $\mu V/(V/m)^2$ for E-field Probes

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):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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%.

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6. TEST PROCEDURE

I. RF EMISSIONS

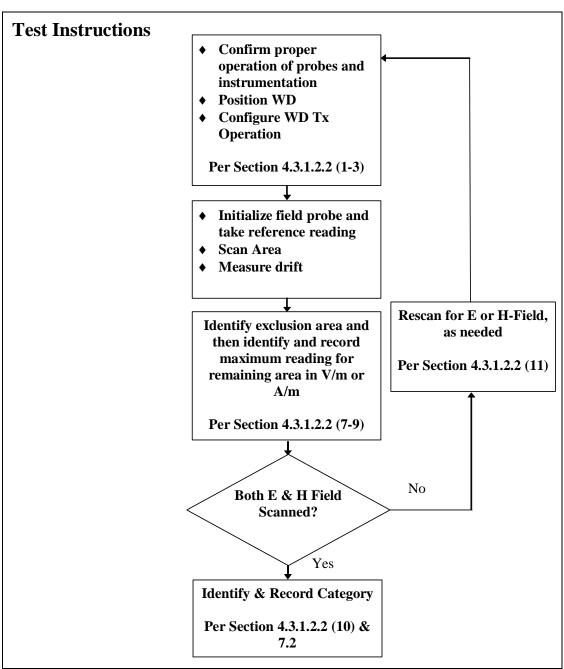


Figure 6-1 RF Emissions Flow Chart

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Test Setup

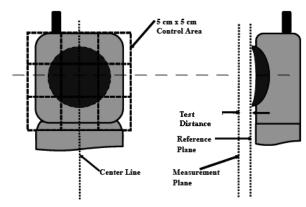


Figure 6-2
E/H-Field Emissions Test Setup Diagram (See Test Photographs for actual WD scan grid overlay)

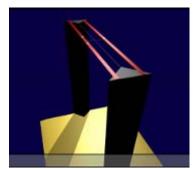


Figure 6-3 HAC Phantom

RF Emissions Test Procedure:

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

- 1. Proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed.
- 2. WD is positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.
- 3. The WD operation for maximum rated RF output power was configured and confirmed with the base station simulator, at the test channel and other normal operating parameters as intended for the test. The battery was ensured to be fully charged before each test.
- 4. The center sub-grid was centered over the center of the acoustic output (also audio band magnetic output, if applicable). The WD audio output was positioned tangent (as physically possible) to the measurement plane.
- 5. A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the HAC Phantom.
- 6. The measurement system measured the field strength at the reference location.
- 7. Measurements at 2mm or 5mm increments in the 5 x 5 cm region were performed at a distance 15 mm from the center point of the probe measurement element to the WD. A 360° rotation about the azimuth axis at the maximum interpolated position was measured. For the worst-case condition, the peak reading from this rotation was used in re-evaluating the HAC category.
- 8. The system performed a drift evaluation by measuring the field at the reference location.
- 9. Steps 1-8 were done for both the E and H-Field measurements.

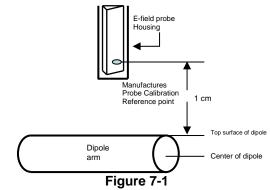
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7. SYSTEM CHECK

I. System Check Parameters

The input signal was an un-modulated continuous wave. The following points were taken into consideration in performing this check:

- Average Input Power P = 100mW RMS (20dBm RMS) after adjustment for return loss
- The test fixture must meet the 2 wavelength separation criterion
- The proper measurement of the 1 cm probe to dipole separation, which is measured from top surface
 of the dipole to the calibration reference point of the sensor, defined by the probe manufacturer is
 shown in the following diagram:



Separation Distance from Dipole to Field Probe

RF power was recorded using both an average reading meter and a peak reading meter. Readings of the probe are provided by the measurement system.

To assure proper operation of the near-field measurement probe the input power to the dipole shall be commensurate with the full rated output power of the wireless device (e.g. - for a cellular phone wireless device the average peak antenna input power will be on the order of 100mW (i.e. - 20dBm) RMS after adjustment for any mismatch.

II. Validation Procedure

A dipole antenna meeting the requirements given in C63.19 was placed in the position normally occupied by the WD.

The length of the dipole was scanned with both E-field and H-field probes and the maximum values for each were recorded.

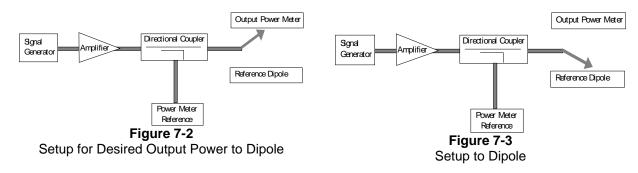
Measurement of CW

Using the near-field measurement system, scan the antenna over the radiating dipole and record the greatest field reading observed. Due to the nature of E-fields about free-space dipoles, the two E-field peaks measured over the dipole are averaged to compensate for non-parallelity of the setup (

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see manufacturer method on dipole calibration certificates, page 2). Field strength measurements shall be made only when the probe is stationary.

RF power was recorded using both an average and a peak power reading meter.



Using this setup configuration, the signal generator was adjusted for the desired output power (100mW) at a specified frequency. The reference power from the coupled port of the directional coupler is recorded. Next, the output cable is connected to the reference dipole, as shown in Figure 7-3.

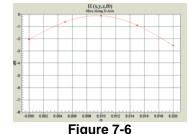
The input signal level was adjusted until the reference power from the coupled port of the directional coupler was the same as previously recorded, to compensate for the impedance mismatch between the output cable and the reference dipole. To assure proper operation of the near-field measurement probe the input power to the reference dipole was verified to the full rated output power of the wireless device. The dipole was secured in a holder in a manner to meet the 20 dB reflection. The near-field measurement probe was positioned over the dipole. The antenna was scanned over the appropriate sized area to cover the dipole from end to end. 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 a free-space RF dipole:



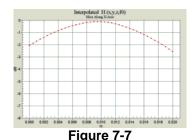
2-D Raw Data from scan along dipole axis



2-D Interpolated points from scan along dipole axis



2-D Raw Data from scan along transverse axis



2-D Interpolated points from scan along transverse axis

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III. System Check Results

Validation Results

Frequency (MHz)	Dipole S/N	Input Power (dBm)	E-field Result (V/m)	Target Field (V/m)	% Deviation
835	1003	20.0	157.8	166.0	-4.9%
1880	1137	20.0	145.6	136.8	6.4%
Frequency (MHz)	Dipole S/N	Input Power (dBm)	H-field Result (A/m)	Target Field (A/m)	% Deviation
835	1003	20.0	0.435	0.458	-5.0%
1880	1137	20.0	0.460	0.460	0.0%

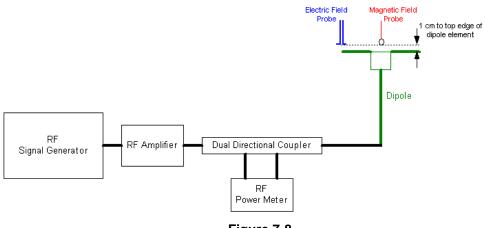


Figure 7-8 System Check Setup

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8. MODULATION FACTOR

A calibration was made of the modulation response of the probe and its instrumentation chain. This calibration was performed with the field probe, attached to its instrumentation. The response of the probe system to a CW field at the frequency of interest is compared to its response to a modulated signal with equal peak amplitude to that of a CW signal. The field level of the test signals are ensured to be more than 10 dB 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 reading was applied to the DUT measurements.

All voice modes for this device have been investigated in this section of the report. According to the FCC 3G Measurement Procedures, May 2006 for RF Emissions, variations in peak field and power readings.

This was done using the following procedure:

- 1. The probe was illuminated with a CW signal at the intended measurement frequency and wireless device power.
- 2. The probe was positioned at the field maxima over the dipole antenna (determined after an area scan over the dipole) illuminated with the CW signal.
- 3. The reading of the probe measurement system of the CW signal at the maximum point was recorded.
- 4. Using a Spectrum Analyzer, the modulated signal adjusted with the same peak level of the CW signal was determined.
- 5. The probe measurement system reading was recorded with the modulated signal. The appropriate system crest factors for the modulation type were configured in the software to the system measurements.
- 6. The ratio of the CW reading to modulated signal reading is the probe modulation factor (PMF) for the modulation and field probe combination. This was repeated for 80% AM.
- 7. Steps 1-6 were repeated at all frequency bands and for both E and H field probes.

The modulation factors obtained were applied to readings taken of the actual wireless device, in order to obtain an accurate peak field reading using the formula:

 $Peak = 20 \cdot log (Raw \cdot PMF)$

Modulation Factors:

f (MHz)	Protocol	E-Field (V/m)	H-Field (A/m)	E-Field Modulation Factor	H-Field Modulation Factor	f (MHz)	Protocol	E-Field (V/m)	H-Field (A/m)	E-Field Modulation Factor	H-Field Modulation Factor
835	AM	629.3	2.212	1.290	0.910	835	AM	175.1	0.4947	1.385	1.313
835	GSM	297	1.033	2.733	1.948	835	WCDMA	252.3	0.703	0.961	0.924
835	CW	811.8	2.012			835	CW	242.5	0.6497		
1880	AM	155.4	0.6561	1.445	1.187	1880	AM	129.2	0.5285	1.449	1.219
1880	GSM	77.53	0.3586	2.896	2.172	1880	WCDMA	192.5	0.6853	0.972	0.940
1880	CW	224.5	0.7789			1880	CW	187.2	0.6442		

Figure 8-1
Modulation Factors

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Spectrum Analyzer Plots of ESG-D Signal used for PMF measurements:

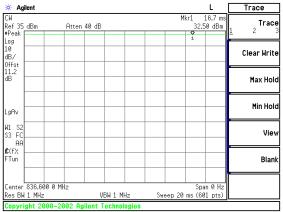


Figure 8-2 GSM850 CW Signal

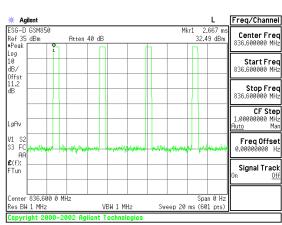


Figure 8-4 GSM850 Signal

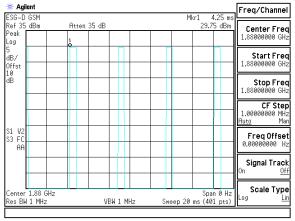


Figure 8-6 PCS GSM Signal

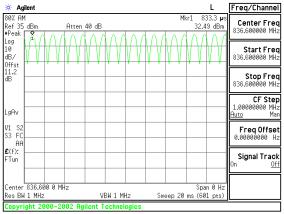


Figure 8-3 GSM850 80% AM Signal

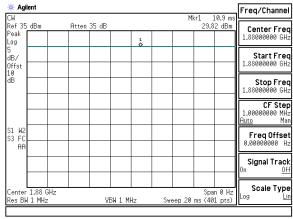


Figure 8-5 PCS CW Signal

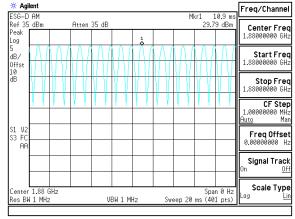


Figure 8-7 PCS 80% AM Signal

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9. FCC 3G MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

I. Procedures Used to Establish RF Signal for HAC Testing

The handset was placed into a simulated call using a base station simulator in a shielded chamber. Such test signals offer a consistent means for testing HAC and are recommended for evaluating HAC. Measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, this was configured with the base station simulator. The HAC measurement software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5% occurred, the tests were repeated.

II. HAC Measurement Conditions for UMTS

Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1s".

HAC Measurements

HAC is measured using the 12.2 kbps RMC with TPC bits configured to all "1s". HAC in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise, HAC is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the configuration that results in the highest HAC for that RF channel in 12.2 RMC.

WCDMA RF Conducted Power Table									
Mode	3GPP 34.121 Subtest	Cellu	Cellular Band [dBm]			PCS Band [dBm]			
	Subtest	4132	4183	4233	9262	9400	9538		
WCDMA	12.2 kbps RMC	22.86	22.71	22.70	22.29	22.37	22.49		
WODIVIA	12.2 kbps AMR	22.62	22.70	22.76	22.47	22.39	22.43		

GSM PE Co	nducted Pov	ver Table
OSM KI CO	ilaucteu i Ov	Voice
Band	Channel	GSM [dBm] CS (1 Slot)
	128	32.99
Cellular	190	32.91
	251	32.81
	512	29.43
PCS	661	29.40
	810	29.40

Figure 9-1 Conducted Power Measurements for LG530G, LG530g

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10. OVERALL MEASUREMENT SUMMARY

FCC ID:	ZNFLG530G
Model:	LG530G, LG530g
S/N:	HAC RFE

I. E-FIELD EMISSIONS:

Table 10-1
HAC Data Summary for E-field

	TIAC Data Sullilliary for L-field										
Mode	Channel	Backlight	Scan Center	Conducted Power at BS (dBm)	Time Avg. Field (V/m)	Peak Field (V/m)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC MARGIN (dB)	RESULT	Excl Blocks per 4.4
E-field Emi	issions										
GSM850	128	off	Acoustic	32.99	49.79	136.1	42.68	48.50	-5.82	M4	none
GSM850	190	off	Acoustic	32.91	50.39	137.7	42.78	48.50	-5.72	M4	none
GSM850	251	off	Acoustic	32.81	41.60	113.7	41.12	48.50	-7.38	M4	none
GSM1900	512	off	Acoustic	29.43	14.00	40.5	32.16	38.50	-6.34	M4	1,2,3
GSM1900	661	off	Acoustic	29.40	15.10	43.8	32.83	38.50	-5.67	M4	1,2,3
GSM1900	810	off	Acoustic	29.40	14.70	42.6	32.58	38.50	-5.92	M4	1,2,3
GSM1900	661	off	T-coil	29.40	15.10	43.8	32.83	38.50	-5.67	M4	1,2,3

Mode	Channel	Backlight	Scan Center	Conducted Power at BS (dBm)	Time Avg. Field (V/m)	Peak Field (V/m)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC Margin (db)	RESULT	Excl Blocks per 4.4
E-field Emissio	ns										
WCDMA850	4132	off	Acoustic	22.86	50.79	48.8	33.8	51.0	-17.23	M4	none
WCDMA850	4183	off	Acoustic	22.71	41.76	40.1	32.1	51.0	-18.93	M4	none
WCDMA850	4233	off	Acoustic	22.70	45.89	44.1	32.9	51.0	-18.11	M4	none
WCDMA1900	9262	off	Acoustic	22.29	33.24	32.3	30.2	41.0	-10.81	M4	none
WCDMA1900	9400	off	Acoustic	22.37	33.13	32.2	30.2	41.0	-10.84	M4	none
WCDMA1900	9538	off	Acoustic	22.49	36.12	35.1	30.9	41.0	-10.09	M4	none

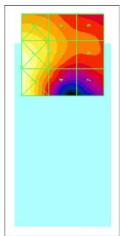


Figure 10-1
Sample E-field Scan Overlay
(See Test Setup Photographs for actual WD overlay)

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	€ LG	Reviewed by: Quality Manager
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FCC ID:	ZNFLG530G
Model:	LG530G, LG530g
S/N:	HAC RFE

II. H-FIELD EMISSIONS:

Table 10-2 HAC Data Summary for H-field

	TIAC Data Summary for Ti-field											
Mode	Channel	Backlight	Scan Center	Conducted Power at BS (dBm)	Time Avg. Field (A/m)	Peak Field (A/m)	Peak Field (dBA/m)	FCC Limit (dBA/m)	FCC MARGIN (dB)	RESULT	Excl Blocks per 4.4	
H-field Em	issions											
GSM850	128	off	Acoustic	32.99	0.0946	0.184	-14.7	-1.9	-12.79	M4	none	
GSM850	190	off	Acoustic	32.91	0.1069	0.208	-13.6	-1.9	-11.73	M4	none	
GSM850	251	off	Acoustic	32.81	0.0837	0.163	-15.8	-1.9	-13.85	M4	none	
GSM1900	512	off	Acoustic	29.43	0.0410	0.089	-21.0	-11.9	-9.11	M4	1,2,4	
GSM1900	661	off	Acoustic	29.40	0.0435	0.094	-20.5	-11.9	-8.59	M4	1,2,4	
GSM1900	810	off	Acoustic	29.40	0.0556	0.121	-18.4	-11.9	-6.46	M4	1,2,4	

Mode	Channel	Backlight	Scan Center	Conducted Power at BS (dBm)	Time Avg. Field (A/m)	Peak Field (V/m)	Peak Field (dBA/m)	FCC Limit (dBA/m)	FCC Margin (db)	RESULT	Excl Blocks per 4.4
H-field Emissio	ns										
WCDMA850	4132	off	Acoustic	22.86	0.1089	0.101	-19.9	0.6	-20.54	M4	none
WCDMA850	4183	off	Acoustic	22.71	0.0911	0.084	-21.5	0.6	-22.10	M4	none
WCDMA850	4233	off	Acoustic	22.70	0.1016	0.094	-20.5	0.6	-21.15	M4	none
WCDMA1900	9262	off	Acoustic	22.29	0.0793	0.075	-22.5	-9.4	-13.15	M4	none
WCDMA1900	9400	off	Acoustic	22.37	0.0952	0.089	-21.0	-9.4	-11.57	M4	none
WCDMA1900	9538	off	Acoustic	22.49	0.1004	0.094	-20.5	-9.4	-11.10	M4	none

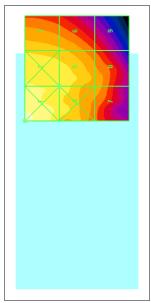


Figure 10-2
Sample H-field Scan Overlay
(See Test Setup Photographs for actual WD overlay)

FCC ID: ZNFLG530G	PCTEST*	HAC (RF EMISSIONS) TEST REPORT	① LG	Reviewed by: Quality Manager
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FCC ID:	ZNFLG530G
Model:	LG530G, LG530g
S/N:	HAC RFE

III. Worst-case Configuration Evaluation

Table 10-3
Peak Reading 360° Probe Rotation at Azimuth axis

Mode	Channel	Backlight	Scan Center	Time Avg. Field (V/m)	Peak Field (V/m)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC MARGIN (dB)	RESULT
Probe Rotation at Worst-Case									
GSM1900	512	off	Acoustic	16.72	48.4	33.70	38.50	-4.80	M3

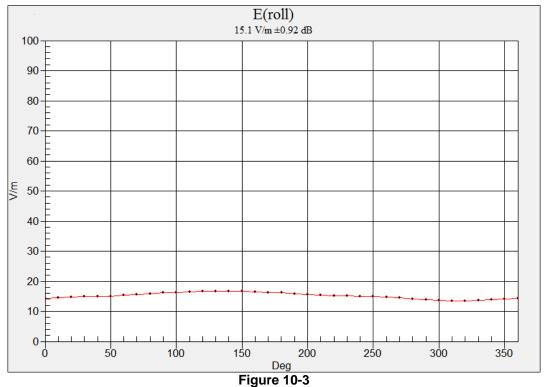


Figure 10-3
Worst-Case Probe Rotation about Azimuth axis

FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT	① LG	Reviewed by: Quality Manager
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^{*} Note: Location of probe rotation is shown in Figure 10-1 or Figure 10-2

11. EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E5515C	Wireless Communications Test Set	2/8/2011	Annual	2/8/2012	GB45360985
Agilent	E4407B	ESA Spectrum Analyzer	4/5/2011	Annual	4/5/2012	US39210313
Agilent	E5515C	Wireless Communications Tester	4/21/2011	Annual	4/21/2012	US41140256
Agilent	E5515C	Wireless Communications Test Set	10/10/2011	Annual	10/10/2012	GB46110872
Agilent	E5515C	Wireless Communications Test Set	10/14/2011	Annual	10/14/2012	GB41450275
Agilent	E5515C	Wireless Communications Test Set	10/14/2011	Annual	10/14/2012	GB43304447
Agilent	E5515C	Wireless Communications Test Set	10/20/2011	Annual	10/20/2012	GB46310798
Anritsu	MA2481A	Power Sensor	2/7/2011	Annual	2/7/2012	3681
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	N/A		N/A	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	N/A		N/A	N/A
Pasternack	PE2208-6	Bidirectional Coupler	6/3/2011	Annual	6/3/2012	N/A
Pasternack	PE2209-10	Bidirectional Coupler	6/3/2011	Annual	6/3/2012	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	4/19/2011	Annual	4/19/2012	107826
Rohde & Schwarz	CMU200	Base Station Simulator	6/1/2011	Annual	6/1/2012	833855/0010
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/7/2011	Annual	10/7/2012	103962
Rohde & Schwarz	NRVD	Dual Channel Power Meter	4/8/2011	Biennial	4/8/2013	101695
SPEAG	ER3DV6	Freespace E-field Probe	8/22/2011	Annual	8/22/2012	2335
SPEAG	H3DV6	Freespace H-field Probe	8/22/2011	Annual	8/22/2012	6170
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/16/2011	Annual	9/16/2012	704
SPEAG	CD835V3	Freespace 835 MHz Dipole	2/8/2011	Biennial	2/8/2013	1003
SPEAG	CD1880V3	Freespace 1880 MHz Dipole	2/9/2011	Biennial	2/9/2013	1137

Table 11-1 Equipment List

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT		Reviewed by: Quality Manager
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 $^{^{\}star}$ Calibration traceable to the National Institute of Standards and Technology (NIST).

12. MEASUREMENT UNCERTAINTY

Wireless Communications Device Near-Field Measurement								
		Uncertainty	/ Estimation	n				
Uncertainty Component	Data (dB)	Data Type	Prob. Dist.	Divisor	Ci (E)	Ci (H)	Unc. (dB)	Notes/Comment s
Measurement System								
RF System Reflections	0.50	Tolerance	N	1.00	1	1	0.50	Refl. < -20 dB
Field Probe Calibration	0.21	Tolerance	N	1.00	1	1	0.21	
Field Probe Isotropy	0.01	Tolerance	N	1.00	1	1	0.01	
Field Probe Frequency Response	0.135	Tolerance	N	1.00	1	1	0.14	
Field Probe Linearity	0.013	Tolerance	N	1.00	1	1	0.01	
Probe Modulation Factor	0.270	Accuracy	R	1.73	1	1	0.16	
Boundary Effects	0.105	Accuracy	R	1.73	1	1	0.06	*
Probe Positioning Accuracy	0.20	Accuracy	R	1.73	1	0.670	0.12	*
Probe Positioner	0.050	Accuracy	R	1.73	1	0.670	0.03	*
Extrapolation/Interpolation	0.045	Tolerance	R	1.73	1	1	0.03	*
Resolution to 2mm error	0.210	Tolerance	N	1.00	1	1	0.21	
System Detection Limit	0.05	Tolerance	R	1.73	1	1	0.03	*
Readout Electronics	0.015	Tolerance	N	1.00	1	1	0.02	*
Integration Time	0.11	Tolerance	R	1.73	1	1	0.06	*
Response Time	0.033	Tolerance	R	1.73	1	1	0.02	*
Phantom Thickness	0.10	Tolerance	R	1.73	1	1	0.06	*
System Repeatability (Field x 2=power)	0.17	Tolerance	N	1.00	1	1	0.17	
Test Sample Related	<u> </u>				•			
Device Positioning Vertical	0.2	Tolerance	R	1.73	1	1	0.12	*
Device Positioning Lateral	0.045	Tolerance	R	1.73	1	1	0.03	*
Device Holder and Phantom	0.1	Tolerance	R	1.73	1	1	0.06	*
Power Drift	0.21	Tolerance	R	1.73	1	1	0.12	
Combined Standard Uncertainty (k=1)							0.66	16.5%
Expanded Uncertainty [95% confidence] (k=2)							1.33	32.3%
Expanded Uncertainty [95% confidence] on Field							0.66	16,2%

Table 12-1 Uncertainty Estimation Table

Notes:

- Test equipments are calibrated according to techniques outlined in NIS81, NIS3003 and NIST Tech Note 1297. All
 equipments have traceability according to NIST. Measurement Uncertainties are defined in further detail in NIS 81
 and NIST Tech Note 1297 and UKAS M3003.
- 2. * Uncertainty specifications from Schmidt & Partner Engineering AG (not site specific)

Measurement uncertainty reflects the quality and accuracy of a measured result as compared to the true value. Such statements are generally required when stating results of measurements so that it is clear to the intended audience that the results may differ when reproduced by different facilities. Measurement results vary due to the measurement uncertainty of the instrumentation, measurement technique, and test engineer. Most uncertainties are calculated using the tolerances of the instrumentation used in the measurement, the measurement setup variability, and the technique used in performing the test. While not generally included, the variability of the equipment under test also figures into the overall measurement uncertainty. Another component of the overall uncertainty is based on the variability of repeated measurements (so-called Type A uncertainty). This may mean that the Hearing Aid immunity tests may have to be repeated by taking down the test setup and resetting it up so that there are a statistically significant number of repeat measurements to identify the measurement uncertainty. By combining the repeat measurement results with that of the instrumentation chain using the technique contained in NIS 81 and NIS 3003, the overall measurement uncertainty was estimated.

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13. TEST DATA

See following Attached Pages for Test Data.

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DUT: CD835V3 - SN1003

Type: CD835V3 Serial: 1003

Communication System: CW; Frequency: 835 MHz;

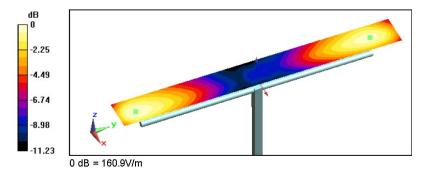
Measurement Standard: DASY5 (IEEE/IEC/ANSI 063.19-2007)

DASY5 Configuration:

- Probe: ER3DV6 SN2335; Calibrated: 8/22/2011
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.6 (2);

835 MHz / 100mW HAC Dipole Validation at 10mm/Hearing Aid Compatibility Test (41x361x1):

Measurement grid: dx=5mm, dy=5mm
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 119.6 V/m; Power Drift = -0.05 dB
Average value of Total (interpolated) = 157.8 V/m



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DUT: CD835V3 - SN1003

Type: CD835V3 Serial: 1003

Communication System: CW; Frequency: 835 MHz;

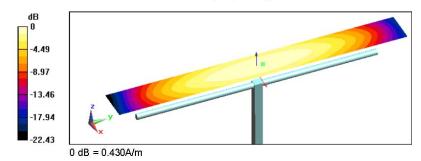
Measurement Standard: DASY5 (IEEE/IEC/ANSI 063.19-2007)

DASY5 Configuration:

- Probe: H3DV6 SN6170; Calibrated: 8/22/2011
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.6 (2);

835 MHz / 100 mW HAC Validation at 10 mm/Hearing Aid Compatibility Test (41x361x1):

Measurement grid: dx=5mm, dy=5mm
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.455 A/m; Power Drift = 0.0076 dB
Maximum value of Total (interpolated) = 0.435 A/m



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DUT: CD1880V3 - SN1137

Type: CD1880V3 Serial: 1137

Communication System: CW; Frequency: 1880 MHz;

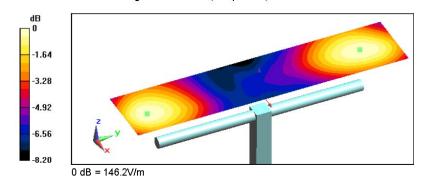
Measurement Standard: DASY5 (IEEE/IEC/ANSI 063.19-2007)

DASY5 Configuration:

- Probe: ER3DV6 SN2335; Calibrated: 8/22/2011
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.6 (2);

1880 MHz / 100mW HAC Dipole Validation at 10mm/Hearing Aid Compatibility Test (41x181x1):

Measurement grid: dx=5mm, dy=5mm Probe Modulation Factor = 1.000 Device Reference Point: 0, 0, -6.3 mm Reference Value = 151.4 V/m; Power Drift = -0.07 dB Average value of Total (interpolated) = 145.6 V/m



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DUT: CD1880V3 - SN1137

Type: CD1880V3 Serial: 1137

Communication System: CW; Frequency: 1880 MHz;

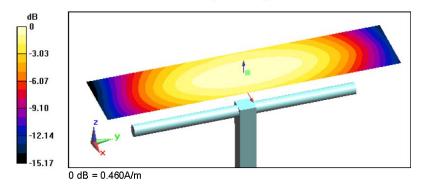
Measurement Standard: DASY5 (IEEE/IEC/ANSI 063.19-2007)

DASY5 Configuration:

- Probe: H3DV6 SN6170; Calibrated: 8/22/2011
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.6 (2);

1880 MHz / 100 mW HAC Validation at 10 mm/Hearing Aid Compatibility Test (41x181x1):

Measurement grid: dx=5mm, dy=5mm
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.485 A/m; Power Drift = 0.05 dB
Maximum value of Total (interpolated) = 0.460 A/m



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Date: 1/7/2012



DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:8.3

Communication System: GSM850; Frequency: 836.6 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

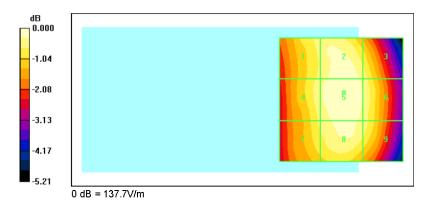
- Probe: ER3DV6 SN2335; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

GSM850 Mid Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 137.7 V/m
Probe Modulation Factor = 2.733
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 67.0 V/m; Power Drift = -0.195 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak E-field in V/m

		Grid 3
129.4 M4	136.2 M4	130.7 M4
Grid 4	Grid 5	Grid 6
laga a saal	407 7 844	
131.4 W4	137.7 IVI4	133.0 M4
	Grid 8	Grid 9



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DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:8.3

Communication System: GSM850; Frequency: 836.6 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

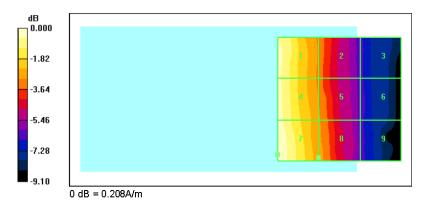
- Probe: H3DV6 SN6170; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

GSM850 Mid Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.208 A/m
Probe Modulation Factor = 1.948
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.062 A/m; Power Drift = 0.137 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak H-field in A/m

		Grid 3
0.201 M4	0.146 M4	0.100 M4
		Grid 6
0.203 M4	0.149 M4	0.101 M4
Grid 7	Grid 8	Grid 9
0.208 M4		



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DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:8.3

Communication System: GSM1900; Frequency: 1880 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

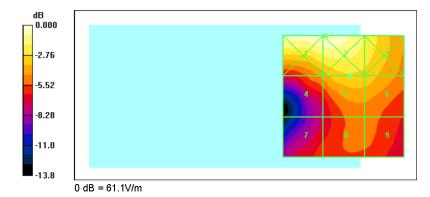
- Probe: ER3DV6 SN2335; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

GSM1900 Mid Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 43.8 V/m
Probe Modulation Factor = 2.896
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 14.1 V/m; Power Drift = 0.106 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak E-field in V/m

	Grid 2	
61.0 M3	61.1 M3	49.4 M3
		Grid 6
37.7 M4	43.8 M4	42.8 M4
Grid 7		Grid 9



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DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:8.3

Communication System: GSM1900; Frequency: 1850.2 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

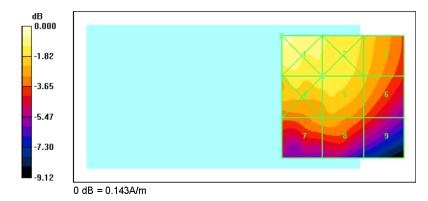
- Probe: H3DV6 SN6170; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

GSM1900 Low Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.121 A/m
Probe Modulation Factor = 2.172
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.058 A/m; Power Drift = 0.137 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak H-field in A/m

		Grid 3
0.143 M3	0.127 M4	0.115 M4
		Grid 6
0.121 M4	0.121 M4	0.110 M4
	Grid 8	Grid 9



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DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:1

Communication System: WCDMA850; Frequency: 826.4 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

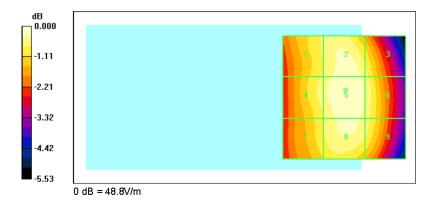
- Probe: ER3DV6 SN2335; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

WCDMA850 Low Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 48.8 V/m
Probe Modulation Factor = 0.961
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 66.6 V/m; Power Drift = -0.006 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

		Grid 3
45.3 M4	48.2 M4	45.8 M4
Grid 4	Grid 5	Grid 6
46.1 M4	48.8 M4	46.5 M4
		46.5 M4 Grid 9



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DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:1

Communication System: WCDMA850; Frequency: 826.4 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

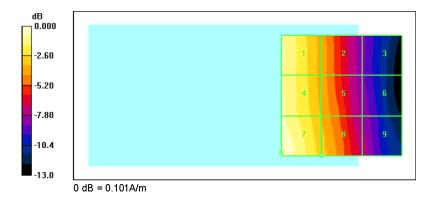
- Probe: H3DV6 SN6170; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

WCDMA850 Low Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.101 A/m
Probe Modulation Factor = 0.924
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.058 A/m; Power Drift = -0.175 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

		Grid 3
0.093 M4	0.065 M4	0.039 M4
		Grid 6
0.096 M4	n neg Ma	0.044 M/
0.000 1814	0.000 1814	0.041 1814
	Grid 8	Grid 9



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DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:1

Communication System: WCDMA1900; Frequency: 1907.6 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

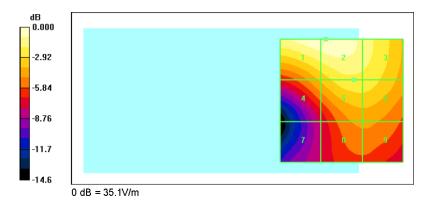
- Probe: ER3DV6 SN2335; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

WCDMA1900 High Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 35.1 V/m
Probe Modulation Factor = 0.972
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 28.5 V/m; Power Drift = -0.045 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

1		Grid 3
35.0 M4	35.1 M4	30.4 M4
1		Grid 6
23.0 M4	27.2 M4	27.0 M4
		27.0 M4 Grid 9



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DUT: ZNFLG530G

Type: Portable Handset Serial: HAC RFE Backlight off Duty Cycle: 1:1

Communication System: WCDMA1900; Frequency: 1907.6 MHz;

Measurement Standard: DASY4 (High Precision Assessment)

DASY5 Configuration:

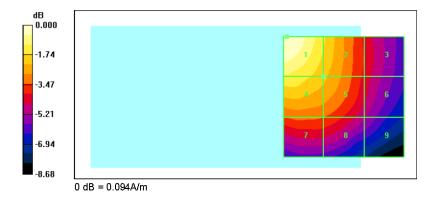
- Probe: H3DV6 SN6170; Calibrated: 8/22/2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn704; Calibrated: 9/16/2011
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.6 Build 2;

WCDMA1900 High Channel/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.094 A/m
Probe Modulation Factor = 0.940
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.076 A/m; Power Drift = -0.015 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

		Grid 3
0.094 M4	0.078 M4	0.059 M4
		Grid 6
0.000 844	0.072.844	0.058 M4
U.U8∠ IVI4	U.U/3 N/4	U.U38 IVI4
	Grid 8	Grid 9



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14. CALIBRATION CERTIFICATES

The following pages include the probe calibration used to evaluate HAC for the DUT.

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





Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura 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

lient PC Test

Certificate No: ER3-2335_Aug11

Accreditation No.: SCS 108

С

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CALIBRATION CERTIFICATE

Object

ER3DV6 - SN:2335

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:

August 22, 2011

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)

Cal Date (Certificate No.) Scheduled Calibration Primary Standards 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 29-Mar-11 (No. 217-01367) Reference 20 dB Attenuator SN: S5086 (20b) Apr-12 Reference 30 dB Attenuator SN: S5129 (30b) 29-Mar-11 (No. 217-01370) Apr-12 Reference Probe ER3DV6 4-Oct-10 (No. ER3-2328_Oct10) SN: 2328 Oct-11 DAE4 SN: 789 6-Apr-11 (No. DAE4-789_Apr11) Apr-12 Secondary Standards ID Check Date (in house) Scheduled Check RF generator HP 8648C US3642U01700 4-Aug-99 (in house check Oct-09) In house check: Oct-11 Network Analyzer HP 8753E US37390585 18-Oct-01 (in house check Oct-10) In house check: Oct-11

Callbrated by:

Name
Function
Signature
Technical Manager

Approved by:

Niels Kuster
Quality Manager

Issued: August 22, 2011

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

Certificate No: ER3-2335_Aug11

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Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst

Service suisse d'étalonnage

C Servizio svizzero di taratura Ş Swiss Calibration Service

Accreditation No.: SCS 108

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

Glossary:

NORMx,y,z 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

φ rotation around probe axis Polarization φ

Polarization 9 9 rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., 9 = 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:

a) 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:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ for XY sensors and $\vartheta = 90$ for Z sensor (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
- $NORM(f)x,y,z = NORMx,y,z * frequency_response$ (see Frequency Response Chart).
- DCPx,y,z: 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
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: 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 NORMx (no uncertainty required).

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August 22, 2011 ER3DV6 - SN:2335

Probe ER3DV6

SN:2335

Manufactured: Calibrated:

September 9, 2003 August 22, 2011

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

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August 22, 2011 ER3DV6-SN:2335

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2335

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μV/(V/m) ²)	1.67	1.67	1.87	± 10.1 %
DCP (mV) ^B	96.9	98.2	99.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	112.1	±1.9 %
			Y	0.00	0.00	1.00	118.7	
			Z	0.00	0.00	1.00	113.4	

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%.

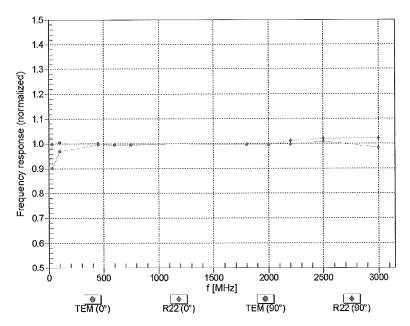
Certificate No: ER3-2335_Aug11 Page 4 of 10

FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT	① LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 43 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Faye 43 01 00

B Numerical linearization parameter: uncertainty not required.
E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

August 22, 2011 ER3DV6-SN:2335

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



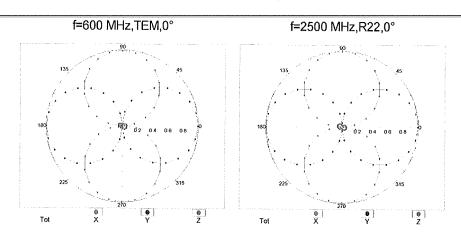
Uncertainty of Frequency Response of E-field: \pm 6.3% (k=2)

Page 5 of 10 Certificate No: ER3-2335_Aug11

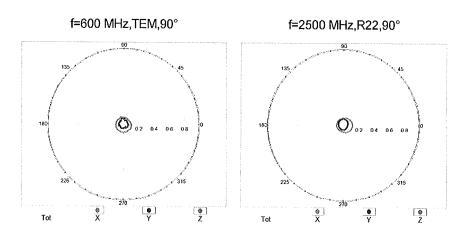
FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST RE	PORT () LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 44 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Faye 44 01 00

ER3DV6- SN:2335 August 22, 2011

Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



Receiving Pattern (ϕ), $\vartheta = 90^{\circ}$



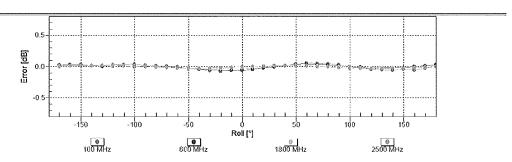
Certificate No: ER3-2335_Aug11

Page 6 of 10

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT		Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 45 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Page 45 01 60

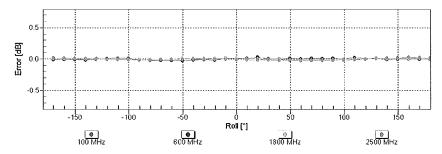
ER3DV6- SN:2335 August 22, 2011

Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Receiving Pattern (ϕ), $\vartheta = 90^{\circ}$



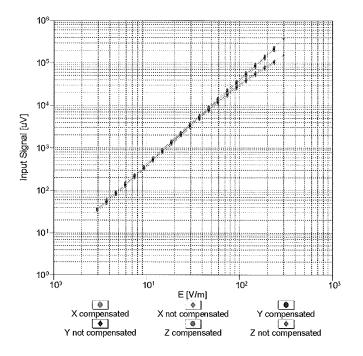
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

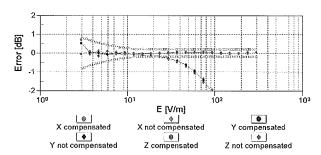
Certificate No: ER3-2335_Aug11 Page 7 of 10

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	(LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 46 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Fage 40 01 00

ER3DV6-SN:2335 August 22, 2011

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



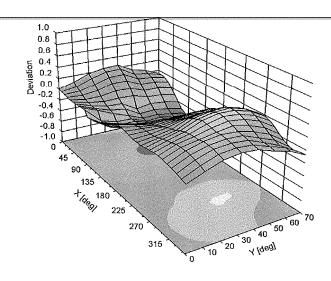


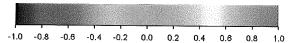
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: ER3-2335_Aug11 Page 8 of 10

FCC ID: ZNFLG530G	PCTEST'	PCTEST HAC (RF EMISSIONS) TEST REPORT		Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 47 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Faye 41 01 00

Deviation from Isotropy in Air Error (ϕ , ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ER3-2335_Aug11

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FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT		Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 48 of 80
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ER3DV6- SN:2335 August 22, 2011

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2335

DAO1/LAO1 - 1 didilicters of 1 100c, LIND 40 - 011.2000

Other Probe Parameters	
Sensor Arrangement	Rectangular
Connector Angle (°)	-90.4
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

Certificate No: ER3-2335_Aug11 Page 10 of 10

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT		Reviewed by: Quality Manager
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0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Page 49 01 00

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





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Client PC 1

Certificate No: H3-6170_Aug11

Accreditation No.: SCS 108

CALIBRATION CERTIFICATE

Object H3DV6 - SN:6170

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: August 22, 2011

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)

16 11 9 16 11

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	23-Jun-11 (No. H3-6182_Jun11)	Jun-12
DAE4	SN: 789	6-Apr-11 (No. DAE4-789_Apr11)	Apr-12
Secondary Standards	ID.	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by:

Katja Pokovic

Technical Manager

Approved by:

Niels Kuster

Quality Manager

Issued: August 22, 2011

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

Certificate No: H3-6170_Aug11

Page 1 of 10

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	€ LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 50 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		rage 30 01 60

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





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Accreditation No.: SCS 108

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Glossary:

NORMx,y,z sensitivity in free space diode compression point

CF crest factor (1/duty_cycle) of the RF signal A, B, C modulation dependent linearization parameters

Polarization φ φ rotation around probe axis

Polarization 9 9 rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., 9 = 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:

 a) 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:

- NORMx, y, z: Assessed for E-field polarization 9 = 0 for XY sensors and 9 = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
- X,Y,Z(f)_a0a1a2= X,Y,Z_a0a1a2* frequency_response (see Frequency Response Chart).
- DCPx,y,z: 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
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: 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).

Certificate No: H3-6170_Aug11

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FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	(RF EMISSIONS) TEST REPORT	
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0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Fage 31 01 00

H3DV6 -- SN:6170 August 22, 2011

Probe H3DV6

SN:6170

Manufactured: Calibrated:

May 19, 2005 August 22, 2011

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

Certificate No: H3-6170_Aug11

Page 3 of 10

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	(LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 52 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Faye 32 01 00

H3DV6-- SN:6170 August 22, 2011

DASY/EASY - Parameters of Probe: H3DV6 - SN:6170

Basic Calibration Parameters

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / √(mV))	a0	2.55E-003	2.70E-003	3.01E-003	± 5.1 %
Norm (A/m / √(mV))	a1	8.79E-005	-5.63E-005	-1.31E-004	± 5.1 %
Norm (A/m / √(mV))	a2	1.72E-005	-1.25E-005	4.95E-005	± 5.1 %
DCP (mV) ^B		92.9	90.3	94.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc [±] (k=2)
10000	CW	0.00	Х	0.00	0.00	1.00	98.4	±3.0 %
			Υ	0.00	0.00	1.00	97.5	
			Z	0.00	0.00	1.00	96.7	

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%.

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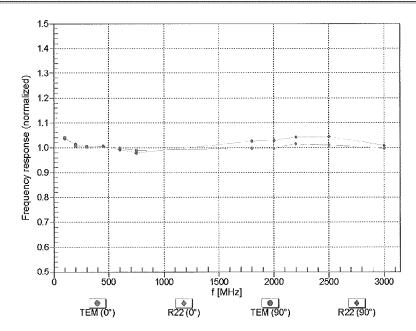
FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT	(LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 53 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Fage 33 01 00

B Numerical linearization parameter: uncertainty not required.

E 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:6170 August 22, 2011

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



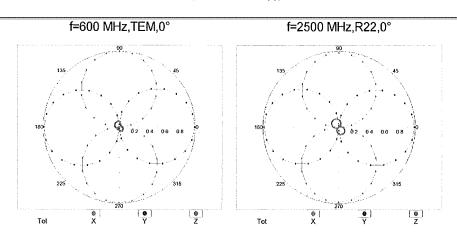
Uncertainty of Frequency Response of H-field: \pm 6.3% (k=2)

Certificate No: H3-6170_Aug11 Page 5 of 10

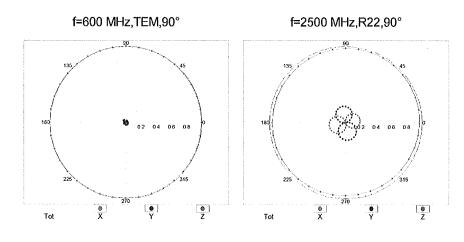
FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT	① LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 54 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		rage 34 of 60

H3DV6- SN:6170 August 22, 2011

Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



Receiving Pattern (ϕ), $\vartheta = 90^{\circ}$



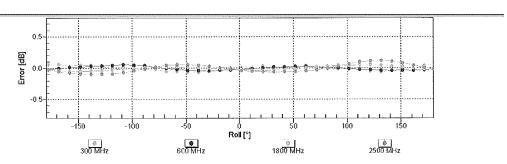
Page 6 of 10

Certificate No: H3-6170_Aug11

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	€ LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 55 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		rage 33 01 00

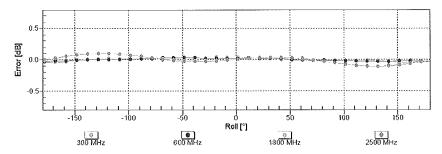
H3DV6- SN:6170 August 22, 2011

Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Receiving Pattern (ϕ), $\vartheta = 90^{\circ}$



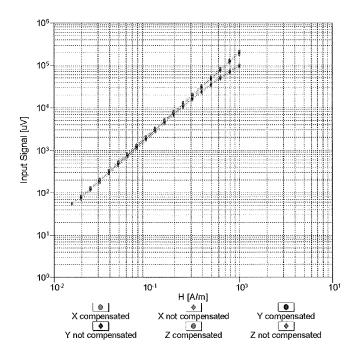
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

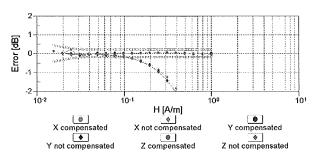
Certificate No: H3-6170_Aug11 Page 7 of 10

FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT	① LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 56 of 80
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August 22, 2011 H3DV6- SN:6170

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





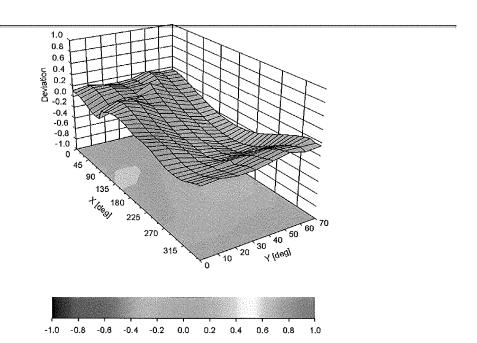
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: H3-6170_Aug11 Page 8 of 10

FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT	L G	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 57 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		Fage 37 01 00

H3DV6- SN:6170 August 22, 2011

Deviation from Isotropy in Air Error (ϕ, ϑ) , f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: H3-6170_Aug11 Page 9 of 10

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	(t) LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 58 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		rage 30 01 00

H3DV6- SN:6170 August 22, 2011

DASY/EASY - Parameters of Probe: H3DV6 - SN:6170

Sensor Arrangement	Rectangular
Connector Angle (°)	171.7
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

Certificate No: H3-6170_Aug11 Page 10 of 10

FCC ID: ZNFLG530G	PCTEST	НАС	C (RF EMISSIONS) TEST REPORT	LG	Reviewed by: Quality Manager
Filename:	Test Dates:		EUT Type:		Page 59 of 80
0Y1201030004.ZNF	January 6-12, 2012		Portable Handset		rage 39 01 00

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client PC Test Certificate No: CD835V3-1003_Feb11

CALIBRATION CERTIFICATE CD835V3 - SN: 1003 Object QA CAL-20.v5 Calibration procedure(s) Calibration procedure for dipoles in air Calibration date: February 08, 2011 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 (Certificate No.) Scheduled Calibration Power meter EPM-442A GB37480704 06-Oct-10 (No. 217-01266) Oct-11 Power sensor HP 8481A US37292783 06-Oct-10 (No. 217-01266) Oct-11 29-Dec-10 (No. ER3-2336_Dec10) Probe FR3DV6 SN: 2336 Dec-11 Probe H3DV6 SN: 6065 29-Dec-10 (No. H3-6065_Dec10) Dec-11 SN: 781 20-Oct-10 (No. DAE4-781_Oct10) Oct-11 Secondary Standards ID# Check Date (in house) Scheduled Check Power meter Agilent 4419B SN: GB42420191 09-Oct-09 (in house check Oct-10) In house check: Oct-11 Power sensor HP 8482H SN: 3318A09450 09-Oct-09 (in house check Oct-10) In house check: Oct-11 Power sensor HP 8482A SN: US37295597 09-Oct-09 (in house check Oct-10) In house check: Oct-11 Network Analyzer HP 8753E US37390585 18-Oct-01 (in house check Oct-10) In house check: Oct-11 RF generator E4433B MY 41000675 03-Nov-04 (in house check Oct-09) In house check: Oct-11 Name Function Calibrated by: Claudio Leubler Laboratory Technician Katja Pokovic Approved by: Technical Manager Issued: February 10, 2011 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: CD835V3-1003, Feb11

Page 1 of 6

FCC ID: ZNFLG530G	PCTEST	HAC (RF EMISSIONS) TEST REPORT	€ LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 60 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		rage 00 01 00

Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Accreditation No.: SCS 108

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ANSI-C63.19-2006 [1]

American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

[2]

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, 2], 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, 2], 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.

Certificate No: CD835V3-1003_Feb11 Page 2 of 6

FCC ID: ZNFLG530G	PCTEST'	HAC (RF EMISSIONS) TEST REPORT	① LG	Reviewed by: Quality Manager
Filename:	Test Dates:	EUT Type:		Page 61 of 80
0Y1201030004.ZNF	January 6-12, 2012	Portable Handset		1 age 01 01 00

1 Measurement Conditions

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

DASY Version	DASY5	V52.6.1 (408)
DASY PP Version	SEMCAD X	V14.4.2 (2595)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
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	0.458 A/m

Uncertainty for H-field measurement: 8.2% (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end-	100 mW forward power	170.7 V/m
Maximum measured above low end	100 mW forward power	161.3 V/m
Averaged maximum above arm	100 mW forward power	166.0 V/m

Uncertainty for E-field measurement: 12.8% (k=2)

3 Appendix

3.1 Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	16.6 dB	(41.9 - j11.1) Ohm
835 MHz	24.1 dB	(48.2 + j5.9) Ohm
900 MHz	16.5 dB	(58.5 – j14.0) Ohm
950 MHz	17.9 dB	(49.3 + j12.8) Ohm
960 MHz	12.9 dB	(62.2 + j22.8) 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.

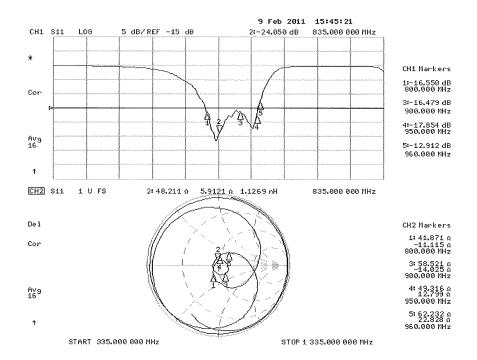
After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



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3.3.3 DASY4 H-field Result

Date/Time: 08.02.2011 13:00:11

Test Laboratory: SPEAG Lab2

HAC RF_CD835_1003_H_110208_CL

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1003

Communication System: CW; Frequency: 835 MHz Medium parameters used: $\sigma=0$ mho/m, $\epsilon_r=1$; $\rho=1$ kg/m³

Phantom section: RF Section

Measurement Standard; DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2010

• Sensor-Surface: (Fix Surface)

• Electronics: DAE4 Sn781; Calibrated: 20.10.2010

Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070

Measurement SW: DASY52, V52.6.1 Build (408)

Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Dipole H-Field measurement @ 835MHz/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 = 0.458 A/m

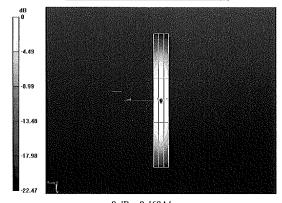
Probe Modulation Factor = 1.000

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.488 A/m; Power Drift = -0.0088 dB Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
0.376	0.398	0.379
M4	M4	M4
Grid 4	Grid 5	Grid 6
0.435	0.458	0.434
M4	M4	M4
Grid 7	Grid 8	Grid 9
0.388	0.407	0.381
M4	M4	M4



0 dB = 0.460 A/m

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3.3.2 DASY4 E-field Result

Date/Time: 08.02.2011 13:58:56

Test Laboratory: SPEAG Lab2

HAC RF_CD835_1003_E_110208_CL

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1003

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³

Phantom section: RF Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Dipole E-Field measurement @ 835MHz/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 = 170.7 V/m

Probe Modulation Factor = 1.000

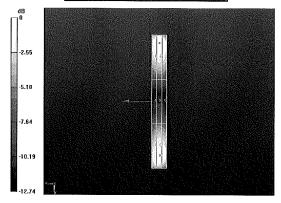
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 123.4 V/m; Power Drift = 0.02 dB

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

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
164.3	170.7	164.5
M4	M4	M4
Grid 4	Grid 5	Grid 6
85.8	90.5	88.8
M4	M4	M4
Grid 7	Grid 8	Grid 9
152.9	161.3	158.3
M4	M4	M4



0 dB = 170.7 V/m

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Calibration Laboratory of

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





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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

PC Test Client

Certificate No: CD1880V3-1137_Feb11/2

CALIBRATION CERTIFICATE (Replacement of No: CD1880V3-1137_Feb11) CD1880V3 - SN: 1137 Object QA CAL-20.v5 Calibration procedure(s) Calibration procedure for dipoles in air Calibration date: February 09, 2011 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) Cal Date (Certificate No.) Primary Standards Scheduled Calibration Power meter EPM-442A GB37480704 06-Oct-10 (No. 217-01266) Oct-11 US37292783 Power sensor HP 8481A 06-Oct-10 (No. 217-01266) Oct-11 Probe ER3DV6 SN: 2336 29-Dec-10 (No. ER3-2336_Dec10) Dec-11 Probe H3DV6 SN: 6065 29-Dec-10 (No. H3-6065_Dec10) DAE4 SN: 781 20-Oct-10 (No. DAE4-781_Oct10) Oct-11 Secondary Standards Check Date (in house) ID# Scheduled Check Power meter Agilent 4419B SN: GB42420191 09-Oct-09 (in house check Oct-10) In house check: Oct-11 Power sensor HP 8482H SN: 3318A09450 09-Oct-09 (in house check Oct-10) In house check: Oct-11 Power sensor HP 8482A SN: US37295597 09-Oct-09 (in house check Oct-10) In house check: Oct-11 Network Analyzer HP 8753E US37390585 18-Oct-01 (in house check Oct-10) In house check: Oct-11 RF generator E4433B MY 41000675 03-Nov-04 (in house check Oct-09) In house check: Oct-11 Name Function Calibrated by: Claudio Leubler Laboratory Technician Katja Pokovic Approved by: Technical Manager Issued: February 23, 2011 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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.

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1. Measurement Conditions

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

DASY Version	DASY5	V52.6.1 (408)
DASY PP Version	SEMCAD X	V14.4.2 (2595)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
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	0.460 A/m

Uncertainty for H-field measurement: 8.2% (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW forward power	139.0 V/m
Maximum measured above low end	100 mW forward power	134.5 V/m
Averaged maximum above arm	100 mW forward power	136.8 V/m

Uncertainty for E-field measurement: 12.8% (k=2)

3. Appendix

3.1 Antenna Parameters

Frequency	Return Loss	Impedance
1730 MHz	23.0 dB	(49.6 + j7.1) Ohm
1880 MHz	21.2 dB	(51.1 + j8.7) Ohm
1900 MHz	21.8 dB	(53.3 + j7.7) Ohm
1950 MHz	28.1 dB	(54.1 – j0.2) Ohm
2000 MHz	20.5 dB	(41.4 – j0.8) 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.

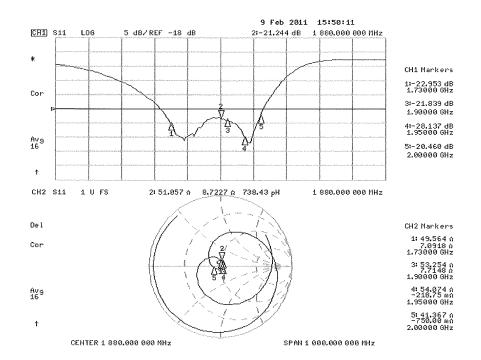
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3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



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Date/Time: 09.02.2011 11:34:28

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1137_H_110208_CL

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1137

Communication System: CW; Frequency: 1880 MHz Medium parameters used: $\sigma=0$ mho/m, $\epsilon_r=1;\, \rho=1$ kg/m³

Phantom section: RF Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: H3DV6 SN6065; ; Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Dipole H-Field measurement @ 1880MHz/H 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 = 0.460 A/m

Probe Modulation \hat{F} actor = 1.000

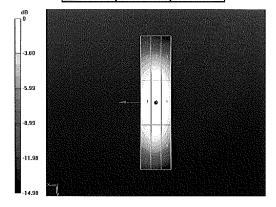
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.487 A/m; Power Drift = 0.0057 dB

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

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
0.401	0.418	0.396
M2	M2	M2
Grid 4	Grid 5	Grid 6
0.443	0.460	0.435
M2	M2	M2
Grid 7	Grid 8	Grid 9
0.409	0.426	0.399
M2	M2	M2



0 dB = 0.460 A/m

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3.3.3 DASY4 E-Field Result

Date/Time: 08.02.2011 16:54:42

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1137_E_110208_CL

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1137

Communication System: CW; Frequency: 1880 MHz

Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m³

Phantom section: RF Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Dipole E-Field measurement @ 1880MHz/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 = 139.0 V/m

Probe Modulation Factor = 1.000

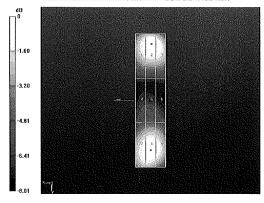
Device Reference Point: 0, 0, -6.3 mm

Reference Value = 138.8 V/m; Power Drift = -0.05 dB

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

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
131.8	139.0	135.0
M2	M2	M2
Grid 4	Grid 5	Grid 6
84.076	87.648	85.767
M3	M3	M3
Grid 7	Grid 8	Grid 9
131.1	134.5	130.5
M2	M2	M2



0 dB = 139.0 V/m

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4. Additional Measurements

4.1 Measurement Conditions

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

DASY Version	DASY5	V52.6.1 (408)
DASY PP Version	SEMCAD X	V14.4.2 (2595)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 90 mm
Frequency	1730 MHz ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

4.1.1 Maximum Field values

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW forward power	0.489 A/m
Uncertainty for H-field measurement: 8.2% (k=2)		

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW forward power	152.7 V/m
Maximum measured above low end	100 mW forward power	150.2 V/m
Averaged maximum above arm	100 mW forward power	151.5 V/m

Uncertainty for E-field measurement: 12.8% (k=2)

Certificate No: CD1880V3-1137_Feb11/2

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4.1.2 DASY4 H-field result

Date/Time: 09.02.2011 11:27:03

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1137_H_1730_110208_CL

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1137

Communication System: CW; Frequency: 1730 MHz Medium parameters used: $\sigma=0$ mho/m, $\epsilon_r=1$; $\rho=1$ kg/m³

Phantom section: RF Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

• Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2010

• Sensor-Surface: (Fix Surface)

Electronics: DAE4 Sn781; Calibrated: 20.10.2010

• Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070

Measurement SW: DASY52, V52.6.1 Build (408)

Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Dipole H-Field measurement @ 1880 MHz/H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10 mm @ 1730 MHz/Hearing Aid Compatibility Test (41x181x1):

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

Maximum value of peak Total field = 0.489 A/m

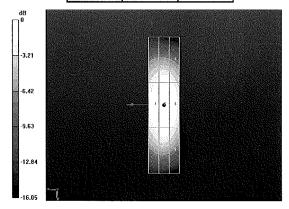
Probe Modulation Factor = 1.000

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.519 A/m; Power Drift = 0.02 dB Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
0.407	0.424	0.403
M2	M2	M2
Grid 4	Grid 5	Grid 6
0.467	0.489	0.462
M2	M2	M2
Grid 7	Grid 8	Grid 9
0.418	0.437	0.409
M2	M2	M2



0 dB = 0.490 A/m

Certificate No: CD1880V3-1137_Feb11/2

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4.1.3 DASY4 E-field result

Date/Time: 08.02.2011 16:26:13

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1137_E_1730_110208_CL

DUT: HAC Dipole 1880 MHz; Type; CD1880V3; Serial: 1137

Communication System: CW; Frequency: 1730 MHz Medium parameters used: σ = 0 mho/m, ϵ_r = 1; ρ = 1000 kg/m³ Phantom section: RF Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

 $\label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement @ 1880MHz/E S can - measurement distance from the probe sensor center to CD1880 \\ \label{eq:Dipole E-Field measurement & CD1880 } \label{eq:Dip$

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

Maximum value of peak Total field = 152.7 V/m

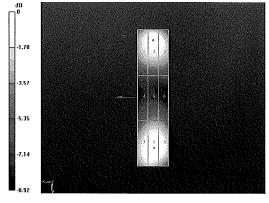
Probe Modulation Factor = 1.000

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 156.8 V/m; Power Drift = 0.0092 dB Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
143.8	150.2	144.8
M2	M2	M2
Grid 4	Grid 5	Grid 6
97.621	103.8	102.2
M3	M3	M3
Grid 7	Grid 8	Grid 9
145.9	152.7	149.2
M2	M2	M2



0 dB = 152.7 V/m

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15. CONCLUSION

The measurements indicate that the wireless communications device complies with the HAC limits specified in accordance with the ANSI C63.19 Standard and FCC WT Docket No. 01-309 RM-8658. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters specific to the test. The test results and statements relate only to the item(s) tested.

Please note that the M-rating for this equipment only represents the field interference possible against a hypothetical and typical hearing aid. The measurement system and techniques presented in this evaluation are proposed in the ANSI standard as a means of best approximating wireless device compatibility with a hearing-aid. The literature is under continual re-construction.

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