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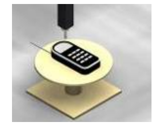


HEARING AID COMPATIBILITY

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro, Maetan dong,
Yeongtong-gu, Suwon-si
Gyeonggi-do 443-742, Korea

Date of Testing:
March 5-6, 2013
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1303140502.A3L

FCC ID:	**A3LSGHI337**
APPLICANT:	**SAMSUNG ELECTRONICS CO., LTD.**

Scope of Test:	RF Emissions Testing
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):	SGH-I337
Tx Frequencies Tested:	824.20 - 848.80 MHz (GSM 850) 1850.20 - 1909.80 MHz (GSM 1900) 826.40 - 846.60 MHz (UMTS V) 1852.4 - 1907.6 MHz (UMTS II)
Test Device Serial No.:	*Pre-Production Sample* [S/N: 04F50]

C63.19-2007 HAC Category:	**M3 (RF EMISSIONS CATEGORY)**

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 has 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.

Randy Ortanez
President

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

T A B L E   O F   C O N T E N T S

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-8658[1] 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.

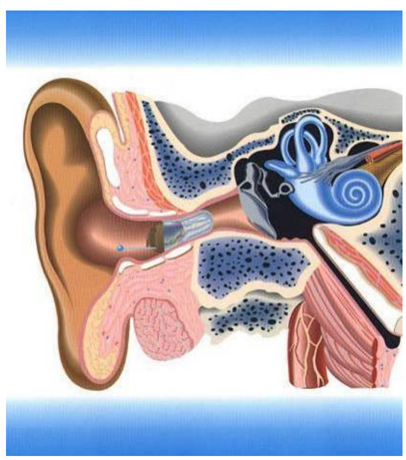


Figure 1-1 Hearing Aid *in-vitu*

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

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).

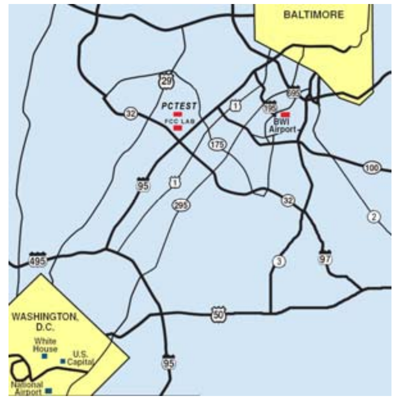
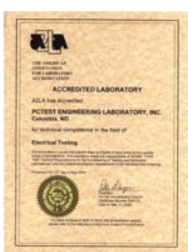


Figure 2-1
Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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 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 TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and all Industry Canada Standards (RSS).
- 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.

3. EUT DESCRIPTION

FCC ID:	A3LSGHI337
Manufacturer:	Samsung Electronics Co., Ltd. 129, Samsung-ro, Maetan dong, Yeongtong-gu, Suwon-si Gyeonggi-do 443-742, Korea
Model(s):	SGH-I337
Serial Number:	04F50
Tx Frequencies Tested:	824.20 - 848.80 MHz (GSM 850) 1850.20 - 1909.80 MHz (GSM 1900) 826.40 - 846.60 MHz (UMTS V) 1852.4 - 1907.6 MHz (UMTS II)
Antenna Configurations:	Internal Antenna
Maximum Tested Conducted Power (HAC):	32.84 dBm (GSM 850), 30.28 dBm (GSM 1900), 23.92 dBm (UMTS V), 23.00 dBm (UMTS II)
HAC Test Configurations:	GSM 850, 128, 190, 251, BT Off, WLAN Off, LTE Off GSM 1900, 512, 661, 810, BT Off, WLAN Off, LTE Off UMTS V, 4132, 4183, 4233, BT Off, WLAN Off, LTE Off UMTS II, 9262, 9400, 9538, BT Off, WLAN Off, LTE Off
EUT Type:	Portable Handset

Air-Interface	Band (MHz)	Type Transport	HAC Tested	Simultaneous But Not Tested	Concurrent HAC Tested or not tested	Voice over Digital Transport OTT Capability	WIFI Low Power	Additional GSM Power Reduction
GSM	850	VO	Yes	Yes: WIFI or BT	Not tested[1]	N/A	N/A	NA
	1900							
	GPRS/EDGE	DT	N/A	Yes: WIFI or BT	N/A	Yes		
WCDMA	835	VO	Yes	Yes: WIFI or BT	Not tested[1]	N/A	N/A	NA
	1900							
	HSPA	DT	N/A	Yes: WIFI or BT	N/A	Yes		
LTE	700	DT	No[2]	Yes: WIFI or BT	Not tested[1]	Yes	N/A	NA
	850							
	1700							
	1900							
WIFI	2450	DT	No	Yes: GSM, WCDMA	NA	Yes	No	NA
	5200							
	5300							
	5500							
	5800							
BT	2450	DT	No	Yes: GSM, WCDMA	NA	N/A	N/A	NA

Type Transport
VO = Voice Only
DT = Digital Data - Not intended for CMRS Service

Notes:
1. Non-concurrent mode was found to be the Worst Case mode
2. LTE was not tested for packet transport data services outside of a CMRS.

Table 3: A3LSGHI337 Air Interfaces

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 dB(V/m)	H-field emissions 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	< 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

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:	± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm

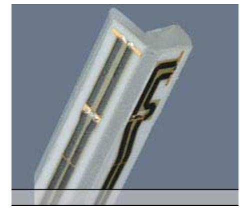


Figure 5-1
E-field Free-space Probe

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 ± 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 Interference:	< 10% at 3 GHz (for plane wave)

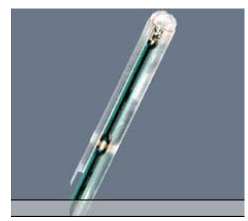


Figure 5-2
H-Field Free-space Probe

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).

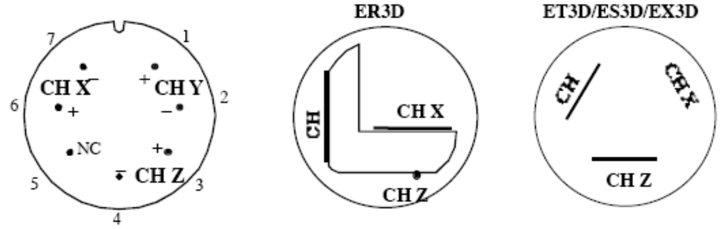
Magnetic field sensors are measuring the integral of the H-field across their sensor area surrounded by the loop. They are calibrated in a precise, homogeneous field. When measuring a gradient field, the result will be very close to the field in the center of the loop which is equivalent to the value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

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



(seen from back) (seen from front)

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

Instrumentation Chain

Equation 1

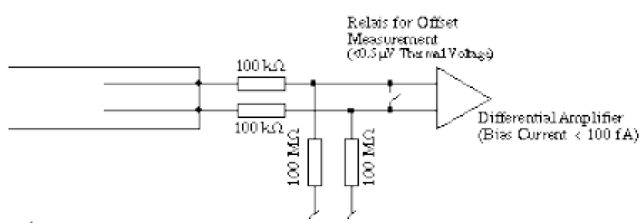
Conversion of Connector Voltage u_i to E-Field E_i

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

whereby

E_i:	electric field in V/m
u_i:	voltage of channel i at the connector in µV
$Norm_i$:	sensitivity of channel i in $\mu V/(V/m)^2$
$ConvF$:	enhancement factor in liquid (ConvF=1 for Air)
DCP:	diode compression point in µV
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 $Norm_i$ and *DCP*
- larger bias currents will cause higher offset

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).

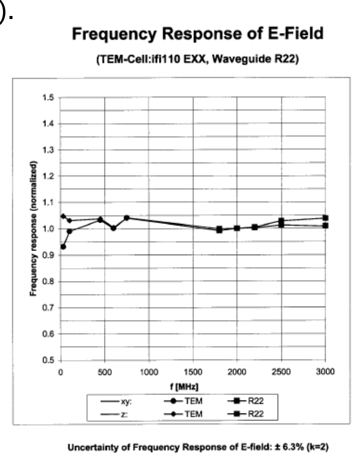


Figure 5-3 E-Field Probe Frequency Response

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:

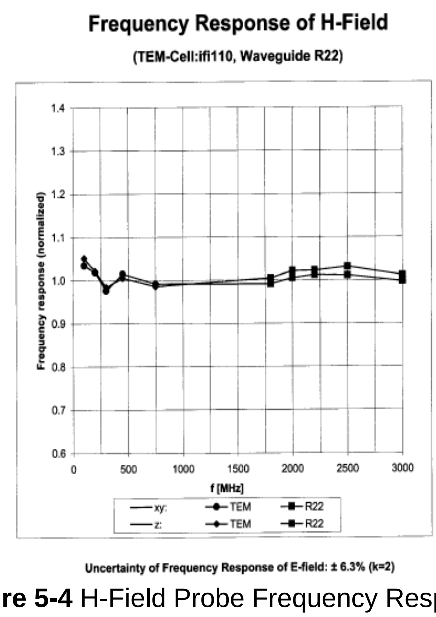


Figure 5-4 H-Field Probe Frequency Response

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:

$$\text{Peak Field} = 20 \cdot \log(\text{Raw} \cdot \text{PMF})$$

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.

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.

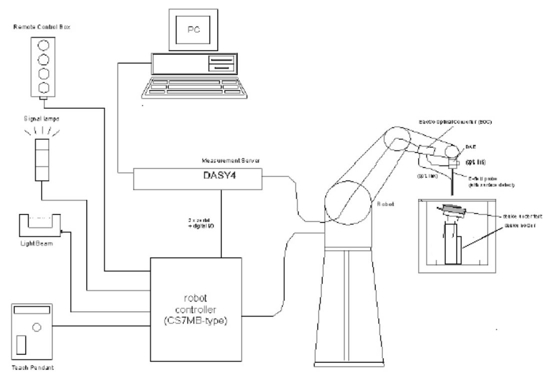


Figure 5-6
SPEAG Robotic System Diagram

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:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

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

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

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

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

with V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z) $\mu V/(V/m)^2$ 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%.

6. TEST PROCEDURE

I. RF EMISSIONS

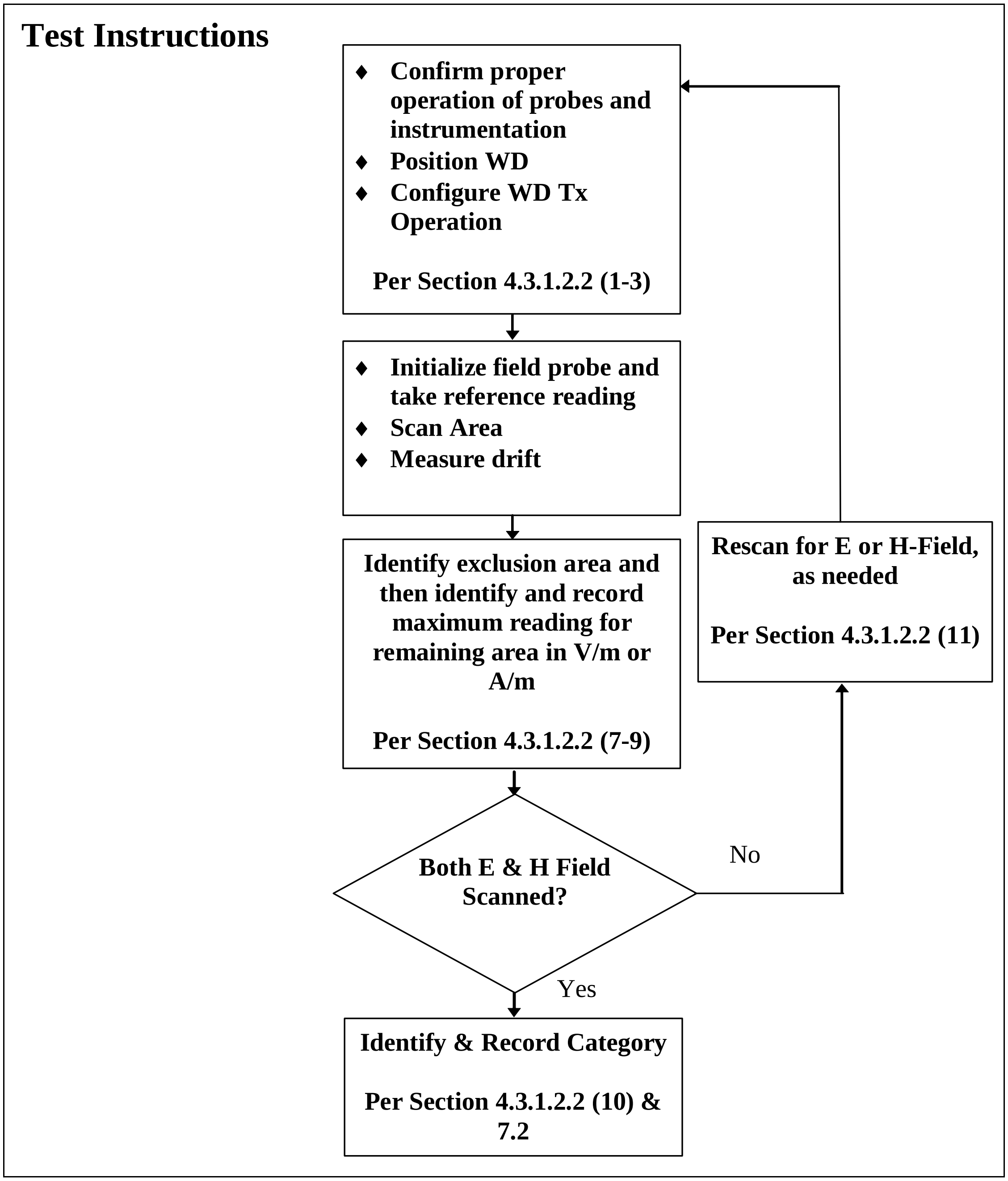


Figure 6-1 RF Emissions Flow Chart

Test Setup

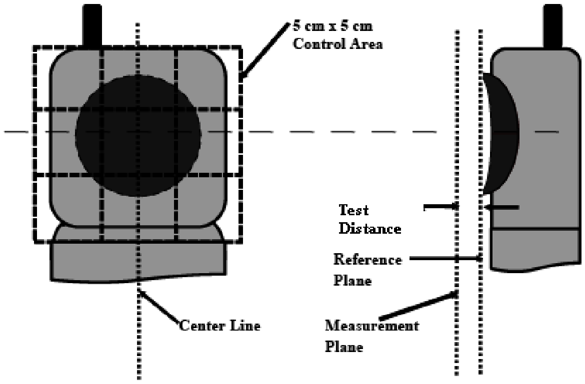


Figure 6-2
E/H-Field Emissions Test Setup Diagram (See Test Photographs for actual WD scan grid overlay)

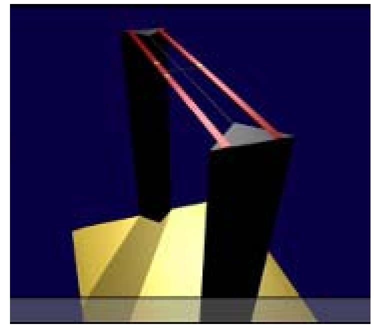


Figure 6-3
HAC Phantom

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^{o} 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.

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:

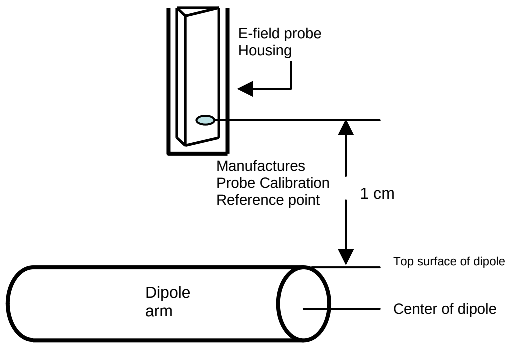


Figure 7-1
Separation Distance from Dipole to Field Probe

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 (

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.

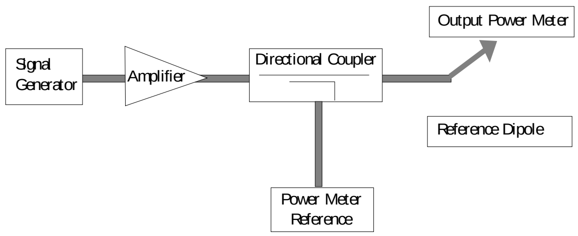


Figure 7-2
Setup for Desired Output Power to Dipole

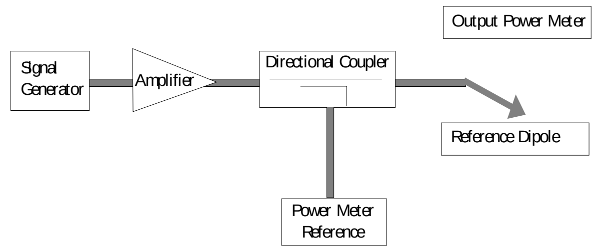


Figure 7-3
Setup to Dipole

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:

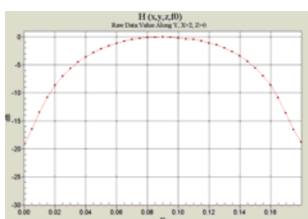


Figure 7-4
2-D Raw Data from scan along dipole axis

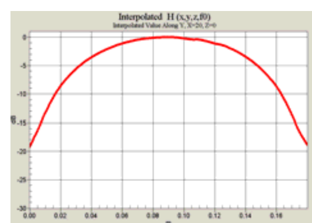


Figure 7-5
2-D Interpolated points from scan along dipole axis

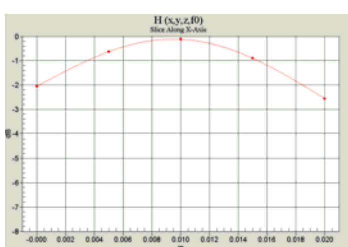


Figure 7-6
2-D Raw Data from scan along transverse axis

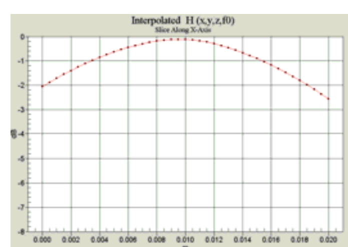


Figure 7-7
2-D Interpolated points from scan along transverse axis

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	1082	20.0	171.0	**165.4**	**3.4%**
1880	1064	20.0	133.4	**136.2**	**-2.1%**

Frequency (MHz)	Dipole S/N	Input Power (dBm)	H-field Result (A/m)	Target Field (A/m)	% Deviation
835	1082	20.0	0.487	**0.452**	**7.7%**
1880	1064	20.0	0.429	**0.466**	**-7.9%**

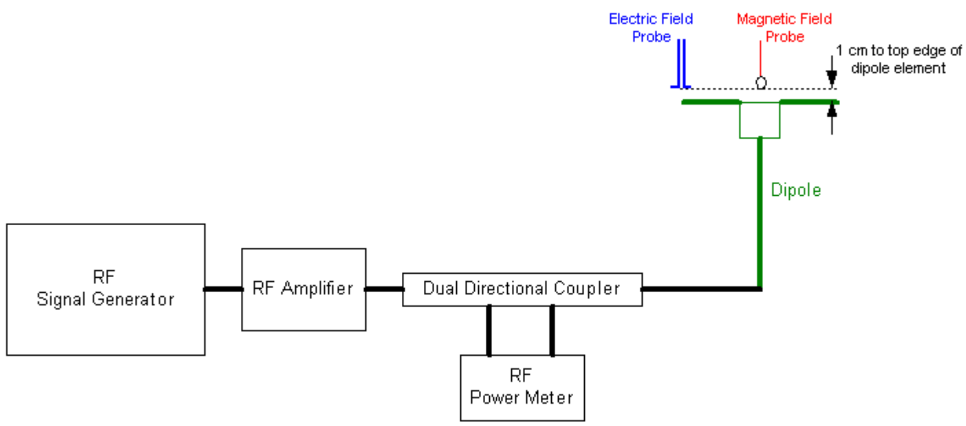


Figure 7-8
System Check Setup

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:

$$\text{Peak} = 20 \cdot \log(\text{Raw} \cdot \text{PMF})$$

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	287	1.033	2.829	1.948	835	UMTS	252.3	0.703	0.961	0.924
835	CW	811.8	2.012			835	CW	242.5	0.6497		
1880	AM	390.8	1.215	1.319	1.115	1880	AM	129.2	0.5285	1.449	1.219
1880	GSM	184.8	0.5843	2.790	2.319	1880	UMTS	192.5	0.6853	0.972	0.940
1880	CW	515.6	1.355			1880	CW	187.2	0.6442		

Figure 8-1
Modulation Factors

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

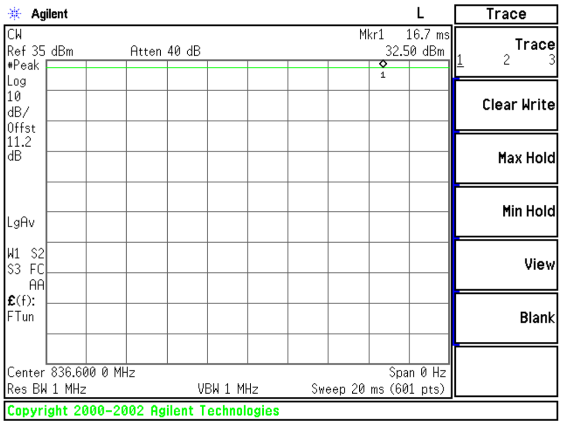


Figure 8-2 GSM850 CW Signal

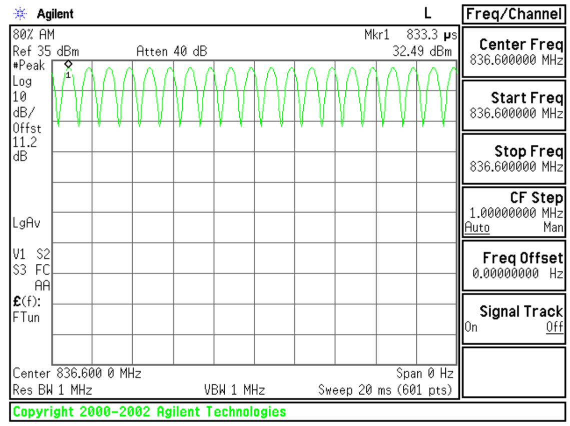


Figure 8-3 GSM850 80% AM Signal

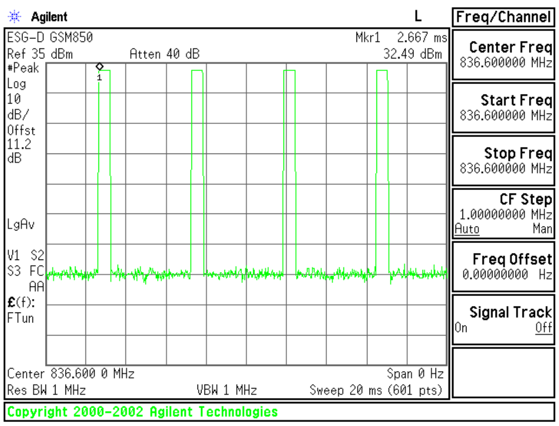


Figure 8-4 GSM850 Signal

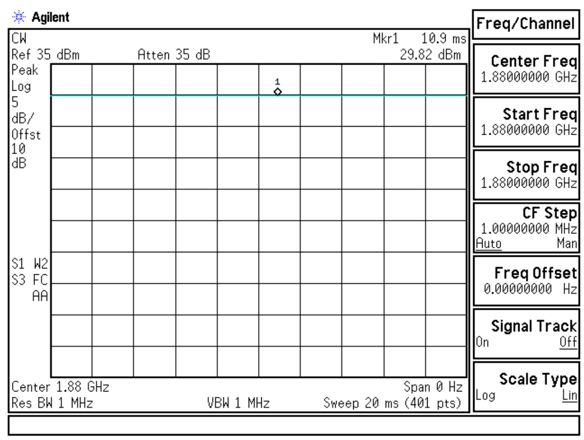


Figure 8-5 PCS CW Signal

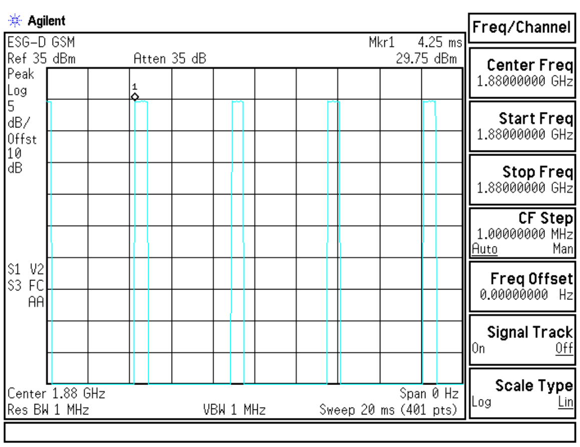


Figure 8-6 PCS GSM Signal

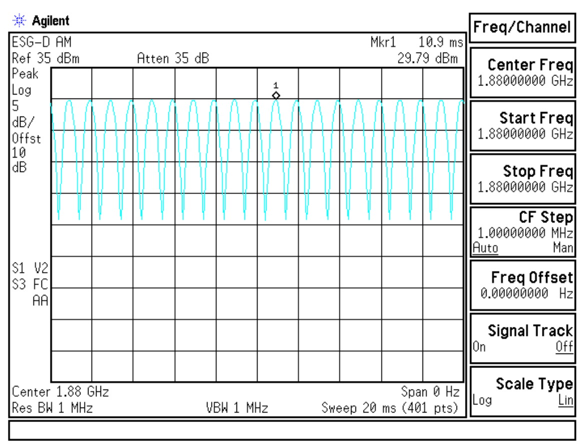


Figure 8-7 PCS 80% AM Signal

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.

GSM RF Conducted Power Table		
Band	Channel	GSM [dBm] CS (1 Slot)
GSM 850	128	32.74
	190	32.84
	251	32.34
GSM 1900	512	29.89
	661	30.03
	810	30.28

UMTS RF Conducted Power Table						
3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]		
	4132	4183	4233	9262	9400	9538
12.2 kbps RMC	23.82	23.79	23.92	23.00	22.91	22.62
12.2 kbps AMR	23.81	23.74	23.91	22.97	22.94	22.61

Figure 9-1
Conducted Power Measurements for SGH-I337

10. OVERALL MEASUREMENT SUMMARY

FCC ID:	A3LSGHI337
Model:	SGH-I337
S/N:	04F50

I. E-FIELD EMISSIONS:

Table 10-1
HAC Data Summary for E-field

Mode	Channel	Backlight	Scan Center	Battery Cover	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 Emissions												
GSM850	128	off	Acoustic	Standard	32.74	33.63	95.1	39.57	**48.50**	-8.93	M4	none
GSM850	190	off	Acoustic	Standard	32.84	37.94	107.3	40.61	**48.50**	-7.89	M4	none
GSM850	251	off	Acoustic	Standard	32.34	36.32	102.7	40.23	**48.50**	-8.27	M4	none
GSM1900	512	off	Acoustic	Standard	29.89	23.54	65.7	36.35	**38.50**	-2.15	M3	none
GSM1900	661	off	Acoustic	Standard	30.03	22.91	63.9	36.11	**38.50**	-2.39	M3	none
GSM1900	810	off	Acoustic	Standard	30.28	23.62	65.9	36.38	**38.50**	-2.12	M3	none
GSM1900	810	off	Acoustic	Inductive	30.28	23.32	65.1	36.27	**38.50**	-2.23	M3	none

Mode	Channel	Backlight	Scan Center	Battery Cover	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 Emissions												
UMTS V	4132	off	Acoustic	Standard	23.82	65.99	63.4	36.0	**51.0**	-14.95	M3	none
UMTS V	4183	off	Acoustic	Standard	23.79	52.37	50.3	34.0	**51.0**	-16.96	M4	none
UMTS V	4233	off	Acoustic	Standard	23.92	45.03	43.3	32.7	**51.0**	-18.27	M4	none
UMTS II	9262	off	Acoustic	Standard	23.00	35.69	34.7	30.8	**41.0**	-10.19	M4	none
UMTS II	9400	off	Acoustic	Standard	22.91	32.90	32.0	30.1	**41.0**	-10.90	M4	none
UMTS II	9538	off	Acoustic	Standard	22.62	32.81	31.9	30.1	**41.0**	-10.92	M4	none

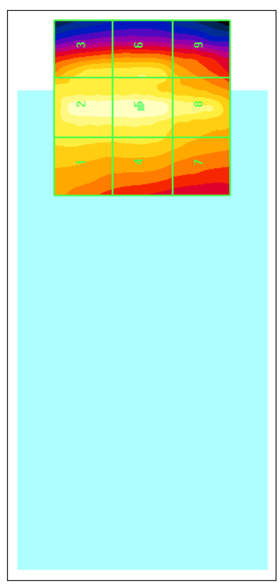


Figure 10-1
Sample E-field Scan Overlay
(See Test Setup Photographs for actual WD overlay)

FCC ID:	A3LSGHI337
Model:	SGH-I337
S/N:	04F50

II. H-FIELD EMISSIONS:

Table 10-2
HAC Data Summary for H-field

Mode	Channel	Backlight	Scan Center	Battery Cover	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 Emissions												
GSM850	128	off	Acoustic	Standard	32.74	0.0730	0.142	-16.9	-1.9	-15.04	M4	none
GSM850	190	off	Acoustic	Standard	32.84	0.0686	0.134	-17.5	-1.9	-15.58	M4	none
GSM850	251	off	Acoustic	Standard	32.34	0.0718	0.140	-17.1	-1.9	-15.19	M4	none
GSM1900	512	off	Acoustic	Standard	29.89	0.0602	0.140	-17.1	-11.9	-5.20	M4	none
GSM1900	661	off	Acoustic	Standard	30.03	0.0634	0.147	-16.7	-11.9	-4.75	M3	none
GSM1900	810	off	Acoustic	Standard	30.28	0.0653	0.151	-16.4	-11.9	-4.50	M3	none

Mode	Channel	Backlight	Scan Center	Battery Cover	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 Emissions												
UMTS V	4132	off	Acoustic	Standard	23.82	0.1143	0.106	-19.5	0.6	-20.12	M4	none
UMTS V	4183	off	Acoustic	Standard	23.79	0.0977	0.090	-20.9	0.6	-21.49	M4	none
UMTS V	4233	off	Acoustic	Standard	23.92	0.0886	0.082	-21.7	0.6	-22.34	M4	none
UMTS II	9262	off	Acoustic	Standard	23.00	0.1071	0.101	-19.9	-9.4	-10.54	M4	none
UMTS II	9400	off	Acoustic	Standard	22.91	0.0973	0.091	-20.8	-9.4	-11.38	M4	none
UMTS II	9538	off	Acoustic	Standard	22.62	0.1044	0.098	-20.2	-9.4	-10.76	M4	none

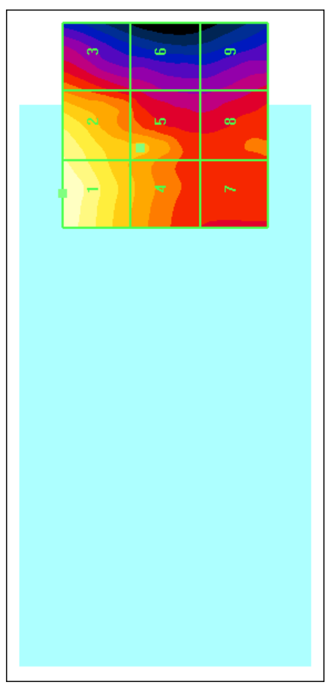


Figure 10-2
Sample H-field Scan Overlay
(See Test Setup Photographs for actual WD overlay)

III. Worst-case Configuration Evaluation

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

Mode	Channel	Backlight	Scan Center	Battery Cover	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	810	off	Acoustic	Standard	24.83	69.3	36.81	**38.50**	-1.69	M3

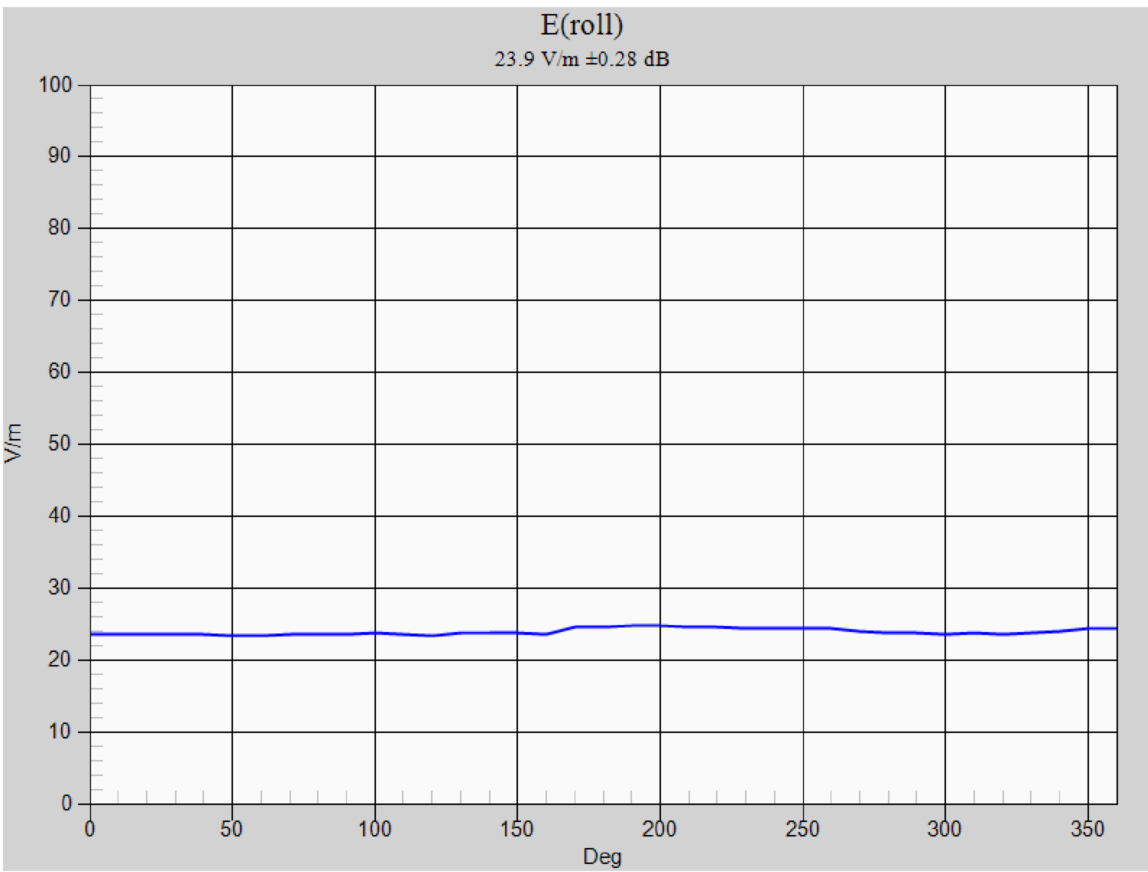


Figure 10-3
Worst-Case Probe Rotation about Azimuth axis

* Note: Locations of probe rotation (with and without exclusions) are shown in Figure 10-1 or Figure 10-2 denoted by the green square markers.

11. EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4407B	ESA Spectrum Analyzer	4/3/2012	Annual	4/3/2013	US39210313
Agilent	E4432B	ESG-D Series Signal Generator	3/15/2012	Annual	3/15/2013	US40053896
Agilent	E5515C	Wireless Communications Test Set	9/24/2012	Annual	9/24/2013	GB43163447
Agilent	E5515C	Wireless Communications Test Set	10/18/2012	Biennial	10/18/2014	GB43193563
Agilent	E5515C	Wireless Communications Test Set	4/4/2012	Annual	4/4/2013	US41140256
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	N/A	CBT*	N/A	21910
Anritsu	ML2496A	Power Meter	11/28/2012	Annual	11/28/2013	1138001
Anritsu	ML2438A	Power Meter	12/4/2012	Annual	12/4/2013	1070030
Anritsu	MA2481A	Power Sensor	4/5/2012	Annual	4/5/2013	5605
Anritsu	MA2411B	Pulse Power Sensor	12/4/2012	Annual	12/4/2013	1207364
Anritsu	MA2411B	Pulse Power Sensor	12/5/2012	Annual	12/5/2013	1126066
Anritsu	MA2481D	Universal Sensor	12/17/2012	Annual	12/17/2013	1204419
Anritsu	MA2481D	Universal Sensor	12/17/2012	Annual	12/17/2013	1204343
Anritsu	MA24106A	USB Power Sensor	8/22/2012	Annual	8/22/2013	1231538
Control Company	36934-158	Wall-Mounted Thermometer	1/4/2012	Biennial	1/4/2014	122014497
Control Company	36934-158	Wall-Mounted Thermometer	1/4/2012	Biennial	1/4/2014	122014488
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	N/A	CBT*	N/A	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	N/A	CBT*	N/A	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	N/A	CBT*	N/A	1226
Pasternack	PE2208-6	Bidirectional Coupler	N/A	CBT*	N/A	N/A
Pasternack	PE2209-10	Bidirectional Coupler	N/A	CBT*	N/A	N/A
Pasternack	PE2237-20	Bidirectional Coupler	N/A	CBT*	N/A	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	5/22/2012	Annual	5/22/2013	109892
Rohde & Schwarz	NRVD	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Rohde & Schwarz	NRV-Z32	Peak Power Sensor (100uW-2W)	10/11/2012	Biennial	10/11/2014	100155
Rohde & Schwarz	NRV-Z32	Peak Power Sensor (1mW-20W)	10/11/2012	Annual	10/11/2013	100004
Rohde & Schwarz	SME06	Signal Generator	10/11/2012	Annual	10/11/2013	832026
Seekonk	NC-100	Torque Wrench (8" lb)	11/29/2011	Triennial	11/29/2014	21053
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/15/2012	Annual	5/15/2013	859
SPEAG	CD1880V3	Freespace 1880 MHz Dipole	5/22/2012	Biennial	5/22/2014	1064
SPEAG	CD835V3	Freespace 835 MHz Dipole	5/22/2012	Biennial	5/22/2014	1082
SPEAG	ER3DV6	Freespace E-field Probe	1/11/2013	Annual	1/11/2014	2353
SPEAG	H3DV6	Freespace H-field Probe	1/11/2013	Annual	1/11/2014	6207

Table 11-1
Equipment List

Calibration traceable to the National Institute of Standards and Technology (NIST).

***Note: CBT (Calibrated Before Testing).** Prior to testing, the measurement paths containing a cable, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

12. MEASUREMENT UNCERTAINTY

Wireless Communications Device Near-Field Measurement Uncertainty Estimation								
Uncertainty Component	Data (dB)	Data Type	Prob. Dist.	Divisor	Ci (E)	Ci (H)	Unc. (dB)	Notes/Comments
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								
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:
1. 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.

13. TEST DATA

See following Attached Pages for Test Data.

Date: 3/5/2013

PCTEST Hearing-Aid Compatability Facility

DUT: CD835V3 - SN1082

Type: CD835V3
Serial: 1082

Communication System: CW; Frequency: 835 MHz;

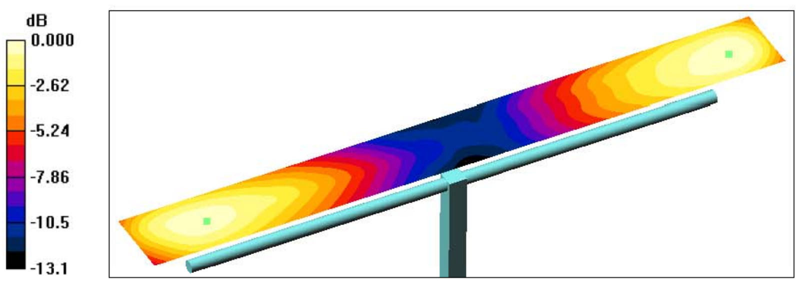
Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: ER3DV6 - SN2353; Calibrated: 1/11/2013
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 117.3 V/m; Power Drift = 0.127 dB
Average value of Peak (interpolated) = 171.0 V/m



0 dB = 171.4V/m

Date: 3/5/2013

PCTEST Hearing-Aid Compatability Facility

DUT: CD835V3 - SN1082

Type: CD835V3
Serial: 1082

Communication System: CW; Frequency: 835 MHz;

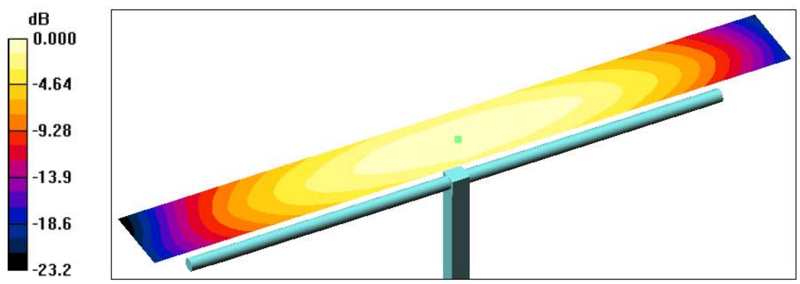
Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: H3DV6 - SN6207; Calibrated: 1/11/2013
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.487 A/m; Power Drift = 0.160 dB
Maximum value of Total (interpolated) = 0.487 A/m



0 dB = 0.487A/m

Date: 3/5/2013

PCTEST Hearing-Aid Compatability Facility

DUT: CD1880V3 - SN1064

Type: CD1880V3
Serial: 1064

Communication System: CW; Frequency: 1880 MHz;

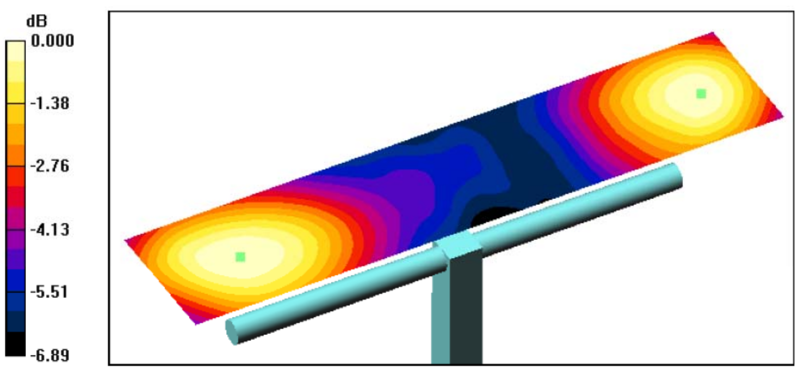
Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: ER3DV6 - SN2353; Calibrated: 1/11/2013
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 151.0 V/m; Power Drift = -0.169 dB
Average value of Peak (interpolated) = 133.4 V/m



0 dB = 133.8V/m

Date: 3/5/2013

PCTEST Hearing-Aid Compatability Facility

DUT: CD1880V3 - SN1064

Type: CD1880V3
Serial: 1064

Communication System: CW; Frequency: 1880 MHz;

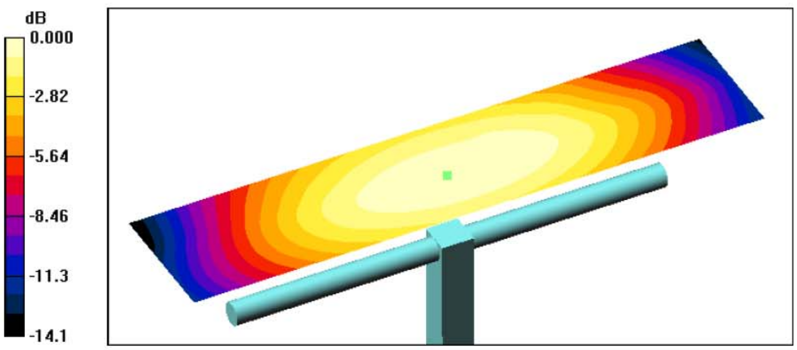
Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: H3DV6 - SN6207; Calibrated: 1/11/2013
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.442 A/m; Power Drift = 0.170 dB
Maximum value of Total (interpolated) = 0.429 A/m



0 dB = 0.429A/m

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:8.3

Communication System: GSM; Frequency: 836.6 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

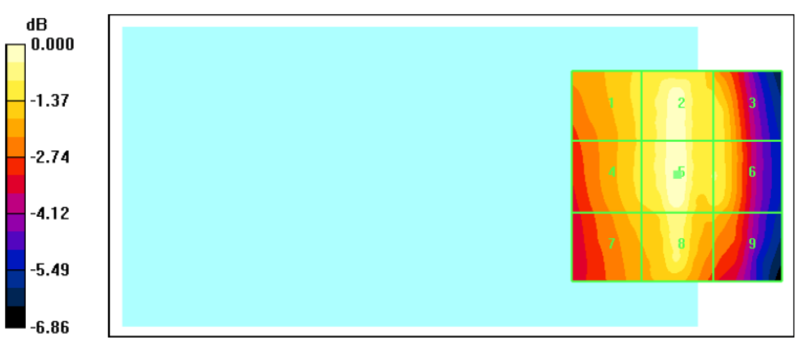
- Probe: ER3DV6 - SN2353; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 107.3 V/m
Probe Modulation Factor = 2.829
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 46.7 V/m; Power Drift = -0.105 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak E-field in V/m

Grid 1 **94.0 M4**	Grid 2 **106.5 M4**	Grid 3 **96.4 M4**
Grid 4 **93.8 M4**	Grid 5 **107.3 M4**	Grid 6 **97.1 M4**
Grid 7 **90.3 M4**	Grid 8 **100.9 M4**	Grid 9 **89.0 M4**



0 dB = 107.3V/m

Date: 3/6/2013

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:8.3

Communication System: GSM; Frequency: 824.2 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: H3DV6 - SN6207; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.142 A/m
Probe Modulation Factor = 1.948
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.035 A/m; Power Drift = 0.012 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak H-field in A/m

Grid 1 **0.125 M4**	Grid 2 **0.082 M4**	Grid 3 **0.048 M4**
Grid 4 **0.126 M4**	Grid 5 **0.089 M4**	Grid 6 **0.056 M4**
Grid 7 **0.142 M4**	Grid 8 **0.100 M4**	Grid 9 **0.068 M4**

0 dB = 0.142A/m

PCTEST ENGINEERING LABORATORY, INC.

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:8.3

Communication System: GSM; Frequency: 1909.8 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

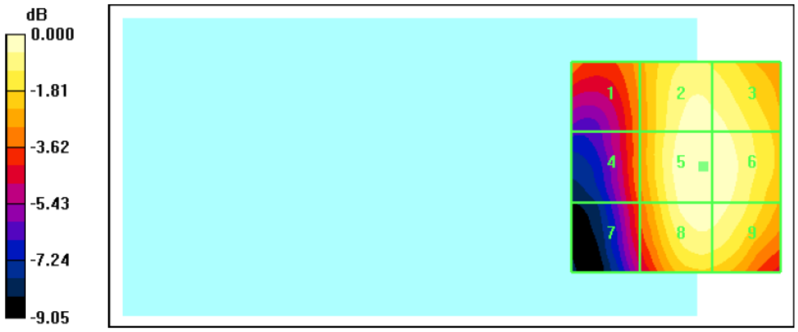
- Probe: ER3DV6 - SN2353; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 65.9 V/m
Probe Modulation Factor = 2.790
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 29.5 V/m; Power Drift = -0.040 dB
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

Peak E-field in V/m

Grid 1 **48.4 M3**	Grid 2 **63.9 M3**	Grid 3 **63.7 M3**
Grid 4 **47.3 M4**	Grid 5 **65.9 M3**	Grid 6 **65.6 M3**
Grid 7 **44.8 M4**	Grid 8 **64.2 M3**	Grid 9 **63.8 M3**



0 dB = 65.9V/m

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:8.3

Communication System: GSM; Frequency: 1909.8 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: H3DV6 - SN6207; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.151 A/m
Probe Modulation Factor = 2.319
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.048 A/m; Power Drift = 0.085 dB
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

Peak H-field in A/m

Grid 1 **0.151 M3**	Grid 2 **0.144 M3**	Grid 3 **0.113 M4**
Grid 4 **0.123 M4**	Grid 5 **0.123 M4**	Grid 6 **0.098 M4**
Grid 7 **0.107 M4**	Grid 8 **0.109 M4**	Grid 9 **0.098 M4**

0 dB = 0.151A/m

Date: 3/6/2013

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:1

Communication System: UMTS; Frequency: 826.4 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

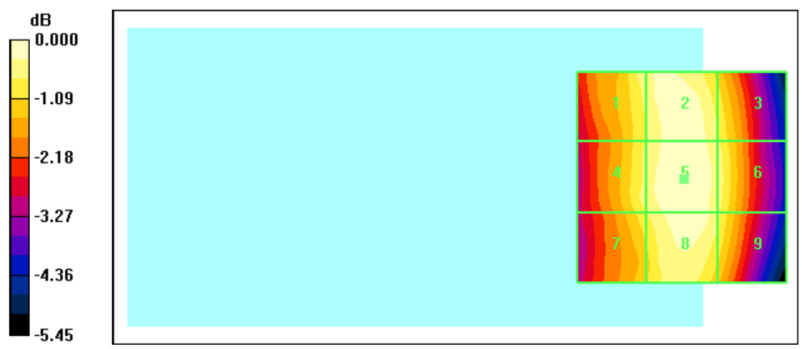
- Probe: ER3DV6 - SN2353; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 63.4 V/m
Probe Modulation Factor = 0.961
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 83.8 V/m; Power Drift = 0.106 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **60.1 M4**	Grid 2 **62.5 M4**	Grid 3 **58.8 M4**
Grid 4 **59.5 M4**	Grid 5 **63.4 M4**	Grid 6 **59.8 M4**
Grid 7 **58.0 M4**	Grid 8 **62.5 M4**	Grid 9 **59.0 M4**



0 dB = 63.4V/m

Date: 3/6/2013

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:1

Communication System: UMTS; Frequency: 826.4 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

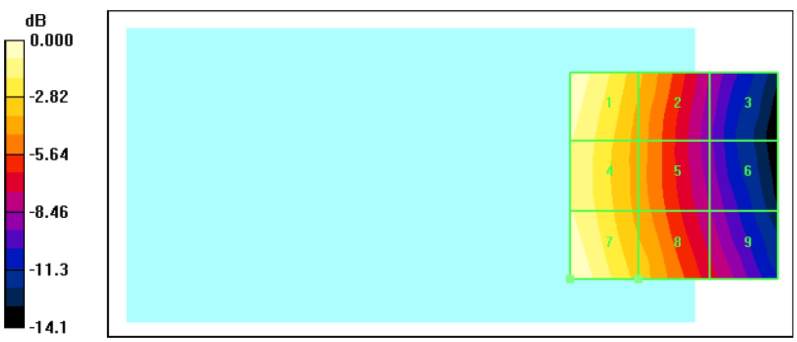
- Probe: H3DV6 - SN6207; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.106 A/m
Probe Modulation Factor = 0.924
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.055 A/m; Power Drift = 0.163 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.105 M4**	Grid 2 **0.071 M4**	Grid 3 **0.041 M4**
Grid 4 **0.096 M4**	Grid 5 **0.066 M4**	Grid 6 **0.041 M4**
Grid 7 **0.106 M4**	Grid 8 **0.074 M4**	Grid 9 **0.047 M4**



0 dB = 0.106A/m

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:1

Communication System: UMTS; Frequency: 1852.4 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: ER3DV6 - SN2353; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

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

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 34.7 V/m
Probe Modulation Factor = 0.972
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 43.3 V/m; Power Drift = -0.176 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **29.9 M4**	Grid 2 **34.7 M4**	Grid 3 **34.2 M4**
Grid 4 **26.7 M4**	Grid 5 **34.5 M4**	Grid 6 **34.1 M4**
Grid 7 **22.8 M4**	Grid 8 **31.8 M4**	Grid 9 **31.6 M4**

0 dB = 34.7V/m

PCTEST Hearing-Aid Compatability Facility

DUT: A3LSGHI337

Type: Portable Handset
Serial: 04F50
Backlight off
Duty Cycle: 1:1

Communication System: UMTS; Frequency: 1852.4 MHz;

Measurement Standard: DASY5 (High Precision Assessment)

DASY5 Configuration:

- Probe: H3DV6 - SN6207; Calibrated: 1/11/2013
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn859; Calibrated: 5/15/2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, V52.8 Build 4;

UMTS II 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 = 0.940
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.068 A/m; Power Drift = 0.053 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.101 M4**	Grid 2 **0.089 M4**	Grid 3 **0.065 M4**
Grid 4 **0.083 M4**	Grid 5 **0.074 M4**	Grid 6 **0.054 M4**
Grid 7 **0.073 M4**	Grid 8 **0.068 M4**	Grid 9 **0.055 M4**

0 dB = 0.101A/m

14. CALIBRATION CERTIFICATES

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

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

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

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

Accreditation No.: SCS 108

Client **PC Test**

Certificate No: ER3-2353_Jan13

CALIBRATION CERTIFICATE

Object: ER3DV6 - SN:2353

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: January 11, 2013

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.

KOK 1/28/13

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ER3DV6	SN: 2328	12-Oct-12 (No. ER3-2328_Oct12)	Oct-13
DAE4	SN: 789	18-Sep-12 (No. DAE4-789_Sep12)	Sep-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: January 11, 2013

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

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

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

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

Accreditation No.: SCS 108

Glossary:

NORMx,y,z	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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
b) CTIA Test Plan for Hearing Aid Compatibility, April 2010.

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 for XY sensors and ϑ = 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; Dx,y,z; VRx,y,z*: *A, B, C, D* 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).

Probe ER3DV6

SN:2353

Manufactured: March 8, 2005
Calibrated: January 11, 2013

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

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2353

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)	1.54	1.74	1.83	± 10.1 %
DCP (mV)[B]	99.2	97.9	99.3	

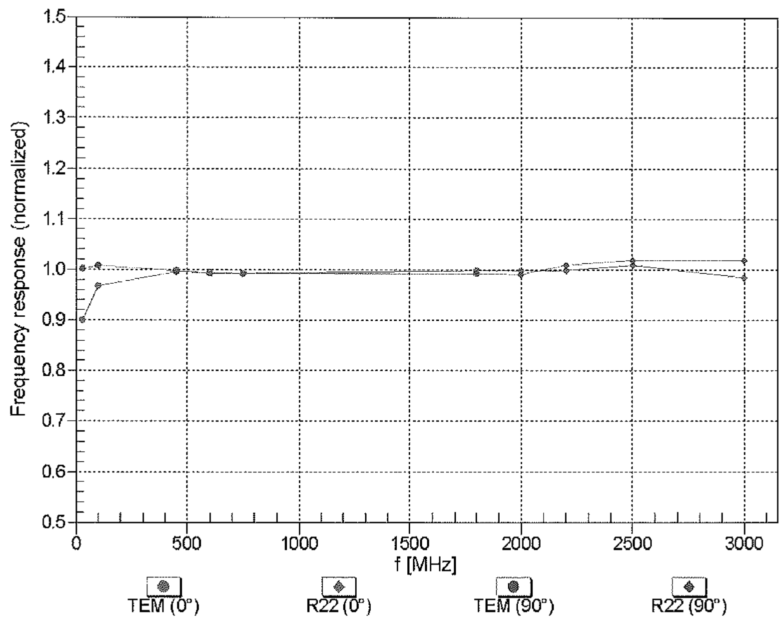
Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	159.7	±2.7 %
		Y	0.0	0.0	1.0		158.5	
		Z	0.0	0.0	1.0		199.1	

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

[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.

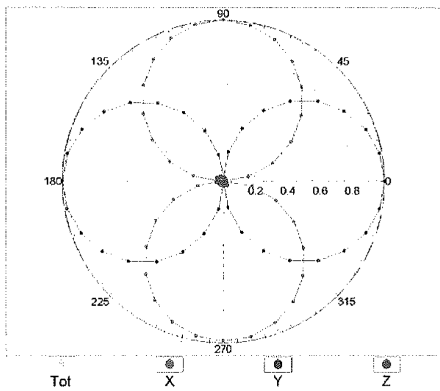
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



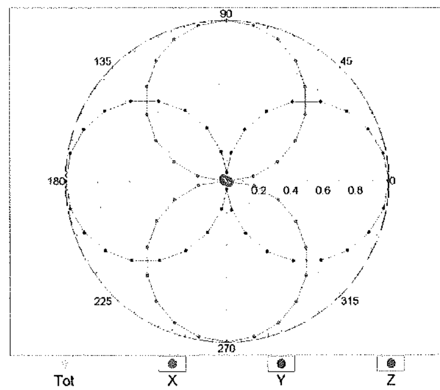
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM,0°

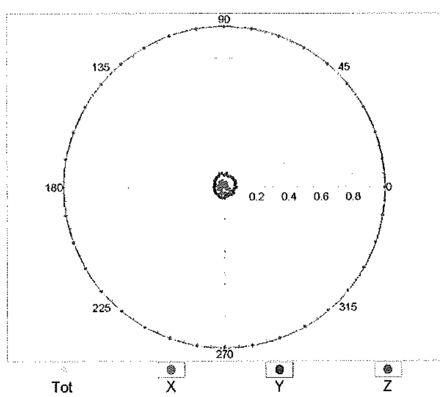


f=2500 MHz,R22,0°

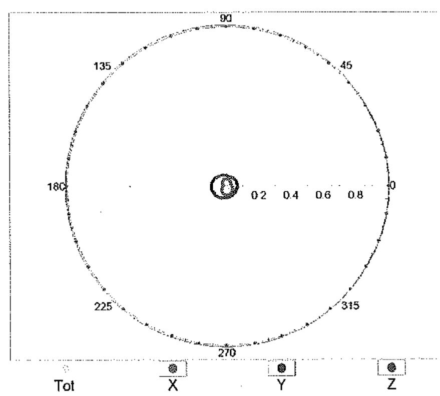


Receiving Pattern (ϕ), $\vartheta = 90°$

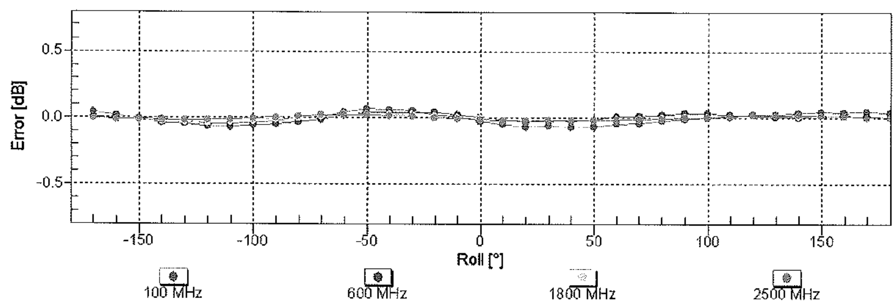
f=600 MHz,TEM,90°



f=2500 MHz,R22,90°

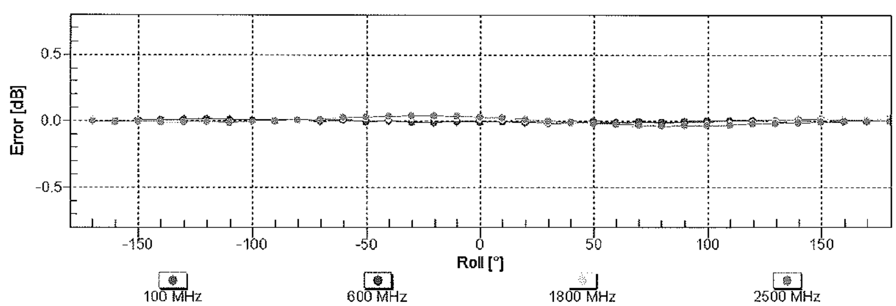


Receiving Pattern (ϕ), ϑ = 0°



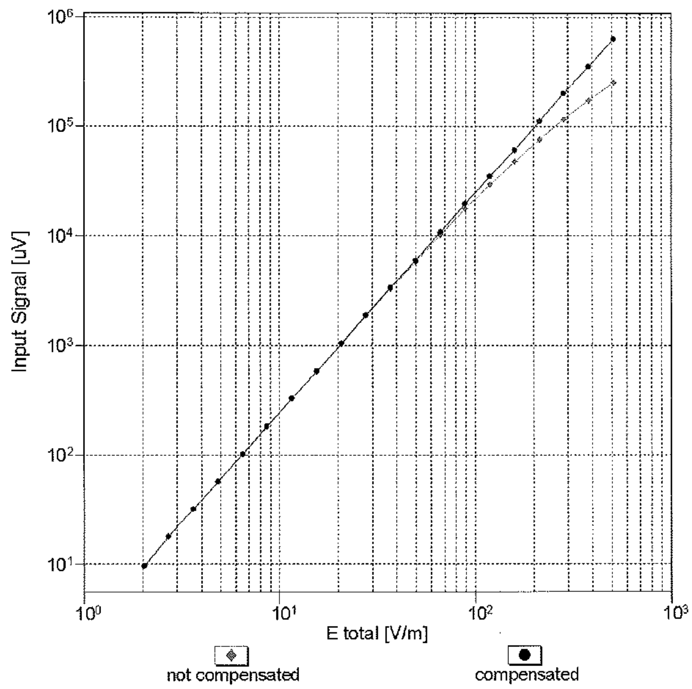
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

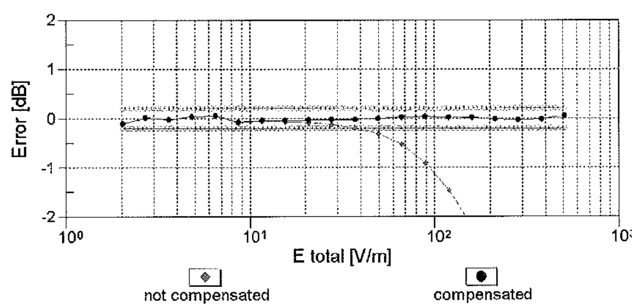
Receiving Pattern (ϕ), ϑ = 90°



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

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

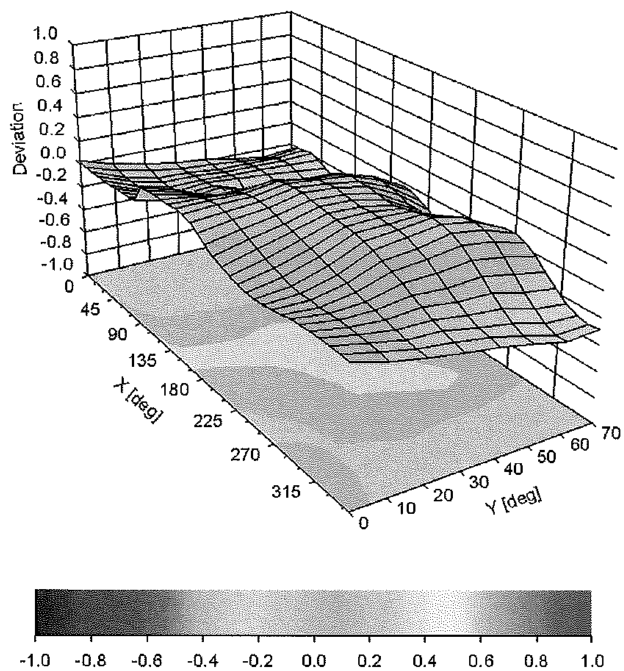




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Deviation from Isotropy in Air

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2353

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-10.3
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

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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: H3-6207_Jan13

CALIBRATION CERTIFICATE

Object: H3DV6 - SN:6207

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: January 11, 2013

KOK 1/28/13

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe H3DV6	SN: 6182	12-Oct-12 (No. H3-6182_Oct12)	Oct-13
DAE4	SN: 789	18-Sep-12 (No. DAE4-789_Sep12)	Sep-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 11, 2013

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

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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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.
b) CTIA Test Plan for Hearing Aid Compatibility, April 2010.

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 for XY sensors and ϑ = 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; Dx,y,z; VRx,y,z*: *A, B, C, D* 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).

Probe H3DV6

SN:6207

Manufactured: June 12, 2006
Calibrated: January 11, 2013

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

DASY/EASY - Parameters of Probe: H3DV6 - SN:6207

Basic Calibration Parameters

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / √(mV))	a0	2.39E-003	2.35E-003	2.92E-003	± 5.1 %
Norm (A/m / √(mV))	a1	2.09E-004	6.49E-004	1.17E-004	± 5.1 %
Norm (A/m / √(mV))	a2	1.61E-004	2.41E-004	1.94E-004	± 5.1 %
DCP (mV)[B]		93.1	92.7	93.2	

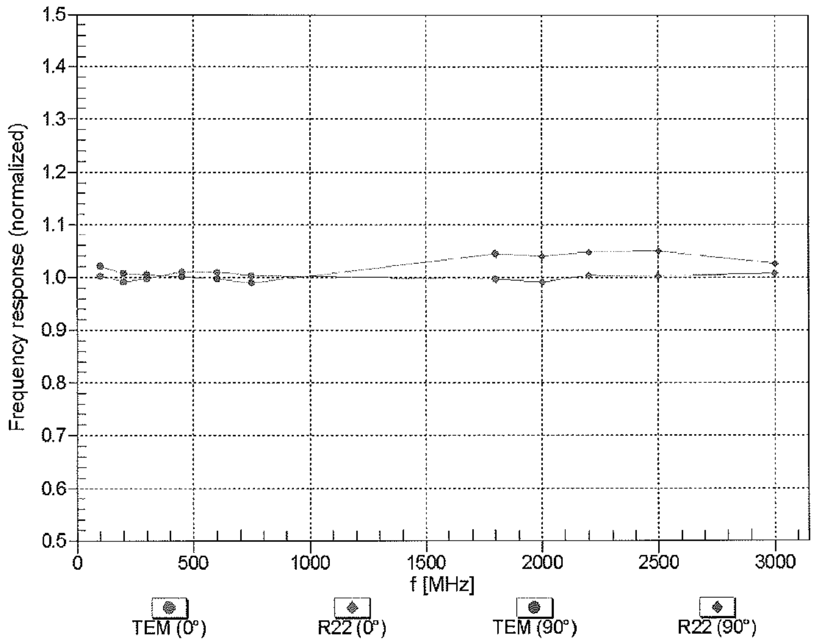
Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	127.7	±3.0 %
		Y	0.0	0.0	1.0		147.3	
		Z	0.0	0.0	1.0		123.8	

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%.

[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.

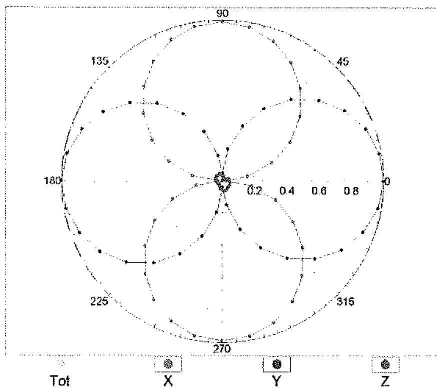
Frequency Response of H-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



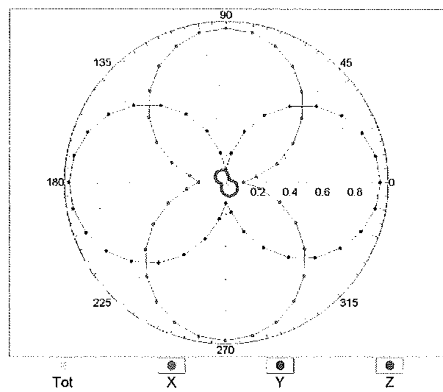
Uncertainty of Frequency Response of H-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM,0°

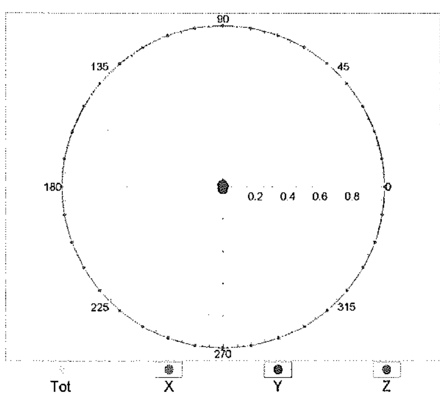


f=2500 MHz,R22,0°

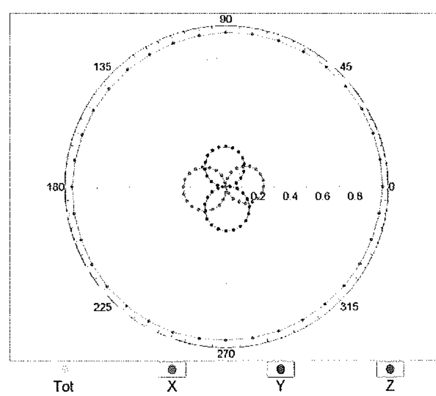


Receiving Pattern (ϕ), $\vartheta = 90°$

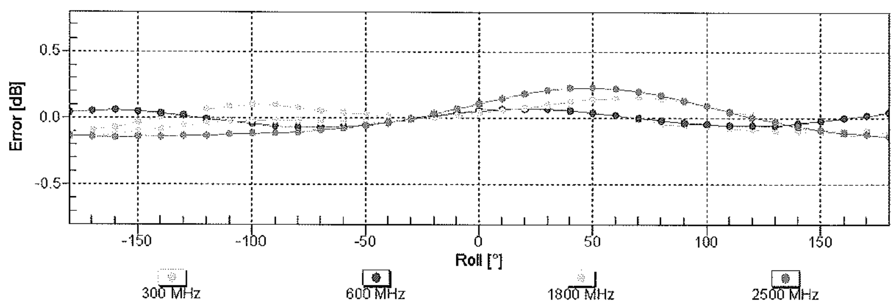
f=600 MHz,TEM,90°



f=2500 MHz,R22,90°

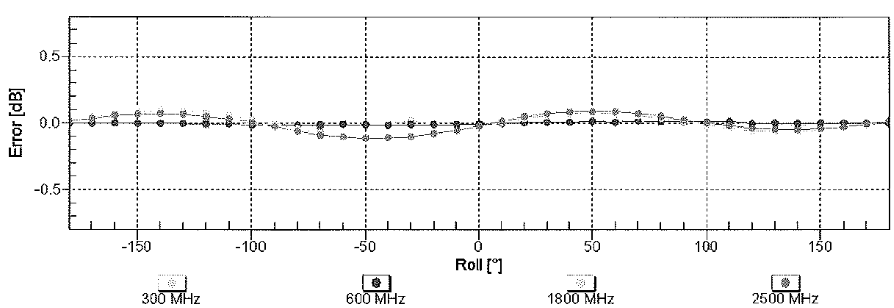


Receiving Pattern (ϕ), $\vartheta = 0°$



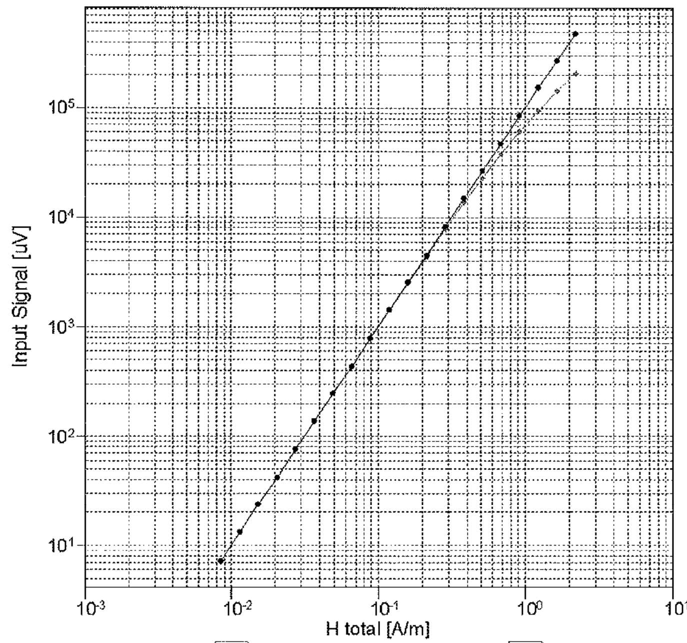
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

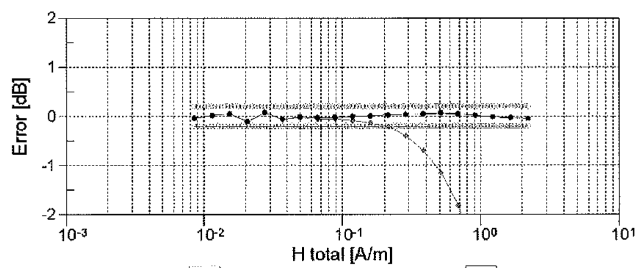
Receiving Pattern (ϕ), $\vartheta = 90°$



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

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

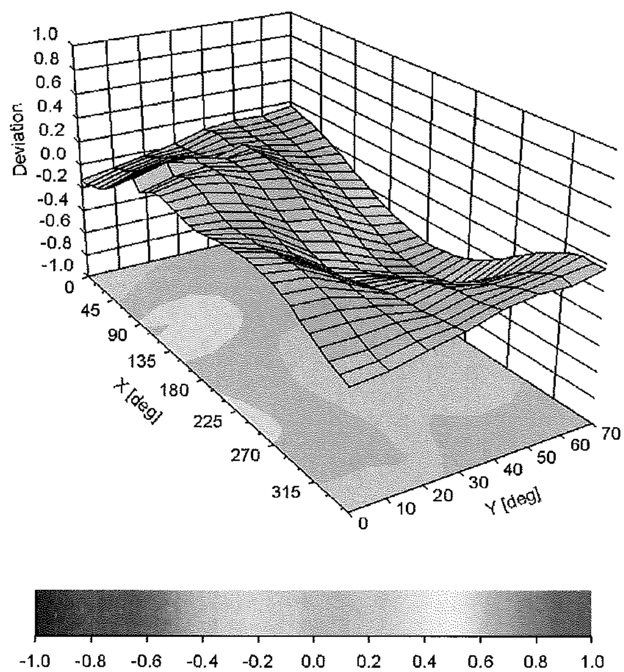




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Deviation from Isotropy in Air

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: H3DV6 - SN:6207

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-179.8
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

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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **CD835V3-1082_May12/2**

CALIBRATION CERTIFICATE (Replacement of No: CD835V3-1082_May12)

Object	CD835V3 - SN: 1082
Calibration procedure(s)	QA CAL-20.v6 Calibration procedure for dipoles in air
Calibration date:	May 22, 2012

✓KOK 6/13/12

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Probe ER3DV6	SN: 2336	29-Dec-11 (No. ER3-2336_Dec11)	Dec-12
Probe H3DV6	SN: 6065	29-Dec-11 (No. H3-6065_Dec11)	Dec-12
DAE4	SN: 781	25-Apr-12 (No. DAE4-781_Apr12)	Apr-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-11)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 30, 2012

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Certificate No: CD835V3-1082_May12/2 Page 1 of 8

References

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

[2] ANSI-C63.19-2011
American National Standard, 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 (15 mm for [2]) above the top metal 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] and [2], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (15 mm for [2]) (in z) above the metal 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, in the plane 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.

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 coresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	10mm 15mm	
Scan resolution	dx, dy = 5 mm	
Frequency	835 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 835 MHz

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW input power	**0.452 A / m ± 8.2 % (k=2)**

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	168.8 V / m
Maximum measured above low end	100 mW input power	161.9 V / m
Averaged maximum above arm	100 mW input power	**165.4 V / m ± 12.8 % (k=2)**

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	108.7 V / m
Maximum measured above low end	100 mW input power	105.2 V / m
Averaged maximum above arm	100 mW input power	**107.0 V / m ± 12.8 % (k=2)**

Appendix

Antenna Parameters

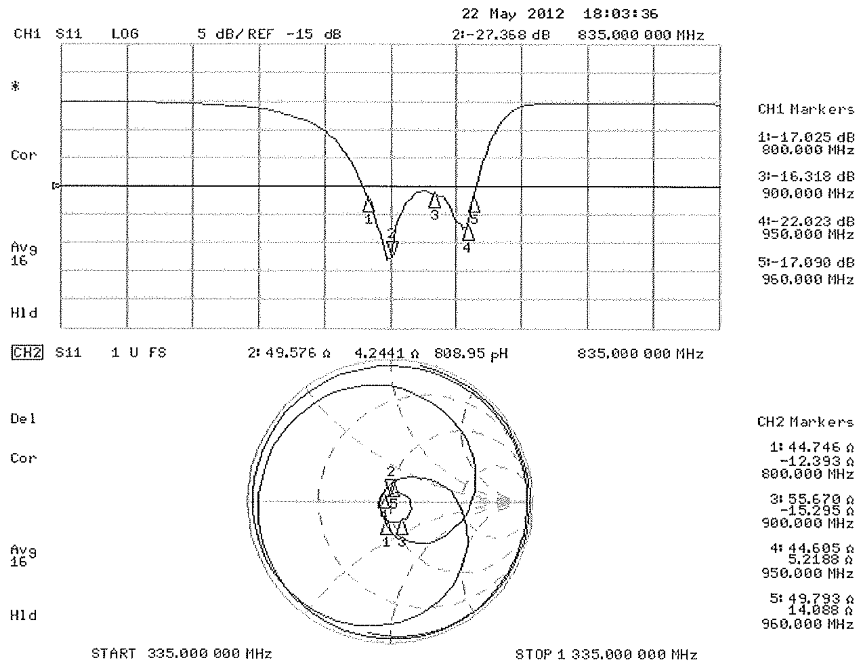
Frequency	Return Loss	Impedance
800 MHz	17.0 dB	44.7 Ω - 12.4 jΩ
835 MHz	27.4 dB	49.6 Ω + 4.2 jΩ
900 MHz	16.3 dB	55.7 Ω - 15.3 jΩ
950 MHz	22.0 dB	44.6 Ω + 5.2 jΩ
960 MHz	17.1 dB	49.8 Ω + 14.1 jΩ

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.
Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

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

Impedance Measurement Plot



DASY5 H-field Result

Date: 22.05.2012

Test Laboratory: SPEAG Lab2

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1082

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

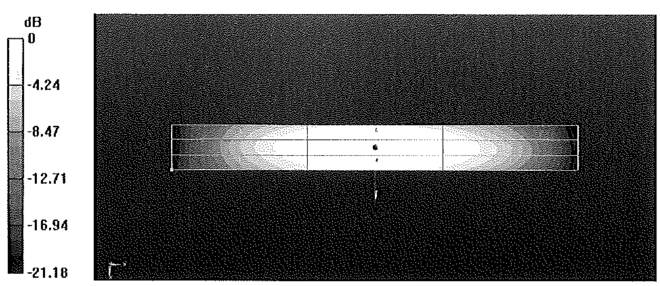
DASY52 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 25.04.2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole H-Field measurement @ 835MHz/H-Scan - 835MHz d=10mm/Hearing Aid Compatibility Test (41x361x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.4810 A/m; Power Drift = -0.00 dB
PMR not calibrated. PMF = 1.000 is applied.
H-field emissions = 0.452 A/m
Near-field category: M4 (AWF 0 dB)

PMF scaled H-field

Grid 1 **M4** **0.379 A/m**	Grid 2 **M4** **0.398 A/m**	Grid 3 **M4** **0.376 A/m**
Grid 4 **M4** **0.433 A/m**	Grid 5 **M4** **0.452 A/m**	Grid 6 **M4** **0.424 A/m**
Grid 7 **M4** **0.386 A/m**	Grid 8 **M4** **0.400 A/m**	Grid 9 **M4** **0.371 A/m**



0 dB = 0.452 A/m = -6.90 dB A/m

Certificate No: CD835V3-1082_May12/2 Page 6 of 8

DASY5 H-field Result

Date: 22.05.2012

Test Laboratory: SPEAG Lab2

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1082

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

DASY52 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 25.04.2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole E-Field measurement @ 835MHz/E-Scan - 835MHz d=10mm/Hearing Aid Compatibility Test (41x361x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 107.4 V/m; Power Drift = -0.01 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 168.8 V/m
Near-field category: M4 (AWF 0 dB)

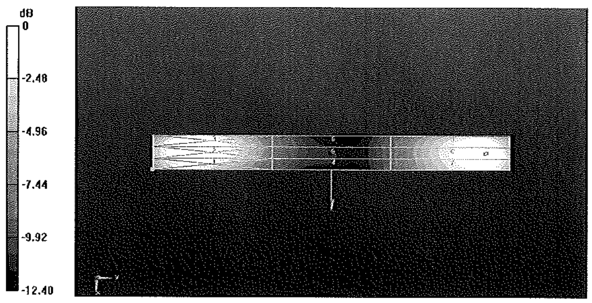
PMF scaled E-field

Grid 1 **M4** **153.5 V/m**	Grid 2 **M4** **168.8 V/m**	Grid 3 **M4** **167.6 V/m**
Grid 4 **M4** **83.09 V/m**	Grid 5 **M4** **88.85 V/m**	Grid 6 **M4** **87.84 V/m**
Grid 7 **M4** **156.2 V/m**	Grid 8 **M4** **161.9 V/m**	Grid 9 **M4** **155.8 V/m**

Dipole E-Field measurement @ 835MHz/E-Scan - 835MHz d=15mm/Hearing Aid Compatibility Test (41x361x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 107.0 V/m; Power Drift = -0.04 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 105.2 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 M4 101.9 V/m	Grid 2 M4 108.7 V/m	Grid 3 M4 108.6 V/m
Grid 4 M4 61.82 V/m	Grid 5 M4 64.60 V/m	Grid 6 M4 64.40 V/m
Grid 7 M4 103.6 V/m	Grid 8 M4 105.2 V/m	Grid 9 M4 103.6 V/m



0 dB = 168.8 V/m = 44.55 dB V/m

Certificate No: CD835V3-1082_May12/2 Page 8 of 8

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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: **CD1880V3-1064_May12/2**

CALIBRATION CERTIFICATE (Replacement of No: CD1880V3-1064_May12)

Object	CD1880V3 - SN: 1064
Calibration procedure(s)	QA CAL-20.v6 Calibration procedure for dipoles in air
Calibration date:	May 22, 2012

✓ KOK 6/13/12

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Probe ER3DV6	SN: 2336	29-Dec-11 (No. ER3-2336_Dec11)	Dec-12
Probe H3DV6	SN: 6065	29-Dec-11 (No. H3-6065_Dec11)	Dec-12
DAE4	SN: 781	25-Apr-12 (No. DAE4-781_Apr12)	Apr-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-11)	In house check: Oct-12
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-11)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 30, 2012

References

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

[2] ANSI-C63.19-2011
American National Standard, 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 (15 mm for [2]) above the top metal 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] and [2], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (15 mm for [2]) (in z) above the metal 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, in the plane 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.

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 coresponds to a coverage probability of approximately 95%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	10mm 15mm	
Scan resolution	dx, dy = 5 mm	
Frequency	1730 MHz ± 1 MHz 1880 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 1730 MHz

H-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured	100 mW input power	**0.481 A / m ± 8.2 % (k=2)**

E-field 10 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end	100 mW input power	149.3 V / m
Maximum measured above low end	100 mW input power	147.1 V / m
Averaged maximum above arm	100 mW input power	**148.2 V / m ± 12.8 % (k=2)**

E-field 15 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end	100 mW input power	96.1 V / m
Maximum measured above low end	100 mW input power	95.6 V / m
Averaged maximum above arm	100 mW input power	**95.9 V / m ± 12.8 % (k=2)**

Maximum Field values at 1880 MHz

H-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured	100 mW input power	**0.466 A / m ± 8.2 % (k=2)**

E-field 10 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end	100 mW input power	137.2 V / m
Maximum measured above low end	100 mW input power	135.2 V / m
Averaged maximum above arm	100 mW input power	**136.2 V / m ± 12.8 % (k=2)**

E-field 15 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end	100 mW input power	89.0 V / m
Maximum measured above low end	100 mW input power	86.6 V / m
Averaged maximum above arm	100 mW input power	**87.8 V / m ± 12.8 % (k=2)**

Appendix

Antenna Parameters

Nominal Frequencies

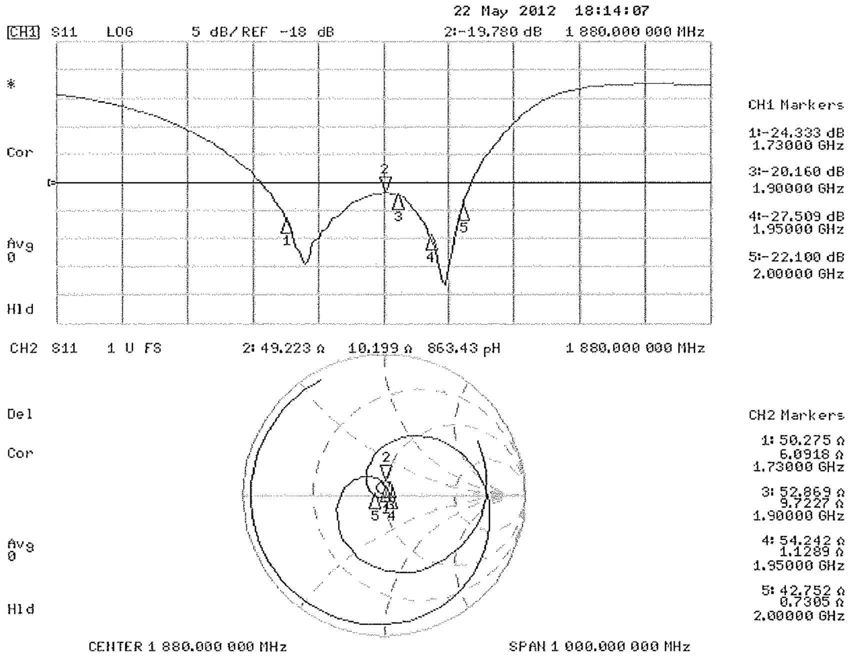
Frequency	Return Loss	Impedance
1730 MHz	24.3 dB	50.3 Ω + 6.1 jΩ
1880 MHz	19.8 dB	49.2 Ω + 10.2 jΩ
1900 MHz	20.2 dB	52.9 Ω + 9.7 jΩ
1950 MHz	27.5 dB	54.2 Ω + 1.1 jΩ
2000 MHz	22.1 dB	42.8 Ω + 0.7 jΩ

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.
Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

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

Impedance Measurement Plot



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DASY5 H-field Result

Date: 22.05.2012

Test Laboratory: SPEAG Lab2

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: CD1880V3 - SN: 1064

Communication System: CW; Frequency: 1880 MHz, Frequency: 1730 MHz
Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 25.04.2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole H-Field measurement @ 1880MHz/H-Scan - 1880MHz d=10mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.4930 A/m; Power Drift = 0.01 dB
PMR not calibrated. PMF = 1.000 is applied.
H-field emissions = 0.466 A/m
Near-field category: M2 (AWF 0 dB)

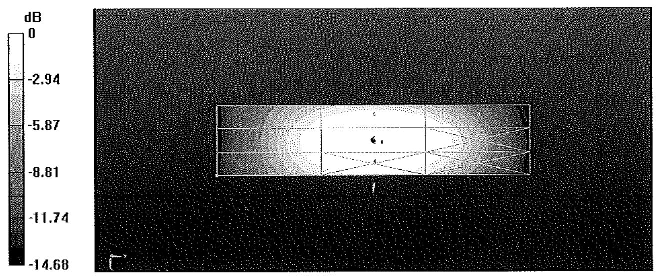
PMF scaled H-field

Grid 1 **M2** **0.411 A/m**	Grid 2 **M2** **0.422 A/m**	Grid 3 **M2** **0.400 A/m**
Grid 4 **M2** **0.451 A/m**	Grid 5 **M2** **0.466 A/m**	Grid 6 **M2** **0.440 A/m**
Grid 7 **M2** **0.414 A/m**	Grid 8 **M2** **0.431 A/m**	Grid 9 **M2** **0.403 A/m**

Dipole H-Field measurement @ 1880MHz/H-Scan - 1730MHz d=10mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.5120 A/m; Power Drift = -0.02 dB
PMR not calibrated. PMF = 1.000 is applied.
H-field emissions = 0.4807 A/m
Near-field category: M2 (AWF 0 dB)

PMF scaled H-field

Grid 1 **M2** **0.408 A/m**	Grid 2 **M2** **0.419 A/m**	Grid 3 **M2** **0.396 A/m**
Grid 4 M2 0.464 A/m	Grid 5 **M2** **0.481 A/m**	Grid 6 **M2** **0.452 A/m**
Grid 7 M2 0.411 A/m	Grid 8 M2 0.428 A/m	Grid 9 **M2** **0.400 A/m**



0 dB = 0.466 A/m = -6.62 dB A/m

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DASY5 E-field Result

Date: Date: 22.05.2012

Test Laboratory: SPEAG Lab2

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: CD1880V3 - SN: 1064

Communication System: CW; Frequency: 1880 MHz, Frequency: 1730 MHz
Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2011
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 25.04.2012
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole E-Field measurement @ 1880MHz/E-Scan - 1880MHz d=10mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 151.1 V/m; Power Drift = -0.00 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 137.2 V/m
Near-field category: M2 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M2** **127.7 V/m**	Grid 2 **M2** **137.2 V/m**	Grid 3 **M2** **134.5 V/m**
Grid 4 **M3** **84.33 V/m**	Grid 5 **M3** **90.51 V/m**	Grid 6 **M3** **89.47 V/m**
Grid 7 **M2** **128.2 V/m**	Grid 8 **M2** **135.2 V/m**	Grid 9 **M2** **134.6 V/m**

Dipole E-Field measurement @ 1880MHz/E-Scan - 1880MHz d=15mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 151.0 V/m; Power Drift = 0.01 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 86.58 V/m
Near-field category: M3 (AWF 0 dB)

PMF scaled E-field

Grid 1 M3 85.58 V/m	Grid 2 M3 88.96 V/m	Grid 3 M3 88.18 V/m
Grid 4 **M3** **67.32 V/m**	Grid 5 **M3** **69.34 V/m**	Grid 6 **M3** **69.03 V/m**
Grid 7 **M3** **84.29 V/m**	Grid 8 **M3** **86.58 V/m**	Grid 9 **M3** **86.23 V/m**

Dipole E-Field measurement @ 1880MHz/E-Scan - 1730MHz d=10mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 166.4 V/m; Power Drift = 0.01 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 147.1 V/m
Near-field category: M2 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M2** **136.5 V/m**	Grid 2 **M2** **147.1 V/m**	Grid 3 **M2** **144.6 V/m**
Grid 4 **M3** **94.60 V/m**	Grid 5 **M3** **102.1 V/m**	Grid 6 **M3** **101.1 V/m**
Grid 7 M2 141.6 V/m	Grid 8 M2 149.3 V/m	Grid 9 M2 148.6 V/m

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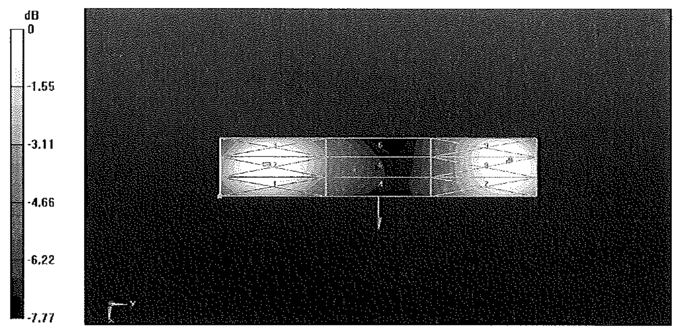
Dipole E-Field measurement @ 1880MHz/E-Scan - 1730MHz d=15mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 166.7 V/m; Power Drift = -0.03 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 95.61 V/m
Near-field category: M3 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M3** **91.80 V/m**	Grid 2 **M3** **95.61 V/m**	Grid 3 **M3** **94.82 V/m**
Grid 4 **M3** **72.98 V/m**	Grid 5 **M3** **75.76 V/m**	Grid 6 **M3** **75.42 V/m**
Grid 7 **M3** **93.58 V/m**	Grid 8 **M3** **96.07 V/m**	Grid 9 **M3** **95.69 V/m**



0 dB = 137.2 V/m = 42.75 dB 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.

16. REFERENCES

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