SAMSUNG ELECTRONICS Co., Ltd.,
Regulatory Compliance Group
IT R&D Center

416, Maetan-3dong,
Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea 443-742

TEST REPORT ON HAC

Model Tested:	**SGH-T379**
FCC ID (Requested) :	**A3LSGHT379**
Job No :	**AI-043**
Report No :	**AI-043-M1**
Date issued :	**2011-06-29**
Result Summary :	**M3 -2007 (RF EMISSION Category)**

- Abstract –

This document reports on HAC Tests carried out in accordance with ANSI C63.19(2007), FCC Rule Part(s) FCC 47 CFR §20.19, §6.3, §7.3

Prepared By

MK YOUN – Test Engineer

Authorized By

JD JANG – Technical Manager

Contents

SAMSUNG

1. GENERAL INFORMATION

Test Sample :	850/1900 GSM/GPRS EDGE and AWS PCS WCDMA/HSDPA Phone with Bluetooth
Model Number :	SGH-T379
Serial Number :	Identical prototype (S/N :# FI-116-H)
Manufacturer :	SAMSUNG ELECTRONICS Co., Ltd.
Address :	416 Maetan3-Dong, Yeongtong-gu, Suwon City Gyeonggi-Do, Korea 443-742
Test Standard :	ANSI C 63.19 (2007), FCC 47 CFR § 20.19, §6.3, §7.3
FCC Classification	Licensed Portable Transmitter Held to Ear (PCE)
Test Dates :	Jun. 13, 2011 ~ Jun. 15, 2011
Tested for :	FCC/TCB Certification

2. DESCRIPTION OF DEVICE

Tx Freq. Range :	824.2 ~ 848.8 MHz(GSM850) 1712.4 ~ 1752.5 MHz(AWS WCDMA) 1850.2 ~ 1909.8 MHz(GSM1900) 1850.2 ~ 1909.8 MHz(PCS WCDMA)
Rx Freq. Range :	869.2 ~ 893.8 MHz(GSM850) 2112.4 ~ 2152.5 MHz(AWS WCDMA) 1930.20 ~ 1989.80 MHz(GSM1900) 1932.4 ~ 1987.6 MHz(PCS WCDMA)
Antenna Configuration :	PIFA
Antenna Manufacturer :	Gwang-Jin
Antenna Dmimensions :	46.01X18.99X5.12(mm)

Indicating Operating modes for Air Interfaces/Bands

Air Interface	Band(MHz)	Type	C63.19-2007 Tested	Simultaneous Transmissions Note:Not to be tested	Reduced Power 20.19 (c)(1)	Voice Over Digital Transport (Data)
GSM	835	Voice	Yes	Yes: BT	No	N/A
GSM	1900	Voice	Yes	Yes: BT	No	N/A
WCDMA	1700	Voice	Yes	Yes: BT	No	N/A
WCDMA	1900	Voice	Yes	Yes: BT	No	N/A
GSM	All band (835,1900)	Data	N/A	N/A	N/A	No
WCDMA	All band (1700,1900)	Data	N/A	N/A	N/A	Yes
BT	2450	Data	N/A	N/A	N/A	N/A

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

3. DESCRIPTION OF TEST EQUIPMENT

3.1 HAC Measurement Setup

Robotic System

Measurements are performed using the DASY4(or Dasy5) automated dosimetric assessment system. Which is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Stäubli), robot controller, measurement server, Samsung computer, near-field probe, probe alignment sensor, and the SAM twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig. 3.1).

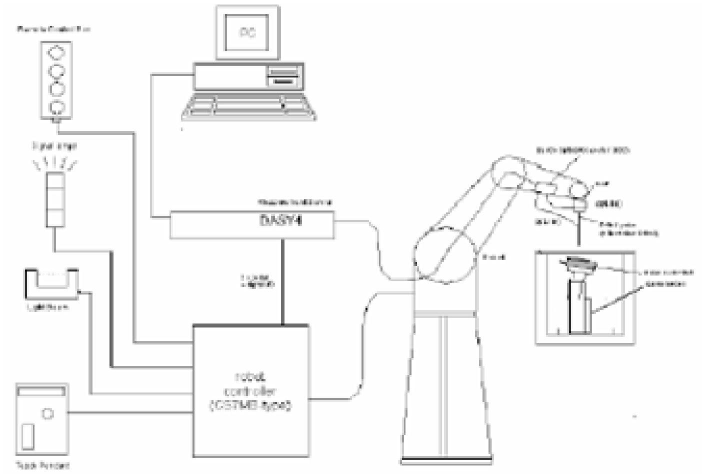


Figure 3.1 HAC Measurement System Setup

System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control is used to drive the robot motors. The PC consists of the Samsung computer with Windows XP system and HAC Measurement Software DASY4(or Dasy5), LCD monitor, mouse and keyboard. The Stäubli 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 measurement server

System Electronics

The DAE4(or DAE3) 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 measurement server 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.

3.2 Probe Description

ER3DV6 E-Field Probe Description

Construction: One dipole parallel, two dipoles normal to probe axis
Built-in shielding against static charges

Figure 3.2 E-field Probe

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 2V/m to 1000V/m
(M3 or better device readings fall well below diode compression point)

Linearity : ±0.2dB
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

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: 10mA/mto2A/mat1 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 3.3 H-field Probe

3.3 Test Arch Phantom

Enables easy and well defined positioning of the phone and calibration dipoles as well as simple teaching of the robot (See Figure 3.4)

Dimensions: 370 x 370 x 370 mm

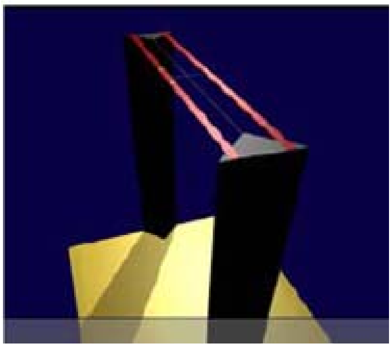


Figure 3.4 Test Arch Phantom

3.4 Validation Dipole

The reference dipole should have a return loss better than –20 dB (measured in the setup) at the resonant frequency to reduce the uncertainty in the power measurement.

Application	- Free space antenna - Hearing Aid susceptibility measurements according to ANSI C 63.19 - Validaation of Hearing Aid RF setup for wireless device emission measurement according to ANSI C63.19
Frequency	835 MHz, 1730MHz, 1880 MHz (1880MHz Dipole used for 1730MHz Validation)
Return Loss	< -20 dB at specified validation position
Dimensions	835 MHz : 166 x 330 mm 1880MHz : 80.8 x 330 mm

3.5 Equipment Calibration

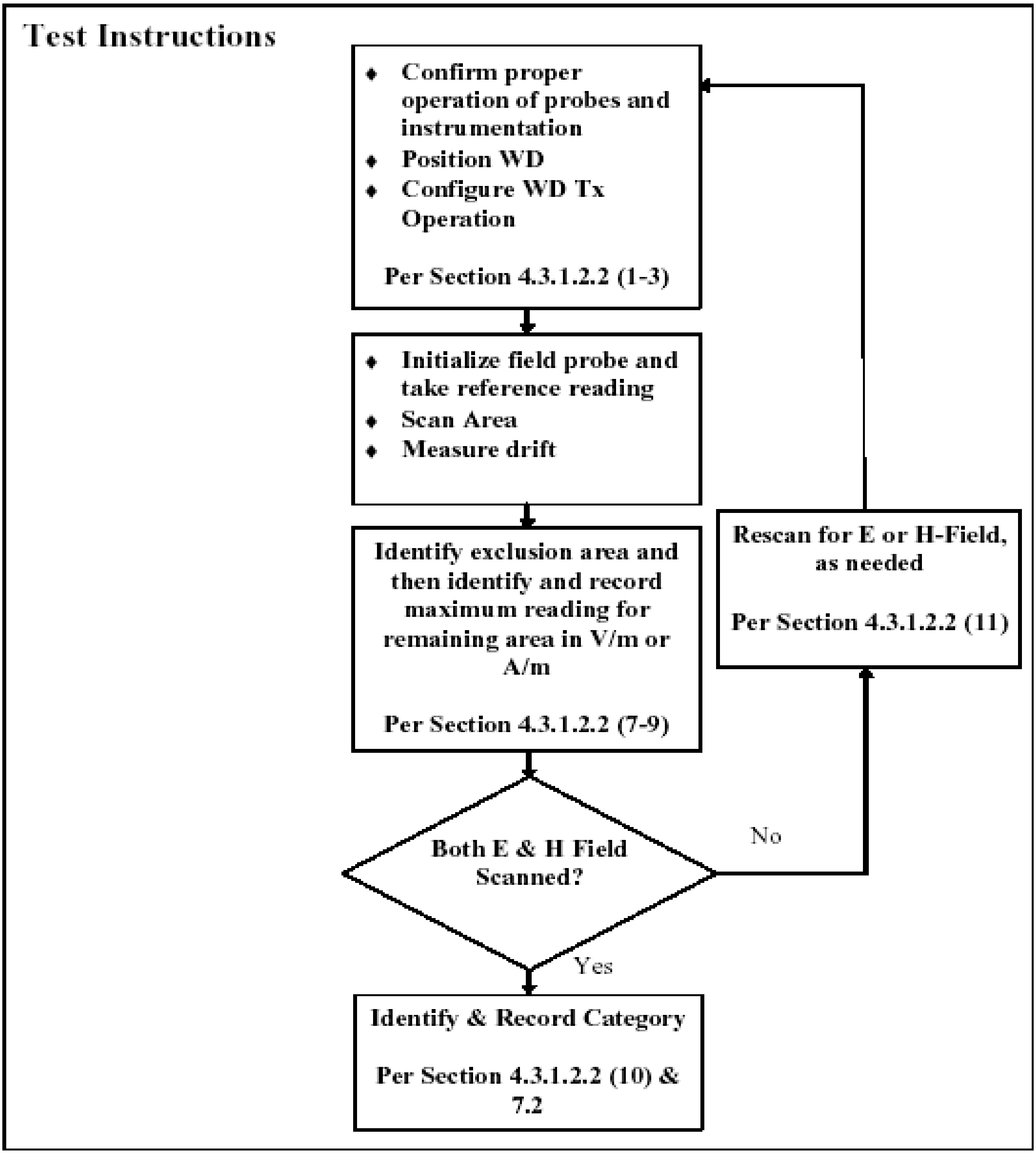
Table 3.1 Test Equipment Calibration

Type	Calibration Due Date	Serial No.
SPEAG DAE4	2011.09.22	533
SPEAG E-Field Probe ER3DV6	2012.03.21	2370
SPEAG H-Field Probe H3DV6	2012.03.15	6197
SPEAG Validation Dipole CD835 V3	2013.04.12	1021
SPEAG Validation Dipole CD1880 V3	2013.03.15	1016
Stäubli Robot TX90XL	Not Required	F10/5FN5A1/A/01
HAC Phantom	Not Required	1018
E4438C Signal Generator	2012.04.14	MY47271094
BBS3Q7ECK Power Amp	2011.12.01	1024
N1912A P-Series Power Meter	2012.04.01	MY45100306
N1912A Wideband Power Sensor	2012.04.01	MY45240464
N1912A Wideband Power Sensor	2012.04.01	MY45240463
DASY52 S/W (ver 52.6)	Not Required	-
778D Directional Coupler	2011.06.29	18843
E4440A Spectrum Analyzer	2012.01.26	MY46186167
Base Station Simulator	2011.12.20	MY50261069

NOTE:

The E-field and H-field probe was calibrated by SPEAG

4. HAC MEASUREMENT PROCEDURE



The evaluation was performed using the following procedure.

1. Confirm proper operation of the field probe, probe measurement system, and other instrumentation.
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 increments in the 5 x 5 cm region were performed at a distance 1cm from the probe elements to the WD. A 360° rotation about the azimuth axis at the maximum interpolated position was measured. For the worst-case condition, the peak reading from this rotation was used in re-evaluating the HAC category.
8. The system performed a drift evaluation by measuring the field at the reference location.
9. Steps 1-8 were done for both the E and H-Field measurements.
10. 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.

5. DESCRIPTION OF TEST POSITION

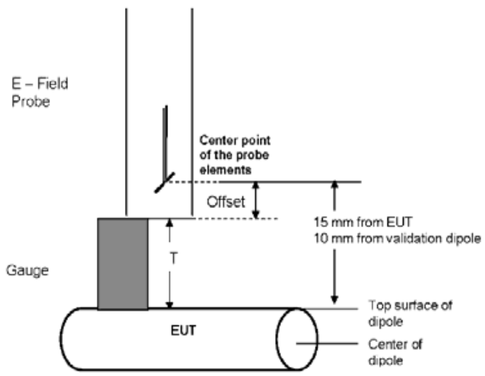
5.1 Measurement reference and plane

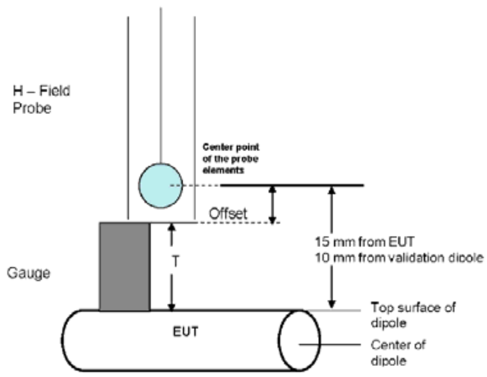
1. The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.

2. The grid is centered on the audio frequency output transducer of the WD (speaker or T- coil).

3. The grid is in a reference plane, which is defined as the planar area that contains the
highest point in the area of the phone that normally rests against the user's ear.
It is parallel to the centerline of the receiver area of the phone and is defined by
the points of the receiver-end of the WD handset, which, in normal handset use,
4. The measurement plane is parallel to, and 1.5 cm in front of, the reference plar

Figure 5.1 Wireless Device and Measurement Plane





6.Measurement Uncertainty

Source of Uncertainty	Value	probability distribution	Divisor	c_i E	c_i H	Standard uncertainty		vi or veff	
						E	H	E	H
Measurement System									
Probe Calibration	5.05	normal	1.000	1	1	5.05	2.55	0	0
Axial Isotropy	4.70	rectangular	1.732	1	1	2.71	2.71	∞	∞
Sensor Displacement	16.50	rectangular	1.732	1	0.145	9.53	1.38	∞	∞
Boundary Effects	2.40	rectangular	1.732	1	1	1.39	1.39	∞	∞
Linearity	4.70	rectangular	1.732	1	1	2.71	2.71	∞	∞
Scaling to Peak Envelop Power	2.00	rectangular	1.732	1	1	1.15	1.15	∞	∞
System Detection Limit	1.00	rectangular	1.732	1	1	0.58	0.58	∞	∞
Readout Electronics	0.30	normal	1.000	1	1	0.30	0.30	∞	∞
Response Time	0.80	rectangular	1.732	1	1	0.46	0.46	∞	∞
Integration time	2.60	rectangular	1.732	1	1	1.50	1.50	∞	∞
RF Ambient condition	3.00	rectangular	1.732	1	1	1.73	1.73	∞	∞
RF Reflections	3.92	normal	1.000	1	1	3.92	3.92	2	2
Probe Positioner	1.20	rectangular	1.732	1	0.67	0.69	0.46	∞	∞
Probe Positioning	4.70	rectangular	1.732	1	0.67	2.71	1.82	∞	∞
Variability between 2mm & 5mm	3.85	normal	1.000	1	1	3.85	3.85	4	4
Extrap. And Interpolation	1.00	rectangular	1.732	1	1	0.58	0.58	∞	∞
Test Sample Related									
Device Positioning	0.57	normal	1.000	1	0.67	0.57	0.38	24	24
Device Holder and Phantom	2.40	rectangular	1.732	1	1	1.39	1.39	∞	∞
Power Drift	5.00	rectangular	1.732	1	1	2.89	2.89	∞	∞
Phantom and Setup Related									
Phantom Thickness	2.40	rectangular	1.732	1	0.7	1.39	0.93	∞	∞
$u_c(F_S)$ **Combined Standard Uncertainty**		**normal**				**13.82**	**9.83**	211	54
$U(F_S)$ **Expanded Uncertainty**		**normal k=**	**2.0**			**27.09**	**19.26**		

7. SYSTEM VERIFICATION

7.1 Test System Validation

Prior to assessment, the system is verified to the ±10% of the specification at 835MHz, 1730MHz, 1880MHz
by using the system validation kit(s). (see Appendix C, Graphic Plot Attached)

Table 7.2 System Validation Results

Frequency	Targeted E-field (V/m)	Measured E-field (V/m)	Deviation (%)	Targeted H-field (A/m)	Measured H-field (A/m)	Deviation (%)	Date
835 MHz	165.2	166.1	0.54	0.453	0.466	2.87	2011.06.13
1880 MHz	138.8	134.6	-3.06	0.471	0.442	-6.16	2011.06.14
1730 MHz	149.3	147.0	-1.51	0.492	0.467	-5.08	2011.06.15

*Validation was measured with input power 100 mW.

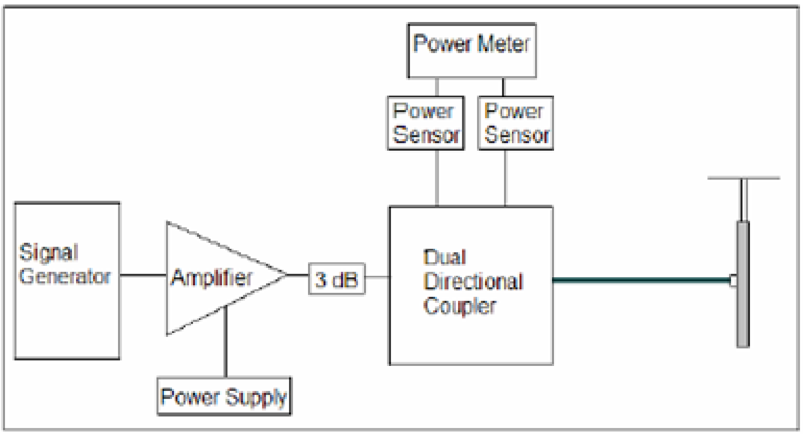


Figure 7.1 Dipole Validation Test Setup

Validations of the DASY4(or Dasy5) test system were performed using the measurement equipment listed in Section 3.2. All validations occur in free space using the DASY4(or Dasy5) test arch. Note that the 10mm probe to dipole separation is measured from the top edge of the dipole to the calibration reference point of the probe. SPEAG uses the center point of the probe sensor(s) as the reference point when establishing targets for their dipoles. Therefore, because SPEAG's dipoles and targets are used, it is appropriate to measure the 10mm separation distance to the center of the sensors as they do. This reference point was used for validation only. Validations were performed at 835 MHz and/or 1880 MHz and/or 1730 MHz. These frequencies are within each operating band and are within 2MHz of the mid-band frequency of the test device. The obtained results from the validations are displayed in the table 7.2.

8. MODULATION FACTOR

After every probe calibration, the response of the probe to each applicable modulated signal (CDMA, GSM, etc) must be assessed at both 835 MHz and 1880 MHz. The response of the probe system to a CW field at the frequency(s) of interest is compared to its response to a modulated signal with equal peak amplitude. For each PMF assessment, a Signal Generator was used to replace the original CW signal with the desired modulated signal. The PMF results are shown in Tables 8.1.

RF Field Probe Modulation Response was measured with the field probe and associated measurement equipment. The proposed setup corresponds to the procedure as required in the Standard.

1. Install a validation dipole for the appropriate frequency band under the Test Arch Phantom Move the probe to the field reference point. Do not move the probe between the corresponding CW and modulated measurements.
2. Install the field probe in the setup.
3. The signal to the dipole must be monitored to record peak amplitude. Set a CW signal to the same level (refer to Appendix B)
4. Set the procedure properties (frequency, modulation frequency and crest factor) according to the measured signal. Define a multimeter job for the field reading.
5. Define a second procedure for the evaluation of the CW signal (frequency set as above, modulation frequency = 0, crest factor = 1) and a multimeter job.
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.

8.1 Modulation Factors

GSM850/GSM1900 Modulation Factors

Frequency	Protocol	E-field (V/m)	H-field (A/m)	E-Field PMF	H-Field PMF
835 MHz	AM	84.0	0.357	1.55	1.64
835 MHz	GSM	48.3	0.235	2.70	2.50
835 MHz	CW	130.5	0.587	-	-
1880 MHz	AM	73.4	0.431	1.54	1.50
1880 MHz	GSM	39.9	0.2482	2.83	2.61
1880 MHz	CW	113.0	0.647	-	-

Table 8.1 Modulation Factors

WCDMA1700/WCDMA1900 Modulation Factors

Frequency	Protocol	E-field (V/m)	H-field (A/m)	E-Field PMF	H-Field PMF
1730 MHz	AM	84.9	0.389	1.59	1.01
1730 MHz	WCDMA	139.0	0.410	0.97	0.96
1730 MHz	CW	134.7	0.393	-	-
1880 MHz	AM	73.4	0.431	1.54	1.50
1880 MHz	WCDMA	111.5	0.673	1.01	0.96
1880 MHz	CW	113.0	0.647	-	-

Table 8.2 Modulation Factors

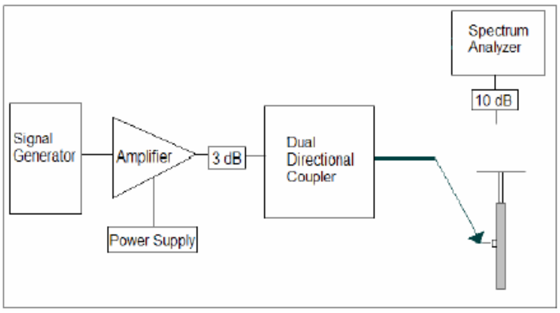


Figure 8.1 Setup to Dipole

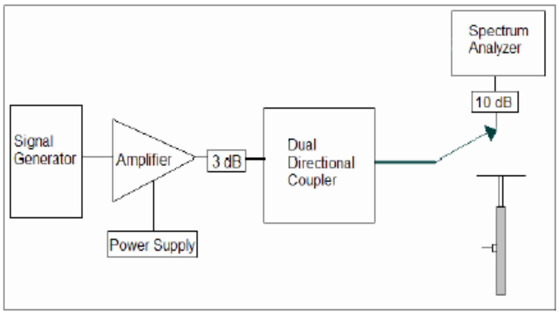


Figure 8.2 Setup to Peak Power using Spectrum Analyzer

8.2 CW and Modulated Signal Zero-span plots(GSM)

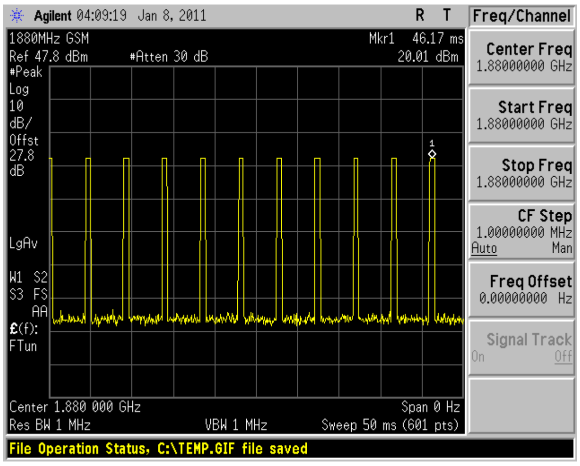


Figure 8.3 GSM1900 Signal

Figure 8.4 GSM1900 CW Signal

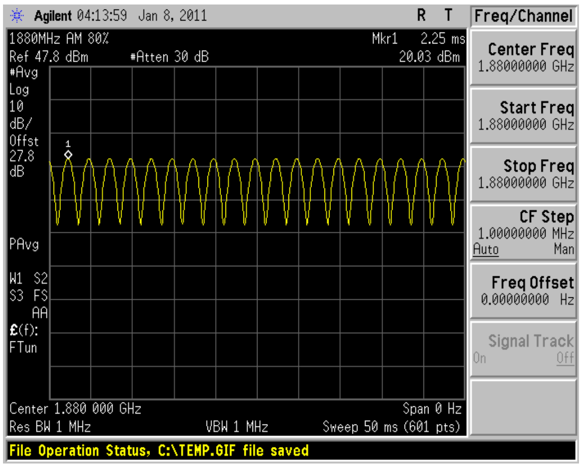


Figure 8.5 GSM1900 80% AM Signal

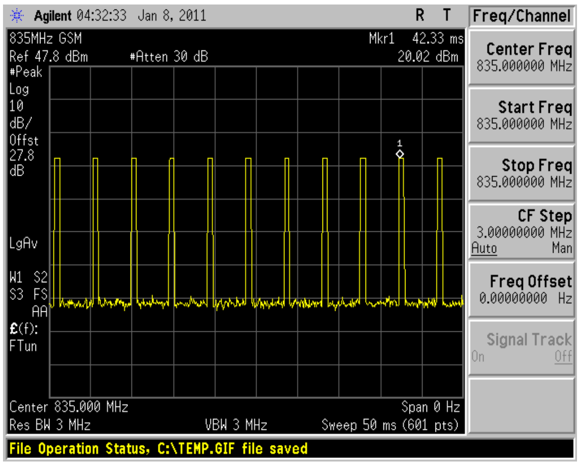


Figure 8.6 GSM850 Signal

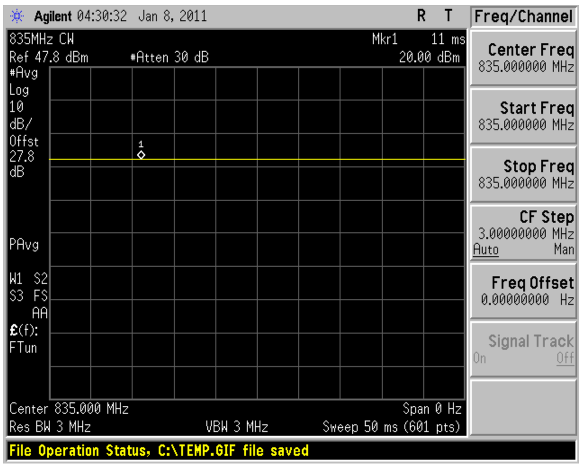


Figure 8.7 GSM850 CW Signal

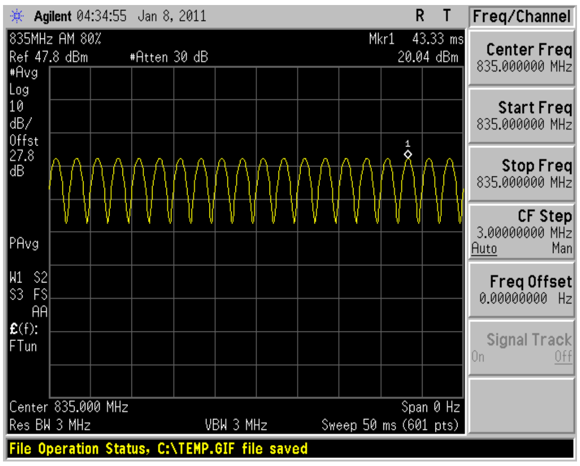


Figure 8.8 GSM850 80% AM Signal

8.3 CW and Modulated Signal Zero-span plots(WCDMA)

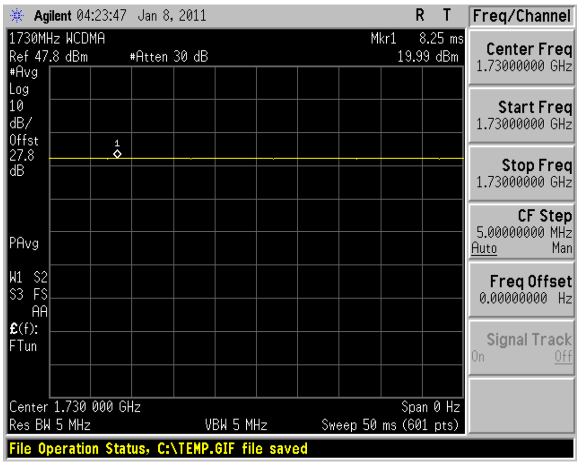


Figure 8.9 WCDMA1700 Signal

Figure 8.10 WCDMA1700 CW Signal

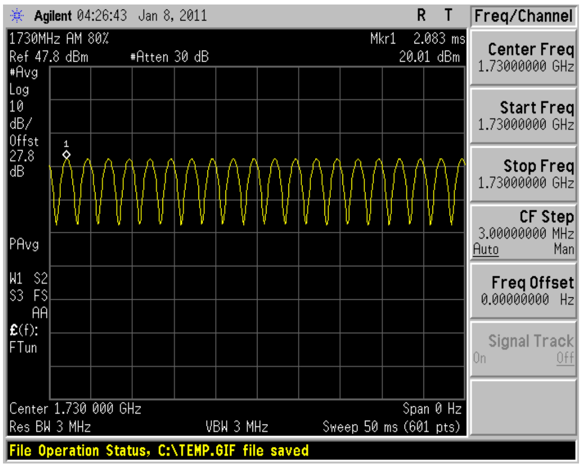


Figure 8.10 WCDMA1700 80% AM Signal

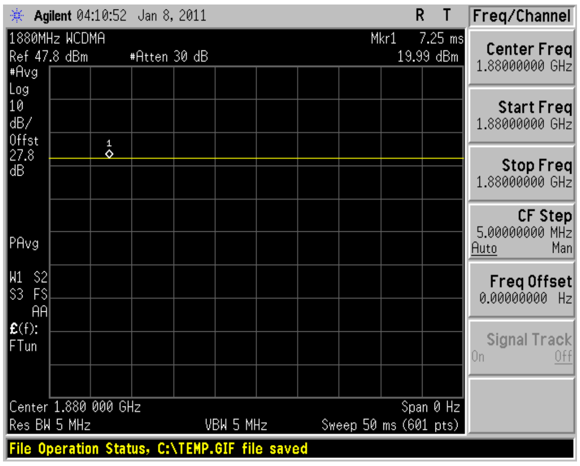


Figure 8.11 WCDMA1900 Signal

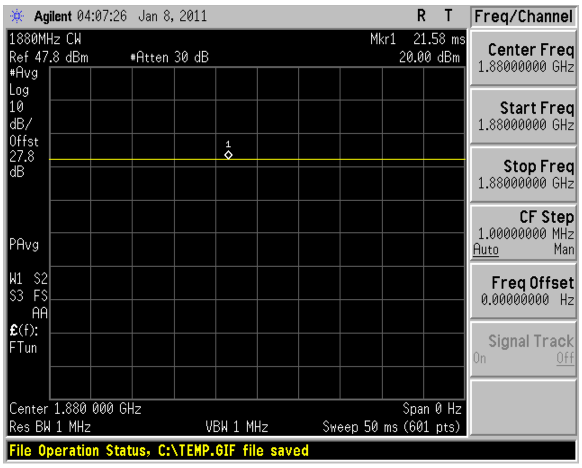


Figure 8.12 WCDMA1900 CW Signal

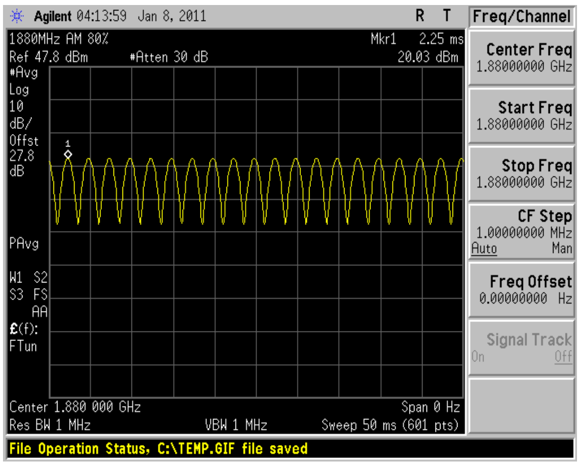


Figure 8.13 WCDMA1900 80% AM Signal

9. Test Results

9.1 Measurement Results(E-field)

GSM E-FIELD EMISSIONS:

Mode	Channel	Back light	Battery	Antenna	Conducted Power at BS(dBm)	Time Avg. Field [V/m]	Peak Field [V/m]	Peak Field [dBV/m]	Category	FCC limit [dBV/m]	FCC Margin [dB]	Excl Blocks Per 4.4
E-field Emissions												
GSM850	128	off	Standard	Intenna	32.43	30.65	82.74	38.35	**M4**	48.5	-10.15	None
GSM850	190	off	Standard	Intenna	32.35	34.86	94.13	39.47	**M4**	48.5	-9.03	None
GSM850	251	off	Standard	Intenna	32.33	45.93	124.00	41.87	**M4**	48.5	-6.63	None
GSM1900	512	off	Standard	Intenna	29.01	24.06	68.08	36.66	**M3**	38.5	-1.84	4,7,8
GSM1900	661	off	Standard	Intenna	29.05	23.40	66.22	36.42	**M3**	38.5	-2.08	4,7,8
GSM1900	810	off	Standard	Intenna	29.11	24.37	68.97	36.77	**M3**	38.5	-1.73	4,7,8
WCDMA1700	1312	off	Standard	Intenna	22.45	32.11	31.15	29.87	**M4**	41.0	-11.13	None
WCDMA1700	1637	off	Standard	Intenna	22.47	35.89	34.81	30.84	**M4**	41.0	-10.16	None
WCDMA1700	1862	off	Standard	Intenna	22.38	41.87	40.61	32.17	**M4**	41.0	-8.83	None
WCDMA1900	9262	off	Standard	Intenna	22.45	34.06	34.40	30.73	**M4**	41.0	-10.27	None
WCDMA1900	9400	off	Standard	Intenna	22.43	35.78	36.14	31.16	**M4**	41.0	-9.84	None
WCDMA1900	9538	off	Standard	Intenna	22.33	33.82	34.16	30.67	**M4**	41.0	-10.33	None
GSM1900	810	On	Standard	Intenna	29.15	23.91	67.66	36.61	**M3**	38.5	-1.89	4,7,8
WCDMA1700	1862	On	Standard	Intenna	22.39	41.38	40.14	32.07	**M4**	41.0	-8.93	None

NOTES:

1. The test data reported are the worst-case HAC value with the test position set in a typical configuration. Test procedures used are according to ANSI C 63.19 (2007).
2. All modes of operation were investigated, and the worst-case results are reported.
3. Battery is fully charged for all readings.
4. *Power Measured ☑ Conducted
5. Battery Option ☑ Standard ☐ Extended ☐ Slim
6. Bluetooth deactivated (According to customer's request)

9.2 Measurement Results(H-field)

GSM H-FIELD EMISSIONS:

Mode	Channel	Back light	Battery	Antenna	Conducted Power at BS(dBm)	Time Avg. Field [A/m]	Peak Field [A/m]	Peak Field [dBA/m]	Category	FCC limit [dBA/m]	FCC Margin [dB]	Excl Blocks Per 4.4
H-field Emissions												
GSM850	128	off	Standard	Intenna	32.46	0.066	0.165	-15.65	**M4**	-1.9	-13.75	None
GSM850	190	off	Standard	Intenna	32.33	0.077	0.193	-14.29	**M4**	-1.9	-12.39	None
GSM850	251	off	Standard	Intenna	32.39	0.104	0.259	-11.73	**M4**	-1.9	-9.83	None
GSM1900	512	off	Standard	Intenna	29.05	0.070	0.184	-14.70	**M3**	-11.9	-2.80	None
GSM1900	661	off	Standard	Intenna	29.11	0.072	0.188	-14.52	**M3**	-11.9	-2.62	None
GSM1900	810	off	Standard	Intenna	29.07	0.057	0.149	-16.54	**M3**	-11.9	-4.64	None
WCDMA1700	1312	off	Standard	Intenna	22.43	0.100	0.096	-20.35	**M4**	-9.4	-10.95	None
WCDMA1700	1637	off	Standard	Intenna	22.49	0.111	0.107	-19.41	**M4**	-9.4	-10.01	None
WCDMA1700	1862	off	Standard	Intenna	22.37	0.110	0.106	-19.49	**M4**	-9.4	-10.09	None
WCDMA1900	9262	off	Standard	Intenna	22.44	0.099	0.095	-20.45	**M4**	-9.4	-11.05	None
WCDMA1900	9400	off	Standard	Intenna	22.40	0.093	0.089	-21.01	**M4**	-9.4	-11.61	None
WCDMA1900	9538	off	Standard	Intenna	22.35	0.085	0.082	-21.72	**M4**	-9.4	-12.32	None

NOTES:

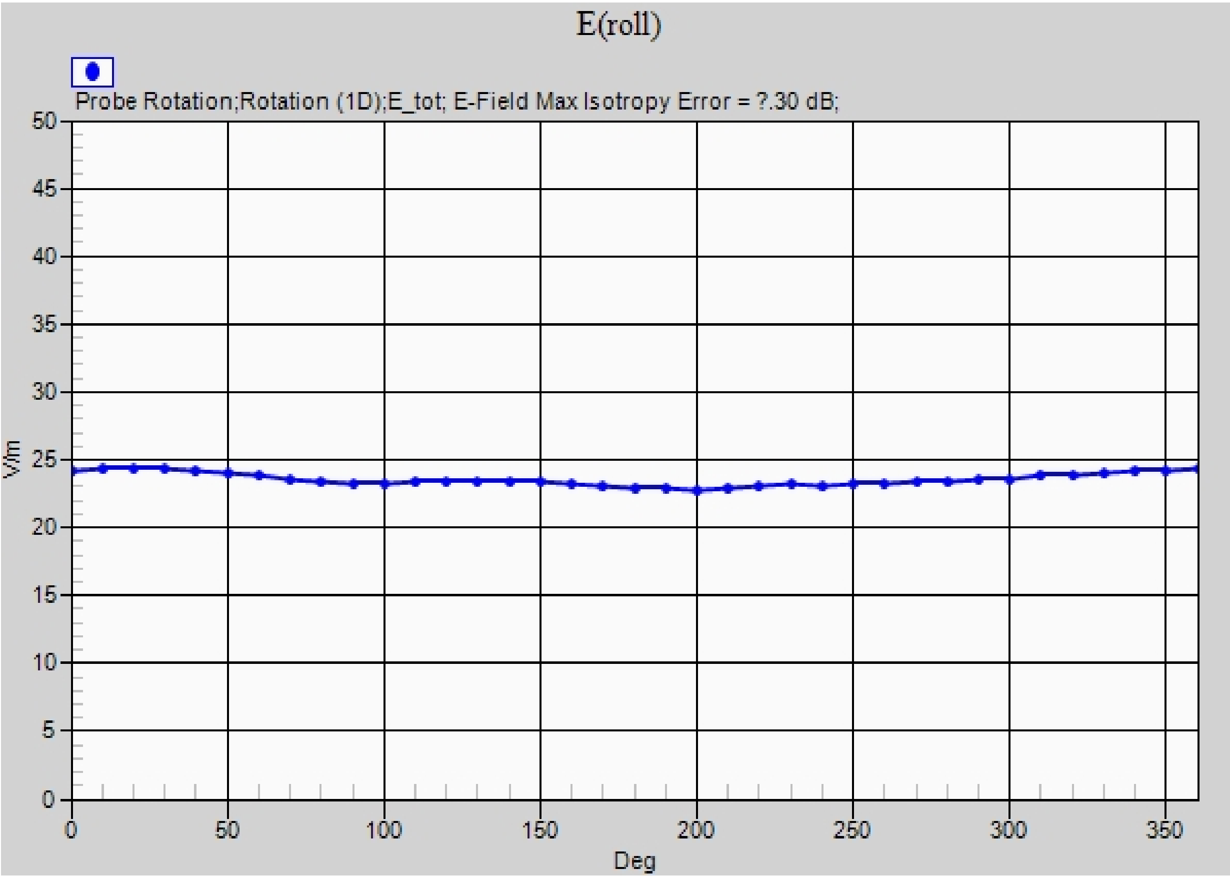
1. The test data reported are the worst-case HAC value with the test position set in a typical configuration. Test procedures used are according to ANSI C 63.19 (2007).
2. All modes of operation were investigated, and the worst-case results are reported.
3. Battery is fully charged for all readings.
4. *Power Measured ☑ Conducted
5. Battery Option ☑ Standard ☐ Extended ☐ Slim
6. Bluetooth deactivated (According to customer's request)

9.9 Worst-case Configuration Evaluation -

GSM1900 E-Field Emission

Mode	Channel	Back light	Battery	Antenna	Conducted Power at BS(dBm)	Time Avg. Field [A/m]	Peak Field [A/m]	Peak Field [dBA/m]	Category	FCC limit [dBA/m]	FCC Margin [dB]	Excl Blocks Per 4.4
E-field Emissions												
GSM1900	810	Off	Standard	Intenna	29.11	24.41	69.1	36.79	M3	38.50	-1.71	**4,7,8**

Peak Reading 360 degree Probe Rotation at Azimuth axis



Worst-Case Probe Rotation about Azimuth axis

Note: Location of probe rotation is shown in APPENDIX E

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APPENDIX A

Probe Modulation Factor

Measurement procedure

1. Modulated signal measurement: Connect the modulated signal with the correct frequency via the cable to the dipole.
2. Run the multimeter in the procedure with the corresponding modulation setting in continuous mode.
3. Adjust the signal amplitude to acheive the same field level display in the multimeter as during the WD field scan. Read the multimeter display and note it together with the probe ID,modulation type and frequency.
4. Read the peak envelope on the monitor in order to adjust the CW signal later to the same level.
5. Switch the signal source off and verify that the ambient and instrumentation noise level is at least 10dB lower.
6. CW measurement: Change the signal to CW at the same center frequency, without touching or moving the dipole or probe in the setup.
7. Adjust the CW signal amplitude to the same peak level on the monitor.
8. Run the multimeter in the CW procedure in continuous mode.
9. Read the multimeter display and note it together with the probe ID, modulation type and frequency.
10. Calculate the Probe Modulation Factor as the ratio between the CW multimeter field reading and the reading for the applicable modulation.
11. Perform the above setup and procedure for E-field and H-field probes.

Spectrum Analyzer setting.

1. Frequency Setting

ex) 835 MHz, 1880MHz, 2450 MHz

2. RBW/VBW/SPAN/Detector Setting.

	CW	GSM	CDMA	WCDMA	AM 80%
RBW	Same setting with modulated signal respectively.	1 MHz	3 MHz	5 MHz	1 MHz
VBW		1 MHz	3 MHz	5 MHz	1 MHz
SPAN		0 MHz	0 MHz	0 MHz	0 MHz
DETECTOR		Peak	Average	Average	Peak

3. Trigger: Video or IF trigger, adjusted to give a stable display of the transmission
4. Sweep rate: Sufficiently rapid to permit the transmit pulse to be resolved accurately.

APPENDIX B

ANSI C63.19 (2007)- Telephone near-field categories.

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

Table B.1 Telephone near-field categories in linear units.

Category	Telephone RF Parameters <960MHz				
Near Field	**AWF**	**E-Field Emissions**		**H-Field Emissions**	
Category M1/T1	0	56 to 61	**dB (V/m)**	+5.6 to +10.6	**dB (A/m)**
	-5	53.5 to 58.5	**dB (V/m)**	+3.1 to +8.1	**dB (A/m)**
Category M2/T2	0	51 to 56	**dB (V/m)**	+0.6 to +5.6	**dB (A/m)**
	-5	48.5 to 53.5	**dB (V/m)**	-1.9 to +3.1	**dB (A/m)**
Category M3/T3	0	46 to 51	**dB (V/m)**	-4.4 to +0.6	**dB (A/m)**
	-5	43.5 to 48.5	**dB (V/m)**	-6.9 to -1.9	**dB (A/m)**
Category M4/T4	0	<46	**dB (V/m)**	< -4.4	**dB (A/m)**
	-5	< 43.5	**dB (V/m)**	< -6.9	**dB (A/m)**
Category	**Telephone RF Parameters >960MHz**				
Near Field	**AWF**	**E-Field Emissions**		**H-Field Emissions**	
Category M1/T1	0	46 to 51	**dB (V/m)**	-4.4 to 0.6	**dB (A/m)**
	-5	43.5 to 48.5	**dB (V/m)**	-6.9 to -1.9	**dB (A/m)**
Category M2/T2	0	41 to 46	**dB (V/m)**	-9.4 to -4.4	**dB (A/m)**
	-5	38.5 to 43.5	**dB (V/m)**	-11.9 to -6.9	**dB (A/m)**
Category M3/T3	0	36 to 41	**dB (V/m)**	-14.4 to -9.4	**dB (A/m)**
	-5	33.5 to 38.5	**dB (V/m)**	-16.9 to -11.9	**dB (A/m)**
Category M4/T4	0	<36	**dB (V/m)**	<-14.4	**dB (A/m)**
	-5	<33.5	**dB (V/m)**	<-16.9	**dB (A/m)**

Table B.2 Telephone near-field categories in logarithmic units.

APPENDIX C

The Validation Measurements

Report Number : AI-043-M1

DUT: CD835V3; Serial: 1021

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)

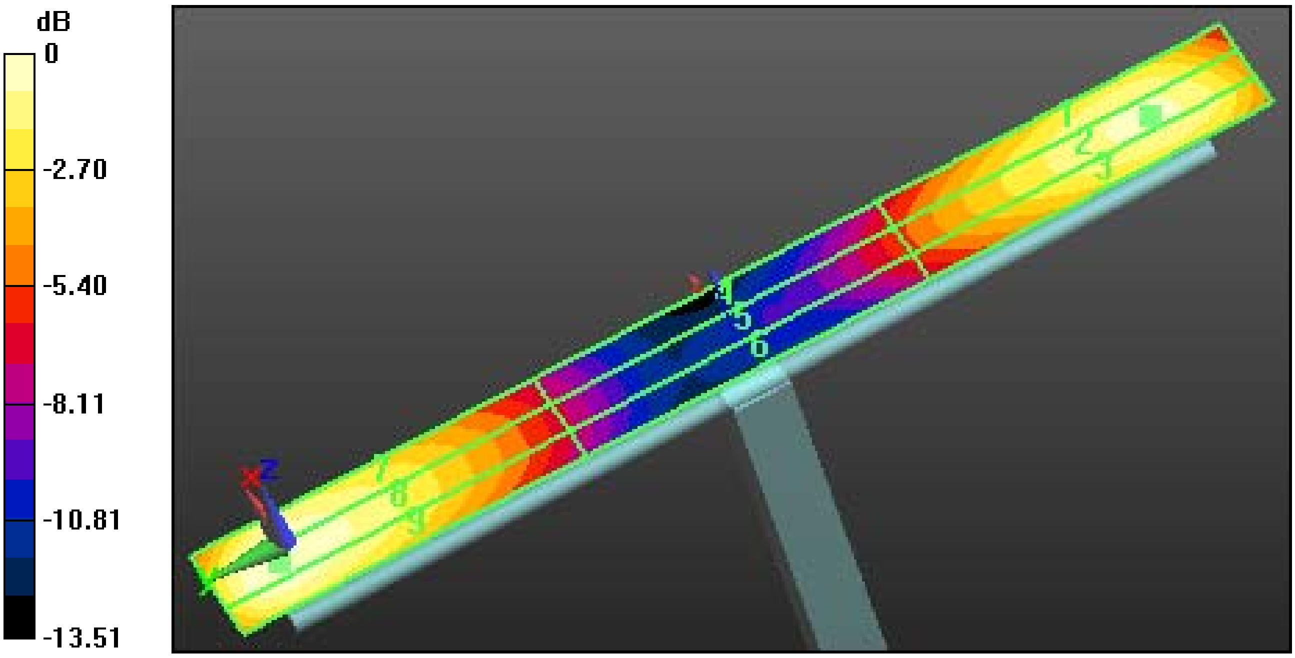
DASY5 Configuration:

- Probe: ER3DV6 - SN2370; ConvF(1, 1, 1); Calibrated: 2011-03-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

835MHz E-Field Validation (2011.06.13)/E Scan 10mm above Dipole/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 172.2 V/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 56.141 V/m; Power Drift = -0.02 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 156.0 M4	Grid 2 160.0 M4	Grid 3 157.4 M4
Grid 4 88.244 M4	Grid 5 90.223 M4	Grid 6 87.856 M4
Grid 7 168.2 M4	Grid 8 172.2 M4	Grid 9 167.1 M4



0 dB = 172.2V/m

DUT: CD1880V3; Serial: 1016

Communication System: CW; Frequency: 1880 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)

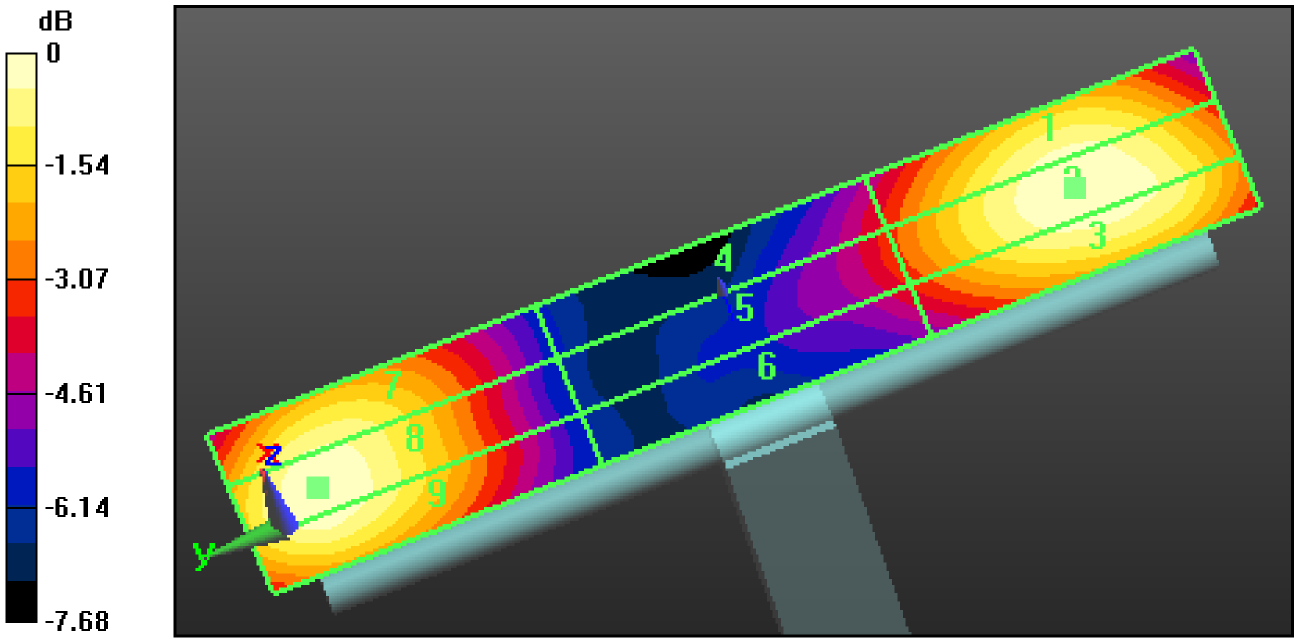
DASY5 Configuration:

- Probe: ER3DV6 - SN2370; ConvF(1, 1, 1); Calibrated: 2011-03-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

1880MHz E-Field Validation (2011.06.14)/E Scan 10mm above Dipole/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 134.8 V/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 71.591 V/m; Power Drift = -0.01 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak E-field in V/m

Grid 1 130.6 M2	Grid 2 134.3 M2	Grid 3 131.8 M2
Grid 4 91.495 M3	Grid 5 93.546 M3	Grid 6 90.012 M3
Grid 7 128.6 M2	Grid 8 134.8 M2	Grid 9 132.6 M2



0 dB = 134.8V/m

DUT: CD1880V3; Serial: 1016

Communication System: CW; 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)

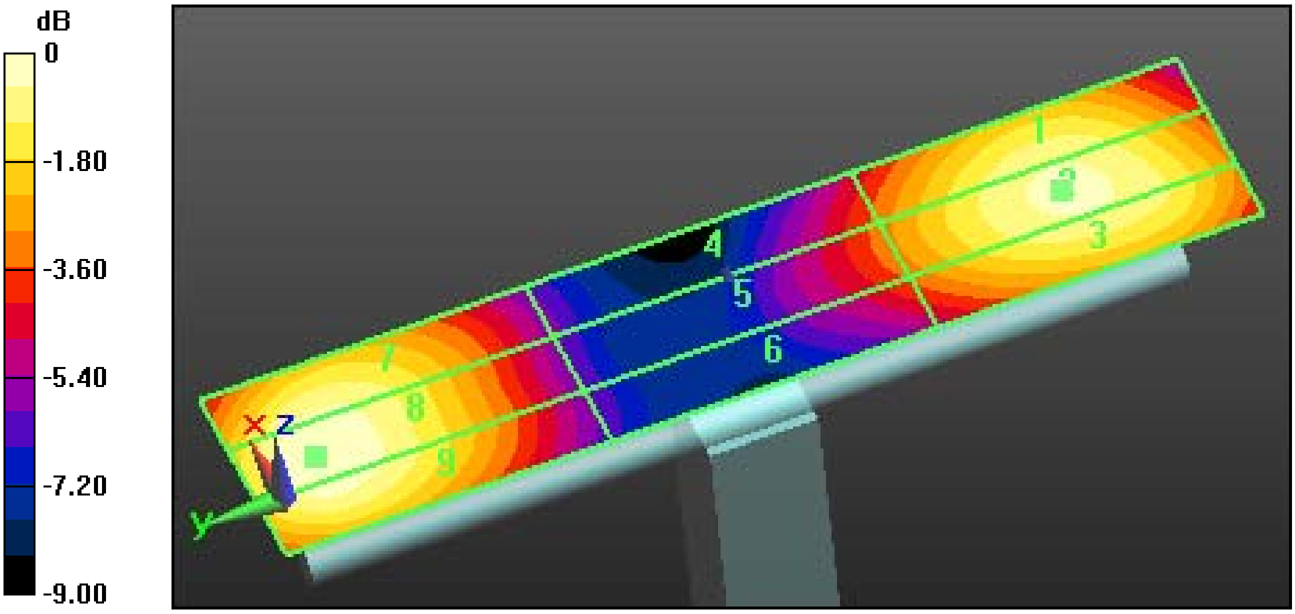
DASY5 Configuration:

- Probe: ER3DV6 - SN2370; ConvF(1, 1, 1); Calibrated: 2011-03-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

1730MHz E-Field Validation(2011.06.15)/E Scan 10mm above Dipole/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 150.5 V/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 70.570 V/m; Power Drift = 0.02 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak E-field in V/m

Grid 1 139.8 M2	Grid 2 143.5 M2	Grid 3 140.0 M2
Grid 4 102.7 M3	Grid 5 105.3 M3	Grid 6 101.4 M3
Grid 7 143.8 M2	Grid 8 150.5 M2	Grid 9 148.0 M2



0 dB = 150.5V/m

DUT: Dipole 835 MHz; Serial: 1021

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

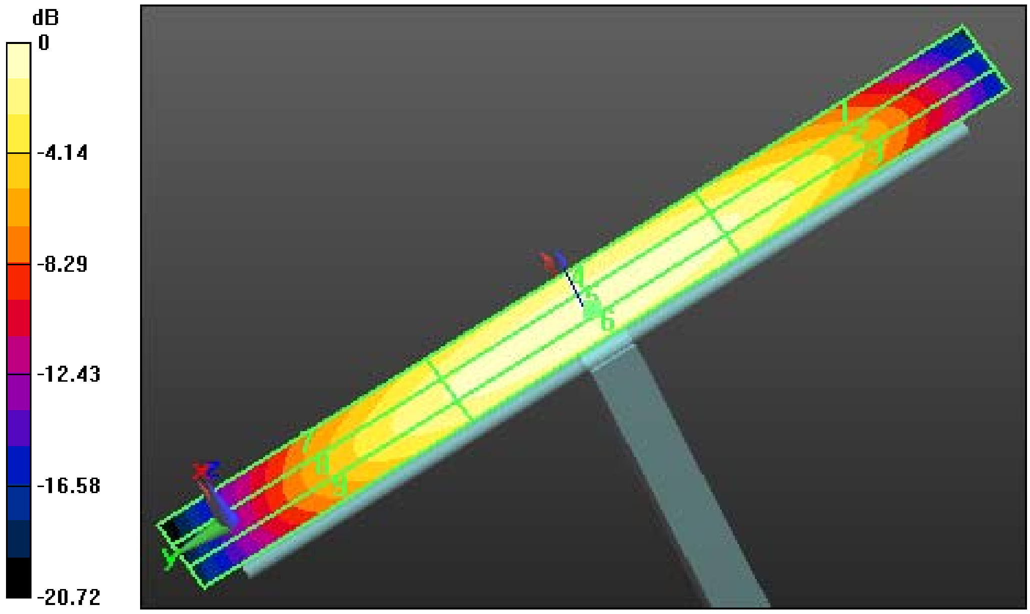
DASY5 Configuration:

- Probe: H3DV6 - SN6197; ; Calibrated: 2011-03-15
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

835MHz H-Field Validation (2011.06.13)/H Scan 10mm above Dipole/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.466 A/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.533 A/m; Power Drift = -0.05 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 0.380 M4	Grid 2 0.417 M4	Grid 3 0.411 M4
Grid 4 0.429 M4	Grid 5 0.466 M4	Grid 6 0.458 M4
Grid 7 0.378 M4	Grid 8 0.408 M4	Grid 9 0.401 M4



0 dB = 0.470A/m

DUT: CD1880V3; Serial: 1016

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

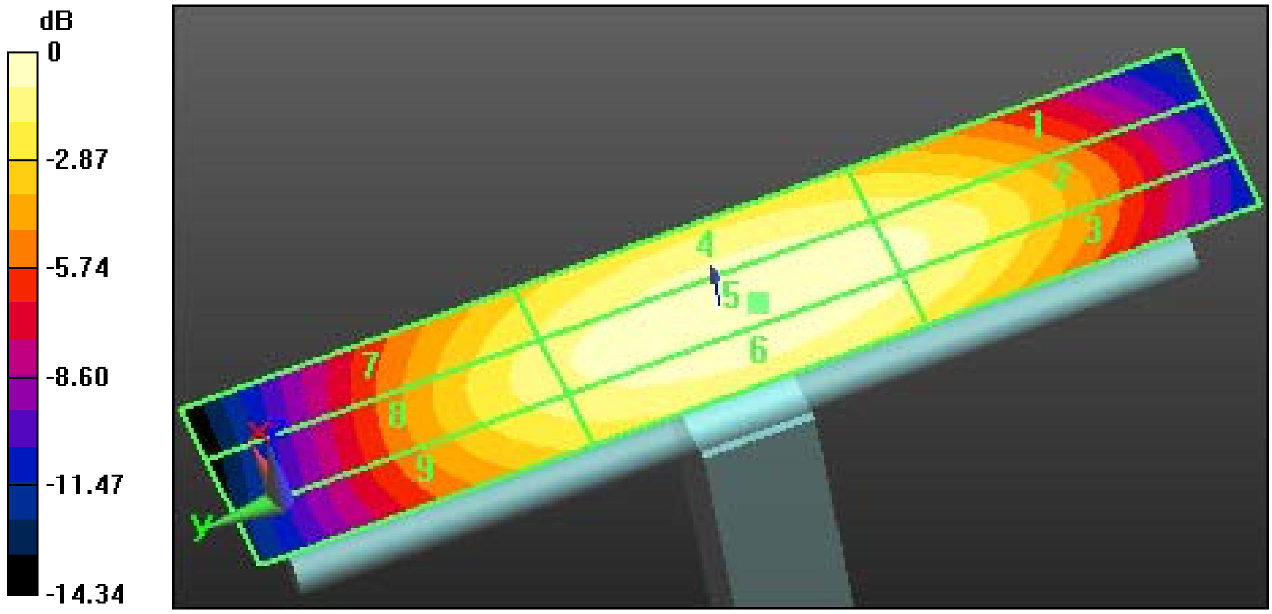
DASY5 Configuration:

- Probe: H3DV6 - SN6197; ; Calibrated: 2011-03-15
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

1880MHz H-Field Validation (2011.06.14)/H Scan 10mm above Dipole/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.442 A/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.503 A/m; Power Drift = -0.06 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak H-field in A/m

Grid 1 0.385 M2	Grid 2 0.415 M2	Grid 3 0.404 M2
Grid 4 0.414 M2	Grid 5 0.442 M2	Grid 6 0.432 M2
Grid 7 0.363 M2	Grid 8 0.385 M2	Grid 9 0.377 M2



0 dB = 0.440A/m

DUT: CD1880V3; Serial: 1016

Communication System: CW; 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)

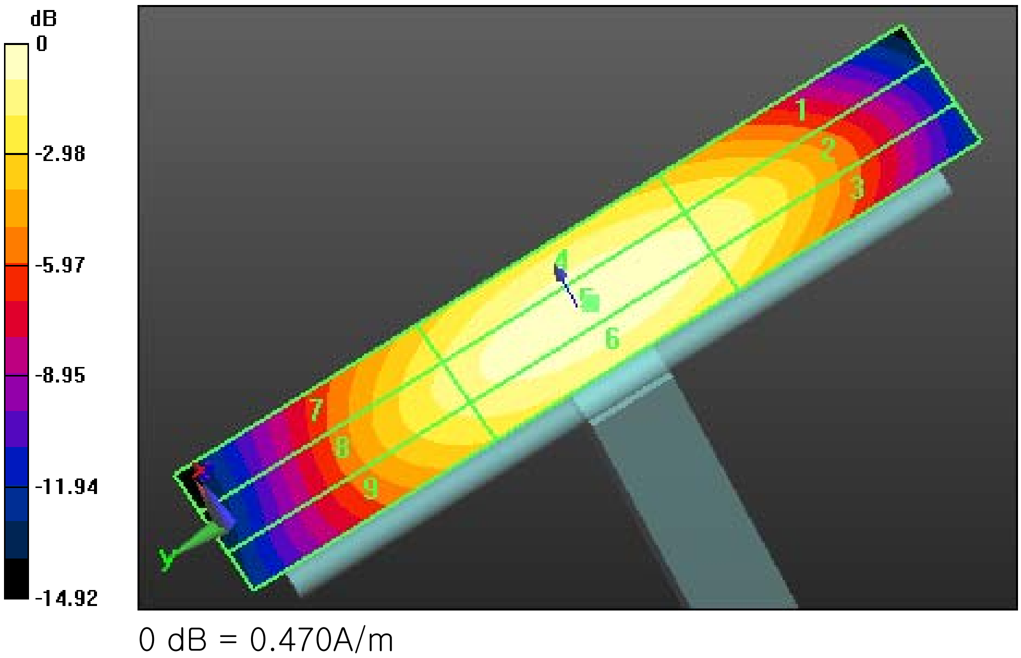
DASY5 Configuration:

- Probe: H3DV6 - SN6197; ; Calibrated: 2011-03-15
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

1730MHz H-Field Validation(2011.06.15)/H Scan 10mm above Dipole/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.467 A/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.539 A/m; Power Drift = -0.0027 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak H-field in A/m

Grid 1 0.391 M2	Grid 2 0.423 M2	Grid 3 0.411 M2
Grid 4 0.438 M2	Grid 5 0.467 M2	Grid 6 0.454 M2
Grid 7 0.377 M2	Grid 8 0.400 M2	Grid 9 0.392 M2



0 dB = 0.470A/m

APPENDIX D

Plots of The HAC Measurements

DUT: SGH-T379; Serial: FI-116-H

Communication System: GSM 850; Frequency: 848.8 MHz
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

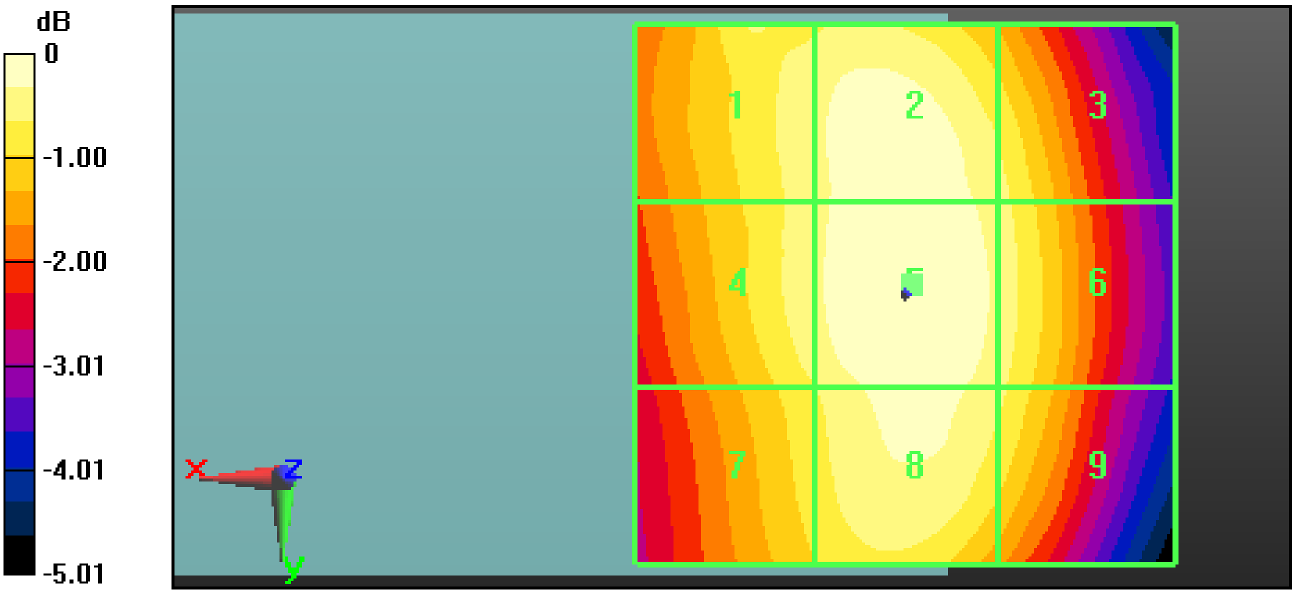
DASY5 Configuration:

- Probe: ER3DV6 - SN2370; ConvF(1, 1, 1); Calibrated: 2011-03-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 E-Field Test/Ch.0251, Ant. Intenna, Bat. Standard(2011.06.13)/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 124.0 V/m
Probe Modulation Factor = 2.700
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 60.883 V/m; Power Drift = 0.08 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak E-field in V/m

Grid 1 118.2 M4	Grid 2 123.2 M4	Grid 3 116.9 M4
Grid 4 118.4 M4	Grid 5 124.0 M4	Grid 6 118.3 M4
Grid 7 114.8 M4	Grid 8 121.7 M4	Grid 9 116.3 M4



0 dB = 124.0V/m

DUT: SGH-T379; Serial: FI-116-H

Communication System: GSM 850; Frequency: 848.8 MHz
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

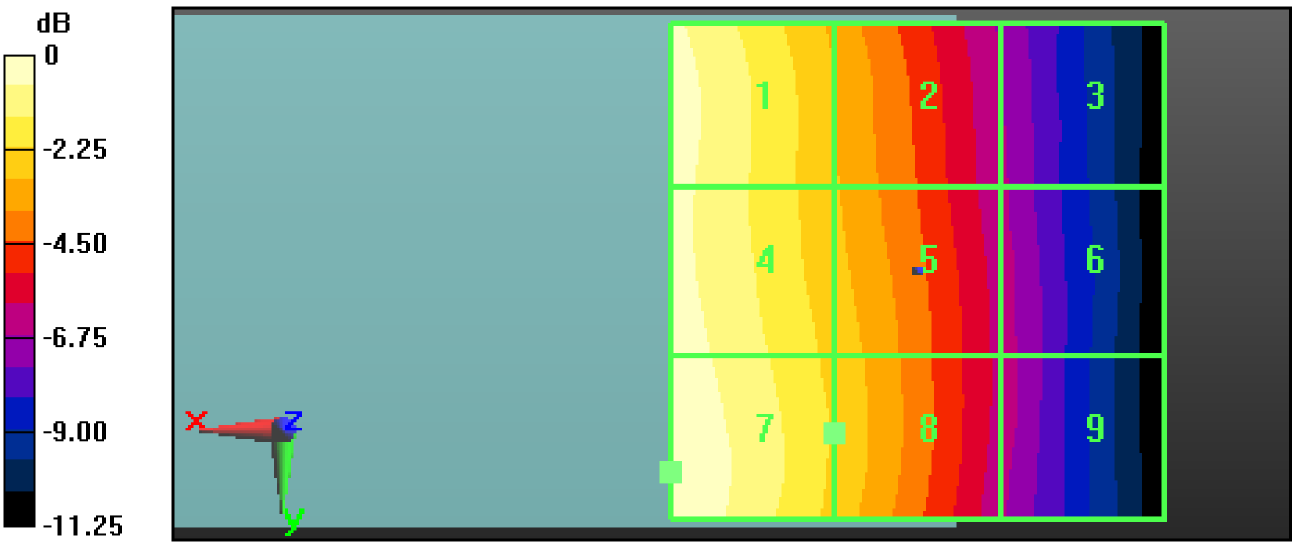
DASY5 Configuration:

- Probe: H3DV6 - SN6197; ; Calibrated: 2011-03-15
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 GSM H-Field Test(2011.06.13)/Ch.0251, Ant. Intenna, Bat. Standard/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.259 A/m
Probe Modulation Factor = 2.500
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.069 A/m; Power Drift = -0.05 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak H-field in A/m

Grid 1 0.249 M4	Grid 2 0.187 M4	Grid 3 0.122 M4
Grid 4 0.250 M4	Grid 5 0.195 M4	Grid 6 0.127 M4
Grid 7 0.259 M4	Grid 8 0.199 M4	Grid 9 0.127 M4



0 dB = 0.260A/m

DUT: SGH-T379; Serial: FI-116-H

Communication System: GSM 1900; Frequency: 1909.8 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)

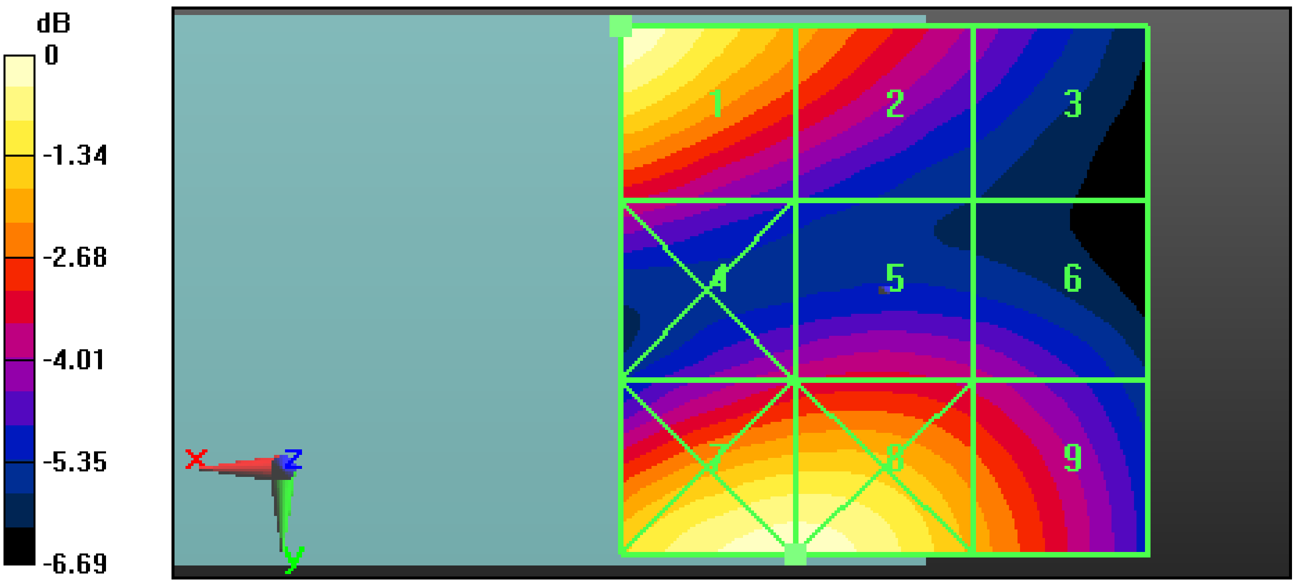
DASY5 Configuration:

- Probe: ER3DV6 - SN2370; ConvF(1, 1, 1); Calibrated: 2011-03-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 E-Field Test/Ch.0810, Ant. Intenna, Bat. Standard(2011.06.14)/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 68.966 V/m
Probe Modulation Factor = 2.830
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 12.239 V/m; Power Drift = -0.11 dB
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

Peak E-field in V/m

Grid 1 68.966 M3	Grid 2 55.237 M3	Grid 3 42.988 M4
Grid 4 46.378 M4	Grid 5 46.852 M4	Grid 6 44.686 M4
Grid 7 67.529 M3	Grid 8 67.511 M3	Grid 9 55.200 M3



0 dB = 68.970V/m

DUT: SGH-T379; Serial: FI-116-H

Communication System: GSM 1900; Frequency: 1880 MHz
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

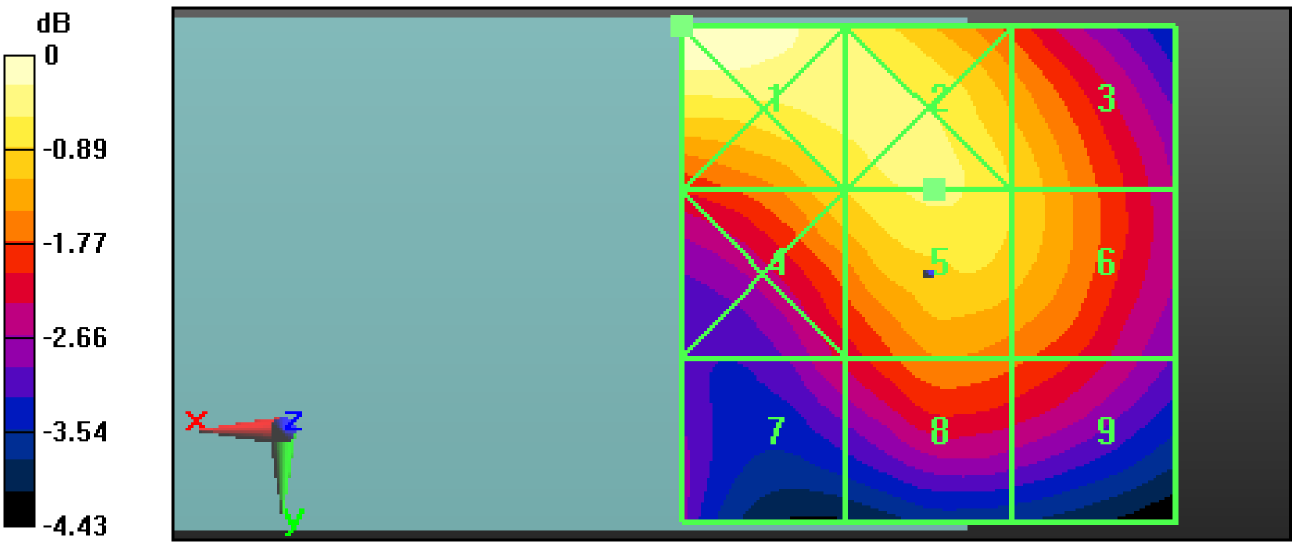
DASY5 Configuration:

- Probe: H3DV6 - SN6197; ; Calibrated: 2011-03-15
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 GSM H-Field Test(2011.06.14)/Ch.0661, Ant. Intenna, Bat. Standard/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.188 A/m
Probe Modulation Factor = 2.610
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.079 A/m; Power Drift = 0.03 dB
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

Peak H-field in A/m

Grid 1 0.200 M3	Grid 2 0.190 M3	Grid 3 0.181 M3
Grid 4 0.181 M3	Grid 5 0.188 M3	Grid 6 0.181 M3
Grid 7 0.154 M3	Grid 8 0.169 M3	Grid 9 0.165 M3



0 dB = 0.200A/m

DUT: SGH-T379; Serial: FI-116-H

Communication System: WCDMA Band4; Frequency: 1752.5 MHz
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

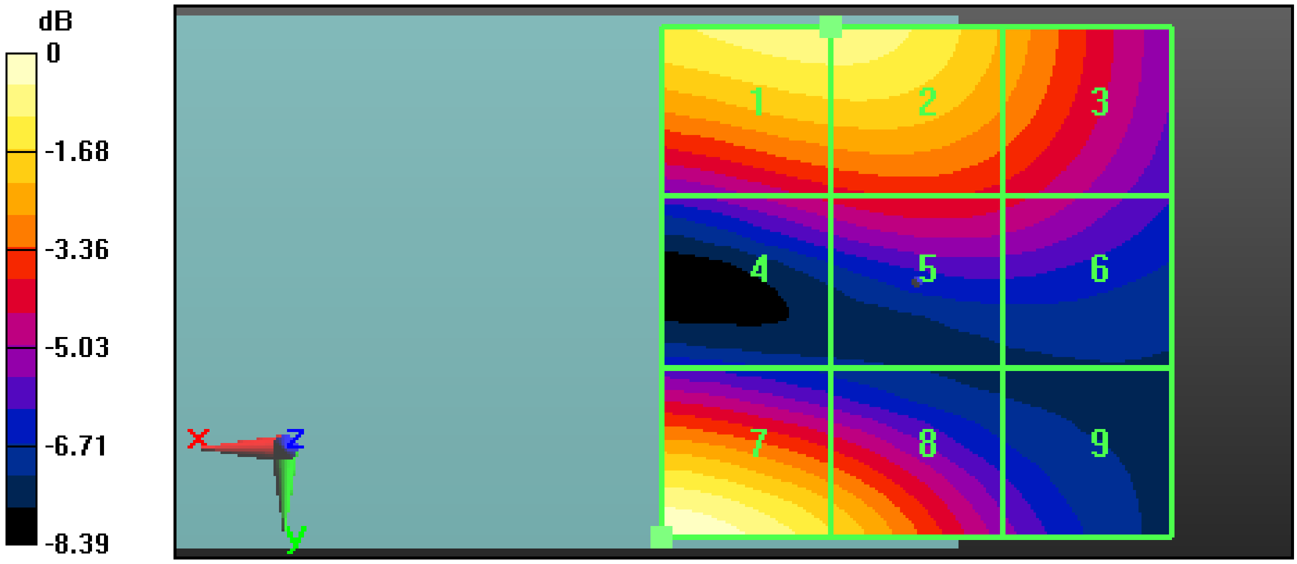
DASY5 Configuration:

- Probe: ER3DV6 - SN2370; ConvF(1, 1, 1); Calibrated: 2011-03-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 WCDMA1700 E-Field Test(2011.06.15)/Ch.1862, Ant. Intenna, Bat. Standard/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 40.614 V/m
Probe Modulation Factor = 0.970
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 21.193 V/m; Power Drift = -0.07 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 37.305 M4	Grid 2 37.261 M4	Grid 3 31.121 M4
Grid 4 24.989 M4	Grid 5 26.169 M4	Grid 6 25.141 M4
Grid 7 40.614 M4	Grid 8 33.941 M4	Grid 9 22.131 M4



0 dB = 40.610V/m

DUT: SGH-T379; Serial: FI-116-H

Communication System: WCDMA Band4; Frequency: 1732.4 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)

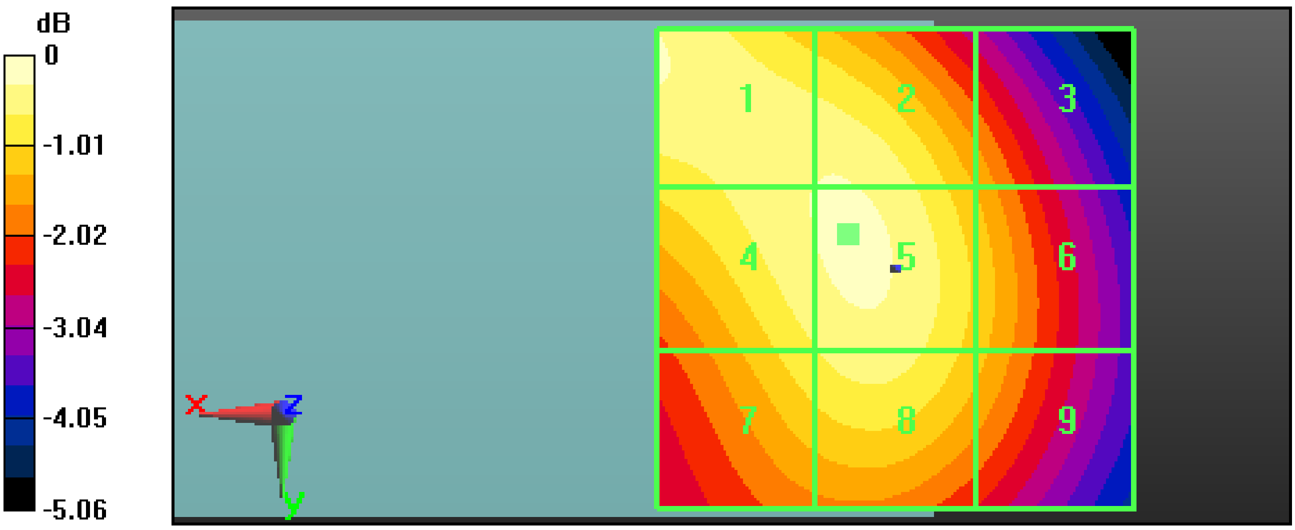
DASY5 Configuration:

- Probe: H3DV6 - SN6197; ; Calibrated: 2011-03-15
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 WCDMA1700 H-Field Test (2011.06.15)/Ch.1412, Ant. Intenna, Bat. Standard/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.107 A/m
Probe Modulation Factor = 0.960
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.128 A/m; Power Drift = -0.12 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 0.106 M4	Grid 2 0.106 M4	Grid 3 0.094 M4
Grid 4 0.106 M4	Grid 5 0.107 M4	Grid 6 0.097 M4
Grid 7 0.102 M4	Grid 8 0.104 M4	Grid 9 0.096 M4



0 dB = 0.110A/m

DUT: SGH-T379; Serial: FI-116-H

Communication System: W1900; Frequency: 1880 MHz
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

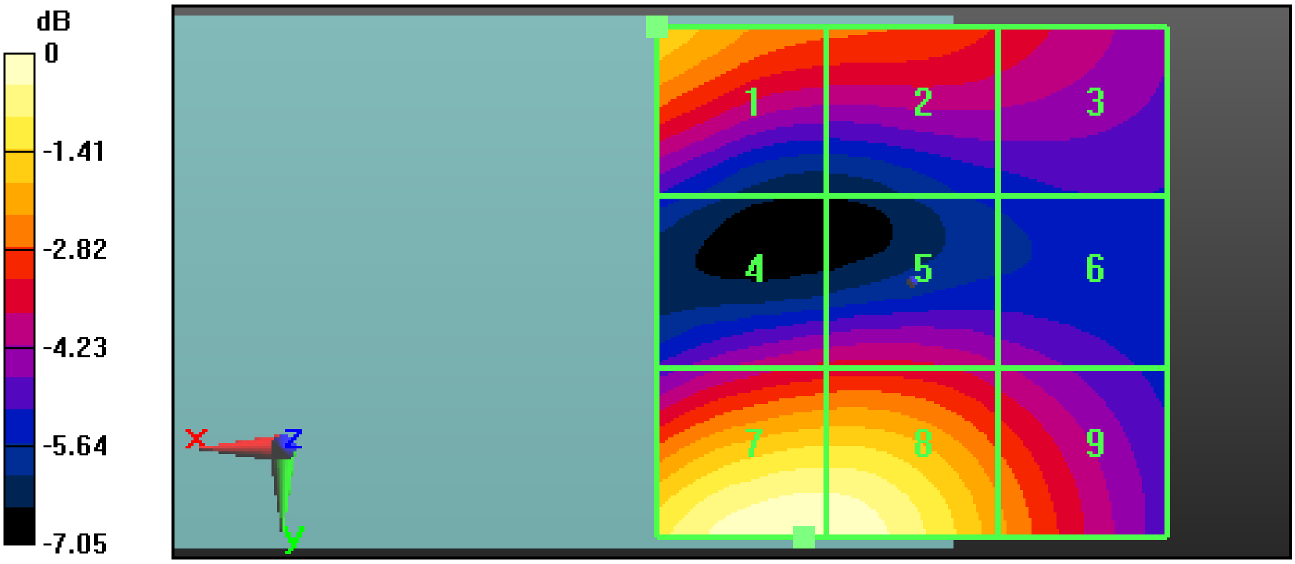
DASY5 Configuration:

- Probe: ER3DV6 - SN2370; ConvF(1, 1, 1); Calibrated: 2011-03-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 WCDMA1900 E-Field Test(2011.06.14)/Ch.9400, Ant. Intenna, Bat. Standard/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 36.135 V/m
Probe Modulation Factor = 1.010
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 16.545 V/m; Power Drift = 0.01 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 30.558 M4	Grid 2 26.598 M4	Grid 3 24.670 M4
Grid 4 24.007 M4	Grid 5 24.295 M4	Grid 6 22.515 M4
Grid 7 36.135 M4	Grid 8 35.994 M4	Grid 9 28.104 M4



0 dB = 36.140V/m

DUT: SGH-T379; Serial: FI-116-H

Communication System: W1900; Frequency: 1852.4 MHz
Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

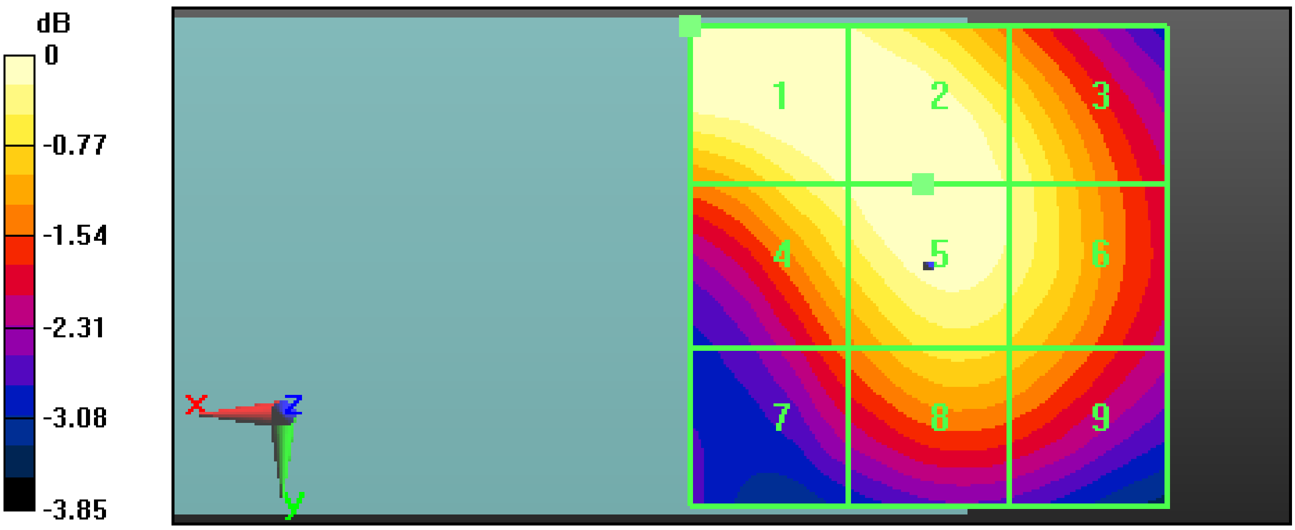
DASY5 Configuration:

- Probe: H3DV6 - SN6197; ; Calibrated: 2011-03-15
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1018
- Measurement SW: DASY52, Version 52.6 (0); SEMCAD X Version 14.4.2 (2595)

SGH-T379 WCDMA1900 H-Field Test (2011.06.14)/Ch.9262, Ant. Intenna, Bat. Standard/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.095 A/m
Probe Modulation Factor = 0.960
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.109 A/m; Power Drift = -0.14 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 0.095 M4	Grid 2 0.092 M4	Grid 3 0.087 M4
Grid 4 0.088 M4	Grid 5 0.091 M4	Grid 6 0.087 M4
Grid 7 0.077 M4	Grid 8 0.084 M4	Grid 9 0.082 M4



0 dB = 0.090A/m

APPENDIX E

Probe Calibration(E-field)

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

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

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

Accreditation No.: SCS 108

Client Samsung (Dymstec)

Certificate No: ER3-2370_Mar11

CALIBRATION CERTIFICATE

Object: ER3DV6 - SN:2370

Calibration procedure(s): QA CAL-02.v6, QA CAL-25.v3
Calibration procedure for E-field probes optimized for close near field evaluations in air

Calibration date: March 21, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ER3DV6	SN: 2328	4-Oct-10 (No. ER3-2328_Oct10)	Oct-11
DAE4	SN: 789	16-Feb-11 (No. DAE4-789_Feb11)	Feb-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: March 21, 2011

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

O.k to use 2011.6.13

Glossary:

NORMx,y,z	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
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.

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.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *Spherical isotropy (3D deviation from isotropy)*: in a locally homogeneous field realized using an open waveguide setup.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ER3DV6

SN:2370

Manufactured: October 12, 2005
Calibrated: March 21, 2011

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

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2370

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)	1.76	1.66	2.00	± 10.1 %
DCP (mV)[B]	96.7	97.9	100.6	

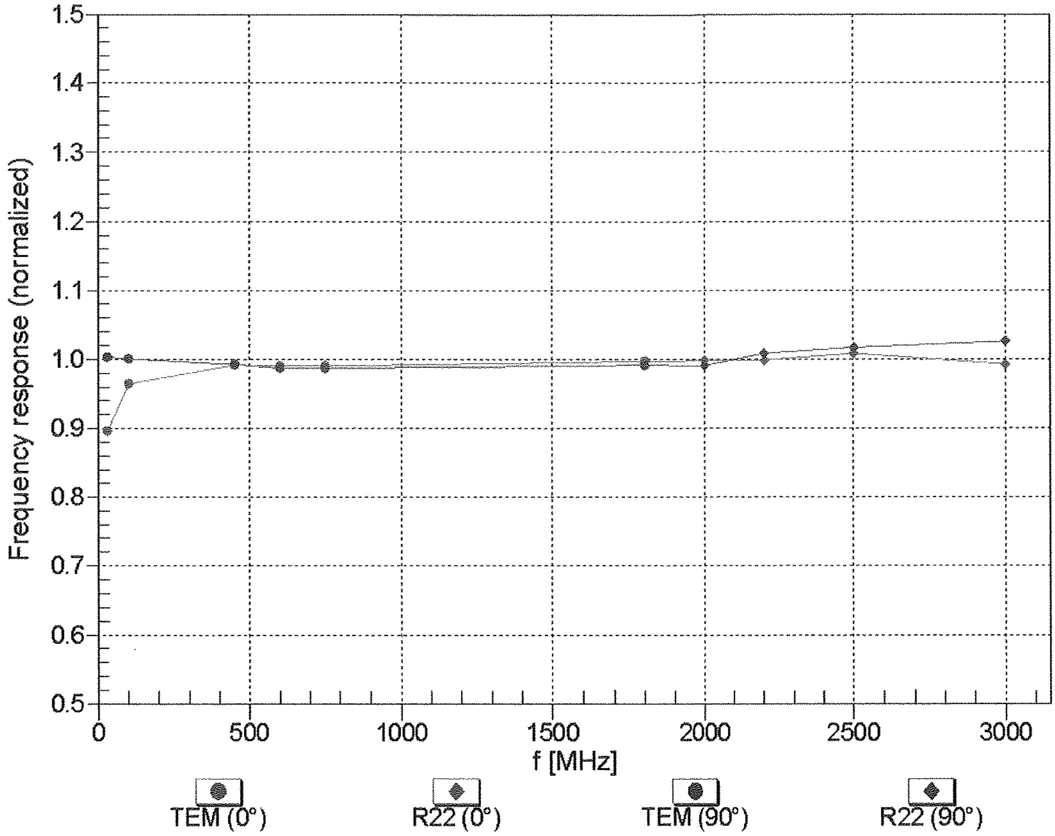
Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	93.5	±2.5 %
			Y	0.00	0.00	1.00	113.5	
			Z	0.00	0.00	1.00	115.6	

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.

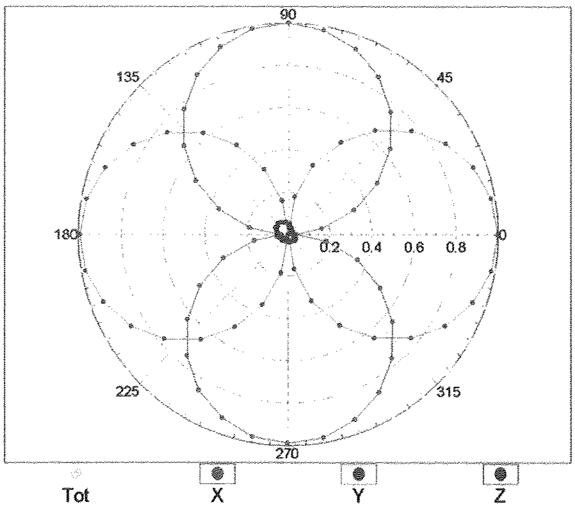
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



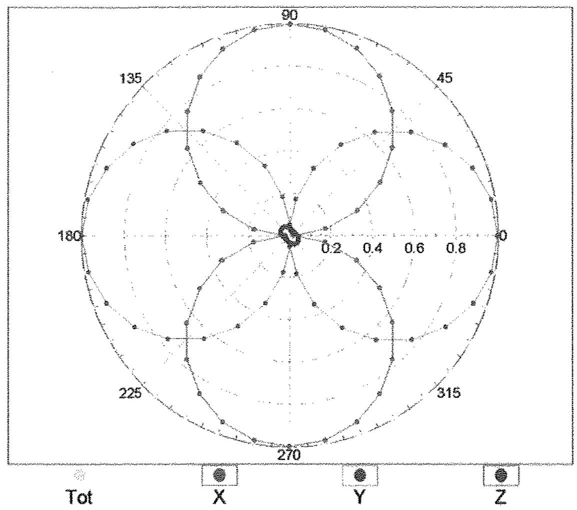
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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

f=600 MHz,TEM,0°

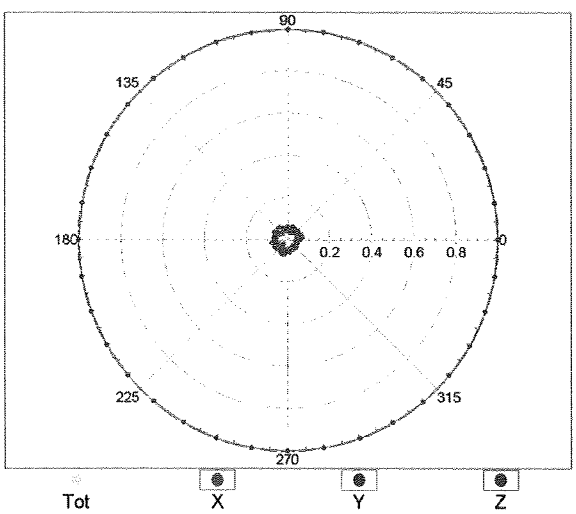


f=2500 MHz,R22,0°

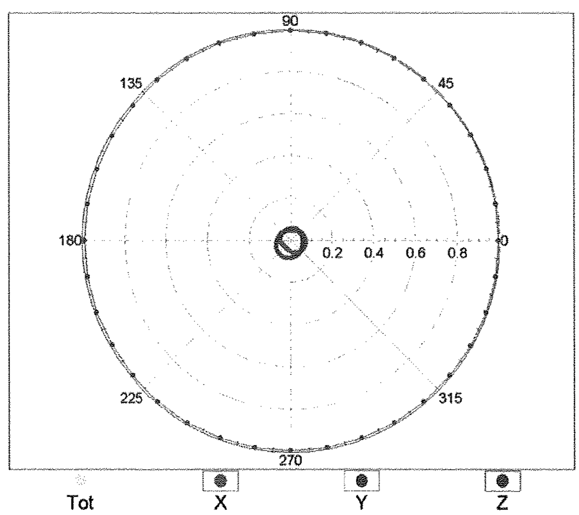


Receiving Pattern (ϕ), $\vartheta = 90°$

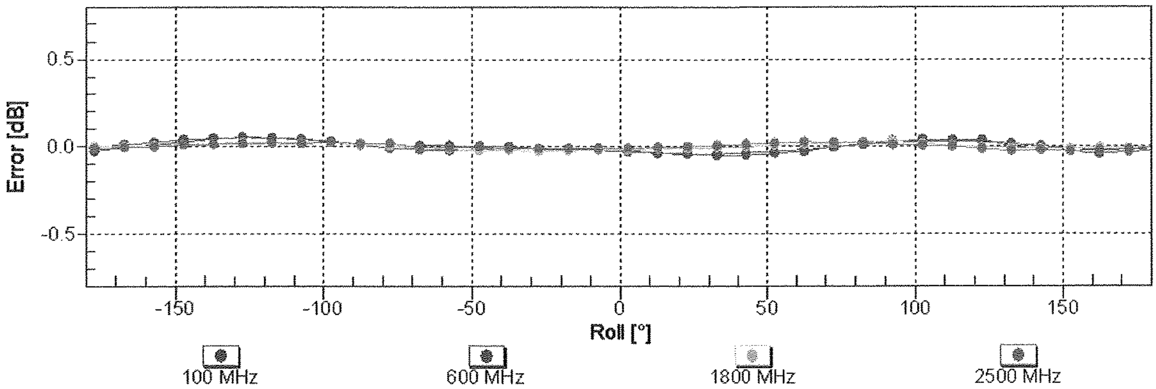
f=600 MHz,TEM,90°



f=2500 MHz,R22,90°

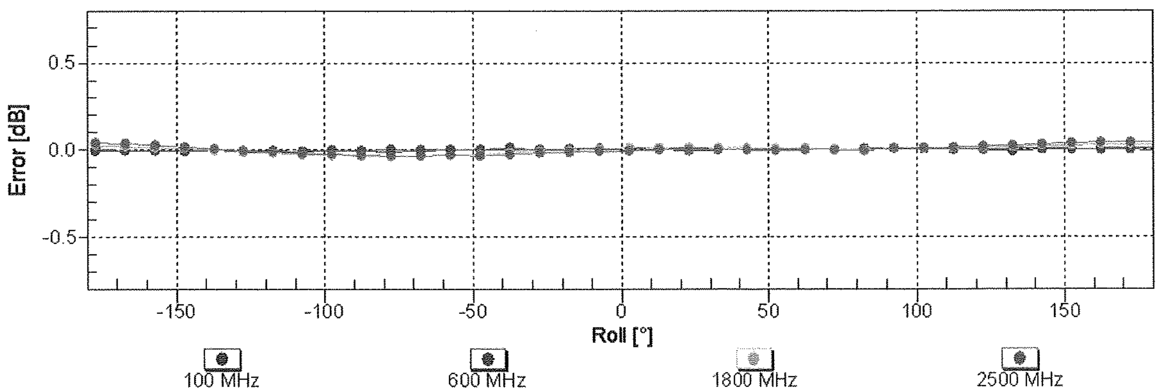


Receiving Pattern (ϕ), ϑ = 0°



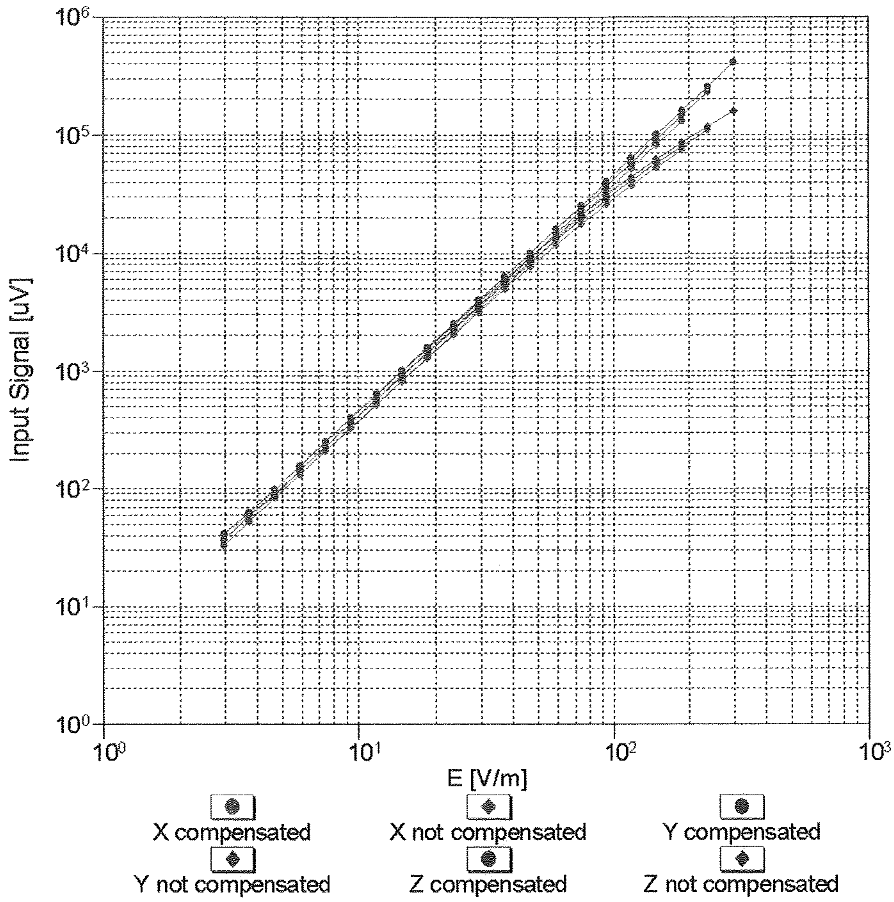
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

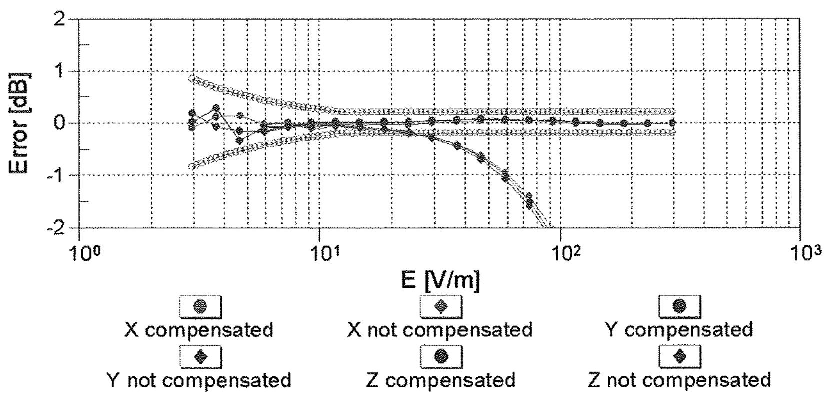
Receiving Pattern (ϕ), ϑ = 90°



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

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

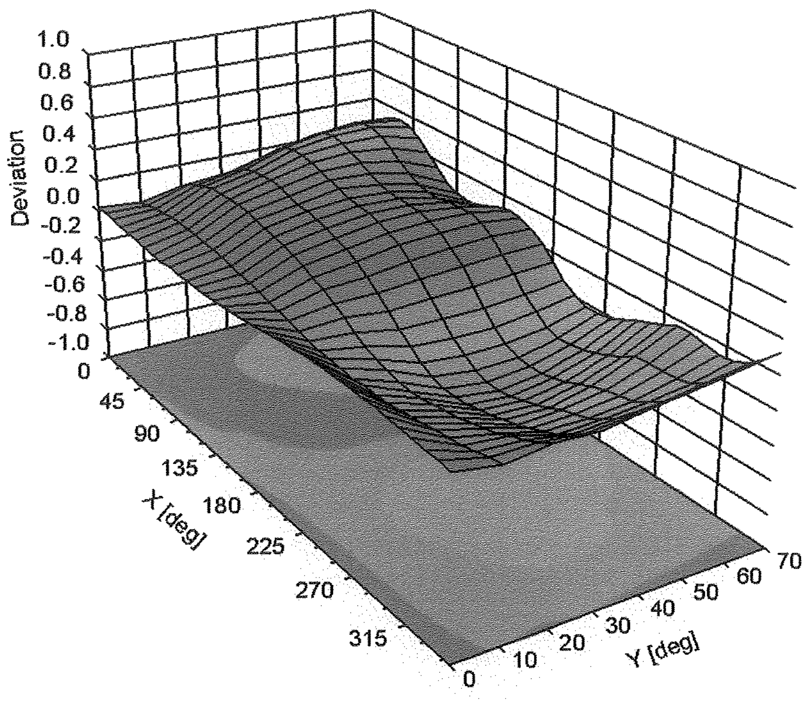


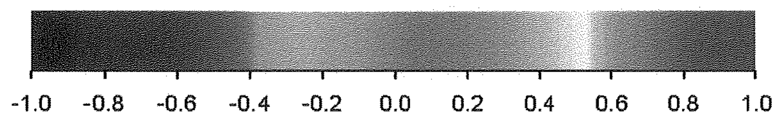


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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:2370

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	132.5
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

Probe Calibration(H-field)

Report Number : AI-043-M1

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 Samsung (Dymstec)

Certificate No: H3-6197_Mar11

CALIBRATION CERTIFICATE

Object: H3DV6 - SN:6197

Calibration procedure(s): QA CAL-03.v6, QA CAL-25.v3
Calibration procedure for H-field probes optimized for close near field evaluations in air

Calibration date: March 15, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe H3DV6	SN: 6182	4-Oct-10 (No. H3-6182_Oct10)	Oct-11
DAE4	SN: 789	16-Feb-11 (No. DAE4-789_Feb11)	Feb-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: March 18, 2011

O.K to use 2011.6.13

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

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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	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.

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.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *Spherical isotropy (3D deviation from isotropy)*: in a locally homogeneous field realized using an open waveguide setup.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *X_a0a1a2* (no uncertainty required).

Probe H3DV6

SN:6197

Manufactured: April 18, 2006
Calibrated: March 15, 2011

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

DASY/EASY - Parameters of Probe: H3DV6 - SN:6197

Basic Calibration Parameters

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / √(mV))	a0	2.42E-003	2.37E-003	2.83E-003	± 5.1 %
Norm (A/m / √(mV))	a1	1.77E-004	2.72E-004	4.03E-005	± 5.1 %
Norm (A/m / √(mV))	a2	1.25E-004	1.29E-004	1.16E-004	± 5.1 %
DCP (mV)[B]		91.6	92.6	94.6	

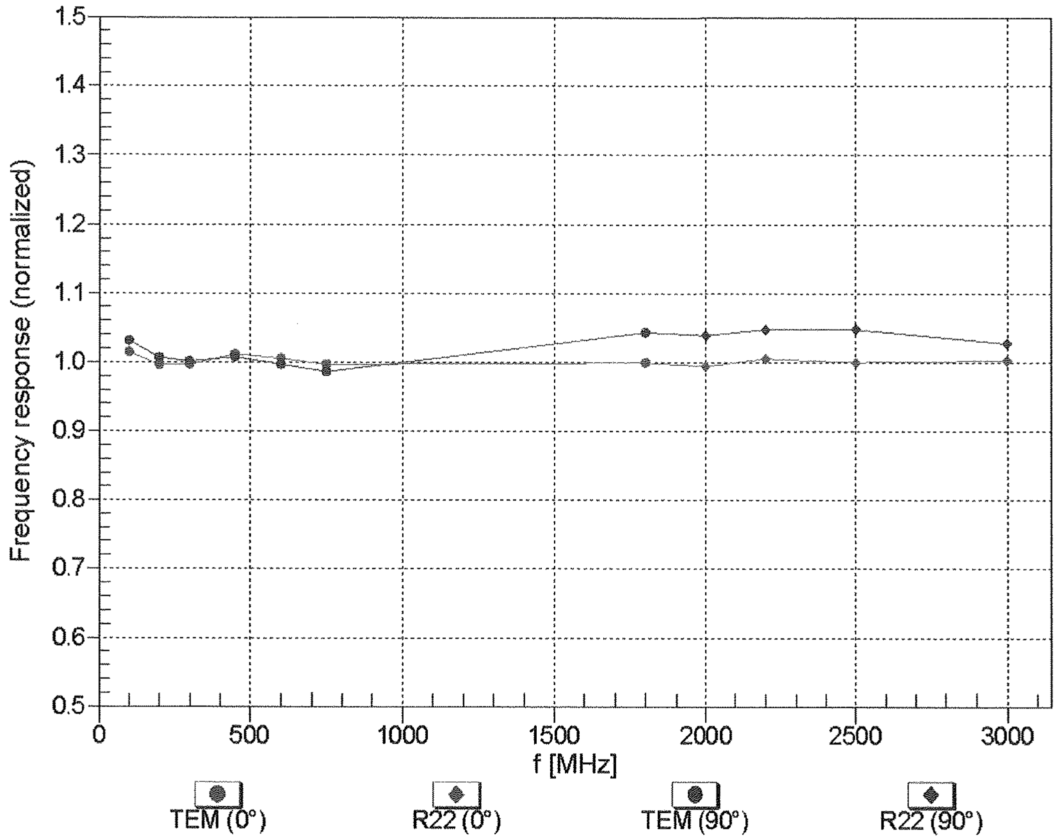
Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	93.3	±2.7 %
			Y	0.00	0.00	1.00	92.7	
			Z	0.00	0.00	1.00	96.8	

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.

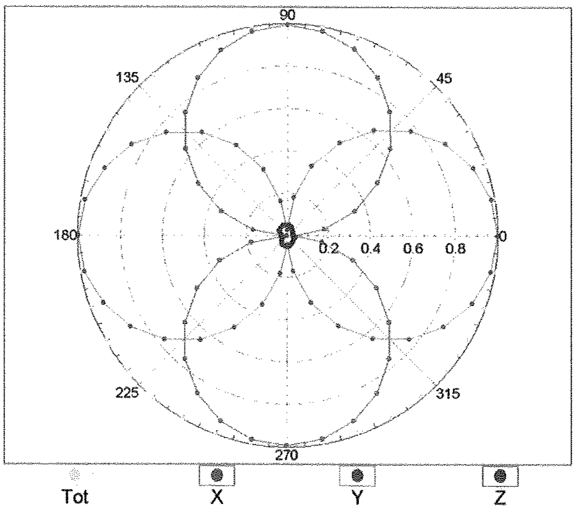
Frequency Response of H-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



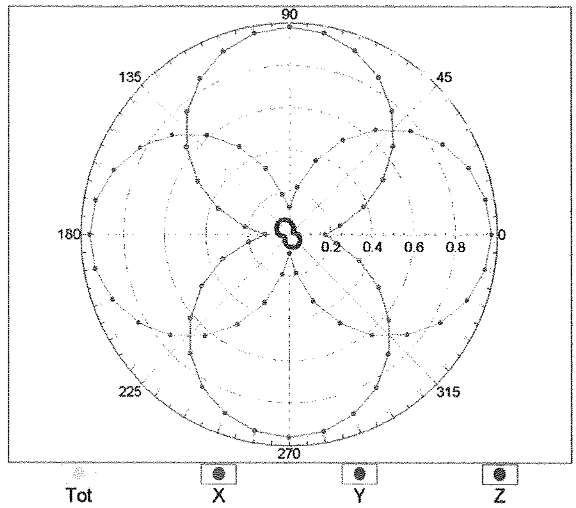
Uncertainty of Frequency Response of H-field: ± 6.3% (k=2)

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

f=600 MHz,TEM,0°

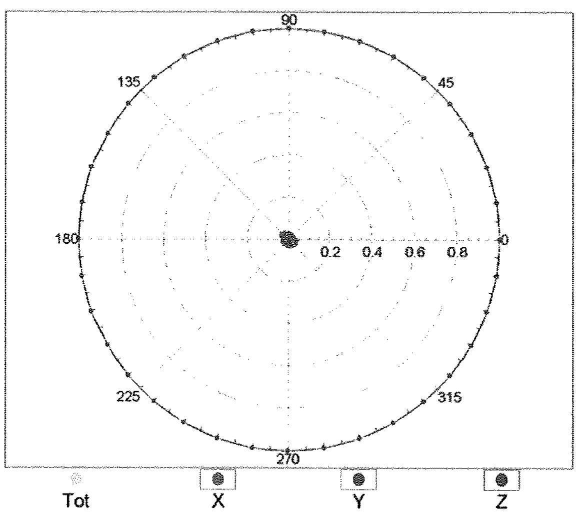


f=2500 MHz,R22,0°

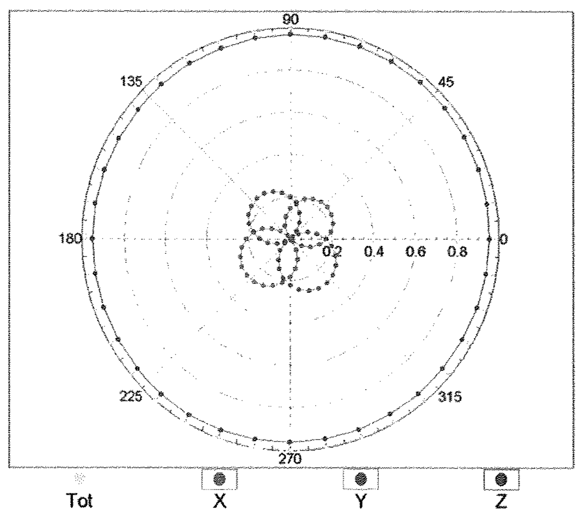


Receiving Pattern (ϕ), $\vartheta = 90°$

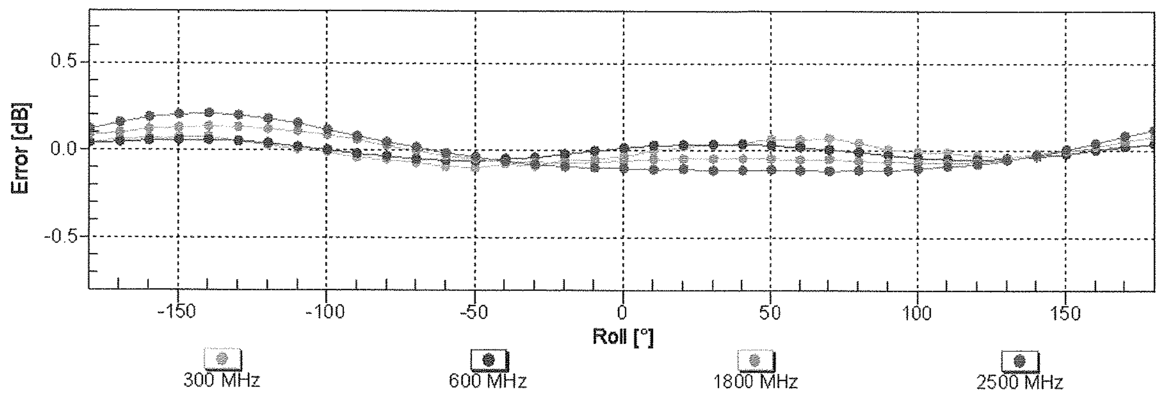
f=600 MHz,TEM,90°



f=2500 MHz,R22,90°

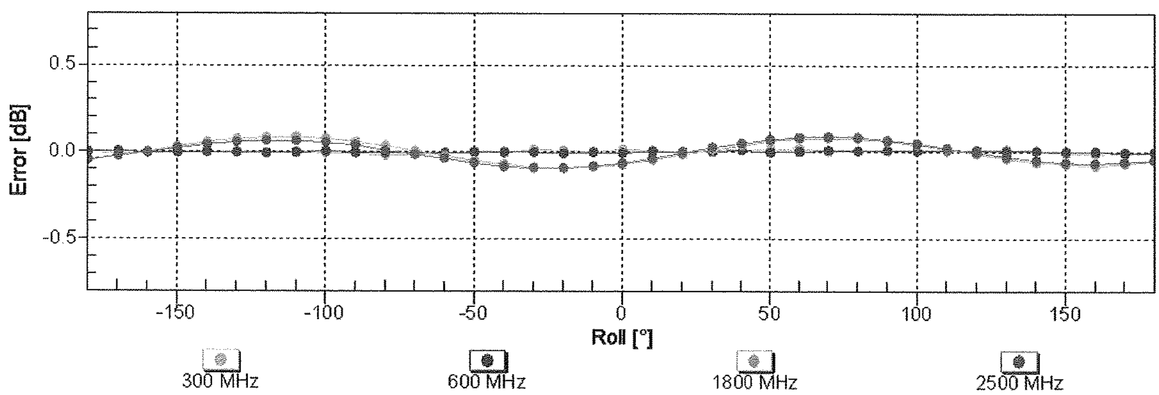


Receiving Pattern (ϕ), ϑ = 0°



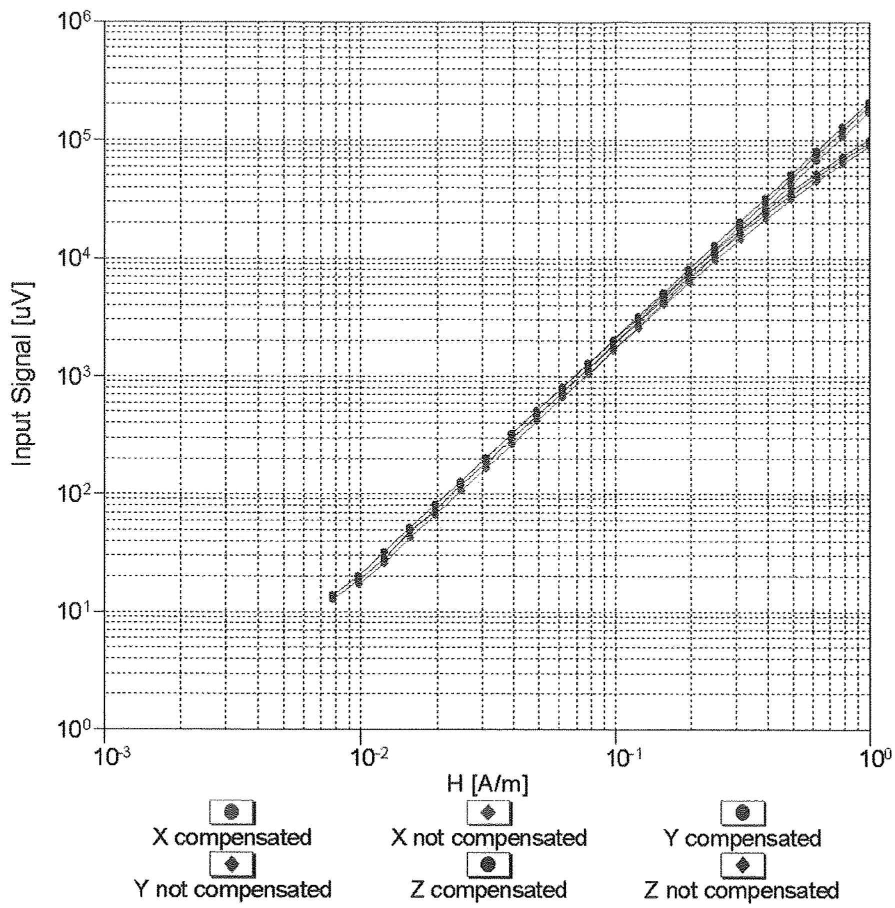
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

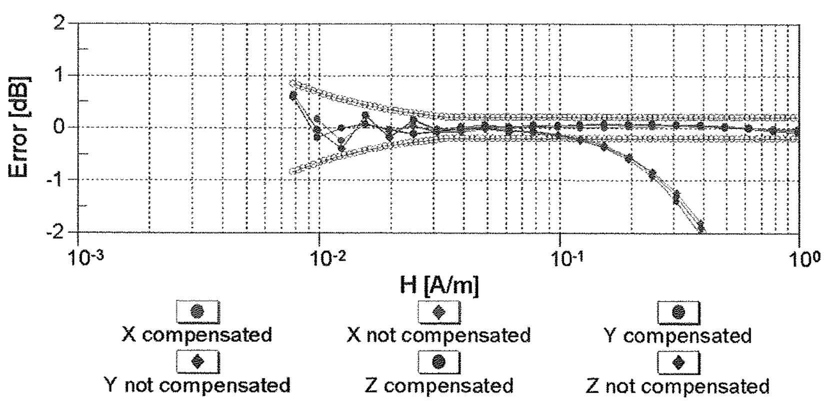
Receiving Pattern (ϕ), ϑ = 90°



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

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

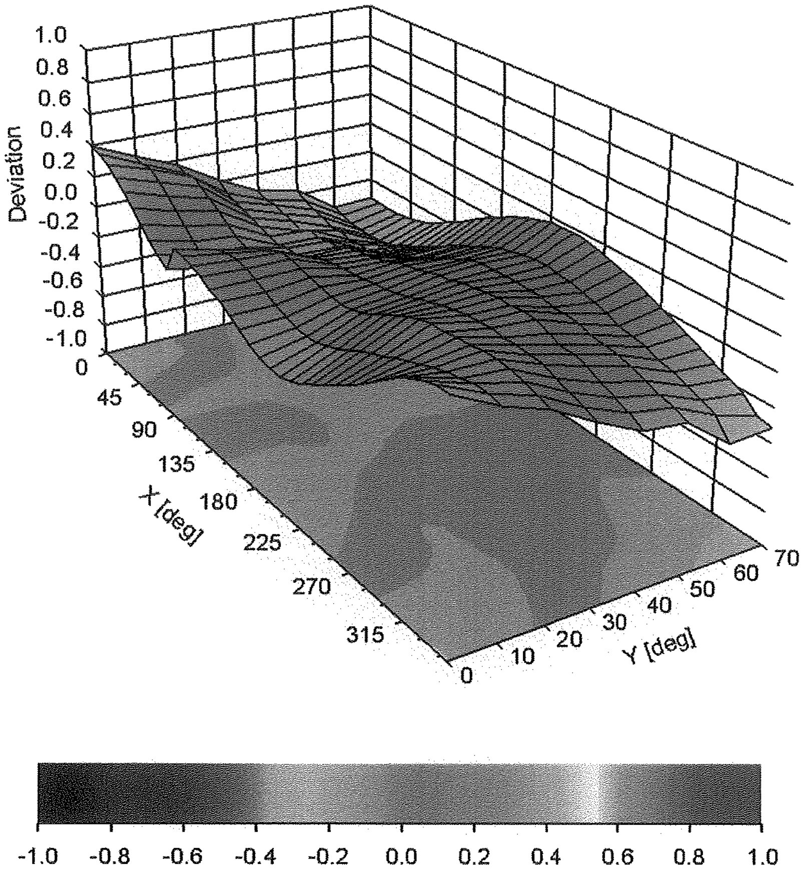




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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:6197

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	170.4
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

APPENDIX F

Calibration of The Validation Dipole

Report Number : AI-043-M1

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

ilac-MRA

SWISS CALIBRATION

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

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

Accreditation No.: SCS 108

Client **Samsung C (Dymstec)**

Certificate No: CD1880V3-1016_Mar11

CALIBRATION CERTIFICATE

Object	CD1880V3 - SN: 1016
Calibration procedure(s)	QA CAL-20.v5 Calibration procedure for dipoles in air
Calibration date:	March 15, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Probe ER3DV6	SN: 2336	29-Dec-10 (No. ER3-2336_Dec10)	Dec-11
Probe H3DV6	SN: 6065	29-Dec-10 (No. H3-6065_Dec10)	Dec-11
DAE4	SN: 781	20-Oct-10 (No. DAE4-781_Oct10)	Oct-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-09)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Fin Bomholt	Technical Director	

Issued: March 16, 2011

O.K to use
2011.5.27

References

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

Methods Applied and Interpretation of Parameters:

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

1. Measurement Conditions

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

DASY Version	DASY5	V52.6.2 (424)
DASY PP Version	SEMCAD X	V14.4.4 (2829)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 90 mm
Frequency	**1880 MHz** ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2. Maximum Field values

H-field 10 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured	100 mW forward power	**0.471 A/m**

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

E-field 10 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end	100 mW forward power	141.6 V/m
Maximum measured above low end	100 mW forward power	136.7 V/m
Averaged maximum above arm	100 mW forward power	**139.2 V/m**

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

3. Appendix

3.1 Antenna Parameters

Frequency	**Return Loss**	**Impedance**
1730 MHz	24.2 dB	(52.2 + j5.9) Ohm
1880 MHz	**22.2 dB**	**(49.8 + j7.8) Ohm**
1900 MHz	22.2 dB	(52.5 + j7.6) Ohm
1950 MHz	34.0 dB	(52.0 + j0.2) Ohm
2000 MHz	20.0 dB	(41.2 + j2.1) Ohm

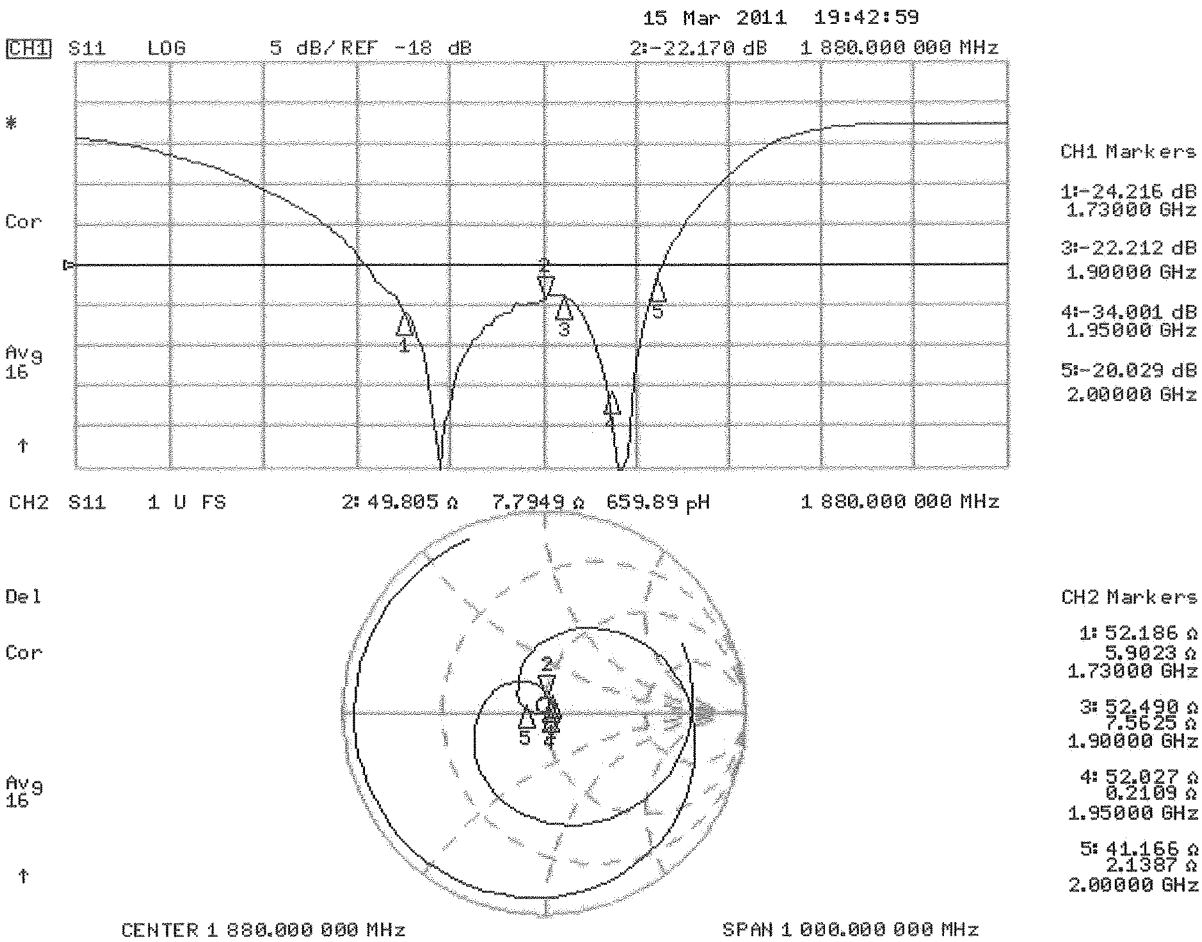
3.2 Antenna Design and Handling

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

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

3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



3.3.2 DASY4 H-Field Result

Date/Time: 15.03.2011 17:11:00

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1016_H_110315_CL

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1016

Communication System: CW; Frequency: 1880 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)

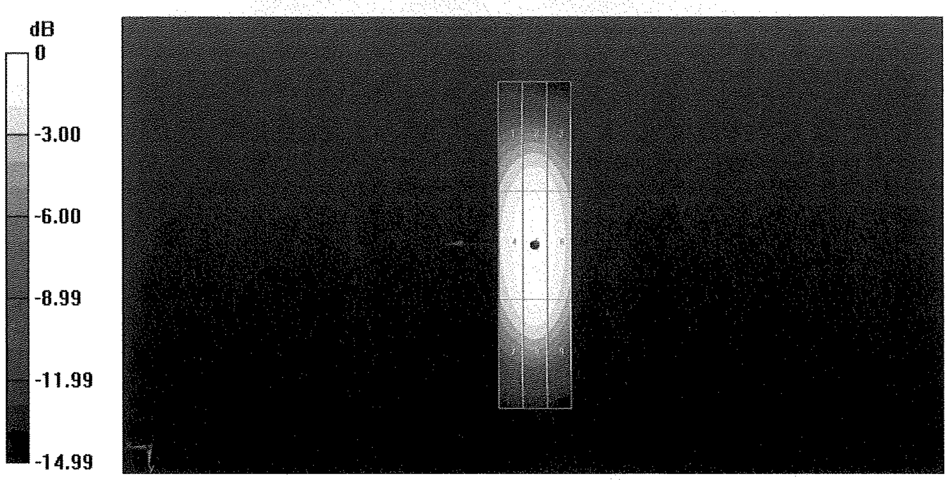
DASY5 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

Dipole H-Field measurement @ 1880MHz/H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.471 A/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.499 A/m; Power Drift = 0.02 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.411 M2**	Grid 2 **0.429 M2**	Grid 3 **0.409 M2**
Grid 4 **0.450 M2**	Grid 5 **0.471 M2**	Grid 6 **0.449 M2**
Grid 7 **0.412 M2**	Grid 8 **0.435 M2**	Grid 9 **0.411 M2**



0 dB = 0.470A/m

3.3.3 DASY4 E-Field Result

Date/Time: 15.03.2011 15:05:06

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1016_E_110315_CL

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1016

Communication System: CW; Frequency: 1880 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)

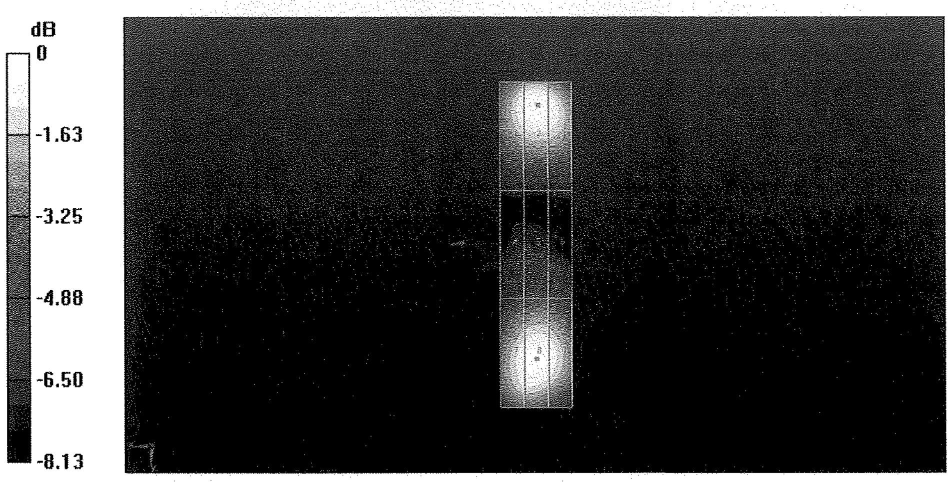
DASY5 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

Dipole E-Field measurement @ 1880MHz/E Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 141.6 V/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 135.5 V/m; Power Drift = 0.01 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **134.0 M2**	Grid 2 **141.6 M2**	Grid 3 **137.0 M2**
Grid 4 **88.457 M3**	Grid 5 **92.910 M3**	Grid 6 **90.833 M3**
Grid 7 **132.7 M2**	Grid 8 **136.7 M2**	Grid 9 **132.4 M2**



0 dB = 141.6V/m

4. Additional Measurements

4.1 Measurement Conditions

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

DASY Version	DASY5	V52.6.2 (424)
DASY PP Version	SEMCAD X	V14.4.4 (2829)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 90 mm
Frequency	**1730 MHz** ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

4.1.1 Maximum Field values

H-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured	100 mW forward power	**0.488 A/m**

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

E-field 10 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end	100 mW forward power	149.4 V/m
Maximum measured above low end	100 mW forward power	145.9 V/m
Averaged maximum above arm	100 mW forward power	**147.7 V/m**

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

4.1.2 DASY4 H-field result

Date/Time: 15.03.2011 17:05:04

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1016_H_1730_110315_CL

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1016

Communication System: CW; 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)

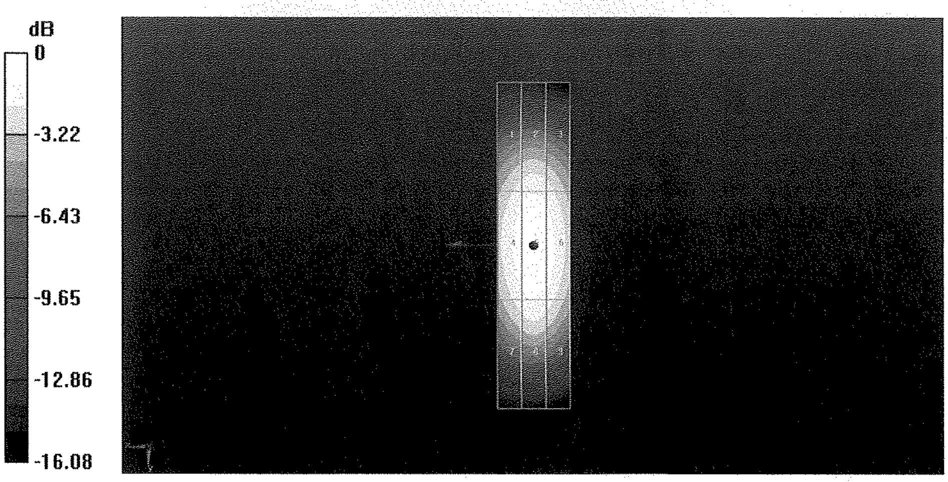
DASY5 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

Dipole H-Field measurement @ 1880MHz/H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm @ 1730 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.488 A/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.519 A/m; Power Drift = 0.02 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.405 M2**	Grid 2 **0.425 M2**	Grid 3 **0.407 M2**
Grid 4 **0.462 M2**	Grid 5 **0.488 M2**	Grid 6 **0.466 M2**
Grid 7 **0.410 M2**	Grid 8 **0.435 M2**	Grid 9 **0.411 M2**



0 dB = 0.490A/m

4.1.3 DASY4 E-field result

Date/Time: 15.03.2011 15:14:58

Test Laboratory: SPEAG Lab2

HAC_RF_CD1880_1016_E_1730_110315_CL

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1016

Communication System: CW; 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)

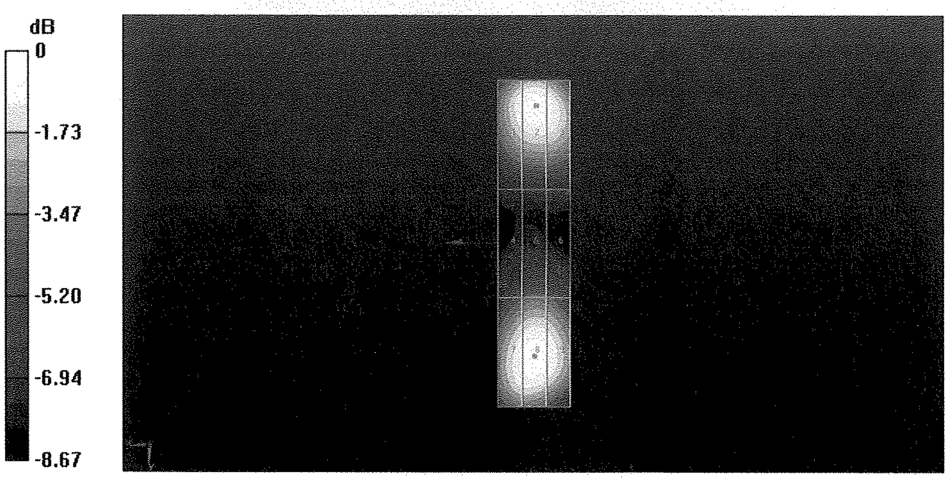
DASY5 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

Dipole E-Field measurement @ 1880MHz/E Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm @ 1730 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 149.4 V/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 144.7 V/m; Power Drift = 0.01 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **140.4 M2**	Grid 2 **149.4 M2**	Grid 3 **145.2 M2**
Grid 4 **99.237 M3**	Grid 5 **104.6 M3**	Grid 6 **102.5 M3**
Grid 7 **140.9 M2**	Grid 8 **145.9 M2**	Grid 9 **141.9 M2**



0 dB = 149.4V/m

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

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

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

Accreditation No.: SCS 108

Client **Samsung (Dymstec)**

Certificate No: CD835V3-1021_Apr11

CALIBRATION CERTIFICATE

Object	CD835V3 - SN: 1021
Calibration procedure(s)	QA CAL-20.v5 Calibration procedure for dipoles in air
Calibration date:	April 12, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Probe ER3DV6	SN: 2336	29-Dec-10 (No. ER3-2336_Dec10)	Dec-11
Probe H3DV6	SN: 6065	29-Dec-10 (No. H3-6065_Dec10)	Dec-11
DAE4	SN: 781	20-Oct-10 (No. DAE4-781_Oct10)	Oct-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Power sensor HP 8482H	SN: 3318A09450	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-10)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11
RF generator E4433B	MY 41000675	03-Nov-04 (in house check Oct-09)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Fin Bomholt	R&D Director	F. Bomholt

Issued: April 12, 2011

O.k to use 2011.6.13

References

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

Methods Applied and Interpretation of Parameters:

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

1 Measurement Conditions

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

DASY Version	DASY5	V52.6.2 (424)
DASY PP Version	SEMCAD X	V14.4.4 (2829)
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 180 mm
Frequency	**835 MHz** ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2 Maximum Field values

H-field 10 mm above dipole surface	condition	**interpolated maximum**
Maximum measured	100 mW forward power	**0.468 A/m**

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

E-field 10 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end-	100 mW forward power	172.1 V/m
Maximum measured above low end	100 mW forward power	170.8 V/m
Averaged maximum above arm	100 mW forward power	**171.5 V/m**

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

3 Appendix

3.1 Antenna Parameters

Frequency	**Return Loss**	**Impedance**
800 MHz	15.9 dB	(42.1 – j12.6) Ohm
835 MHz	**23.3 dB**	**(49.1 + j6.7) Ohm**
900 MHz	17.0 dB	(57.1 – j13.5) Ohm
950 MHz	21.4 dB	(44.3 + j5.7) Ohm
960 MHz	17.0 dB	(50.0 + j14.8) Ohm

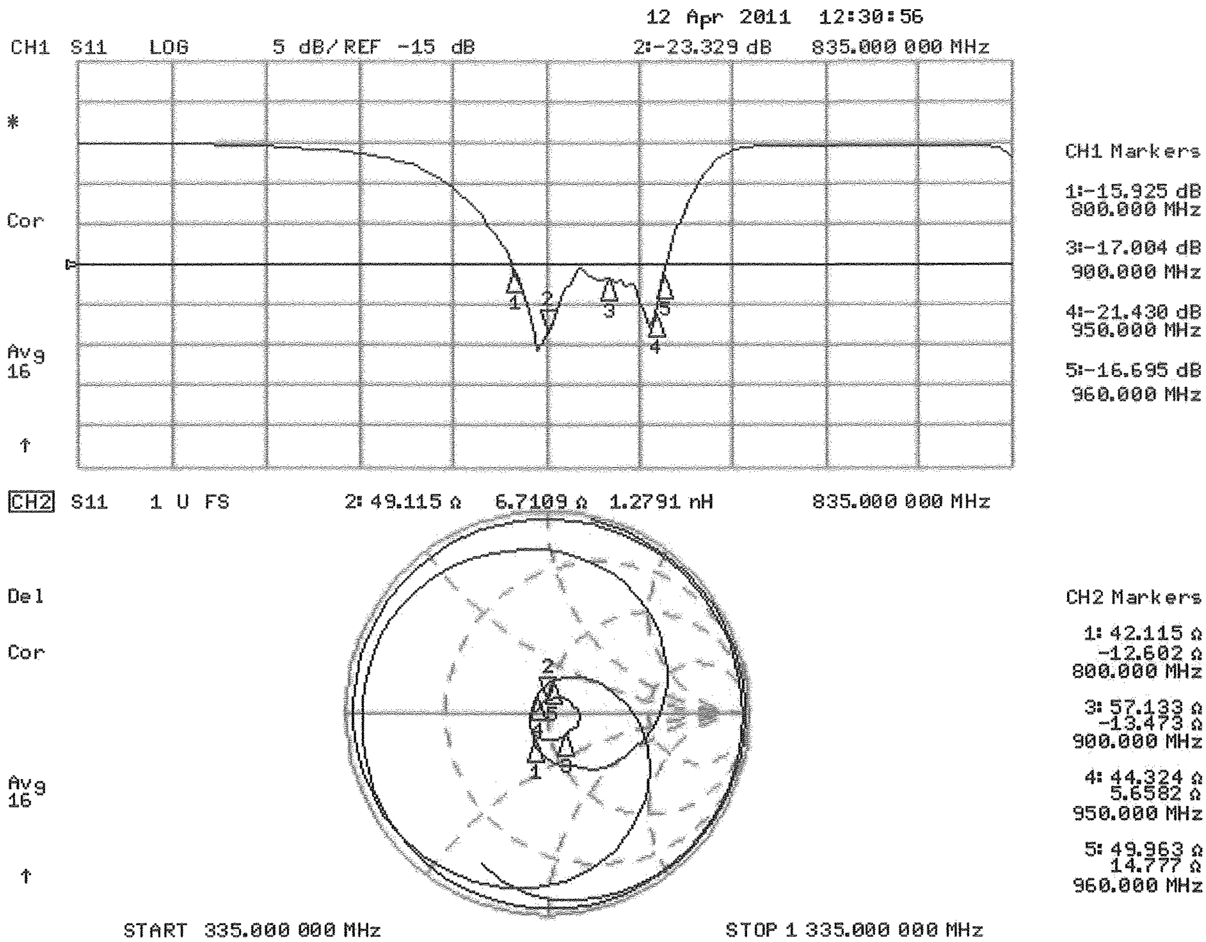
3.2 Antenna Design and Handling

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

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

3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



3.3.3 DASY4 H-field Result

Date/Time: 12.04.2011 11:54:39

Test Laboratory: SPEAG Lab2

HAC RF_CD835_1021_H_110412_CL

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1021

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)

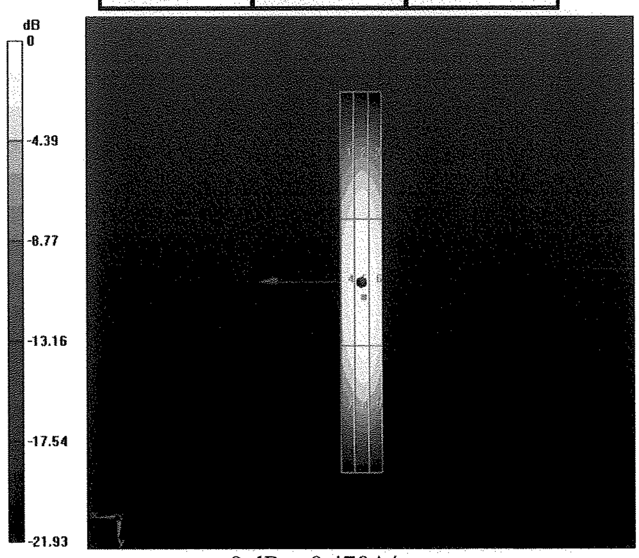
DASY5 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

Dipole H-Field measurement @ 835MHz/H Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.468 A/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 0.495 A/m; Power Drift = 0.0096 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.374 M4**	Grid 2 **0.404 M4**	Grid 3 **0.390 M4**
Grid 4 **0.432 M4**	Grid 5 **0.468 M4**	Grid 6 **0.454 M4**
Grid 7 **0.391 M4**	Grid 8 **0.425 M4**	Grid 9 **0.411 M4**



0 dB = 0.470A/m

3.3.2 DASY4 E-field Result

Date/Time: 12.04.2011 16:27:13

Test Laboratory: SPEAG Lab2

HAC RF_CD835_1021_E_110412_CL

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1021

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)

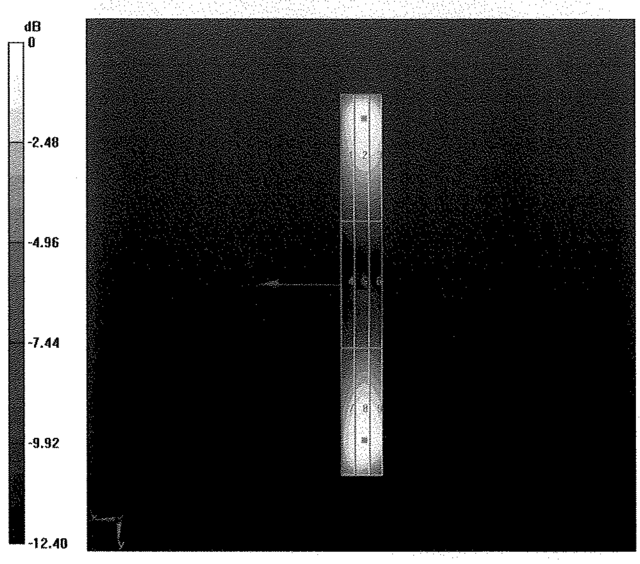
DASY5 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 29.12.2010
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 20.10.2010
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

Dipole E-Field measurement @ 835MHz/E Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 172.1 V/m
Probe Modulation Factor = 1.000
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 128.3 V/m; Power Drift = 0.0079 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **158.1 M4**	Grid 2 **172.1 M4**	Grid 3 **169.3 M4**
Grid 4 **86.327 M4**	Grid 5 **93.060 M4**	Grid 6 **92.017 M4**
Grid 7 **159.5 M4**	Grid 8 **170.8 M4**	Grid 9 **168.0 M4**



0 dB = 172.1V/m