



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

HAC RF Test Report of Portable Cellular Phone FCC ID: PY7A3880044 Model: XPERIA X2

Date of test: Jan 14 – Jan 18, 2010
Date of Report: Jan 21, 2010

Laboratory: HAC Testing Laboratory Sony Ericsson Mobile Communications, Inc. 7001 Development Drive, P.O. Box 13969, Research Triangle Park, NC, 27709, USA

Tested by: Rodney Dixon – Engineering Technician

Test Responsible: William Darden – Deputy Technical Manager 

Accreditation: This laboratory is accredited to ISO/IEC 17025-1999 to perform the following electromagnetic exposure tests:
 Specific Absorption Rate (SAR)
 Dielectric parameters
 RF power measurement
 Hearing Aid Compatibility (HAC)
 On the following types of products: Wireless communications devices.

Statement of Compliance: Sony Ericsson Mobile Communications, Inc declares under its sole responsibility that portable cellular telephone FCC ID PY7A3880044 Model XPERIA X2 to which this declaration relates, is in conformity with the appropriate General Population/Uncontrolled RF exposure standards, recommendations and guidelines (FCC 47 CFR §20.19). It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

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



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1. Introduction

The Sony Ericsson HAC Laboratory has performed measurements to determine the Hearing Aid Compatibility of portable cellular phone FCC ID PY7A3880044 model X2. The applicable RF safety guidelines and the HAC measurement specifications used for the test are described in [1].

2. Description of the Device under Test

2.1. Device description

FCC ID Number / Device Model	PY7A3880044 / X2	
Hardware Revision #	AP1	
Software Revision #	R1AA033	
Mode(s) of Operation		Serial # of Device Tested
Transmitting Frequency Range	GSM/GPRS/EDGE/WCDMA 824-849MHz, WiFi Off	CB511DWACE
	GSM/GPRS/EDGE/WCDMA1850-1910MHz, Wifi Off	CB511DWACE
Production Unit or Identical Prototype (47 CFR §2.908)	Identical Prototype	
Device Category	Portable	
Audio Processing Settings	Settings are non-configurable	
Antenna Position	Internal antenna, non-configurable	

* This product has not been tested using WiFi

Table 1. Device Description

3. Test Equipment Used

3.1. Dosimetric System

The Sony Ericsson HAC Laboratory utilizes Dosimetric Assessment Systems (Dasy4™) HAC measurements manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The measurement uncertainty budget is given in Appendix 10 for the system. The list of calibrated equipment used for the measurements is shown in the following table.

Description	Serial Number	Cal Interval	Cal Due Date
DASY3 DAE V1	369	1 year	May 15, 2010
E-Field Probe ER3DV6	2260	1 year	May 22, 2010
H-Field Probe H3DV6	6095	1 year	May 22, 2010
Dipole Validation Kit, CD835V3	1000	1 year	May 19, 2010
Dipole Validation Kit, CD1880V3	1000	1 year	May 19, 2010
HAC Test Arch Phantom w/Tcoil	10836		

Table 2. RF-HAC, Primary Equipment List



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3.2. Additional Equipment

Description	Serial Number	Cal Interval	Cal Due Date
Signal Generator HP8648C	3443U00306	1 year	January 28, 2011
Power Meter 437B	3126U16187	1 year	January 26, 2010
Power Meter 437B	3110A05347	1 year	January 27, 2010
Power Sensor - 8482H	3318A06848	1 year	January 23, 2010
Power Sensor - 8482H	3318A06426	1 year	January 23, 2010
Dickson FH325 Temp & Hum.	08021393	1 year	February 23, 2010
R & S CMU200	117030	1 year	Jul 14, 2010
Agilent E4445A Spec. Anlzs.	MY46181689	1 year	Aug 31, 2010

Table 3. RF-HAC, Additional Equipment List

3.3. Test Environment

During the tests, the ambient temperature of the laboratory was in the range 18.2 – 20.1 °C , the relative humidity was in the range 31.3 – 44.0 %.



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4. Setup Validation Procedure

A setup validation is performed prior to measurements of the Wireless Device (WD). A calibrated dipole meeting the requirements of C63.19-2007 is placed in the same position as the WD. The test conditions employed in both the spec and the original dipole calibration are then met:

- **Average input power P = 100 mW rms (20 dBm rms) after adjustment for return loss.**
- **Modulation of input signal is CW.**
- **The test fixture meets the two-wavelength separation criterion.**
- **The probe-to-dipole separation, which is measured from closest surface of the dipole to the center point of the probe sensor element, is 10 mm, as shown in the figure.**

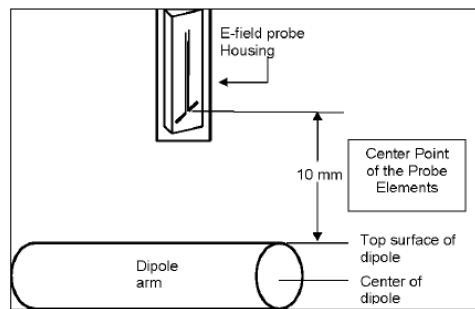


Figure 1. Setup Validation, Dipole to Probe geometry for measurements

To guarantee that the average power input to the dipole is 100mW. The Test setup in Figure 1 is followed. After precisely setting the power such that Power Meter A is receiving 100mW RMS (Figure 2-A), the power at Power Meter B is recorded. After replacing Power Meter A with the Dipole (Figure 2-B), the power is fine tuned to guarantee that the coupled forward power recorded on Power Meter B is identical.

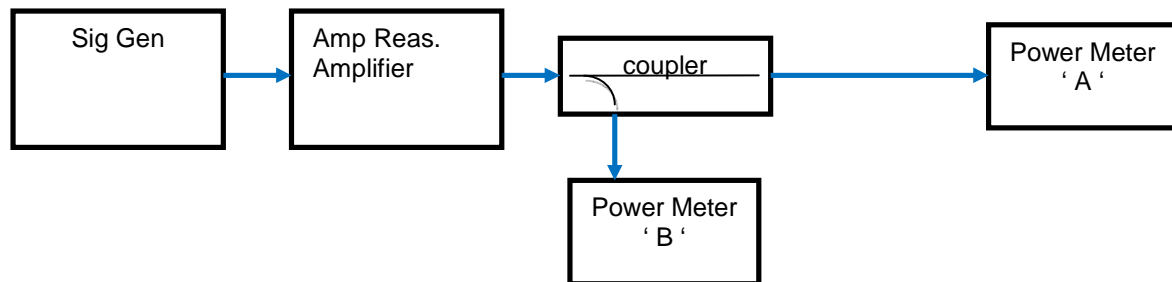


Figure 2-A. Setup Validation, Test Setup – step 1



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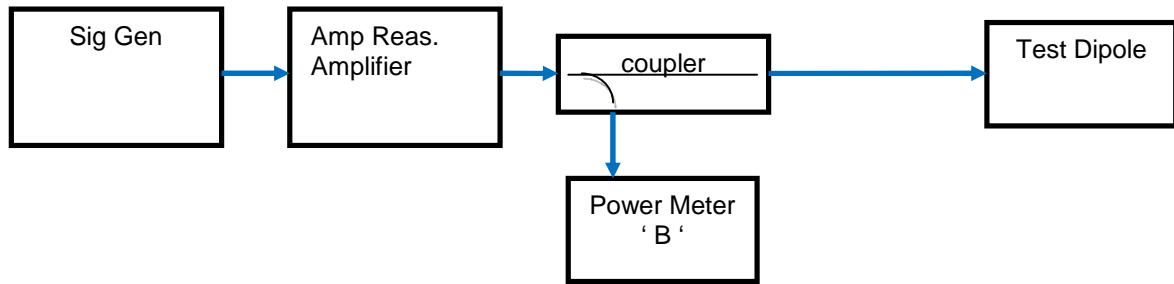


Figure 2-B. Setup Validation, Test Setup – step 2

Utilizing the Dasy4, the E & H field is then probed over the surface 10mm above the dipole. The greatest field readings are then recorded. All field readings are taken with a stationary probe. To account for any degree of the element not being parallel to the scan axis, the E-field maximums are averaged. 2-D scans for the H-field measurement are shown in figures 3 to 6.

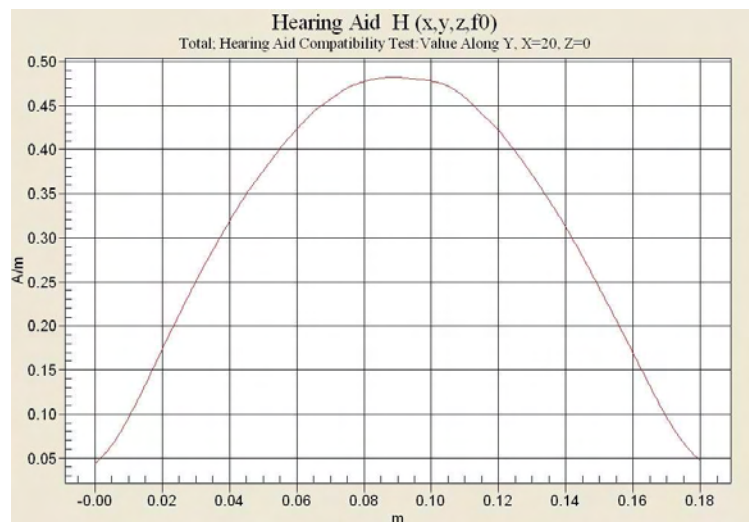


Figure 3. Plot of H-Field Strength along the Major axis of the 835MHz dipole



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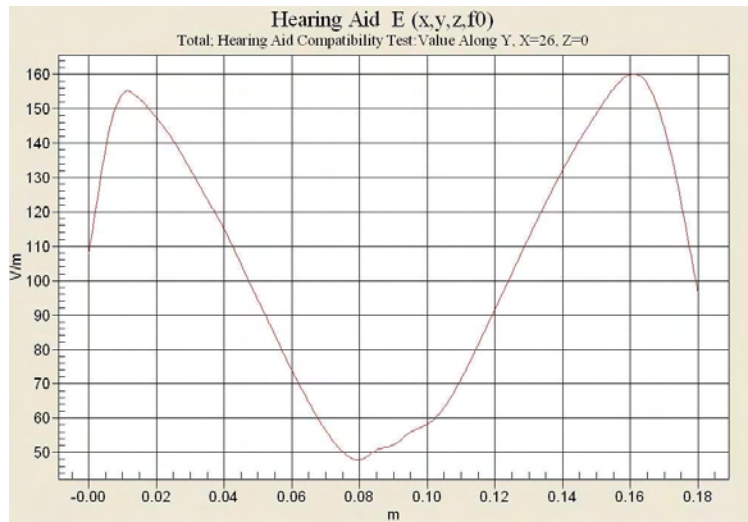


Figure 4. Plot of E-Field Strength along the Major axis of the 835MHz dipole

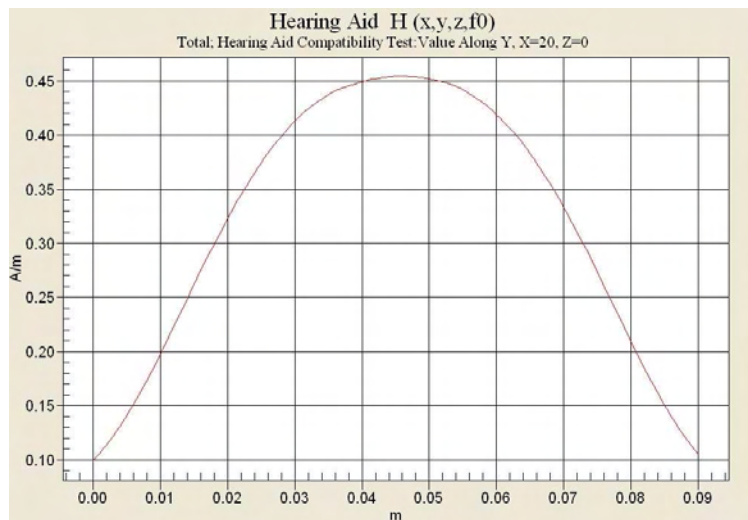


Figure 5. Plot of H-Field Strength along the Major axis of the 1880MHz dipole



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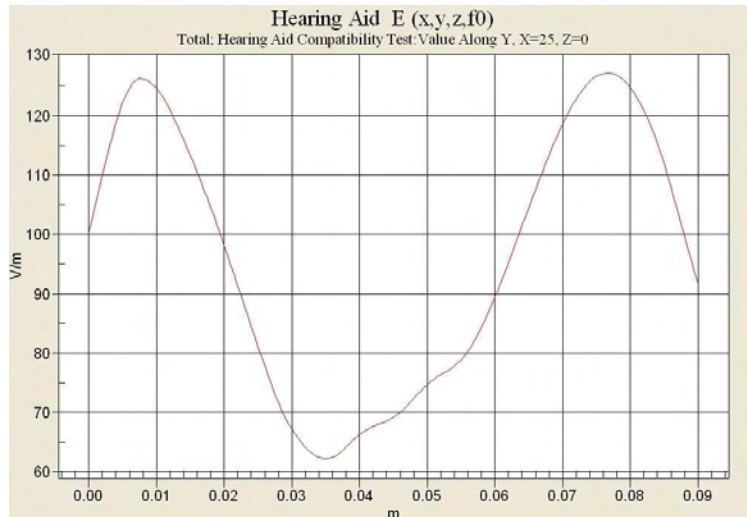


Figure 6. Plot of E-Field Strength along the Major axis of the 1880MHz dipole

Our measured values are compared to the numeric values stated in Table 4.2 of the C63.19 specification. Acceptable values for deviation are $\pm 25\%$ (13% of measurement uncertainty, 12% of deviation). We note that our maximum deviation of -16% is well within the accepted deviation range of $\pm 25\%$.

Freq. (MHz)	Power_In(dBm)	Avg E-Field Peak (V/m)	Target (V/m)	Deviation (%)
835	20.0	158.0	187	-15.5%
1880	20.0	127.2	149	-14.6%
Freq. (MHz)	Power_In(dBm)	H-Field Peak (A/m)	Target (A/m)	Deviation (%)
835	20.0	0.482	0.476	1.2%
1880	20.0	0.454	0.456	-0.4%

Table 4. Setup Validation Results



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5. Probe Modulation Factor

Per the C63.19-2007 spec, a calibration is made of the modulation response of the probe and its instrumentation chain. This calibration shall be performed with the field probe attached to the instrumentation that is to be used with it during the measurement. The response of the probe system to a CW field at the frequencies of interest is compared to its response to a modulated signal with equal amplitude. The field level of the test signals shall 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 field shall be applied to the readings taken of modulated fields of the specified type.

The following procedure is applied:

- 1) Illuminate a dipole with a CW signal at the intended measurement frequency.
- 2) Fix the probe at the location of the dipole's field maximum (determined in previous section), maintenance of the 10mm gap from probe to dipole surface is maintained (see Fig 1.)
- 3) Record the reading of the probe measurement system of the CW signal.
- 4) Record the power level of the CW signal being used to drive the field generating device.
- 5) Replace the CW signal with an equal amplitude signal utilizing the the same modulation of the WD.
- 6) Record the modulated signal reading from the probe measurement system.
- 7) The ratio, in linear units, of the CW to modulated signal reading is the modulation factor.
- 8) Repeat steps 1-7 for all bands, all intended modulation schemes, for both the E & H field probes.

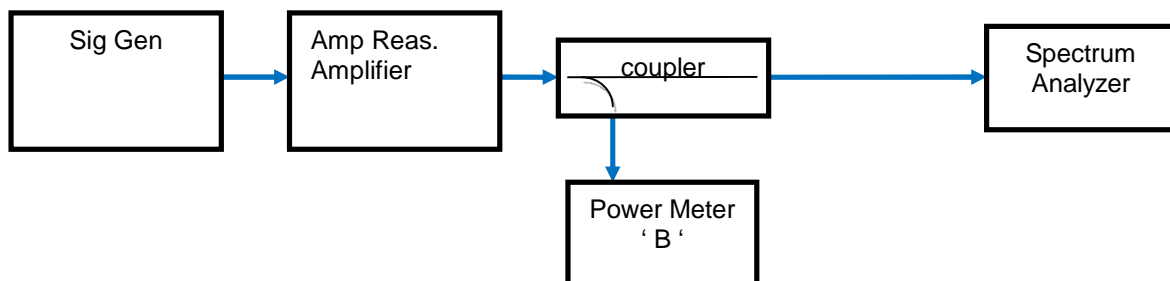


Figure 7-A. Probe Modulation Factor, Test Setup – step 1

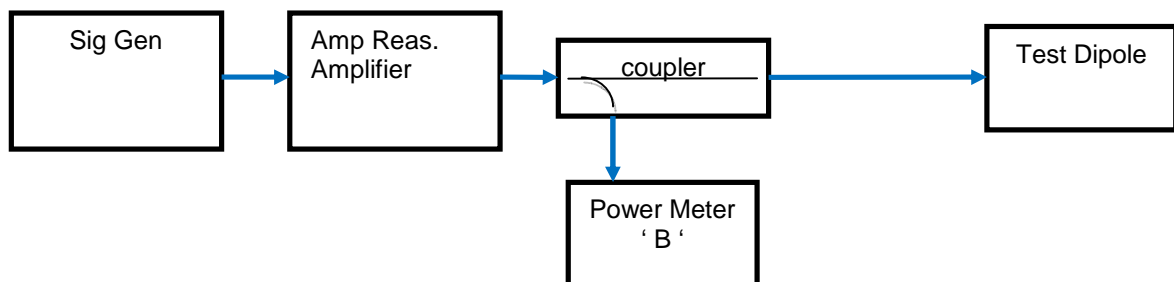


Figure 7-B. Probe Modulation Factor, Test Setup – step 2



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Tabular results for the derived Probe Modulation Factors (PMFs) may be found in Table 5. Screen shots of the forward power used in the PMF measurements are found in Figures 8 to 15.

Field	Band	Modulation	Probe reading (A/m or V/m, PMF=1)	PMF
E	850	WCDMA	96.4	1.441
E	850	GSM	46.3	3.003
E	850	CW	138.9	1.000
E	850	AM	88.5	1.569
E	1900	WCDMA	78.9	1.384
E	1900	GSM	38.4	2.844
E	1900	CW	109.2	1.000
E	1900	AM	70.5	1.550
H	850	WCDMA	0.3	1.557
H	850	GSM	0.1	3.191
H	850	CW	0.5	1.000
H	850	AM	0.3	1.720
H	1900	WCDMA	0.3	1.386
H	1900	GSM	0.1	3.026
H	1900	CW	0.5	1.000
H	1900	AM	0.3	1.595

Table 5: Probe Modulation Factors

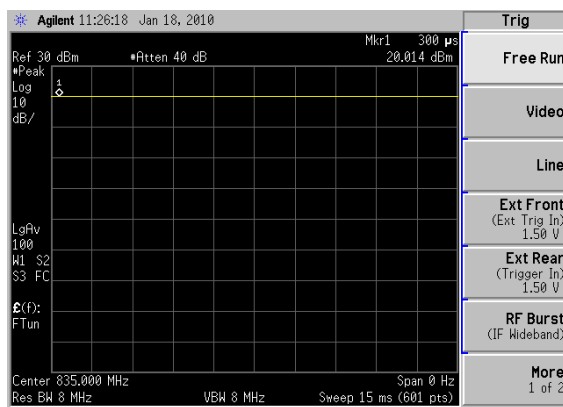


Figure 8. Fwd power for CW Modulation, 835MHz

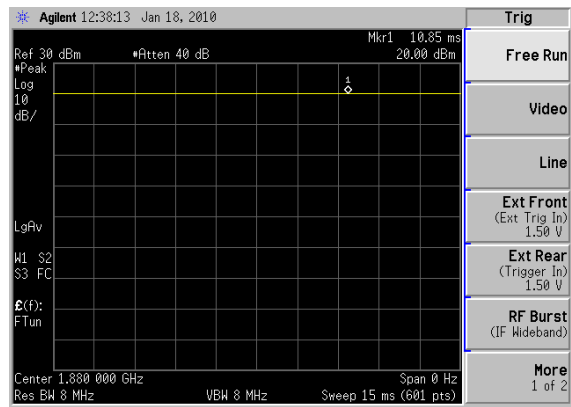


Figure 9. Fwd power for CW Modulation, 1880 MHz



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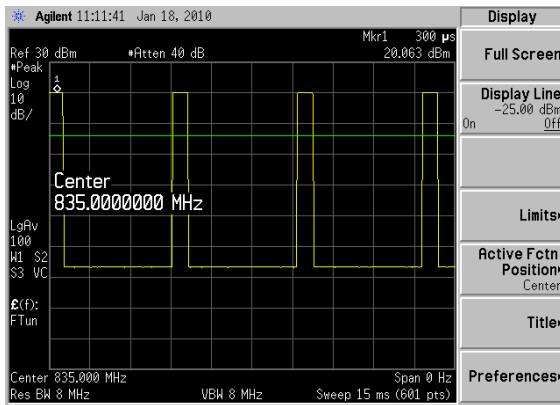


Figure 10. Fwd power for GSM Modulation, 835MHz

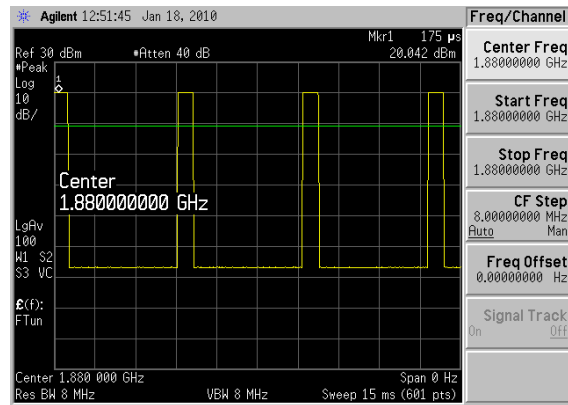


Figure 11. Fwd power for GSM Modulation, 1880 MHz



Figure 12. Fwd power for WCDMA Modulation, 835MHz

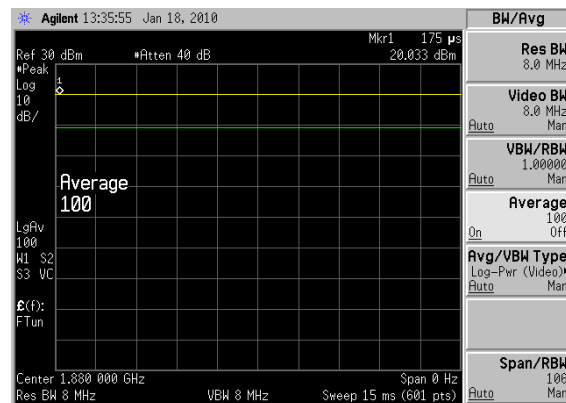


Figure 13. Fwd power for WCDMA Modulation, 1880 MHz

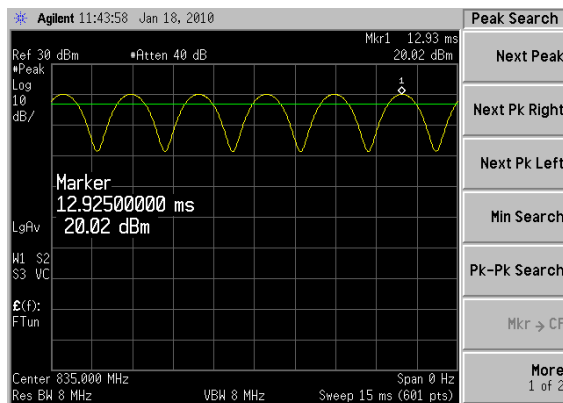


Figure 14. Fwd power for 80% AM Modulation, 835MHz

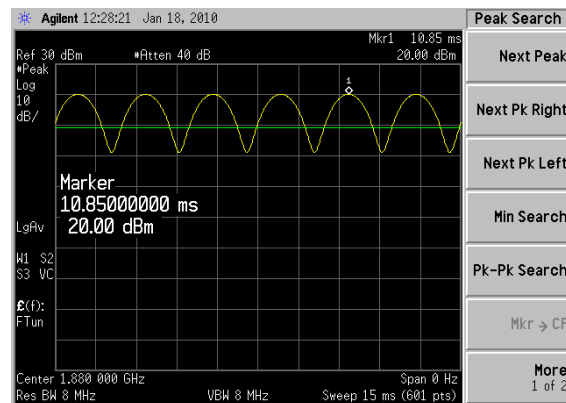


Figure 15. Fwd power for 80% AM Modulation, 1880 MHz



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6. Near-Field Measurement Procedures

To perform the near-field scan of the WD we ensure that the unit is operating at the maximum power output possible, thereby ensuring that the maximum field variables will be measured. The WD is driven from a standard battery that is fully charged prior to each scan. The WD is wirelessly connected to a base station emulator that is configured to request continuous maximum output power from the WD throughout the time that the fields are probed.

A measurement grid is defined over which the electric and magnetic RF field strength will be measured. The grid is a 50 mm by 50 mm area that is divided into nine evenly-sized blocks or sub-grids. The grid is centered on the audio frequency output transducer of the WD. The grid is located by reference to a reference plane. This reference plane is the planar area that contains the highest point in the area of the WD that normally rests against the user’s ear. A measurement plane is located parallel to the reference plane and 15 mm from it, away from the phone. The grid is located in the measurement plane. The E-field probe, and separately the H-field probe, are to be used to measure the field strengths in the 50 mm by 50 mm reference plane.

Each sub-grid will have a maximum E & H-field value within it. In determining the M rating, three non-central & contiguous sub-grids may be excluded for E. Additionally three non-central & contiguous sub-grids may be excluded for H. Of the final E & H subgrid selections, the central subgrid, and three others must be common to both.

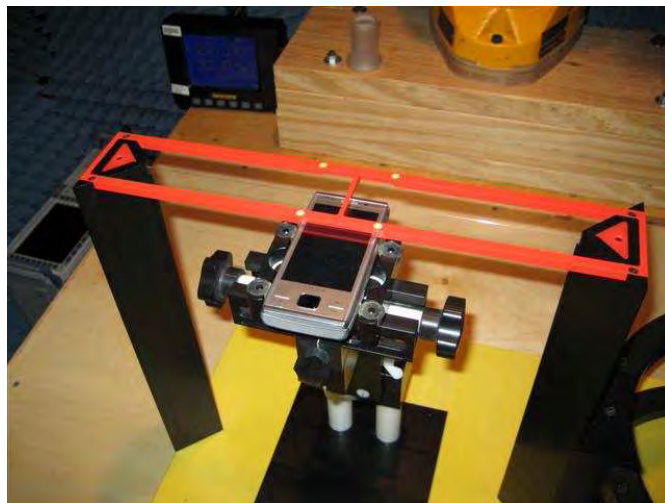


Figure 16. Position of device during testing



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The procedure to perform the field scan is as follows:

- 1) Confirm proper operation of the field probe, probe measurement system and other instrumentation and the positioning system.
- 2) Position the WD in its intended test position relative to the test phantom.
- 3) Configure the WD normal operation for maximum rated RF output power, at the desired channel and other operating parameters.
- 4) The center sub-grid shall be centered on the center of the audio output transducer.
- 5) Record the reading.
- 6) Scan the entire 50 mm by 50 mm region in equally spaced 5mm increments and record the reading at each measurement point.
- 7) From the entire scan, identify the maximum field readings within each subgrid.
- 8) Multiply each maximum sub-grid value by the appropriate Probe Modulation Factor.
- 9) After determining the exclusion sub-grids, determine the M rating for this scan based on the limits found in Table 6.
- 10) Repeat Step 1) through Step 9) for both the E-field and H-field measurements.
- 11) Repeat Steps 1_ through 10) for both GSM modulation and WCDMA modulation.
- 12) The highest M rating of all scans is the overall M rating for the WD.

Category		Telephone RF parameters < 960 MHz			
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 > 960 MHz			
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 6. RF-HAC Limits in Logarithmic units per C63.19-2007 Specification



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7. HAC Test Results

Tables 7 to 11 show the conducted power, maximum field values, margin to limits, exclusion blocks, and M-rating for the E & H field scans for both GSM & WCDMA operation. Appendices 1 to 8 show detailed data on the results for the channel with the minimum margin in a band for a particular combination of Probe & Modulation. Table 11 highlights the test configuration with the lowest overall margin. This occurs for the case of the E-Field, for the High Channel of GSM1900. Based on this margin, the device receives an overall rating of M3.

Mode	Channel	Backlight	Scan Center	Antenna	Conductd Power (dBm)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC Margin (dBV/m)	Rating	Exclusion Blocks
GSM850	128	off	Acoustic	Internal	33.0	43.65	48.5	-4.85	M3	2,3,6
GMS850	189	off	Acoustic	Internal	33.0	44.63	48.5	-3.87	M3	2,3,6
GSM850	251	off	Acoustic	Internal	33.0	45.72	48.5	-2.78	M3	2,3,6
GMS1900	512	off	Acoustic	Internal	28.9	36.70	38.5	-1.80	M3	4,7,8
GMS1900	661	off	Acoustic	Internal	29.0	37.31	38.5	-1.19	M3	4,7,8
GSM1900	810	off	Acoustic	Internal	29.0	38.34	38.5	-0.16	M3	2,3,6

Table 7. Measurement Data Summary for GSM, E-Field

Mode	Channel	Backlight	Scan Center	Antenna	Conductd Power (dBm)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC Margin (dBV/m)	Rating	Exclusion Blocks
WCDMA850	4133	off	Acoustic	Internal	23.5	38.36	51	-12.64	M4	2,3,6
WCDMA850	4175	off	Acoustic	Internal	23.4	38.92	51	-12.08	M4	2,3,6
WCDMA850	4232	off	Acoustic	Internal	23.5	38.59	51	-12.41	M4	2,3,6
WCDMA1900	9263	off	Acoustic	Internal	22.8	34.81	41	-6.19	M4	4,7,8
WCDMA1900	9400	off	Acoustic	Internal	22.9	35.50	41	-5.50	M4	4,7,8
WCDMA1900	9537	off	Acoustic	Internal	22.7	35.22	41	-5.78	M4	2,3,6

Table 8. Measurement Data Summary for WCDMA, E-Field



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Mode	Channel	Backlight	Scan Center	Antenna	Conductd Power (dBm)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC Margin (dBV/m)	Rating	Exclusion Blocks
GSM850	128	off	Acoustic	Internal	33.0	-12.84	-1.9	-10.94	M4	1,4,7
GMS850	189	off	Acoustic	Internal	33.0	-12.01	-1.9	-10.11	M4	1,4,7
GSM850	251	off	Acoustic	Internal	33.0	-10.93	-1.9	-9.03	M4	1,4,7
GMS1900	512	off	Acoustic	Internal	28.9	-13.81	-11.9	-1.91	M4	6,8,9
GMS1900	661	off	Acoustic	Internal	29.0	-13.72	-11.9	-1.82	M4	1,4,7
GSM1900	810	off	Acoustic	Internal	29.0	-12.51	-11.9	-0.61	M4	1,2,3

Table 9. Measurement Data Summary for GSM, H-Field

Mode	Channel	Backlight	Scan Center	Antenna	Conductd Power (dBm)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC Margin (dBV/m)	Rating	Exclusion Blocks
WCDMA850	4133	off	Acoustic	Internal	23.5	-18.42	0.6	-19.02	M4	1,4,7
WCDMA850	4175	off	Acoustic	Internal	23.4	-17.65	0.6	-18.25	M4	1,4,7
WCDMA850	4232	off	Acoustic	Internal	23.5	-17.99	0.6	-18.59	M4	1,4,7
WCDMA1900	9263	off	Acoustic	Internal	22.8	-16.77	-9.4	-7.37	M4	6,8,9
WCDMA1900	9400	off	Acoustic	Internal	22.9	-16.36	-9.4	-6.96	M4	1,4,7
WCDMA1900	9537	off	Acoustic	Internal	22.7	-16.42	-9.4	-7.02	M4	1,2,3

Table 10. Measurement Data Summary for WCDMA, H-Field

Mode	Channel	Backlight	Scan Center	Antenna	Conductd Power (dBm)	Peak Field (dBV/m)	FCC Limit (dBV/m)	FCC Margin (dBV/m)	Rating	Exclusion Blocks
GSM1900	810	off	Acoustic	Internal		38.34	38.5	-0.16	M3	2,3,6

Table 11. Measurement Data Summary for GSM1900 High Channel, E-Field



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Appendix 1: GSM850 – High CH – E Field

Test Laboratory: Sony Ericsson

14Jan10_X2_GSM850_WACE_Efield_T01

Communication System: GSM 850; Frequency: 849 MHz; Duty Cycle: 1:8.3

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2260; ConvF(1, 1, 1); Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

E Scan - ER3D - 2007: 15 mm from Probe Center to the Device 3/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 193.3 V/m

Probe Modulation Factor = 3.00

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 74.2 V/m; Power Drift = 0.129 dB

Hearing Aid Near-Field Category: M3 (AWF -5 dB)

Peak E-field in V/m

Grid 1 158.9 M3	Grid 2 193.1 M3	Grid 3 192.8 M3
Grid 4 148.4 M4	Grid 5 193.3 M3	Grid 6 193.0 M3
Grid 7 136.0 M4	Grid 8 177.8 M3	Grid 9 177.6 M3

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden		No. REP 2010 X2 HAC 01	
Approved SEM/CV/PF/P William Darden	Checked		A

M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

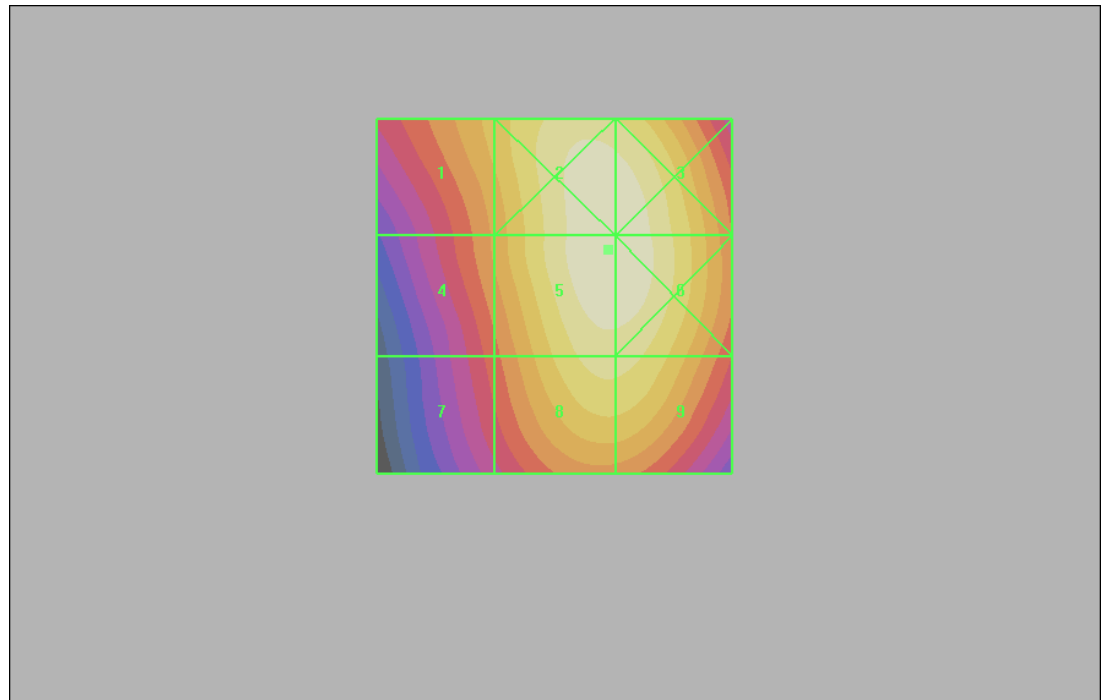
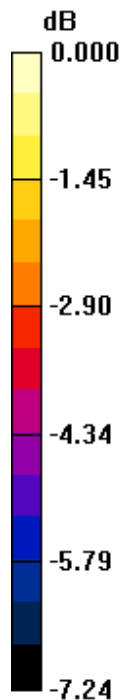
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 193.3 V/m

E Category: M3

Location: -7.5, -6.5, 8.7 mm



0 dB = 193.3V/m



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

Appendix 2: GSM1900 – High CH – E Field

Test Laboratory: Sony Ericsson

14Jan10_X2_GSM1900_WACE_Efield_T01

Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2260; ConvF(1, 1, 1); Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

E Scan - ER3D - 2007: 15 mm from Probe Center to the Device 3/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 82.6 V/m

Probe Modulation Factor = 2.84

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 12.5 V/m; Power Drift = 0.175 dB

Hearing Aid Near-Field Category: M3 (AWF -5 dB)

Peak E-field in V/m

Grid 1 64.2 M3	Grid 2 82.7 M3	Grid 3 82.8 M3
Grid 4 67.4 M3	Grid 5 63.9 M3	Grid 6 67.1 M3
Grid 7 82.6 M3	Grid 8 78.1 M3	Grid 9 65.3 M3

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden		No. REP 2010 X2 HAC 01	
Approved SEM/CV/PF/P William Darden	Checked		A

M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

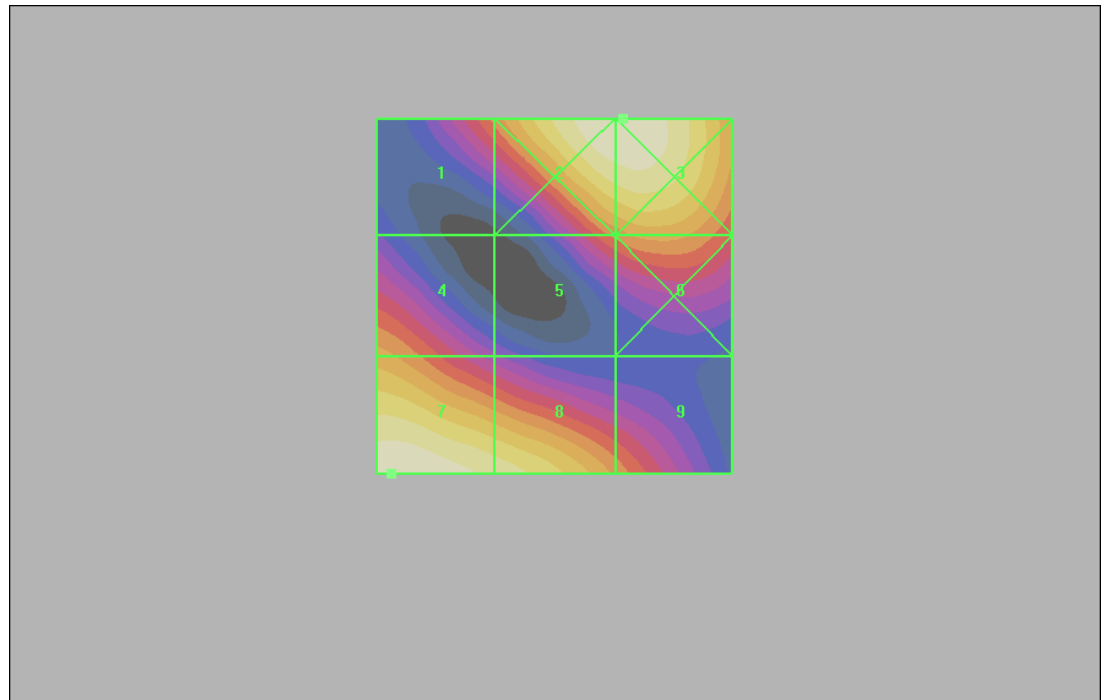
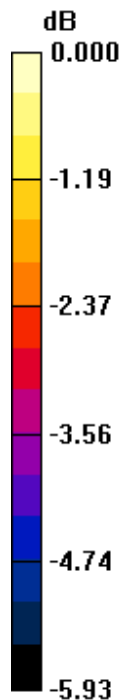
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 82.8 V/m

E Category: M3

Location: -9.5, -25, 8.7 mm



0 dB = 82.8V/m



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

Appendix 3: WCDMA850 – Mid CH – E Field

Test Laboratory: Sony Ericsson

14Jan10_X2_WCDMAB5_WACE_Efield_T01

Communication System: UMTS Band 5 "850"; Frequency: 836.6 MHz; Duty Cycle: 1:1

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2260; ConvF(1, 1, 1); Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

E Scan - ER3D - 2007: 15 mm from Probe Center to the Device 2/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 88.3 V/m

Probe Modulation Factor = 1.44

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 70.8 V/m; Power Drift = -0.009 dB

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

Peak E-field in V/m

Grid 1 75.0 M4	Grid 2 88.1 M4	Grid 3 88.0 M4
Grid 4 69.7 M4	Grid 5 88.3 M4	Grid 6 88.2 M4
Grid 7 64.5 M4	Grid 8 82.9 M4	Grid 9 82.9 M4

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden		No. REP 2010 X2 HAC 01	
Approved SEM/CV/PF/P William Darden	Checked		A

M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

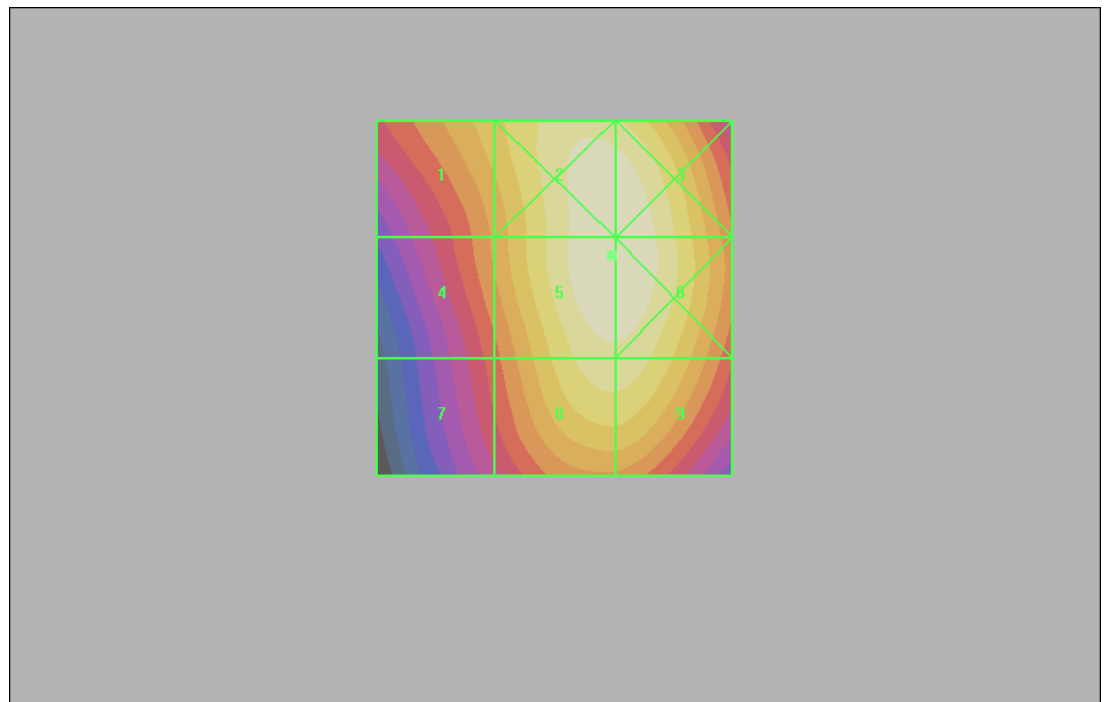
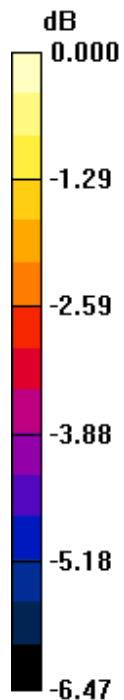
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 88.3 V/m

E Category: M4

Location: -8, -6, 8.7 mm



0 dB = 88.3V/m



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

Appendix 4: WCDMA1900 – Mid CH – E Field

Test Laboratory: Sony Ericsson

14Jan10_X2_WCDMAB2_WACE_Efield_T01

Communication System: UMTS Band 2 "1900"; Frequency: 1880 MHz; Duty Cycle: 1:1

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2260; ConvF(1, 1, 1); Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

E Scan - ER3D - 2007: 15 mm from Probe Center to the Device 2/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 59.6 V/m

Probe Modulation Factor = 1.38

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 17.5 V/m; Power Drift = 0.022 dB

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

Peak E-field in V/m

Grid 1 47.6 M4	Grid 2 59.6 M4	Grid 3 59.6 M4
Grid 4 47.2 M4	Grid 5 45.8 M4	Grid 6 48.0 M4
Grid 7 59.8 M4	Grid 8 55.2 M4	Grid 9 43.8 M4

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden		No. REP 2010 X2 HAC 01	
Approved SEM/CV/PF/P William Darden	Checked		A

M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

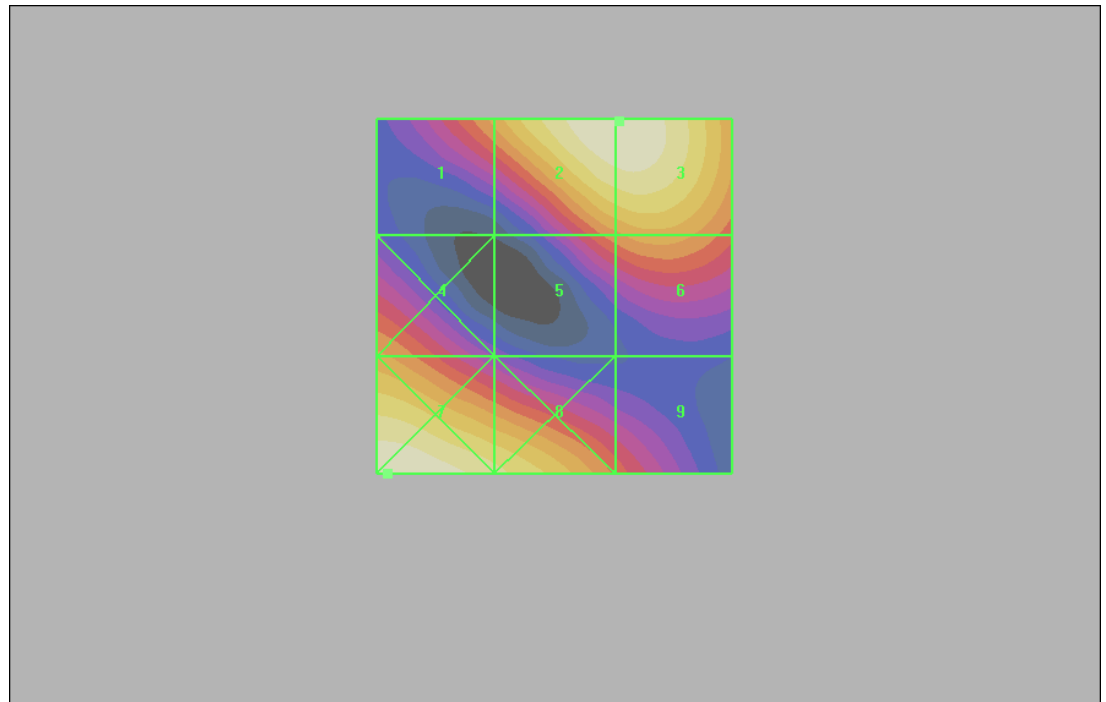
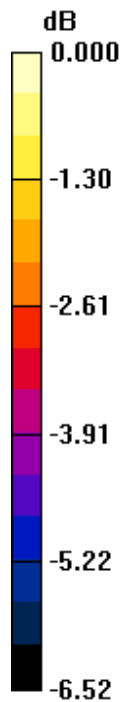
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 59.8 V/m

E Category: M4

Location: 23.5, 25, 8.7 mm



0 dB = 59.8V/m



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

Appendix 5: GSM850 – High CH – H Field

Test Laboratory: Sony Ericsson

14Jan10_X2_GSM850_WACE_Hfield_T01

Communication System: GSM 850; Frequency: 849 MHz; Duty Cycle: 1:8.3

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DAS4 Configuration:

- Probe: H3DV6 - SN6095 - 090708; ; Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device 3/Hearing Aid

Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.284 A/m

Probe Modulation Factor = 3.19

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.070 A/m; Power Drift = 0.076 dB

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

Peak H-field in A/m

Grid 1 0.341 M4	Grid 2 0.253 M4	Grid 3 0.152 M4
Grid 4 0.327 M4	Grid 5 0.264 M4	Grid 6 0.163 M4
Grid 7 0.368 M4	Grid 8 0.284 M4	Grid 9 0.187 M4

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden		No. REP 2010 X2 HAC 01	
Approved SEM/CV/PF/P William Darden	Checked		A

M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

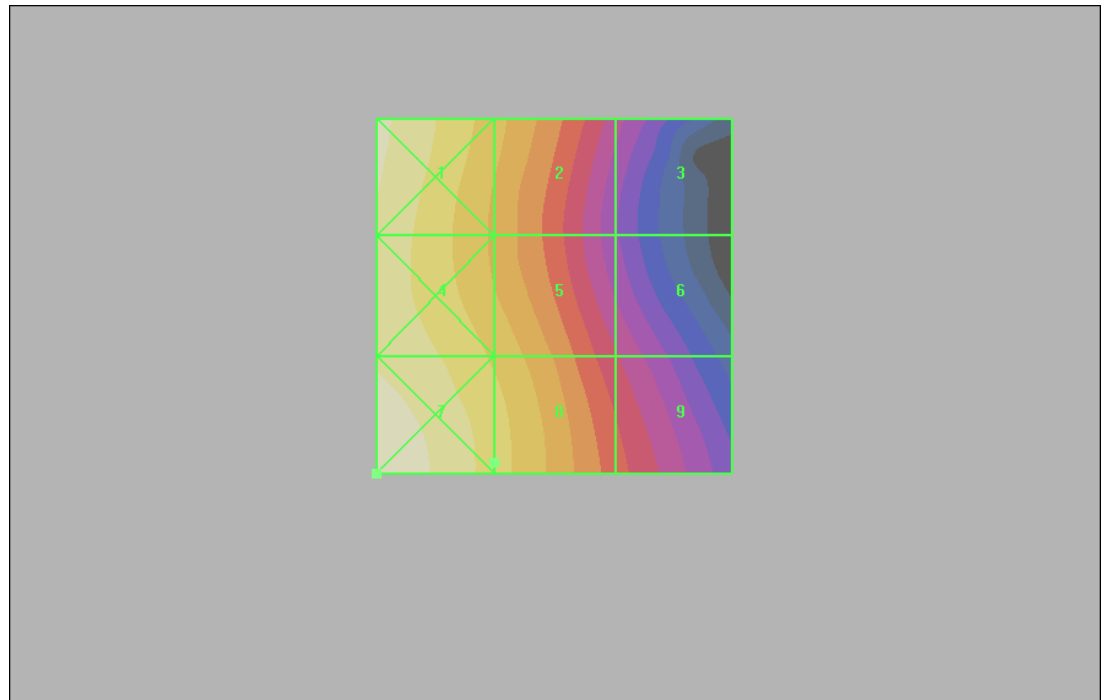
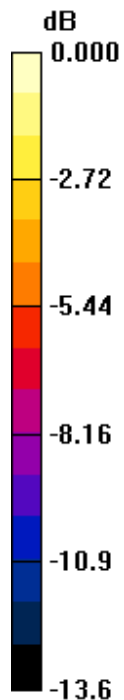
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 0.368 A/m

H Category: M4

Location: 25, 25, 8.7 mm





Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

Appendix 6: GSM1900 – High CH – H Field

Test Laboratory: Sony Ericsson

14Jan10_X2_GSM1900_WACE_Hfield_T01

Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6095 - 090708; ; Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device 3/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.237 A/m

Probe Modulation Factor = 3.03

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.079 A/m; Power Drift = -0.042 dB

Hearing Aid Near-Field Category: M3 (AWF -5 dB)

Peak H-field in A/m

Grid 1 0.239 M3	Grid 2 0.221 M3	Grid 3 0.217 M3
Grid 4 0.200 M3	Grid 5 0.234 M3	Grid 6 0.234 M3
Grid 7 0.237 M3	Grid 8 0.232 M3	Grid 9 0.232 M3

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden		No. REP 2010 X2 HAC 01	
Approved SEM/CV/PF/P William Darden	Checked		A

M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

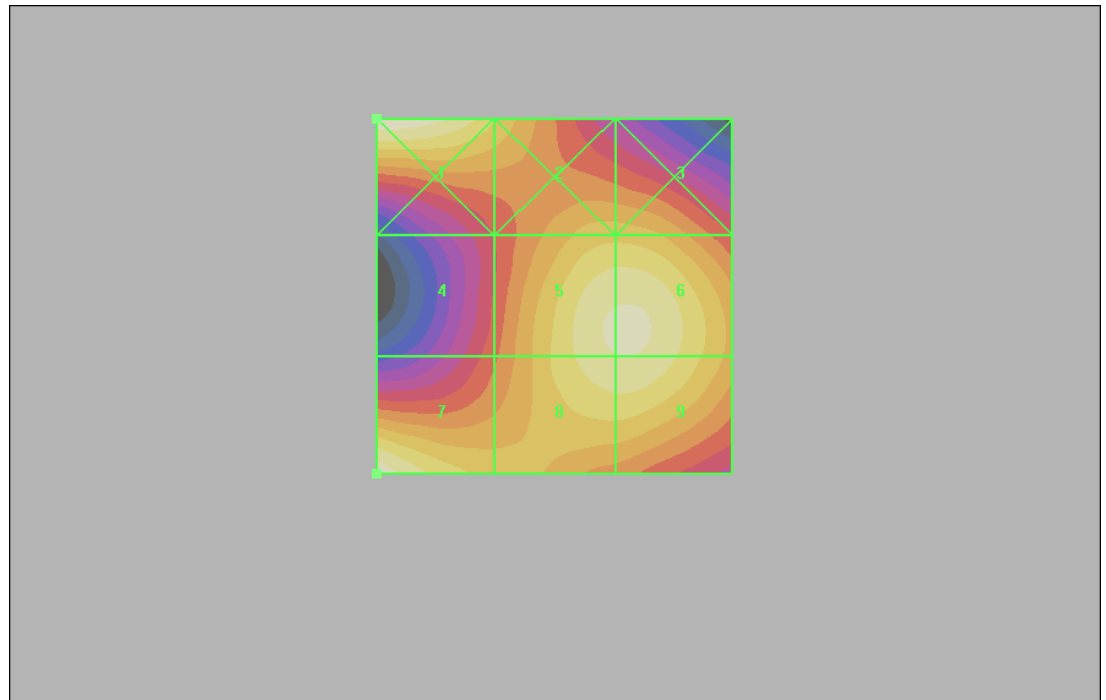
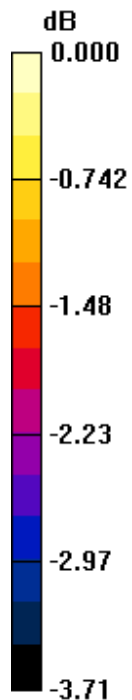
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 0.239 A/m

H Category: M3

Location: 25, -25, 8.7 mm



0 dB = 0.239A/m



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

Appendix 7: WCDMA850 – Mid CH – H Field

Test Laboratory: Sony Ericsson

14Jan10_X2_WCDMAB5_WACE_Hfield_T01

Communication System: UMTS Band 5 "850"; Frequency: 836.6 MHz; Duty Cycle: 1:1

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6095 - 090708; ; Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device 2/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.131 A/m

Probe Modulation Factor = 1.56

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.066 A/m; Power Drift = -0.087 dB

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

Peak H-field in A/m

Grid 1 0.162 M4	Grid 2 0.122 M4	Grid 3 0.075 M4
Grid 4 0.156 M4	Grid 5 0.119 M4	Grid 6 0.076 M4
Grid 7 0.173 M4	Grid 8 0.131 M4	Grid 9 0.089 M4

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden		No. REP 2010 X2 HAC 01	
Approved SEM/CV/PF/P William Darden	Checked		A

M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

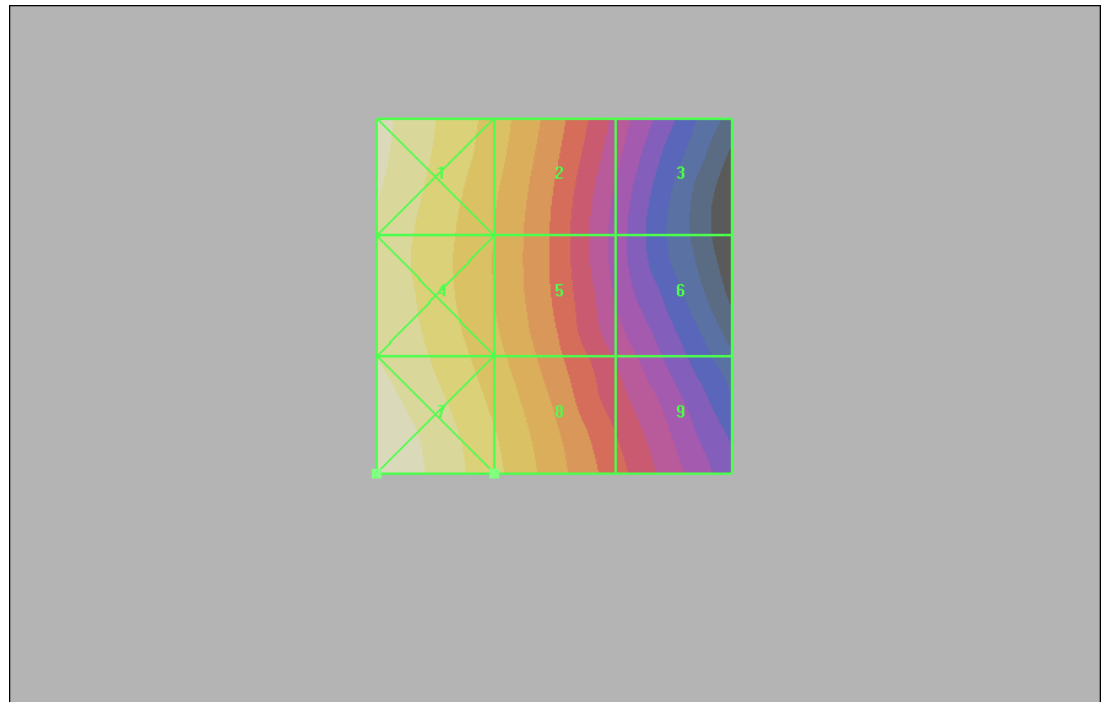
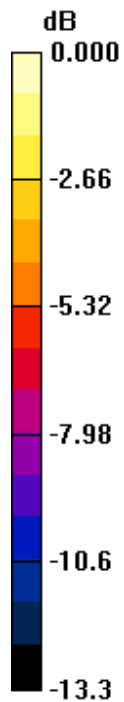
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 0.173 A/m

H Category: M4

Location: 25, 25, 8.7 mm



0 dB = 0.173A/m



Prepared (also subject responsible if other) SEM/CV/PF/P William Darden	No. REP 2010 X2 HAC 01
Approved SEM/CV/PF/P William Darden	Checked A

Appendix 8: WCDMA1900 – Mid CH – H Field

Test Laboratory: Sony Ericsson

14Jan10_X2_WCDMAB2_WACE_Hfield_T01

Communication System: UMTS Band 2 "1900"; Frequency: 1880 MHz; Duty Cycle: 1:1

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

Phantom section: RF Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6095 - 090708; ; Calibrated: 5/22/2009
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn369; Calibrated: 5/15/2009
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

E Scan - ER3D - 2007: 15 mm from Probe Center to the Device 2/Hearing Aid

Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.152 A/m

Probe Modulation Factor = 1.39

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.110 A/m; Power Drift = -0.042 dB

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

Peak H-field in A/m

Grid 1 0.153 M4	Grid 2 0.141 M4	Grid 3 0.138 M4
Grid 4 0.132 M4	Grid 5 0.152 M4	Grid 6 0.152 M4
Grid 7 0.150 M4	Grid 8 0.152 M4	Grid 9 0.152 M4

Category	AWF (dB)	Limits for E-Field Emissions (V/m) > 960MHz	Limits for H-Field Emissions (A/m) > 960MHz
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8



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M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.14 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

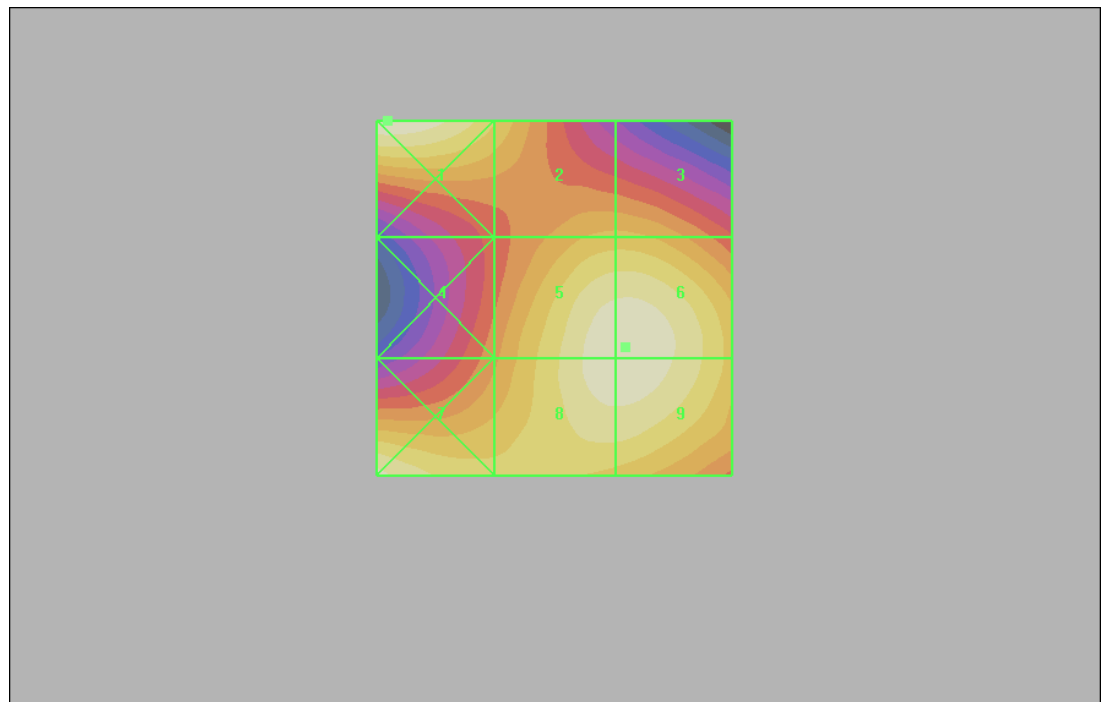
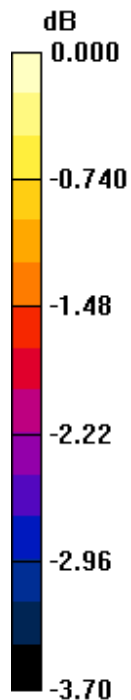
Category	AWF (dB)	Limits for E-Field Emissions (V/m) < 960MHz	Limits for H-Field Emissions (A/m) < 960 MHz
M1	0	631 - 1122	1.91 - 3.39
	-5	473.2 - 841.4	1.43 - 2.54
M2	0	354.8 - 631	1.07 - 1.91
	-5	266.1 - 473.2	0.8 - 1.43
M3	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M4	0	<199.5	<0.6
	-5	<149.6	<0.45

Cursor:

Total = 0.153 A/m

H Category: M4

Location: 23.5, -25, 9.2 mm



0 dB = 0.153A/m