

HAC RF Emissions Test Report

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Measurements made by:	Ari Orte		
Tested device:	RM-260		
FCC ID:	LJPRM-260	IC:	661E-RM260
Supplement reports:	-		
Testing has been carried out in accordance with:	ANSI C63.19-2006 American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test results:	The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		
Date and signatures:			
For the contents:			

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1. SUMMARY OF HAC RF EMISSION TEST REPORT

1.1 Test Details

Period of test	2008-05-26
SN, HW, SW and DUT numbers of tested device	SN: 353274/01/024754/6, HW: 12051001, SW: 16.00, DUT: 12940
Batteries used in testing	BL-5C, DUT: 12692, 12693
State of sample	Prototype unit
Notes	AWF = -5 for GSM

1.2 Maximum Results

The maximum measured HAC RF emission values and categories for electric and magnetic fields are given in section 1.2.

1.2.1 Electric field measurements

Band & Mode	Ch / Freq. [MHz]	Radiated power	Limit of E-field max. value in category M3 [V/m]	Maximum E-field value after exclusion [V/m]	Category
GSM 850	190 / 836.6	32.3 dBm ERP	149.6 – 266.1	150.0	M3 (-5dB)
GSM 1900	661 / 1880.0	32.3 dBm EIRP	47.3 – 84.1	48.0	M3 (-5dB)

1.2.2 Magnetic field measurements

Band & Mode	Ch / Freq. [MHz]	Radiated power	Limit of H-field max. value in category M3 [A/m]	Maximum H-field value after exclusion [A/m]	Category
GSM 850	251 / 848.8	31.9 dBm ERP	0.45 – 0.80	0.179	M4 (-5dB)
GSM 1900	810 / 1909.8	30.6 dBm EIRP	0.14 – 0.25	0.113	M4 (-5dB)

1.2.3 Overall RF emissions category of the tested device

Band & Mode	Combined category (E- and H-fields)	Verdict
GSM 850	M3	Pass
GSM 1900	M4	Pass
Final Category	M3	Pass

1.2.4 Maximum Drift

Maximum drift during measurements	0.16 dB
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1.2.5 Measurement Uncertainty

Extended Uncertainty (k=2) 95%, E-field	14.7 %
Extended Uncertainty (k=2) 95%, H-field	10.9 %

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

Modes of Operation	Bands	Modulation Mode	Duty Cycle	Transmitter Frequency Range (MHz)
GSM	850	GMSK	1/8	824 – 849
GSM	1900	GMSK	1/8	1850 – 1910
WLAN/VOIP	2450	11Mbps QPSK	1	2412 – 2462

Outside of USA the transmitter of the device is capable of operating also in 900MHz and 1800MHz bands, which are not part of this filing.

2.1 Picture of Device



Flip closed



Flip open

3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature [°C]:	18 to 25
Ambient humidity [RH %]:	30 to 70

3.2 Test Signal, Frequencies, and Output Power

The transmitter of the device was put into operation by using a call tester. Communications between the device and the call tester were established by air link.

For all tests the device output power was set to maximum power level; a fully charged battery was used for every test sequence.

The measurements were performed on low, middle and high channels.

4. DESCRIPTION OF THE TEST EQUIPMENT

4.1 Measurement system and components

The measurements were performed using an automated near-field scanning system, DASY 4, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland.

The following table lists calibration dates of SPEAG components:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DAE 4	728	12 months	2009-04
E-field Probe ER3DV6	2333	12 months	2009-01
H-field Probe H3DV6	6053	12 months	2009-01
Dipole Validation Kit, CD835V3	1004	24 months	2009-02
Dipole Validation Kit, CD1880V3	1003	24 months	2009-02

Additional test equipment used in testing and validation:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	SML03	101265	12 months	2008-07
Amplifier	ZHL-42 (SMA)	N072095-5	12 months	2008-07
Power Meter	NRVS	849305/028	12 months	2008-07
Power Sensor	NRV-Z32	839176/020	12 months	2008-07
Radio Communication Tester	CMU 200	101111	12 months	2008-07

4.1.1 Isotropic E-field probe ER3DV6

Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges PEEK enclosure material
Frequency	In air 100 MHz to >6 GHz; Linearity: ± 0.2 dB (100 MHz to 3 GHz)
Directivity	± 0.2 dB in air (rotation around probe axis) ± 0.4 dB in air (rotation normal to probe axis)
Dynamic Range	2 V/m to > 1000 V/m; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 8 mm Distance from probe tip to nearest point of dipole: 1.25 mm
Application	General near-field measurements up to 6 GHz Field component measurements Fast automatic scanning in phantoms

4.1.2 Isotropic H-field probe H3DV6

Construction	Three concentric loop sensors with 3.8 mm loop diameters Resistively loaded detector diodes for linear response Built-in shielding against static charges PEEK enclosure material
Frequency	200 MHz to 3 GHz; Output linearized (absolute accuracy $\pm 6.0\%$, $k=2$)
Directivity	± 0.25 dB (spherical isotropy error)
Dynamic Range	10 mA/m to 2 A/m at 1 GHz
Dimensions	Overall length: 330 mm Tip length: 40 mm Body diameter: 12 mm Tip diameter: 6 mm Distance from probe tip to nearest point of dipole: 1.1 mm
Application	General magnetic near-field measurements up to 3 GHz Field component measurements, surface current measurements Measurements in air or liquids, low interaction

4.1.3 Device Holder

The Device Holder and Test Arch are manufactured by Speag (<http://www.dasy4.com/hac>). Test arch is used for all tests i.e. for both validation testing and device testing. The holder and test arch conforms to the requirements of ANSI C63.19.

The SPEAG device holder (see Section 5.1) was used to position the test device in all tests.

4.2 Validation of the System

The manufacturer calibrates the probes annually. Validation measurements are made regularly using the dipole validation kit. The power level used by manufacturer in dipole calibration is supplied to the dipole antenna. The antenna is scanned at 1.0cm distance between top surface of the dipole and calibration point of the probe.

System Validation, H-field and E-field

f [MHz]	Description	E-field [V/m]	H-field [A/m]
835	Reference result	160.0	0.452
	± 10% window	144.0 – 176.0	0.406 – 0.497
	2008-05-20	169.8	0.476
1880	Reference result	128.8	0.452
	± 10% window	115.9 – 141.7	0.406 – 0.497
	2008-05-20	125.2	0.406

Plots of the system validation scans are given in Appendix A.

5. DESCRIPTION OF THE TEST PROCEDURE

5.1 Test Arch and Device Holder

The test device was placed in the Device Holder (illustrated below) that is supplied by SPEAG. Using this positioner the tested device is positioned under Test Arch.



Device holder and Test Arch supplied by SPEAG

5.2 Test Positions

5.2.1 Scan area centered at the acoustic output

The device was positioned such that Device Reference plane was touching the bottom of the Test Arch. The scan is centered at the acoustic output by aligning the acoustic output with the intersection of the Test Arch's middle bar and dielectric wire.



Photo of the device positioned under Test Arch

5.3 Scan Procedures

Near field scans of 5cm x 5cm were used for determination of the field distribution. Measurement plane distance from WD reference plane is 1cm. Scans were performed for both E- and H-field using appropriate probe. DASY software divides detected values into 3 x 3 sub grids as described in the C63.19 standard.

5.4 Scan area centered at the maximum magnetic T-coil coupling

Scanning centered at the maximum magnetic T-coil coupling was not applicable for the tested device.

5.5 Probe Modulation Factor

All raw measurements in DASY4 system are presented as RMS values. The measurement software then applies Probe Modulation Factor (PMF) to convert readings to “slot averaged” peak values as required by C63.19 standard.

Therefore PMF was assessed as described in C63.19 standard along with Speag's Application Note (AN_Hearing_Aid_Compatibility.pdf, section 28.8, "Definition / Determination of the Probe Modulation Factor").

Observed Modulation Factor:

$$PMF_{(E)} = E\text{-field}_{(CW)} / E\text{-field}_{(Modulated)}$$

$$PMF_{(H)} = H\text{-field}_{(CW)} / H\text{-field}_{(Modulated)}$$

Observed Crest Factor:

$$CF_{(E)} = (PMF_{(E)})^2$$

$$CF_{(H)} = (PMF_{(H)})^2$$

Modulation factors, GSM

f [MHz]	p [dBm]	E-field [V/m] Probe SN: 2333		H-field [A/m] Probe SN: 6053		PMF E-field	PMF H-field
		CW	GSM	CW	GSM		
835.0	20	95.6	33.9	0.452	0.173	2.82	2.61
1880.0	20	136.3	48.4	0.506	0.249	2.82	2.03

5.6 Slot Averaged Calculation Method

The slot-averaged values for the every measured signal type were calculated using observed PMFs.

5.7 Sub-grid Exclusion

The measurement grid defined in C63.19 consists of 9 evenly sized blocks, which are used to define permissible exclusion areas. For both E- and H-field measurements three contiguous blocks may be excluded from the measurements except center block may never be excluded. There must be 4 blocks left that are common for both E- and H-field measurements, so maximum of 5 different blocks can be excluded (e.g. 3 blocks excluded from E-field and 2 blocks from H-field).

5.8 Category Limits

From remaining maximum values after exclusion process, Hearing Aid M-category is defined according to the category limits of c63.19 – 2006.

Category	AWF [dB]	Limits for RF-parameters <960MHz				Limits for RF-parameters >960MHz			
		E-field [V/m]		H-field [A/m]		E-field [V/m]		H-field [A/m]	
		Min	Max	Min	Max	Min	Max	Min	Max
M1	0	631.0	1122.0	1.91	3.39	199.5	354.8	0.60	1.07
M1	-5	473.2	841.4	1.43	2.54	149.6	266.1	0.45	0.80
M2	0	354.8	631.0	1.07	1.91	112.2	199.5	0.34	0.60
M2	-5	266.1	473.2	0.80	1.43	84.1	149.6	0.25	0.45
M3	0	199.5	354.8	0.60	1.07	63.1	112.2	0.19	0.34
M3	-5	149.6	266.1	0.45	0.80	47.3	84.1	0.14	0.25
M4	0		<199.5		<0.60		<63.1		<0.19
M4	-5		<149.6		<0.45		<47.3		<0.14

6. MEASUREMENT UNCERTAINTY

Source of Uncertainty	Tolerance ±%	Probability Distribution	Div.	ci E	ci H	Standard Uncertainty ±%, E	Standard Uncertainty ±%, H	Remark
MEASUREMENT SYSTEM								
Probe Calibration	5.1	N	1	1	1	5.1	5.1	
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7	
Sensor Displacement	16.5	R	√3	1	0.145	9.5	1.4	
Boundary Effect	2.4	R	√3	1	1	1.4	1.4	
Linearity	4.7	R	√3	1	1	2.7	2.7	SAR
Scaling to Peak Envelope Power	2.0	R	√3	1	1	1.2	1.2	
System Detection Limit	1.0	R	√3	1	1	0.6	0.6	
Readout Electronics	0.3	N	1	1	1	0.3	0.3	SAR
Response Time	0.8	R	√3	1	1	0.5	0.5	
Integration Time	2.6	R	√3	1	1	1.5	1.5	SAR
RF Ambient Conditions	3.0	R	√3	1	1	1.7	1.7	SAR
RF Reflections	12.0	R	√3	1	1	6.9	6.9	
Probe Positioner	1.2	R	√3	1	0.67	0.7	0.5	
Probe Positioning	4.7	R	√3	1	0.67	2.7	1.8	
Extrapolation and Interpolation	1.0	R	√3	1	1	0.6	0.6	SAR
TEST SAMPLE RELATED								
Device Positioning Vertical	4.7	R	√3	1	0.67	2.7	1.8	
Device Positioning Lateral	1.0	R	√3	1	1	0.6	0.6	
Device Holder and Test Arch	2.4	R	√3	1	1	1.4	1.4	
Power Drift	5.0	R	√3	1	1	2.9	2.9	SAR
TEST ARCH AND SETUP RELATED								
Test Arch Thickness	2.4	R	√3	1	0.67	1.4	0.9	
COMBINED STANDARD UNCERTAINTY						14.7	10.9	
Expanded Uncertainty on Power						29.4	21.8	
Expanded Uncertainty on Field						14.7	10.9	

7. RESULTS

The calculated maximum field values for the test device are tabulated below:

850MHz RF emissions test results

Option used	Test configuration	Ch 128 824.2MHz	Ch 190 836.6MHz	Ch 251 848.8MHz
GSM850	Power	32.3 dBm	32.3 dBm	31.9 dBm
Flip open	E-field [V/M]	130.6	150.0	146.3
	H-field [A/m]	0.168	0.176	0.179
	Category	M4 (-5dB)	M3 (-5dB)	M4 (-5dB)

1900MHz RF emissions test results

Option used	Test configuration	Ch 512 1850.2MHz	Ch 661 1880.0MHz	Ch 810 1909.8MHz
GSM 1900	Power	31.1 dBm	32.3 dBm	30.6 dBm
Flip open	E-field [V/M]	39.7	48.0	47.0
	H-field [A/m]	0.099	0.097	0.113
	Category	M4 (-5dB)	M3 (-5dB)	M4 (-5dB)

Plots of the measurement scans are shown in **Appendix B**. Excluded cells are colored orange.

APPENDIX A: SYSTEM VALIDATION SCANS

SYSTEM VALIDATION DATA 850MHz

Date/Time: 20.05.2008 16:22:36
Test Laboratory: TCC Nokia
Type: D835V3; Serial: 1004

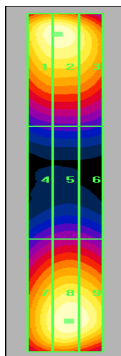
Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³
Phantom section: E Dipole Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2333; Probe Notes:
- ConvF(1, 1, 1); Calibrated: 21.01.2008
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 23.04.2008
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - ER3DV6 - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 170.2 V/m
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, 354.7 mm
Reference Value = 127.2 V/m; Power Drift = -0.010 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)



Grid 1	Grid 2	Grid 3
168.4 M4	169.4 M4	158.8 M4
Grid 4	Grid 5	Grid 6
87.2 M4	91.5 M4	90.1 M4
Grid 7	Grid 8	Grid 9
159.7 M4	170.2 M4	168.3 M4

Date/Time: 20.05.2008 15:42:19
Test Laboratory: TCC Nokia
Type: D835V3; Serial: 1004

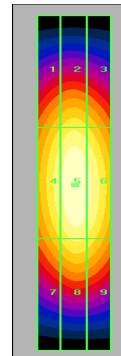
Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³
Phantom section: H Dipole Section

DASY4 Configuration:

- Probe: H3DV6 - SN6053; Probe Notes:
- ; Calibrated: 21.01.2008
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 23.04.2008
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - H3DV6 - 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 = 0.476 A/m
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, 354.7 mm
Reference Value = 0.505 A/m; Power Drift = -0.009 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)



Grid 1	Grid 2	Grid 3
0.390 M4	0.412 M4	0.393 M4
Grid 4	Grid 5	Grid 6
0.446 M4	0.476 M4	0.459 M4
Grid 7	Grid 8	Grid 9
0.392 M4	0.425 M4	0.412 M4

SYSTEM VALIDATION DATA 1900MHZ

Date/Time: 20.05.2008 14:25:19

Test Laboratory: TCC Nokia

Type: CD1880V3; Serial: 1003

Communication System: CW1880

Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: Air; Medium Notes: Not Specified

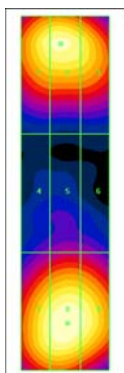
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³

Phantom section: E Dipole Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2333; Probe Notes:
- ConvF(1, 1, 1); Calibrated: 21.01.2008
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 23.04.2008
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - ER3DV6 - 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 = 126.7 V/m
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, 354.7 mm
Reference Value = 131.2 V/m; Power Drift = 0.652 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)



Grid 1 121.6 M2	Grid 2 123.6 M2	Grid 3 117.8 M2
Grid 4 80.8 M3	Grid 5 85.0 M3	Grid 6 83.8 M3
Grid 7 121.9 M2	Grid 8 126.7 M2	Grid 9 123.7 M2

Date/Time: 20.05.2008 15:31:36

Test Laboratory: TCC Nokia

Type: D835V3; Serial: 1004

Communication System: CW1880

Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: Air; Medium Notes: Not Specified

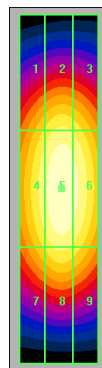
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Phantom section: H Dipole Section

DASY4 Configuration:

- Probe: H3DV6 - SN6053; Probe Notes:
- ; Calibrated: 21.01.2008
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 23.04.2008
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - H3DV6 - 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 = 0.406 A/m
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, 354.7 mm
Reference Value = 0.429 A/m; Power Drift = -0.018 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)



Grid 1 0.346 M2	Grid 2 0.369 M2	Grid 3 0.359 M2
Grid 4 0.382 M2	Grid 5 0.406 M2	Grid 6 0.395 M2
Grid 7 0.345 M2	Grid 8 0.369 M2	Grid 9 0.358 M2

APPENDIX B: MEASUREMENT SCANS

MEASUREMENT DATA GSM850, CHANNEL MIDDLE (836.6 MHz)

Date/Time: 2008-05-26 18:40:18
Test Laboratory: TCC Nokia
Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM850 (ER3DV6)
Frequency: 836.6 MHz; Duty Cycle: 1:7.95
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³
Phantom section: E Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2333
- ConvF(1, 1, 1); Calibrated: 2008-01-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - ER3DV6 - from the closest probe sensor part to the Device = 10mm, Middle/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 150.0 V/m
Probe Modulation Factor = 2.82
Device Reference Point: 0.000, 0.000, 353.7 mm
Reference Value = 55.7 V/m; Power Drift = -0.010 dB
Hearing Aid Near-Field Category: M3 (AWF -5 dB)



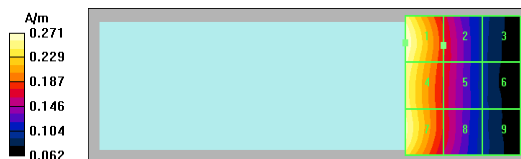
Grid 1	Grid 2	Grid 3
139.9 M4	144.8 M4	135.5 M4
Grid 4	Grid 5	Grid 6
145.6 M4	150.0 M3	140.3 M4
Grid 7	Grid 8	Grid 9
133.2 M4	137.6 M4	129.4 M4

Date/Time: 2008-05-26 19:02:16
Test Laboratory: TCC Nokia
Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM850 (H3DV6)
Frequency: 836.6 MHz; Duty Cycle: 1:6.79
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³
Phantom section: H Device Section

DASY4 Configuration:
- Probe: H3DV6 - SN6053
- ; Calibrated: 2008-01-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - H3DV6 - from the closest probe sensor part to the Device = 10mm, middle/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.271 A/m
Probe Modulation Factor = 2.61
Device Reference Point: 0.000, 0.000, 353.7 mm
Reference Value = 0.052 A/m; Power Drift = -0.029 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)



Grid 1	Grid 2	Grid 3
0.271 M4	0.178 M4	0.099 M4
Grid 4	Grid 5	Grid 6
0.262 M4	0.176 M4	0.099 M4
Grid 7	Grid 8	Grid 9
0.262 M4	0.173 M4	0.099 M4

MEASUREMENT DATA GSM850, CHANNEL HIGH (848.8 MHz)

Date/Time: 2008-05-26 18:45:11
Test Laboratory: TCC Nokia
Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM850 (ER3DV6)
Frequency: 848.8 MHz; Duty Cycle: 1:7.95
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³
Phantom section: E Device Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2333
- ConvF(1, 1, 1); Calibrated: 2008-01-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - ER3DV6 - from the closest probe sensor part to the Device
= 10mm, High/Hearing Aid Compatibility Test (101x101x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 146.3 V/m
Probe Modulation Factor = 2.82
Device Reference Point: 0.000, 0.000, 353.7 mm
Reference Value = 54.5 V/m; Power Drift = -0.039 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)



Grid 1	Grid 2	Grid 3
137.6 M4	142.1 M4	133.8 M4
Grid 4	Grid 5	Grid 6
142.5 M4	146.3 M4	138.5 M4
Grid 7	Grid 8	Grid 9
130.0 M4	135.2 M4	128.5 M4

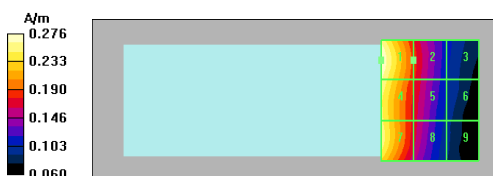
Date/Time: 2008-05-26 19:07:37
Test Laboratory: TCC Nokia
Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM850 (H3DV6)
Frequency: 848.8 MHz; Duty Cycle: 1:6.79
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³
Phantom section: H Device Section

DASY4 Configuration:

- Probe: H3DV6 - SN6053
- ; Calibrated: 2008-01-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - H3DV6 - from the closest probe sensor part to the Device
= 10mm, High/Hearing Aid Compatibility Test (101x101x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.276 A/m
Probe Modulation Factor = 2.61
Device Reference Point: 0.000, 0.000, 353.7 mm
Reference Value = 0.053 A/m; Power Drift = -0.005 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)



Grid 1	Grid 2	Grid 3
0.276 M4	0.184 M4	0.111 M4
Grid 4	Grid 5	Grid 6
0.262 M4	0.179 M4	0.105 M4
Grid 7	Grid 8	Grid 9
0.257 M4	0.170 M4	0.097 M4

MEASUREMENT DATA GSM1900, CHANNEL MIDDLE (1880 MHz)

Date/Time: 2008-05-26 18:13:42

Test Laboratory: TCC Nokia

Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM1900 (ER3DV6)

Frequency: 1880 MHz; Duty Cycle: 1:7.92

Medium: Air; Medium Notes: Not Specified

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

Phantom section: E Device Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2333

- ConvF(1, 1, 1); Calibrated: 2008-01-21

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn728; Calibrated: 2008-04-23

- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - ER3DV6 - from the closest probe sensor part to the Device = 10mm, Middle/Hearing Aid Compatibility Test (101x101x1):

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

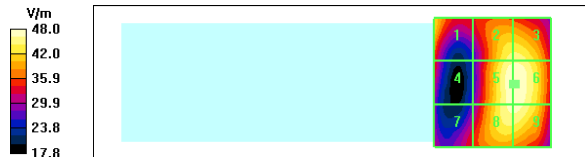
Maximum value of peak Total field = 48.0 V/m

Probe Modulation Factor = 2.82

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 15.1 V/m; Power Drift = -0.078 dB

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



Date/Time: 2008-05-26 19:15:55

Test Laboratory: TCC Nokia

Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM1900 (H3DV6)

Frequency: 1880 MHz; Duty Cycle: 1:4.13

Medium: Air; Medium Notes: Not Specified

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

Phantom section: H Device Section

DASY4 Configuration:

- Probe: H3DV6 - SN6053

- ; Calibrated: 2008-01-21

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn728; Calibrated: 2008-04-23

- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - H3DV6 - from the closest probe sensor part to the Device = 10mm, middle/Hearing Aid Compatibility Test (101x101x1):

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

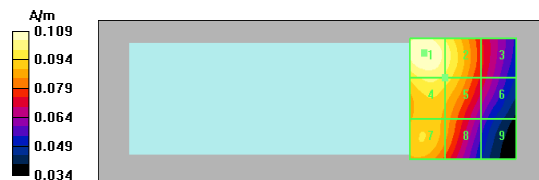
Maximum value of peak Total field = 0.109 A/m

Probe Modulation Factor = 2.03

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 0.041 A/m; Power Drift = 0.013 dB

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



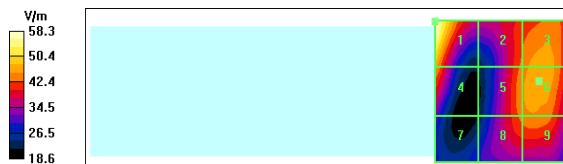
MEASUREMENT DATA GSM1900, CHANNEL HIGH (1909.8 MHz)

Date/Time: 2008-05-26 18:23:30
Test Laboratory: TCC Nokia
Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM1900 (ER3DV6)
Frequency: 1909.8 MHz; Duty Cycle: 1:7.92
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³
Phantom section: E Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2333
- ConvF(1, 1, 1); Calibrated: 2008-01-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - ER3DV6 - from the closest probe sensor part to the Device = 10mm, High/Hearing Aid Compatibility Test (101x101x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 58.3 V/m
Probe Modulation Factor = 2.82
Device Reference Point: 0.000, 0.000, 353.7 mm
Reference Value = 12.5 V/m; Power Drift = -0.012 dB
Hearing Aid Near-Field Category: M3 (AWF -5 dB)



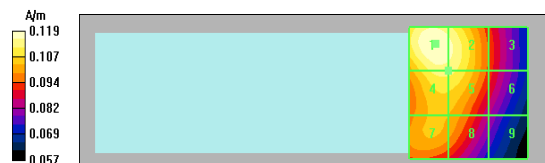
Grid 1	Grid 2	Grid 3
58.3 M3	43.5 M4	46.7 M4
Grid 4	Grid 5	Grid 6
46.3 M4	44.7 M4	47.0 M4
Grid 7	Grid 8	Grid 9
32.3 M4	43.6 M4	44.8 M4

Date/Time: 2008-05-26 19:26:02
Test Laboratory: TCC Nokia
Type: RM-260; Serial: 353274/01/024754/6

Communication System: GSM1900 (H3DV6)
Frequency: 1909.8 MHz; Duty Cycle: 1:4.13
Medium: Air; Medium Notes: Not Specified
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³
Phantom section: H Device Section

DASY4 Configuration:
- Probe: H3DV6 - SN6053
- ; Calibrated: 2008-01-21
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1004
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - H3DV6 - from the closest probe sensor part to the Device = 10mm, High/Hearing Aid Compatibility Test (101x101x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.119 A/m
Probe Modulation Factor = 2.03
Device Reference Point: 0.000, 0.000, 353.7 mm
Reference Value = 0.050 A/m; Power Drift = 0.004 dB
Hearing Aid Near-Field Category: M4 (AWF -5 dB)



Grid 1	Grid 2	Grid 3
0.119 M4	0.117 M4	0.094 M4
Grid 4	Grid 5	Grid 6
0.113 M4	0.113 M4	0.093 M4
Grid 7	Grid 8	Grid 9
0.104 M4	0.103 M4	0.083 M4

APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)



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 **Nokia Salo TCC**

Certificate No: ER3-2333_Jan08

CALIBRATION CERTIFICATE

Object **ER3DV6 - SN:2333**

Calibration procedure(s) **QA CAL-02.v5**
Calibration procedure for E-field probes optimized for close near field evaluations in air

Calibration date: **January 21, 2008**

Condition of the calibrated item **In Tolerance**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ER3DV6	SN: 2328	2-Oct-07 (SPEAG, No. ER3-2328_Oct07)	Oct-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: January 21, 2008

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Nokia Salo TCC**

Certificate No: **H3-6053_Jan08**

CALIBRATION CERTIFICATE

Object	H3DV6 - SN:6053
Calibration procedure(s)	QA CAL-03.v5 Calibration procedure for H-field probes optimized for close near field evaluations in air
Calibration date:	January 21, 2008
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe H3DV6	SN: 6182	2-Oct-07 (SPEAG, No. H3-6182_Oct07)	Oct-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: January 21, 2008

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APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORT(S)



Accredited by the Swiss Federal Office of Metrology and Accreditation
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Nokia Salo TCC**

Certificate No: **CD835V3-1004_Feb07**

CALIBRATION CERTIFICATE

Object **CD835V3 - SN: 1004**

Calibration procedure(s) **QA CAL-20.v4
Calibration procedure for dipoles in air**

Calibration date: **February 13, 2007**

Condition of the calibrated item **In Tolerance**

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
DAE4	SN: 660	1-Mar-06 (SPEAG, No. DAE4-660_Mar06)	Calibration, Mar-07
Probe ER3DV6	SN: 2336	27-Dec-06 (SPEAG, No. ER3-2336_Dec06)	Calibration, Dec-07
Probe H3DV6	SN: 6065	27-Dec-06 (SPEAG, No. H3-6065-Dec06)	Calibration, Dec-07
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-4419B	GB43310788	12-Aug-03 (SPEAG, in house check Oct-06)	In house check: Oct-07
Power sensor HP 8481A	MY41093312	10-Aug-03 (SPEAG, in house check Oct-06)	In house check: Oct-08
Power sensor HP 8481A	MY41093315	10-Aug-03 (SPEAG, in house check Oct-06)	In house check: Oct-08
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07
RF generator R&S SMT06	SN: 100005	26-Jul-04 (SPEAG, in house check Nov-05)	In house check: Nov-07

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

Issued: March 6, 2007

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

1 Measurement Conditions

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

DASY Version	DASY4	V4.7 B53
DASY PP Version	SEMCAD	V1.8 B172
Phantom	HAC Test Arch	SD HAC P01 BA, #1002
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 180 mm
Frequency	835 MHz ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.07 dB	

2 Maximum Field values

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW forward power	0.452 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	161.7 V/m
Maximum measured above low end	100 mW forward power	158.3 V/m
Averaged maximum above arm	100 mW forward power	160.0 V/m

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

3 Appendix

3.1 Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	16.8 dB	(42.5 – j11.2) Ohm
835 MHz	26.1 dB	(52.9 + j4.2) Ohm
900 MHz	15.6 dB	(57.3 – j16.4) Ohm
950 MHz	24.7 dB	(45.3 + j2.9) Ohm
960 MHz	19.1 dB	(51.7 + j11.2) 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.

3.3.2 DASY4 H-Field Result

Date/Time: 2/13/2007 10:40:13 AM

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1004

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: Air
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³
Phantom section: H Dipole Section

DASY4 Configuration:

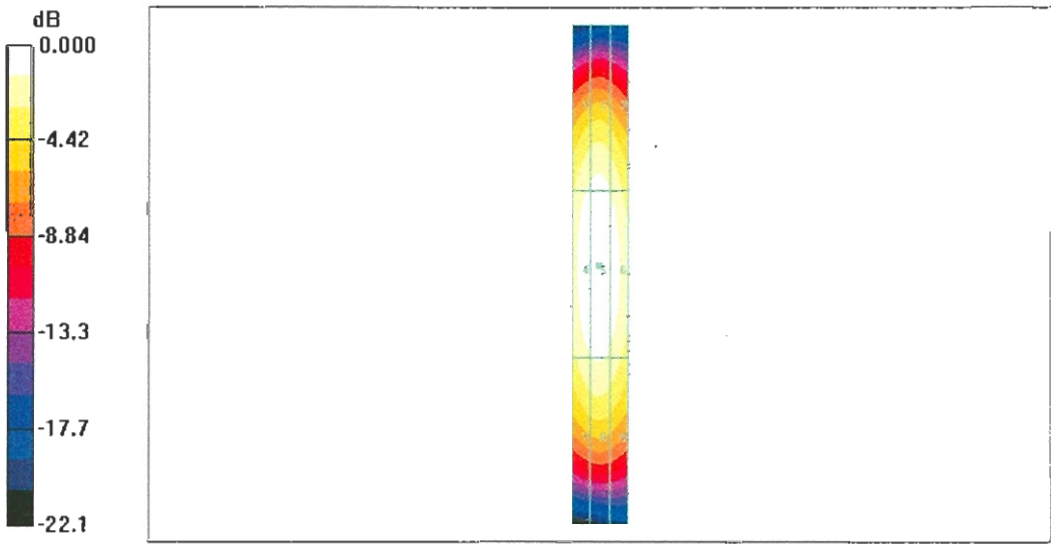
- Probe: H3DV6 - SN6065; ; Calibrated: 12/27/2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn660: Calibrated: 3/1/2006
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1002
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

H Scan - Sensor Center 10mm above CD835 Dipole/Hearing Aid Compatibility Test (41x361x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.452 A/m
Probe Modulation Factor = 1.00
Reference Value = 0.479 A/m; Power Drift = 0.012 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
0.393	0.408	0.380
Grid 4	Grid 5	Grid 6
0.436	0.452	0.425
Grid 7	Grid 8	Grid 9
0.374	0.387	0.365



0 dB = 0.452A/m

3.3.3 DASY4 E-Field Result

Date/Time: 2/13/2007 2:25:30 PM

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1004

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium: Air

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

Phantom section: E Dipole Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 12/27/2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn660; Calibrated: 3/1/2006
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1002
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

E Scan - Sensor Center 10mm above CD835 Dipole/Hearing Aid Compatibility Test (41x361x1):

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

Maximum value of peak Total field = 161.7 V/m

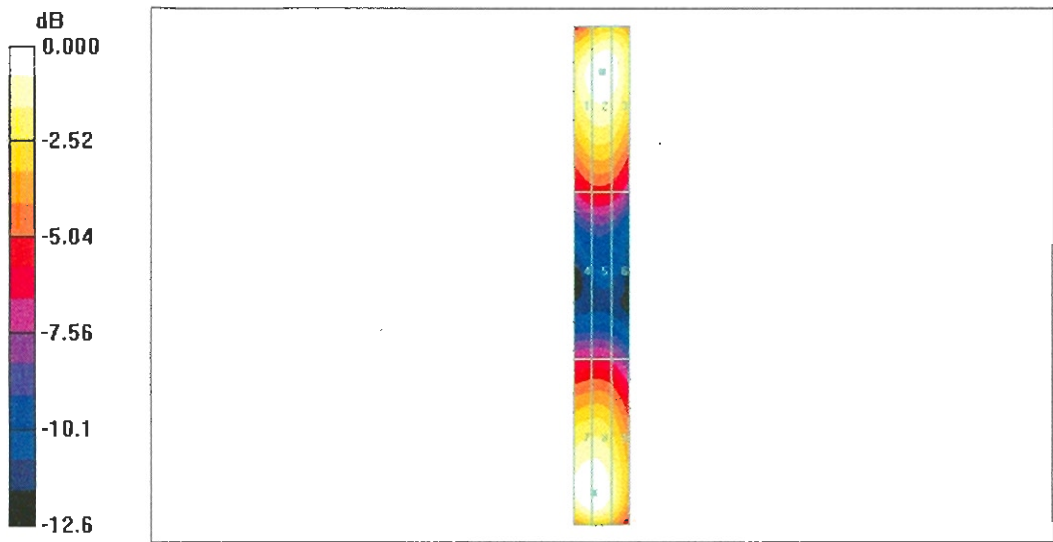
Probe Modulation Factor = 1.00

Reference Value = 107.2 V/m; Power Drift = 0.001 dB

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

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
153.2	158.3	154.4
Grid 4	Grid 5	Grid 6
84.7	85.8	82.6
Grid 7	Grid 8	Grid 9
161.6	161.7	143.5



0 dB = 161.7V/m



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Nokia Salo TCC**

Certificate No: **CD1880V3-1003_Feb07**

CALIBRATION CERTIFICATE

Object **CD1880V3 - SN: 1003**

Calibration procedure(s) **QA CAL-20.v4
Calibration procedure for dipoles in air**

Calibration date: **February 12, 2007**

Condition of the calibrated item **In Tolerance**

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
DAE4	SN: 660	1-Mar-06 (SPEAG, No. DAE4-660_Mar06)	Calibration, Mar-07
Probe ER3DV6	SN: 2336	27-Dec-06 (SPEAG, No. ER3-2336_Dec06)	Calibration, Dec-07
Probe H3DV6	SN: 6065	27-Dec-06 (SPEAG, No. H3-6065-Dec06)	Calibration, Dec-07
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-4419B	GB43310788	12-Aug-03 (SPEAG, in house check Oct-06)	In house check: Oct-07
Power sensor HP 8481A	MY41093312	10-Aug-03 (SPEAG, in house check Oct-06)	In house check: Oct-08
Power sensor HP 8481A	MY41093315	10-Aug-03 (SPEAG, in house check Oct-06)	In house check: Oct-08
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07
RF generator R&S SMT06	SN: 100005	26-Jul-04 (SPEAG, in house check Nov-05)	In house check: Nov-07

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

Issued: February 14, 2007

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1 Measurement Conditions

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

DASY Version	DASY4	V4.7 B53
DASY PP Version	SEMCAD	V1.8 B172
Phantom	HAC Test Arch	SD HAC P01 BA, #1002
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 90 mm
Frequency	1880 MHz ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2 Maximum Field values

H-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured	100 mW forward power	0.452 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	130.9 V/m
Maximum measured above low end	100 mW forward power	126.7 V/m
Averaged maximum above arm	100 mW forward power	128.8 V/m

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

3 Appendix

3.1 Antenna Parameters

Frequency	Return Loss	Impedance
1710 MHz	19.0 dB	(49.8 + j11.3) Ohm
1880 MHz	19.9 dB	(53.7 + j9.9) Ohm
1900 MHz	19.8 dB	(56.3 + j9.0) Ohm
1950 MHz	23.7 dB	(57.0 – j0.7) Ohm
2000 MHz	26.2 dB	(45.4 + j0.7) 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.

3.3.2 DASY4 H-Field Result

Date/Time: 2/12/2007 4:55:48 PM

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1003

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: Air

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

Phantom section: H Dipole Section

DASY4 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 12/27/2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn660; Calibrated: 3/1/2006
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1002
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

H Scan - Sensor Center 10mm above CD1880V3 Dipole/Hearing Aid Compatibility Test (41x181x1):

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

Maximum value of peak Total field = 0.452 A/m

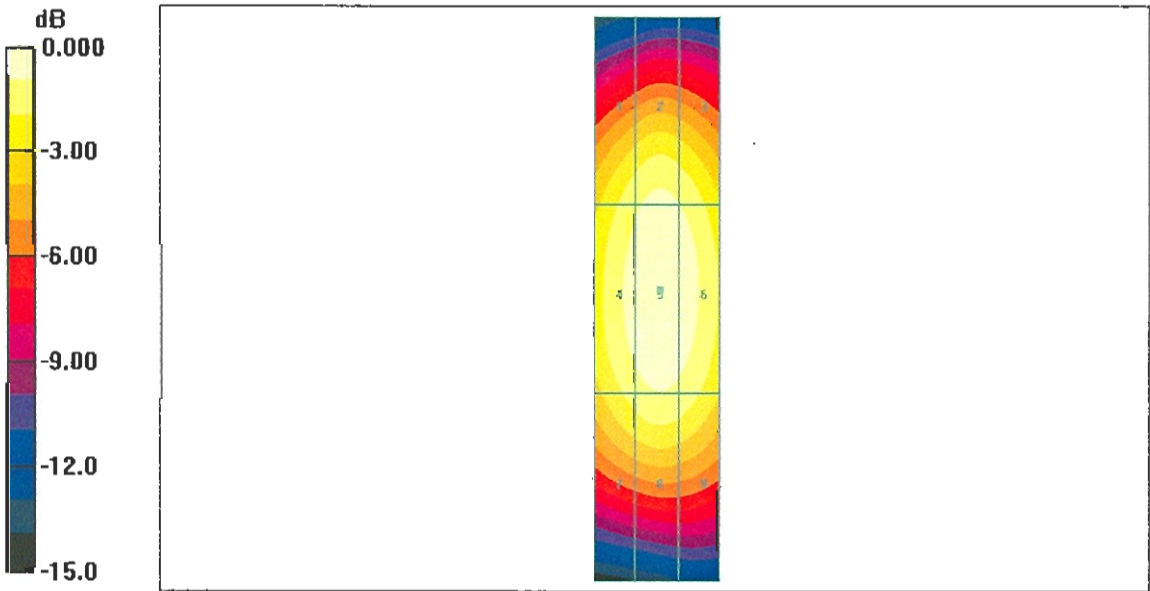
Probe Modulation Factor = 1.00

Reference Value = 0.476 A/m; Power Drift = 0.007 dB

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

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
0.392	0.419	0.404
Grid 4	Grid 5	Grid 6
0.425	0.452	0.437
Grid 7	Grid 8	Grid 9
0.378	0.401	0.388



0 dB = 0.452A/m

3.3.3 DASY4 E-Field Result

Date/Time: 2/12/2007 2:59:33 PM

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1003

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: Air

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

Phantom section: E Dipole Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 12/27/2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn660; Calibrated: 3/1/2006
- Phantom: HAC Test Arch 4.6; Type: SD HAC P01 BA; Serial: 1002
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

E Scan - Sensor Center 10mm above CD1880V3 Dipole/Hearing Aid Compatibility Test (41x181x1):

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

Maximum value of peak Total field = 130.9 V/m

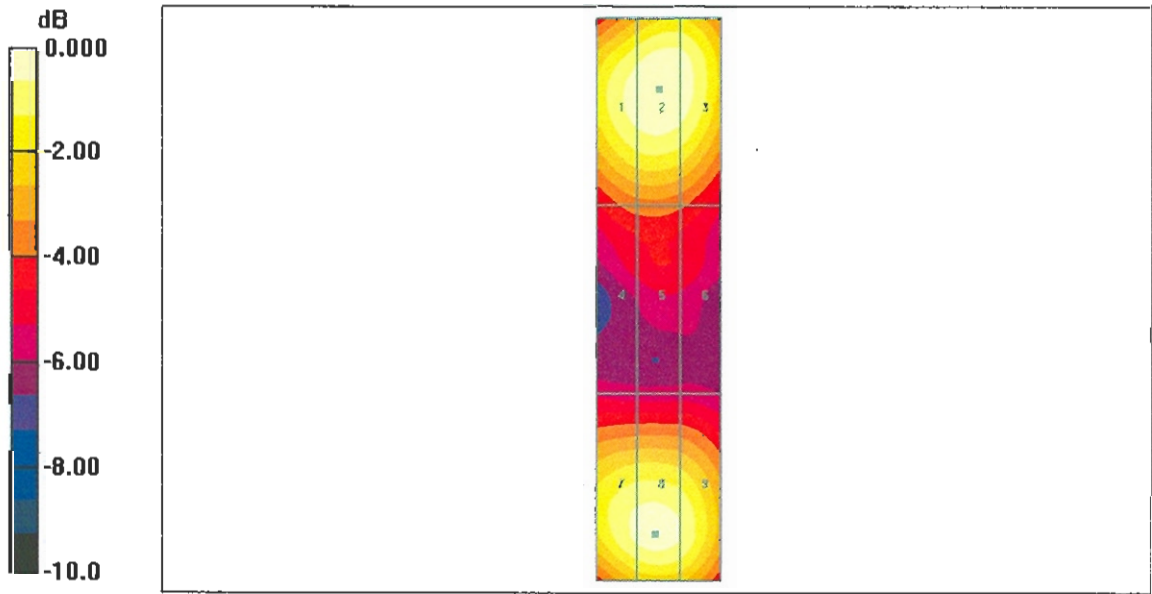
Probe Modulation Factor = 1.00

Reference Value = 139.0 V/m; Power Drift = 0.015 dB

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

Peak E-field in V/m

Grid 1	Grid 2	Grid 3
126.8	130.9	127.9
Grid 4	Grid 5	Grid 6
86.2	87.1	84.0
Grid 7	Grid 8	Grid 9
123.9	126.7	121.4



0 dB = 130.9V/m