

HAC RF Emissions Test Report

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Measurements made by:	Heikki Kuusela		
Tested devices:	RM-497		
FCC ID:	QTLRM-497	IC:	661AD-RM497
Supplement reports:	HAC_Photo_RM-497_14, T-Coil_RM-497_13		
Testing has been carried out in accordance with:	ANSI C63.19-2007 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	2010-07-13
SN, HW, SW and DUT numbers of tested device	SN: 004401/10713661/2, HW: 9007, SW: 08.10, DUT: 14905
Batteries used in testing	BL-4S, DUT: 14901, 14904
State of sample	Prototype unit
Notes	AWF = -5 for GSM

1.2 Maximum Results

The maximum measured HAC RF emissions values and categories for electric and magnetic fields are given in section 1.2.1 and 1.2.2 respectively.

1.2.1 Electric field measurements

Band & Mode	Ch / Freq. [MHz]	Conducted power	Limit of E-field max. value in category M3 [V/m]	Maximum E-field value after exclusion [V/m]	Category
GSM850	251 / 848.8	32.5 dBm	149.6 – 266.1	111.8	M4 (-5dB)
GSM1900	661 / 1880.0	30.5 dBm	47.3 – 84.1	67.6	M3 (-5dB)

1.2.2 Magnetic field measurements

Band & Mode	Ch / Freq. [MHz]	Conducted power	Limit of H-field max. value in category M3 [A/m]	Maximum H-field value after exclusion [A/m]	Category
GSM850	190 / 836.6	32.5 dBm	0.45 – 0.80	0.160	M4 (-5dB)
GSM1900	661 / 1880.0	30.5 dBm	0.14 – 0.25	0.163	M3 (-5dB)

1.2.3 Overall RF emissions category of the tested device

Band & Mode	Combined category (E- and H-fields)	Pass / Fail
GSM850	M4	Pass
GSM1900	M3	Pass
Final Category	M3	Pass

1.2.4 Maximum Drift

Maximum drift during measurements	0.25 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 1900	GMSK	1/8	824 – 849 1850 – 1910

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

2.1 Picture of Device

See separate report HAC_Photo_RM-497_14.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature [°C]:	20.4 to 22.3
Ambient humidity [RH %]:	55 to 72

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 lowest, middle and highest 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
DAE4	1213	12 months	2010-11
E-field Probe ER3DV6	2309	12 months	2010-10
H-field Probe H3DV6	6143	12 months	2010-10
Dipole Validation Kit, CD835V3	1005	24 months	2010-11
Dipole Validation Kit, CD1880V3	1004	24 months	2010-11
DASY4 software	Version 4.7	-	-

Additional test equipment used in testing and validation:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	SML03	101265	12 months	2010-09
Amplifier	ZHL-42 (SMA)	N072095-5	12 months	2010-09
Power Meter	NRVS	838624/032	12 months	2010-09
Power Sensor	NRV-Z32	839176/020	12 months	2010-09
Call Tester	CMU 200	101111	-	-

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
Application	Distance from probe tip to nearest point of dipole: 1.25 mm 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
Application	Distance from probe tip to nearest point of dipole: 1.1 mm 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 10mm 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	164.1	0.441
	± 10% window	147.7 – 180.5	0.397 – 0.485
	2010-07-13	169.1	0.478
1880	Reference result	137.9	0.461
	± 10% window	124.1 – 151.7	0.415 – 0.507
	2010-07-13	135.1	0.467

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.

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 15mm. 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_{mod} [dBm]	E-field [V/m] Probe SN: 2309		H-field [A/m] Probe SN: 6143		PMF E-field	PMF H-field
		CW	GSM	CW	GSM		
835.0	20	99.6	34.7	0.459	0.169	2.87	2.72
1880.0	20	158.4	55.1	0.498	0.221	2.87	2.25

5.6 Slot Averaged Calculation Method

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

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 – 2007.

		Limits for RF-parameters <960MHz	
Category	AWF [dB]	E-field [V/m]	H-field [A/m]
M1	0	631.0 to 1122.0	1.91 to 3.39
	-5	473.2 to 841.4	1.43 to 2.54
M2	0	354.8 to 631.0	1.07 to 1.91
	-5	266.1 to 473.2	0.80 to 1.43
M3	0	199.5 to 354.8	0.60 to 1.07
	-5	149.6 to 266.1	0.45 to 0.80
M4	0	<199.5	<0.60
	-5	<149.6	<0.45

		Limits for RF-parameters >960MHz	
Category	AWF [dB]	E-field [V/m]	H-field [A/m]
M1	0	199.5 to 354.8	0.60 to 1.07
	-5	149.6 to 266.1	0.45 to 0.80
M2	0	112.2 to 199.5	0.34 to 0.60
	-5	84.1 to 149.6	0.25 to 0.45
M3	0	63.1 to 112.2	0.19 to 0.34
	-5	47.3 to 84.1	0.14 to 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.14

6. MEASUREMENT UNCERTAINTY

Source of Uncertainty	Tolerance ±%	Prob. Dist.	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:

GSM850, RF emissions results

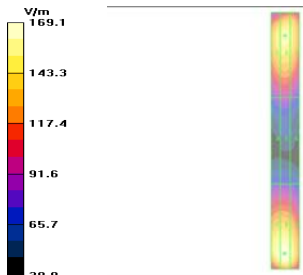
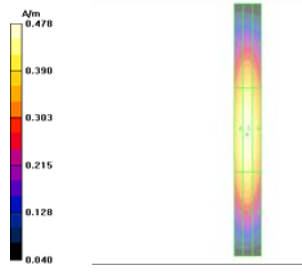
Mode	Flip option	Test configuration	Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz
GSM850	Flip open	Power	32.5 dBm	32.5 dBm	32.5 dBm
		E-field [V/m]	98.9	108.2	111.8
		H-field [A/m]	0.153	0.160	0.155
		Category	M4 (-5 dB)	M4 (-5 dB)	M4 (-5 dB)

GSM1900, RF emissions results

Mode	Flip option	Test configuration	Ch 512 1850.2MHz	Ch 661 1880.0MHz	Ch 810 1909.8MHz
GSM1900	Flip open	Power	30.5 dBm	30.5 dBm	30.5 dBm
		E-field [V/m]	67.2	67.6	58.2
		H-field [A/m]	0.160	0.163	0.145
		Category	M3 (-5 dB)	M3 (-5 dB)	M3 (-5 dB)

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: 2010-07-13 09:41:02 Test Laboratory: TCC Nokia Type: CD835V3; Serial: 1005	Date/Time: 2010-07-13 09:27:10 Test Laboratory: TCC Nokia Type: CD835V3; Serial: 1005																		
Communication System: CW Frequency: 835 MHz; Duty Cycle: 1:1 Medium: Air; Medium Notes: - Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³ Phantom section: E Dipole Section	Communication System: CW Frequency: 835 MHz; Duty Cycle: 1:1 Medium: Air; Medium Notes: - Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³ Phantom section: H Dipole Section																		
DASY4 Configuration: - Probe: ER3DV6 - SN2309 - ConvF(1, 1, 1); Calibrated: 2009-10-27 - Sensor-Surface: (Fix Surface) - Electronics: DAE4 Sn1213; Calibrated: 2009-11-16 - Phantom: HAC Test Arch; Type: SD HAC P01 BA; Serial: - - Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184	DASY4 Configuration: - Probe: H3DV6 - SN6143 - ; Calibrated: 2009-10-23 - Sensor-Surface: (Fix Surface) - Electronics: DAE4 Sn1213; Calibrated: 2009-11-16 - Phantom: HAC Test Arch; Type: SD HAC P01 BA; Serial: - - Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184																		
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 = 169.1 V/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, 354.7 mm Reference Value = 109.2 V/m; Power Drift = 0.052 dB Hearing Aid Near-Field Category: M4 (AWF 0 dB)  <table><tr><td>Grid 1 153.2 M4</td><td>Grid 2 156.6 M4</td><td>Grid 3 152.4 M4</td></tr><tr><td>Grid 4 88.2 M4</td><td>Grid 5 90.5 M4</td><td>Grid 6 86.5 M4</td></tr><tr><td>Grid 7 165.3 M4</td><td>Grid 8 169.1 M4</td><td>Grid 9 159.7 M4</td></tr></table>	Grid 1 153.2 M4	Grid 2 156.6 M4	Grid 3 152.4 M4	Grid 4 88.2 M4	Grid 5 90.5 M4	Grid 6 86.5 M4	Grid 7 165.3 M4	Grid 8 169.1 M4	Grid 9 159.7 M4	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 = 0.478 A/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, 354.7 mm Reference Value = 0.506 A/m; Power Drift = 0.029 dB Hearing Aid Near-Field Category: M4 (AWF 0 dB)  <table><tr><td>Grid1 0.388 M4</td><td>Grid 2 0.407 M4</td><td>Grid 3 0.380 M4</td></tr><tr><td>Grid4 0.457 M4</td><td>Grid 5 0.478 M4</td><td>Grid 6 0.445 M4</td></tr><tr><td>Grid7 0.404 M4</td><td>Grid 8 0.422 M4</td><td>Grid 9 0.392 M4</td></tr></table>	Grid1 0.388 M4	Grid 2 0.407 M4	Grid 3 0.380 M4	Grid4 0.457 M4	Grid 5 0.478 M4	Grid 6 0.445 M4	Grid7 0.404 M4	Grid 8 0.422 M4	Grid 9 0.392 M4
Grid 1 153.2 M4	Grid 2 156.6 M4	Grid 3 152.4 M4																	
Grid 4 88.2 M4	Grid 5 90.5 M4	Grid 6 86.5 M4																	
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Grid1 0.388 M4	Grid 2 0.407 M4	Grid 3 0.380 M4																	
Grid4 0.457 M4	Grid 5 0.478 M4	Grid 6 0.445 M4																	
Grid7 0.404 M4	Grid 8 0.422 M4	Grid 9 0.392 M4																	

SYSTEM VALIDATION DATA 1900MHZ

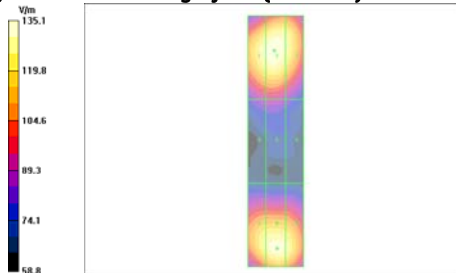
Date/Time: 2010-07-13 09:48:53

Test Laboratory: TCC Nokia
Type: CD1880V3; Serial: 1004

Communication System: CW
Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: Air; Medium Notes: -
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³
Phantom section: E Dipole Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2309
- ConvF(1, 1, 1); Calibrated: 2009-10-27
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16
- Phantom: HAC Test Arch; Type: SD HAC P01 BA; Serial: -
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184

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 = 135.1 V/m
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, 354.7 mm
Reference Value = 148.8 V/m; Power Drift = 0.029 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)



Grid 1	Grid 2	Grid 3
131.8	135.1	129.9
M2	M2	M2
Grid 4	Grid 5	Grid 6
89.9	90.9	85.6
M3	M3	M3
Grid 7	Grid 8	Grid 9
127.7	133.3	129.8
M2	M2	M2

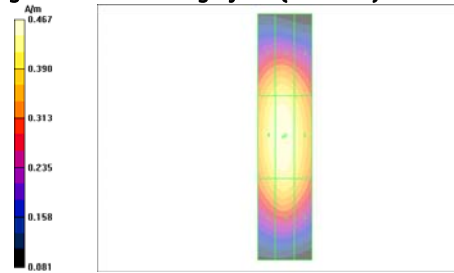
Date/Time: 2010-07-13 09:20:03

Test Laboratory: TCC Nokia
Type: CD1880V3; Serial: 1004

Communication System: CW
Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: Air; Medium Notes: -
Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³
Phantom section: H Dipole Section

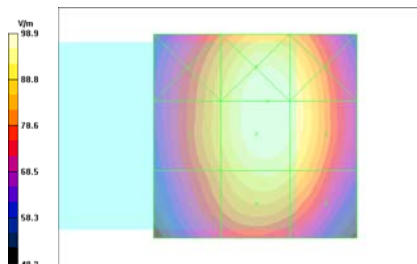
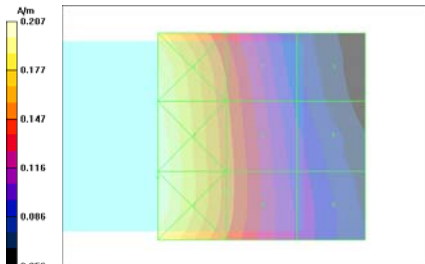
DASY4 Configuration:
- Probe: H3DV6 - SN6143
- ; Calibrated: 2009-10-23
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16
- Phantom: HAC Test Arch; Type: SD HAC P01 BA; Serial: -
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184

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 = 0.467 A/m
Probe Modulation Factor = 1.00
Device Reference Point: 0.000, 0.000, 354.7 mm
Reference Value = 0.495 A/m; Power Drift = 0.035 dB
Hearing Aid Near-Field Category: M2 (AWF 0 dB)



Grid 1	Grid 2	Grid 3
0.412	0.425	0.392
M2	M2	M2
Grid 4	Grid 5	Grid 6
0.450	0.467	0.435
M2	M2	M2
Grid 7	Grid 8	Grid 9
0.407	0.427	0.398
M2	M2	M2

APPENDIX B: MEASUREMENT SCANS

MEASUREMENT DATA GSM850, CHANNEL LOW (824.2 MHz)																			
Date/Time: 2010-07-13 11:11:17 Test Laboratory: TCC Nokia Type: RM-497; Serial: 004401/10713661/2	Date/Time: 2010-07-13 13:22:22 Test Laboratory: TCC Nokia Type: RM-497; Serial: 004401/10713661/2																		
Communication System: GSM850 (ER3DV6) Frequency: 824.2 MHz; Duty Cycle: 1:8.26 Medium: Air; Medium Notes: - Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³ Phantom section: E Device Section	Communication System: GSM850 (H3DV6) Frequency: 824.2 MHz; Duty Cycle: 1:7.34 Medium: Air; Medium Notes: - Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³ Phantom section: H Device Section																		
DASY4 Configuration: - Probe: ER3DV6 - SN2309 - ConvF(1, 1, 1); Calibrated: 2009-10-27 - Sensor-Surface: (Fix Surface) - Electronics: DAE4 Sn1213; Calibrated: 2009-11-16 - Phantom: HAC Test Arch; Type: SD HAC P01 BA; Serial: - - Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184 E Scan - Low/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm Maximum value of peak Total field = 98.9 V/m Probe Modulation Factor = 2.87 Device Reference Point: 0.000, 0.000, 353.7 mm Reference Value = 45.8 V/m; Power Drift = -0.014 dB Hearing Aid Near-Field Category: M4 (AWF -5 dB)	DASY4 Configuration: - Probe: H3DV6 - SN6143 - ; Calibrated: 2009-10-23 - Sensor-Surface: (Fix Surface) - Electronics: DAE4 Sn1213; Calibrated: 2009-11-16 - Phantom: HAC Test Arch; Type: SD HAC P01 BA; Serial: - - Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184 H Scan - Low/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm Maximum value of peak Total field = 0.153 A/m Probe Modulation Factor = 2.71 Device Reference Point: 0.000, 0.000, 353.7 mm Reference Value = 0.048 A/m; Power Drift = -0.056 dB Hearing Aid Near-Field Category: M4 (AWF -5 dB)																		
 <table><tr><td>Grid 1 88.6 M4</td><td>Grid 2 98.9 M4</td><td>Grid 3 96.5 M4</td></tr><tr><td>Grid 4 89.2 M4</td><td>Grid 5 98.9 M4</td><td>Grid 6 96.6 M4</td></tr><tr><td>Grid 7 84.7 M4</td><td>Grid 8 93.4 M4</td><td>Grid 9 90.8 M4</td></tr></table>	Grid 1 88.6 M4	Grid 2 98.9 M4	Grid 3 96.5 M4	Grid 4 89.2 M4	Grid 5 98.9 M4	Grid 6 96.6 M4	Grid 7 84.7 M4	Grid 8 93.4 M4	Grid 9 90.8 M4	 <table><tr><td>Grid 1 0.201 M4</td><td>Grid 2 0.149 M4</td><td>Grid 3 0.094 M4</td></tr><tr><td>Grid 4 0.207 M4</td><td>Grid 5 0.153 M4</td><td>Grid 6 0.103 M4</td></tr><tr><td>Grid 7 0.207 M4</td><td>Grid 8 0.153 M4</td><td>Grid 9 0.106 M4</td></tr></table>	Grid 1 0.201 M4	Grid 2 0.149 M4	Grid 3 0.094 M4	Grid 4 0.207 M4	Grid 5 0.153 M4	Grid 6 0.103 M4	Grid 7 0.207 M4	Grid 8 0.153 M4	Grid 9 0.106 M4
Grid 1 88.6 M4	Grid 2 98.9 M4	Grid 3 96.5 M4																	
Grid 4 89.2 M4	Grid 5 98.9 M4	Grid 6 96.6 M4																	
Grid 7 84.7 M4	Grid 8 93.4 M4	Grid 9 90.8 M4																	
Grid 1 0.201 M4	Grid 2 0.149 M4	Grid 3 0.094 M4																	
Grid 4 0.207 M4	Grid 5 0.153 M4	Grid 6 0.103 M4																	
Grid 7 0.207 M4	Grid 8 0.153 M4	Grid 9 0.106 M4																	

MEASUREMENT DATA GSM850, CHANNEL MIDDLE (836.6 MHz)

Date/Time: 2010-07-13 11:01:39

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM850 (ER3DV6)

Frequency: 836.6 MHz; Duty Cycle: 1:8.26

Medium: Air; Medium Notes: -

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

Phantom section: E Device Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2309

- ConvF(1, 1, 1); Calibrated: 2009-10-27

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184

E Scan -Middle/Hearing Aid Compatibility Test (101x101x1):

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

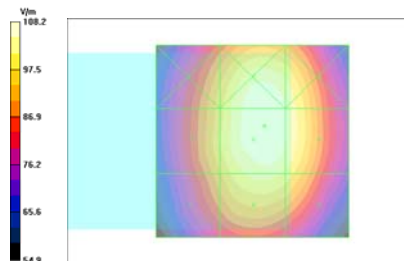
Maximum value of peak Total field = 108.2 V/m

Probe Modulation Factor = 2.87

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 49.5 V/m; Power Drift = -0.021 dB

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



Grid 1	Grid 2	Grid 3
96.2	107.8	105.0
M4	M4	M4
Grid 4	Grid 5	Grid 6
97.3	108.2	105.6
M4	M4	M4
Grid 7	Grid 8	Grid 9
93.5	102.7	100.1
M4	M4	M4

Date/Time: 2010-07-13 13:12:44

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM850 (H3DV6)

Frequency: 836.6 MHz; Duty Cycle: 1:7.34

Medium: Air; Medium Notes: -

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

Phantom section: H Device Section

DASY4 Configuration:

- Probe: H3DV6 - SN6143

- ; Calibrated: 2009-10-23

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184

H Scan - Middle/Hearing Aid Compatibility Test (101x101x1):

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

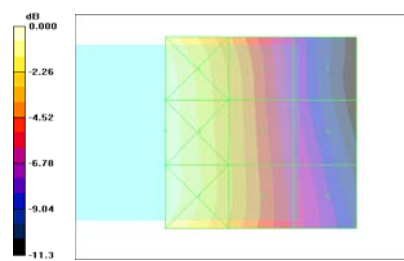
Maximum value of peak Total field = 0.160 A/m

Probe Modulation Factor = 2.71

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 0.051 A/m; Power Drift = -0.224 dB

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



Grid 1	Grid 2	Grid 3
0.220	0.157	0.097
M4	M4	M4
Grid 4	Grid 5	Grid 6
0.222	0.160	0.104
M4	M4	M4
Grid 7	Grid 8	Grid 9
0.219	0.160	0.109
M4	M4	M4

MEASUREMENT DATA GSM850, CHANNEL HIGH (848.8 MHz)

Date/Time: 2010-07-13 11:06:29

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM850 (ER3DV6)

Frequency: 848.8 MHz; Duty Cycle: 1:8.26

Medium: Air; Medium Notes: -

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

Phantom section: E Device Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2309

- ConvF(1, 1, 1); Calibrated: 2009-10-27

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184

E Scan - High/Hearing Aid Compatibility Test (101x101x1):

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

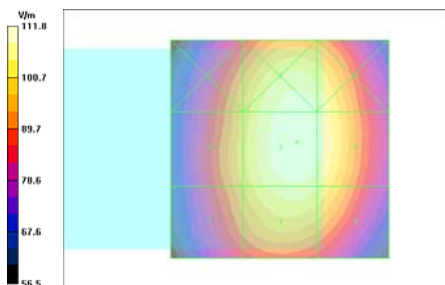
Maximum value of peak Total field = 111.8 V/m

Probe Modulation Factor = 2.87

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 51.3 V/m; Power Drift = -0.003 dB

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



Grid 1 97.7 M4	Grid 2 110.6 M4	Grid 3 108.6 M4
Grid 4 99.8 M4	Grid 5 111.8 M4	Grid 6 109.5 M4
Grid 7 97.0 M4	Grid 8 107.6 M4	Grid 9 105.0 M4

Date/Time: 2010-07-13 13:17:30

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM850 (H3DV6)

Frequency: 848.8 MHz; Duty Cycle: 1:7.34

Medium: Air; Medium Notes: -

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

Phantom section: H Device Section

DASY4 Configuration:

- Probe: H3DV6 - SN6143

- ; Calibrated: 2009-10-23

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 184

H Scan - High/Hearing Aid Compatibility Test (101x101x1):

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

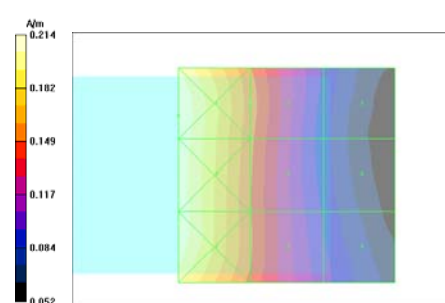
Maximum value of peak Total field = 0.155 A/m

Probe Modulation Factor = 2.71

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 0.046 A/m; Power Drift = -0.010 dB

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



Grid 1 0.214 M4	Grid 2 0.155 M4	Grid 3 0.094 M4
Grid 4 0.212 M4	Grid 5 0.153 M4	Grid 6 0.094 M4
Grid 7 0.212 M4	Grid 8 0.151 M4	Grid 9 0.100 M4

MEASUREMENT DATA GSM1900, CHANNEL LOW (1850.2 MHz)

Date/Time: 2010-07-13 11:29:04

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM1900 (ER3DV6)

Frequency: 1850.2 MHz; Duty Cycle: 1:8.26

Medium: Air; Medium Notes: -

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

Phantom section: E Device Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2309

- ConvF(1, 1, 1); Calibrated: 2009-10-27

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW:

SEMCAD, V1.8 Build 184

E Scan - Low/Hearing Aid Compatibility Test (101x101x1):

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

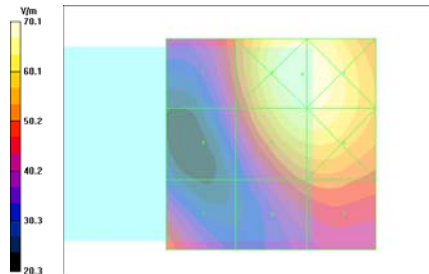
Maximum value of peak Total field = 67.2 V/m

Probe Modulation Factor = 2.87

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 23.6 V/m; Power Drift = -0.011 dB

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



Grid 1	Grid 2	Grid 3
50.3	70.1	70.0
M3	M3	M3
Grid 4	Grid 5	Grid 6
44.0	67.2	67.2
M4	M3	M3
Grid 7	Grid 8	Grid 9
49.9	50.9	52.1
M3	M3	M3

Date/Time: 2010-07-13 12:47:55

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM1900 (H3DV6)

Frequency: 1850.2 MHz; Duty Cycle: 1:5.07

Medium: Air; Medium Notes: -

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

Phantom section: H Device Section

DASY4 Configuration:

- Probe: H3DV6 - SN6143

- ; Calibrated: 2009-10-23

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW:

SEMCAD, V1.8 Build 184

H Scan - Low/Hearing Aid Compatibility Test (101x101x1):

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

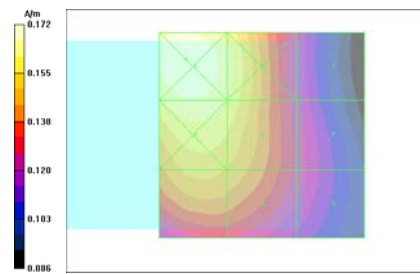
Maximum value of peak Total field = 0.160 A/m

Probe Modulation Factor = 2.25

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 0.068 A/m; Power Drift = -0.013 dB

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



Grid 1	Grid 2	Grid 3
0.172	0.163	0.122
M3	M3	M4
Grid 4	Grid 5	Grid 6
0.166	0.160	0.125
M3	M3	M4
Grid 7	Grid 8	Grid 9
0.151	0.149	0.124
M3	M3	M4

MEASUREMENT DATA GSM1900, CHANNEL MIDDLE (1880 MHz)

Date/Time: 2010-07-13 11:18:34

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM1900 (ER3DV6)

Frequency: 1880 MHz; Duty Cycle: 1:8.26

Medium: Air; Medium Notes: -

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

Phantom section: E Device Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2309

- ConvF(1, 1, 1); Calibrated: 2009-10-27

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW:

SEMCAD, V1.8 Build 184

E Scan -Middle/Hearing Aid Compatibility Test (101x101x1):

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

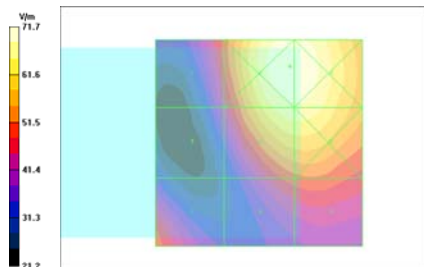
Maximum value of peak Total field = 67.6 V/m

Probe Modulation Factor = 2.87

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 23.3 V/m; Power Drift = -0.021 dB

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



Grid 1	Grid 2	Grid 3
49.7	71.7	71.7
M3	M3	M3
Grid 4	Grid 5	Grid 6
42.8	67.6	67.6
M4	M3	M3
Grid 7	Grid 8	Grid 9
50.3	50.2	51.3
M3	M3	M3

Date/Time: 2010-07-13 12:38:23

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM1900 (H3DV6)

Frequency: 1880 MHz; Duty Cycle: 1:5.07

Medium: Air; Medium Notes: -

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

Phantom section: H Device Section

DASY4 Configuration:

- Probe: H3DV6 - SN6143

- ; Calibrated: 2009-10-23

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW:

SEMCAD, V1.8 Build 184

H Scan - Middle/Hearing Aid Compatibility Test (101x101x1):

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

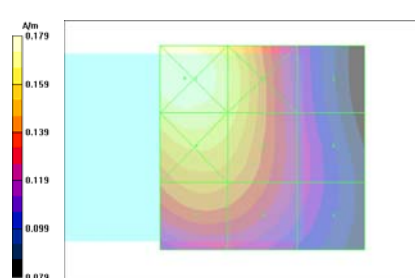
Maximum value of peak Total field = 0.163 A/m

Probe Modulation Factor = 2.25

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 0.068 A/m; Power Drift = -0.021 dB

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



Grid 1	Grid 2	Grid 3
0.179	0.167	0.117
M3	M3	M4
Grid 4	Grid 5	Grid 6
0.171	0.163	0.120
M3	M3	M4
Grid 7	Grid 8	Grid 9
0.150	0.147	0.119
M3	M3	M4

MEASUREMENT DATA GSM1900, CHANNEL HIGH (1909.8 MHz)

Date/Time: 2010-07-13 11:23:54

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM1900 (ER3DV6)

Frequency: 1909.8 MHz; Duty Cycle: 1:8.26

Medium: Air; Medium Notes: -

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

Phantom section: E Device Section

DASY4 Configuration:

- Probe: ER3DV6 - SN2309

- ConvF(1, 1, 1); Calibrated: 2009-10-27

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW:

SEMCAD, V1.8 Build 184

E Scan - High/Hearing Aid Compatibility Test (101x101x1):

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

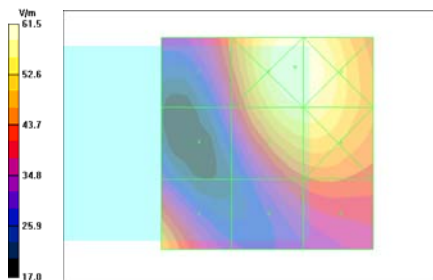
Maximum value of peak Total field = 58.2 V/m

Probe Modulation Factor = 2.87

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 20.4 V/m; Power Drift = -0.021 dB

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



Grid 1	Grid 2	Grid 3
44.8	61.5	61.2
M4	M3	M3
Grid 4	Grid 5	Grid 6
36.6	58.2	58.2
M4	M3	M3
Grid 7	Grid 8	Grid 9
49.2	42.8	44.2
M3	M4	M4

Date/Time: 2010-07-13 12:43:08

Test Laboratory: TCC Nokia

Type: RM-497; Serial: 004401/10713661/2

Communication System: GSM1900 (H3DV6)

Frequency: 1909.8 MHz; Duty Cycle: 1:5.07

Medium: Air; Medium Notes: -

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

Phantom section: H Device Section

DASY4 Configuration:

- Probe: H3DV6 - SN6143

- ; Calibrated: 2009-10-23

- Sensor-Surface: (Fix Surface)

- Electronics: DAE4 Sn1213; Calibrated: 2009-11-16

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

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW:

SEMCAD, V1.8 Build 184

H Scan - High/Hearing Aid Compatibility Test (101x101x1):

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

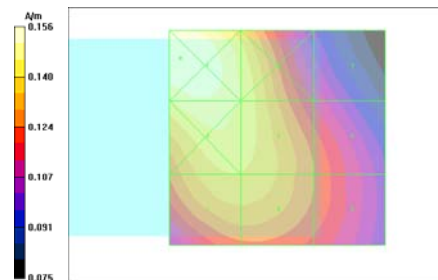
Maximum value of peak Total field = 0.145 A/m

Probe Modulation Factor = 2.25

Device Reference Point: 0.000, 0.000, 353.7 mm

Reference Value = 0.065 A/m; Power Drift = -0.011 dB

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



Grid 1	Grid 2	Grid 3
0.156	0.145	0.112
M3	M3	M4
Grid 4	Grid 5	Grid 6
0.150	0.145	0.124
M3	M3	M4
Grid 7	Grid 8	Grid 9
0.140	0.140	0.124
M4	M4	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: **ER3-2309_Oct09**

CALIBRATION CERTIFICATE

Object **ER3DV6 - SN:2309**

Calibration procedure(s) **QA CAL-02.v5 and QA CAL-25.v2**
Calibration procedure for E-field probes optimized for close near field evaluations in air

Calibration date: **October 27, 2009**

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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ER3DV6	SN: 2328	3-Oct-09 (No. ER3-2328_Oct09)	Oct-10
DAE4	SN: 789	19-Dec-08 (No. DAE4-789_Dec08)	Dec-09

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-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	

Approved by:	Katja Pokovic	Technical Manager	
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Issued: October 27, 2009

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Client **Nokia Salo TCC**

Certificate No: **H3-6143_Oct09**

CALIBRATION CERTIFICATE

Object

H3DV6 - SN:6143

Calibration procedure(s)

QA CAL-03.v5 and QA CAL-25.v2
Calibration procedure for H-field probes optimized for close near field
evaluations in air

Calibration date:

October 23, 2009

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe H3DV6	SN: 6182	3-Oct-09 (No. H3-6182_Oct09)	Oct-10
DAE4	SN: 789	19-Dec-08 (No. DAE4-789_Dec08)	Dec-09

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-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	

Approved by:	Katja Pokovic	Technical Manager	
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Issued: October 27, 2009

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

APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT 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: **CD835V3-1005_Nov08**

CALIBRATION CERTIFICATE

Object **CD835V3 - SN: 1005**

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

Calibration date: **November 11, 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)
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	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Probe ER3DV6	SN: 2336	31-Dec-07 (No. ER3-2336_Dec07)	Dec-08
Probe H3DV6	SN: 6065	31-Dec-07 (No. H3-6065_-Dec07)	Dec-08
DAE4	SN: 781	03-Oct-08 (No. DAE4-781_Oct08)	Oct-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-4419B	GB42420191	11-May-05 (in house check Oct-07)	In house check: Oct-09
Power sensor HP 8482A	US37295597	11-May-05 (in house check Oct-07)	In house check: Oct-09
Power sensor HP 8482H	3318A09450	08-Jan-02 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09
RF generator E4433B	MY 41310391	03-Nov-04 (in house check Oct-07)	In house check: Oct-09

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

Issued: November 13, 2008

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

Test Laboratory: SPEAG Lab 2

H_CD835_1005_081111

DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1005

Communication System: CW; Frequency: 835 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: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 03.10.2008
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

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 = 0.441 A/m

Probe Modulation Factor = 1.00

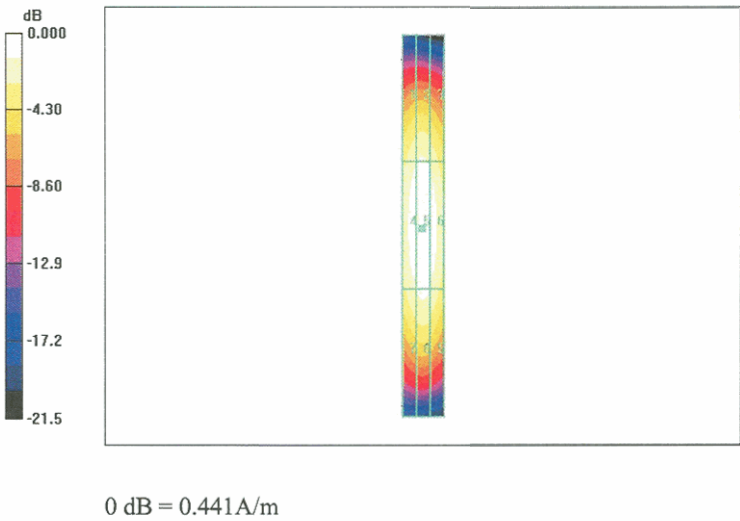
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.467 A/m; Power Drift = 0.006 dB

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

Peak H-field in A/m

Grid 1 0.370 M4	Grid 2 0.385 M4	Grid 3 0.358 M4
Grid 4 0.423 M4	Grid 5 0.441 M4	Grid 6 0.412 M4
Grid 7 0.376 M4	Grid 8 0.394 M4	Grid 9 0.368 M4



Test Laboratory: SPEAG Lab 2

E_CD835_1005_081111

DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1005

Communication System: CW; Frequency: 835 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: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 03.10.2008
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

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

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

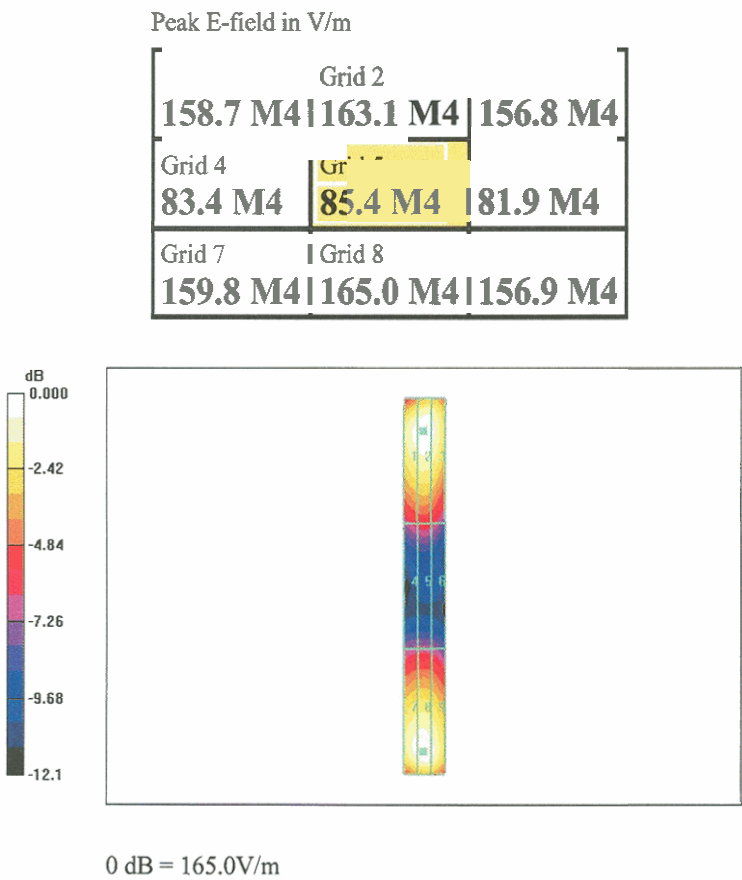
Maximum value of peak Total field = 165.0 V/m

Probe Modulation Factor = 1.00

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 107.1 V/m; Power Drift = -0.020 dB

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





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Nokia Salo TCC**

Certificate No: **CD1880V3-1004_Nov08**

CALIBRATION CERTIFICATE

Object	CD1880V3 - SN: 1004
Calibration procedure(s)	QA CAL-20.v4 Calibration procedure for dipoles in air
Calibration date:	November 11, 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).
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	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Probe ER3DV6	SN: 2336	31-Dec-07 (No. ER3-2336_Dec07)	Dec-08
Probe H3DV6	SN: 6065	31-Dec-07 (No. H3-6065_-Dec07)	Dec-08
DAE4	SN 781	03-Oct-08 (No. DAE4-781_Oct08)	Oct-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-4419B	GB42420191	11-May-05 (in house check Oct-07)	In house check: Oct-09
Power sensor HP 8482A	US37295597	11-May-05 (in house check Oct-07)	In house check: Oct-09
Power sensor HP 8482H	3318A09450	08-Jan-02 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09
RF generator E4433B	MY 41310391	22-Nov-04 (in house check Oct-07)	In house check: Oct-09

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

Issued: November 13, 2008

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

Test Laboratory: SPEAG Lab 2

H_CD1880_1004_081111

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1004

Communication System: CW; 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: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: H3DV6 - SN6065; ; Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 03.10.2008
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm 2/Hearing Aid

Compatibility Test (41x181x1):

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

Maximum value of peak Total field = 0.461 A/m

Probe Modulation Factor = 1.00

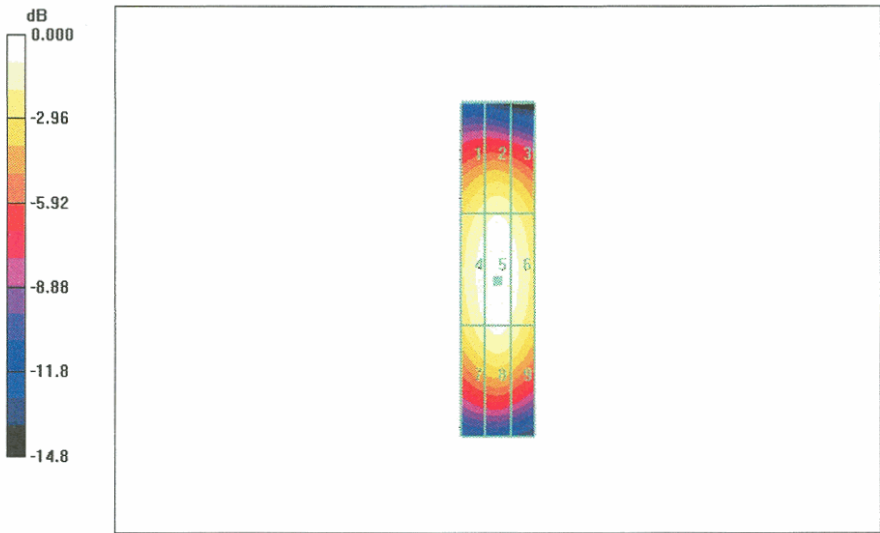
Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 0.488 A/m; Power Drift = -0.018 dB

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

Peak H-field in A/m

Grid 1 0.394 M2	Grid 2 0.410 M2	Grid 3 0.390 M2
Grid 4 0.442 M2	Grid 5 0.461 M2	Grid 6 0.438 M2
Grid 7 0.409 M2	Grid 8 0.430 M2	Grid 9 0.406 M2



0 dB = 0.461A/m

3.3.2 DASY4 E-Field Result

Date/Time: 11.11.2008 12:54:31

Test Laboratory: SPEAG Lab 2

E_CD1880_1004_081111

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1004

Communication System: CW; 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: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 31.12.2007
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 03.10.2008
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

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 = 138.8 V/m

Probe Modulation Factor = 1.00

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 157.2 V/m; Power Drift = -0.005 dB

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

Peak E-field in V/m

131.1 M2 136.9 M2 133.9 M2		
Grid 4 89.6 M3	5 92.1 M3	Grid 6 88.3 M3
Grid 7 133.8 M2	Grid 8 138.8 M2	Grid 9 133.2 M2

