

FCC HAC Test Report – Amendment A

Test Report Number: WR-812.003

Terminal device: Type Nokia RM-19, HW: F6.0, SW: V N100V0700.nep (Detailed information is listed in section 5).

Originator: Anu Balijepalli
Function: TCC – Dallas
Version/Status: 3.0 Approved
Location: TCC Directories
Date: 20 July 2005

Change History:

Version	Date	Status	Handled By	Comments
0.1	03 June 2005	Draft	Anu Balijepalli	Initial Draft
0.2	03 June 2005	Review	Anu Balijepalli	Submit for Approval
1.0	03 June 2005	Approved	Nerina Walton	Approved
1.1	10 June 2005	Change	Anu Balijepalli	Submit for Approval
2.0	10 June 2005	Approved	Nerina Walton	Approved
2.1	19 July 2005	Change	Anu Balijepalli	Submit for Approval
3.0	20 July 2005	Approved	Nerina Walton	Approved

Testing laboratory:

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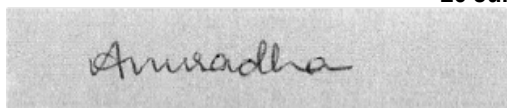
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Date and signatures:

20 July 2005

For the Contents:



Anu Balijepalli,
Technical Review



Nerina Walton,
Manager Review

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1. GENERAL

1.1 Objective

This test is performed to ensure that the EUT meets the requirements required by the FCC Method of Measurement for near field E and H emissions. Please note that this report is only for near field emissions, not for the T-coil HAC testing.

1.2 Test Summary

Test Results: *The test result relates only to those tested devices mentioned in Section 5 of this test report.*

Sample #	Test Performed	Reference	Category
1	Near Field Emissions- E field Near Field Emissions- H field	ANSI C63.19 AISP4 HACTS	M4

2. LIST OF ABBREVIATIONS, ACRONYMS AND TERMS

2.1 Abbreviations

dB - decibel
dBm - decibels per milliwatt (absolute measurement)
MHz - megahertz or 1000000 Hertz
V/m – Volts per meter
A/m – Amps per meter

2.2 Acronyms

AMPS - Advanced Mobile Phone System
BSS - Base Station Simulator
CDMA - Code Division Multiple Access
ESN - Electronic Serial Number
EUT - Equipment under Test
GSM - Global System for Mobile communications
IMEI - International Mobile Equipment Identity
PCS - Personal Communication System
RF- Radio Frequency
TDMA - Time Division Multiple Access

2.3 Terms

Base Station Simulator (BSS) - simulates all the necessary signals that a phone would experience while on a live network. There are many types of base station simulators catering for all current protocols, i.e., GSM, AMPS, TDMA, and CDMA.

Cellular - refers to a frequency in the 800MHz band.

PCS - refers to a frequency in the 1900MHz band.

Crest Factor - is the relation between the peak power and the average power in a signal.

3. STANDARDS BASIS

Testing has been carried out in accordance with:

REF.	Code of the standard	Name of the standard
1	-	ANSI C63.19 AISP4 HACTS

Note: Unless otherwise stated, (by reference to a version number and a publication date), the latest version of the above documents applies.

Deviations:

Not Applicable.

4. TEST EQUIPMENT LIST

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items listed can be obtained from the Engineering Services Group within NMP, Product Creation - Dallas. Where relevant, measuring equipment is subjected to in-service checks between testing. TCC - Dallas shall notify clients promptly, in writing, of identification of defective measuring equipment that casts doubt on the validity of results given in this report.

Test Equipment	NMP #	Calibration Interval	Calibration Expiry
SPEAG DASY4 Robot System	2056	NA	NA
SPEAG Data Acquisition Electronics (DAE)	2292	12 months	Jan - 2006
SPEAG E-field Probe ER3DV4R	2955	12 months	Jan - 2006
SPEAG H-field Probe H3DV6	2957	12 months	Jan-2006
APREL 835MHz Dipole ALS-D-900-S-2	3996	12 months	Aug-2005
APREL 1880MHz Dipole ALS-D-1800-S-2	3395	12 months	May-2006
Wavetek MMS-4303	2970	12 months	Jun-2005
R&S Signal Generator SMT06	3458	12 months	Jun-2005
Boonton Powermeter 4232A	0147	12 months	Aug-2005
AR Power Amplifier 5S1G4	0188	NA	NA
Agilent Powermeter E4418B	2549	12 months	Oct-2005

5. EQUIPMENT-UNDER-TEST (EUT)

The results in this report relate only to the items listed below:

5.1 Description of Tested Device(s):

Sample #	Mode of Operation	Date of Receipt	Condition of Sample	Item	Identifying Information
1	CDMA 800/1900	01 May 2005	Good	Phone	Type: RM-19 Model: 6255i ESN: 044/00444137 HW: F6.0 SW: V N100V0700.nep Code: 0522420CM08TD FCC ID: QMNRM-19

5.2 Photograph of Tested Device(s):



6. TEST METHOD(S) AND SETUP(S)

Testing was performed in accordance with ANSI C63.19.

The test setup is shown in the picture below.



7. PASS/FAIL CRITERIA

The EUT must meet the following M3 category standards –

Category	Wireless Device Parameters		
Near field	AWF	E-field Emissions Peak – V/m	H-field Emissions Peak – A/m
Category M3	AWF =0 (TDMA, CDMA)	63.1 to 112.2	0.19 to 0.34
	AWF = -5 (GSM)	47.3 to 84.1	0.15 to 0.25
Category M4	AWF =0 (TDMA, CDMA)	< 63.1	< 0.19
	AWF = -5 (GSM)	< 47.3	< 0.15



8. DETAILED TEST RESULTS

Test Technician / Engineer	Anu Balijepalli		
Date of Measurement	May 24-27, 2005		
Temperature / Humidity / Pressure	20-25°C	45-60%RH	29-31 in
Test Result	Complies		

8.1 Near Field E and H RF emissions measurements

8.1.1 Test Results

Note: Testing was done at the antenna extended position. The reference grid was at the center of the speaker of the phone.

CDMA Cellular	Frequency (MHz)	Conducted Power (dBm)	E (V/m)	H (A/m)	Excluded Blocks	Category
Ch 1013	824.70	25.3	56.5	0.125	1,4,7	M4
Ch 384	836.52	25.4	59.5	0.113	1,4,7,8,9	M4
Ch 777	848.31	25.4	58.0	0.115	1,4,7,8,9	M4

CDMA PCS	Frequency (MHz)	Conducted Power (dBm)	E (V/m)	H (A/m)	Excluded Blocks	Category
Ch 25	1851.25	23.4	44.3	0.100	1,4,2,6,9	M4
Ch 600	1880.00	23.2	46.4	0.102	1,2,3,4	M4
Ch 1175	1908.75	23.1	42.5	0.100	1,2,3,4	M4

See Appendix B for the grids and plots of these cases.

9. MEASUREMENT UNCERTAINTY

HAC Uncertainty Budget

Error Description	Uncertainty value	Prob. Dist.	Div.	(ci) E	(ci) H	Std. Unc. E	Std. Unc. H	Squared E	Squared H
Measurement System									
Probe Calibration	5.1	N	1	1	1	5.1	5.1	26.0	26.0
Axial Isotropy	4.7	R	1.7321	1	1	2.7	2.7	7.4	7.4
Sensor Displacement	16.5	R	1.7321	1	0.145	9.5	1.4	90.7	1.9
Boundary Effects	2.4	R	1.7321	1	1	1.4	1.4	1.9	1.9
Linearity	4.7	R	1.7321	1	1	2.7	2.7	7.4	7.4
Scaling to Peak Envelope Power	2	R	1.7321	1	1	1.2	1.2	1.3	1.3
System Detection Limit	1	R	1.7321	1	1	0.6	0.6	0.3	0.3
Readout Electronics	0.3	N	1	1	1	0.3	0.3	0.1	0.1
Response Time	0.8	R	1.7321	1	1	0.5	0.5	0.2	0.2
Integration Time	2.6	R	1.7321	1	1	1.5	1.5	2.3	2.3
RF Ambient Conditions	3	R	1.7321	1	1	1.7	1.7	3.0	3.0
RF Reflections	12	R	1.7321	1	1	6.9	6.9	48.0	48.0
Probe Positioner	1.2	R	1.7321	1	0.67	0.7	0.5	0.5	0.2
Probe Positioning	4.7	R	1.7321	1	0.67	2.7	1.8	7.4	3.3
Extrap. and Interpolation	1	R	1.7321	1	1	0.6	0.6	0.3	0.3
Test Sample Related								0.0	0.0
Device Positioning Vertical	4.7	R	1.7321	1	0.67	2.7	1.8	7.4	3.3
Device Positioning Lateral	1	R	1.7321	1	1	0.6	0.6	0.3	0.3
Device Holder and Phantom	2.4	R	1.7321	1	1	1.4	1.4	1.9	1.9
Power Drift	5	R	1.7321	1	1	2.9	2.9	8.3	8.3
Phantom and Setup Related								0.0	0.0
Phantom Thickness	2.4	R	1.7321	1	0.67	1.4	0.9	1.9	0.9
Combined Std. Uncertainty								14.7	10.9
Expanded Std. Uncertainty on Power								29.40%	21.80%
Expanded Std. Uncertainty on Field								14.70%	10.90%

APPENDIX A: VALIDATIONS SCANS

Dipole Validation with the CW Signal:

		Recorded	Peak Value	Theoretical Value
835 MHz	E field	169	239	265
	H field	0.454	0.642	0.673
1880 MHz	E field	137	194	211
	H field	0.468	0.660	0.645

Dipole Validation with Modulation:

The dipole validation with modulation was performed with a 20dBm input for CW, AM and CDMA signals measured at the center of the dipole.

835 MHz	Efield		H field	
	V/m	dB V/m	A/m	dB A/m
CW	59.8	35.5	0.444	-7.1
AM	60.4	35.6	0.473	-6.5
CDMA	63.4	36.0	0.537	-5.4

1880 MHz	Efield		H field	
	V/m	dB V/m	A/m	dB A/m
CW	78.5	37.9	0.444	-7.1
AM	77.6	37.8	0.500	-6.0
CDMA	81.9	38.3	0.691	-3.2

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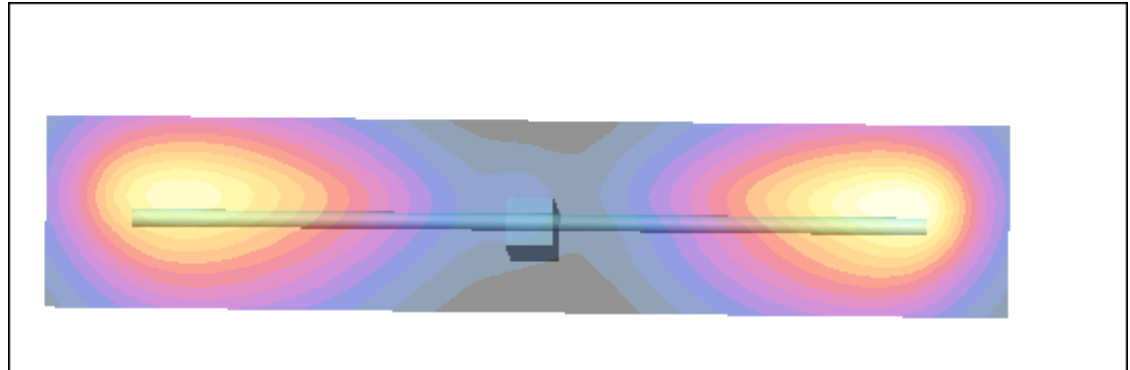
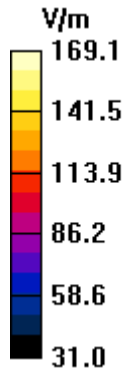
835MHz, E field, CW Validation

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

DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power drift = 0.0898 dB

HAC Procedure/Hearing Aid Compatibility Test 0 deg (21x101x1): Measurement grid: dx=2mm, dy=2mm
Maximum value of Total (measured) = 169.1 V/m

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835MHz, H field, CW Validation

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

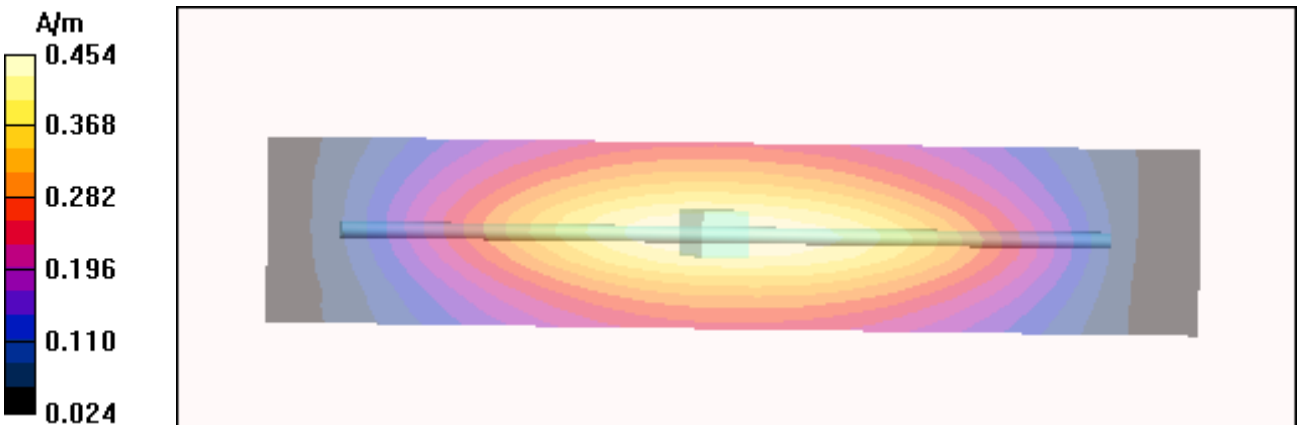
DASY4 Configuration:

- Probe: H3DV6 - SN6058; ; Calibrated: 1/20/2005
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = 0.0121 dB

HAC Procedure/Hearing Aid Compatibility Test 0 deg (21x101x1): Measurement grid: dx=2mm, dy=2mm

Maximum value of Total (measured) = 0.454 A/m



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Date/Time: 5/24/2005 11:07:29 AM

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1880MHz, E field, CW Validation

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

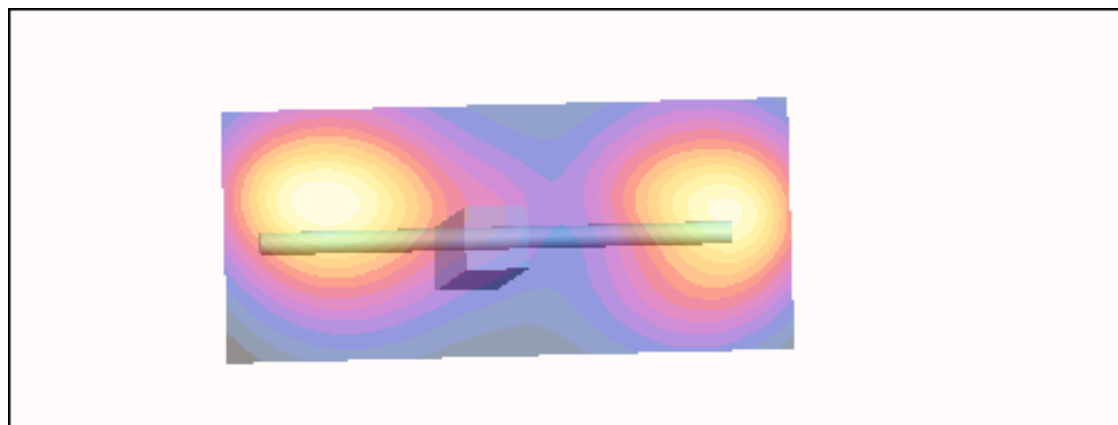
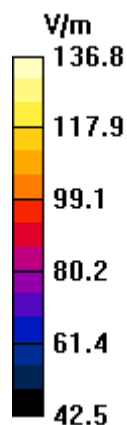
DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = 0.0247 dB

HAC Procedure/Hearing Aid Compatibility Test 0 deg (21x46x1): Measurement grid: dx=2mm, dy=2mm

Maximum value of Total (measured) = 136.8 V/m



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Date/Time: 5/24/2005 11:55:52 AM

Test Laboratory: TCC Dallas

1880MHz, H field, CW Validation

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

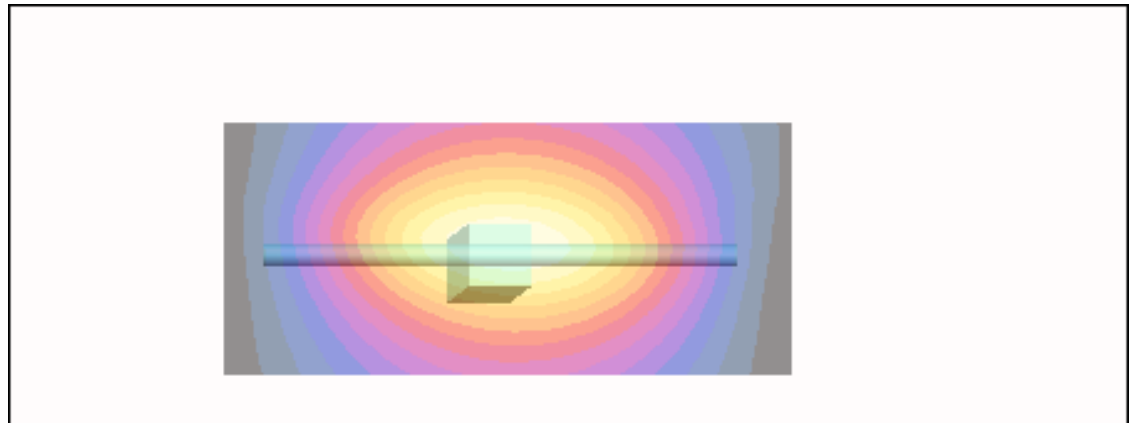
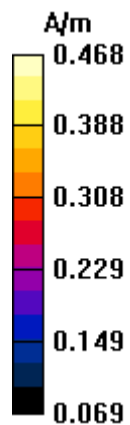
DASY4 Configuration:

- Probe: H3DV6 - SN6058; ; Calibrated: 1/20/2005
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = 0.0301 dB

HAC Procedure/Hearing Aid Compatibility Test 0 deg (21x46x1): Measurement grid: dx=2mm, dy=2mm

Maximum value of Total (measured) = 0.468 A/m



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APPENDIX B: MEASUREMENT SCANS

Date/Time: 5/27/2005 4:20:13 PM

Test Laboratory: TCC Dallas

RM-19, CDMA800, Ch1013, Whip Extend position, E field

Communication System: CDMA800; Frequency: 824.7 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.0277 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

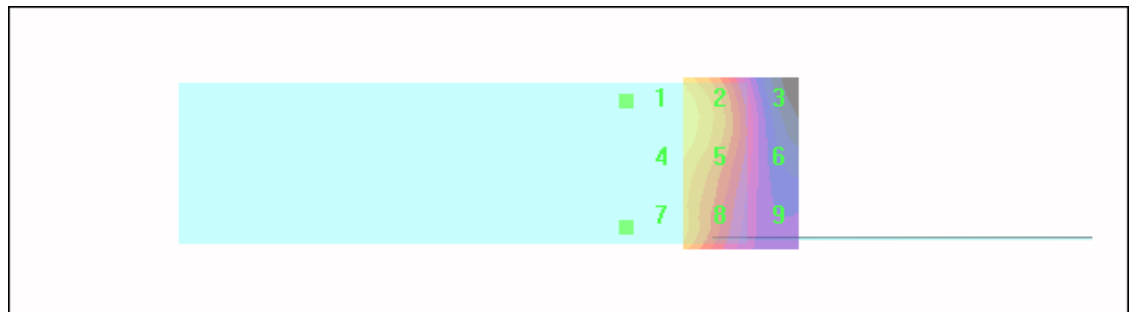
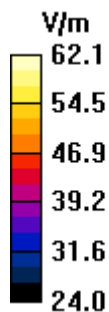
Maximum value of Total field (slot averaged) = 56.5 V/m

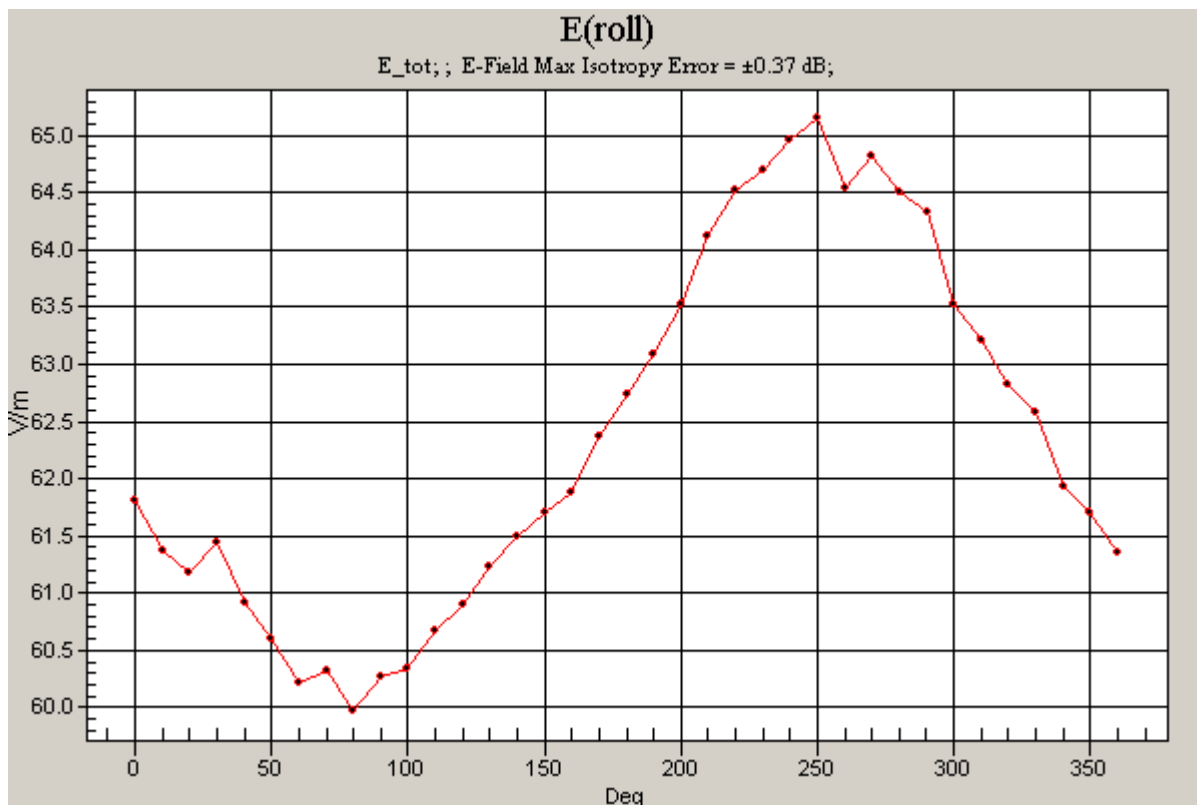
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

E in V/m (Time averaged) E in V/m (Slot averaged)

Grid 1 62.1	Grid 2 56.5	Grid 3 43.4	Grid 1 62.1	Grid 2 56.5	Grid 3 43.4
Grid 4 61.7	Grid 5 56.1	Grid 6 43.3	Grid 4 61.7	Grid 5 56.1	Grid 6 43.3
Grid 7 61.0	Grid 8 53.0	Grid 9 40.2	Grid 7 61.0	Grid 8 53.0	Grid 9 40.2

HAC Procedure/Rotation (1D): 37 rotation steps; E-Field Max Isotropy Error = 0.37 dB;





Date/Time: 5/27/2005 4:14:33 PM

Test Laboratory: TCC Dallas

RM-19, CDMA800, Ch384, Whip Extend position, E field

Communication System: CDMA800; Frequency: 836.52 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.106 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

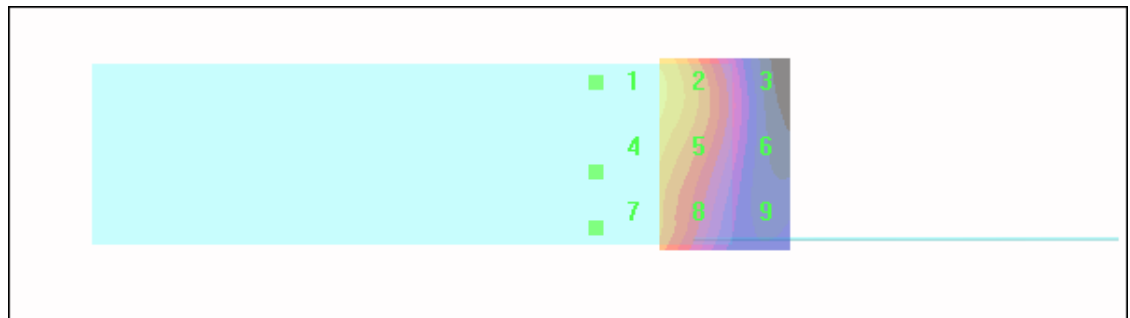
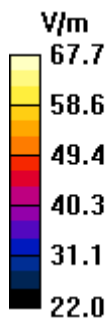
Maximum value of Total field (slot averaged) = 59.5 V/m

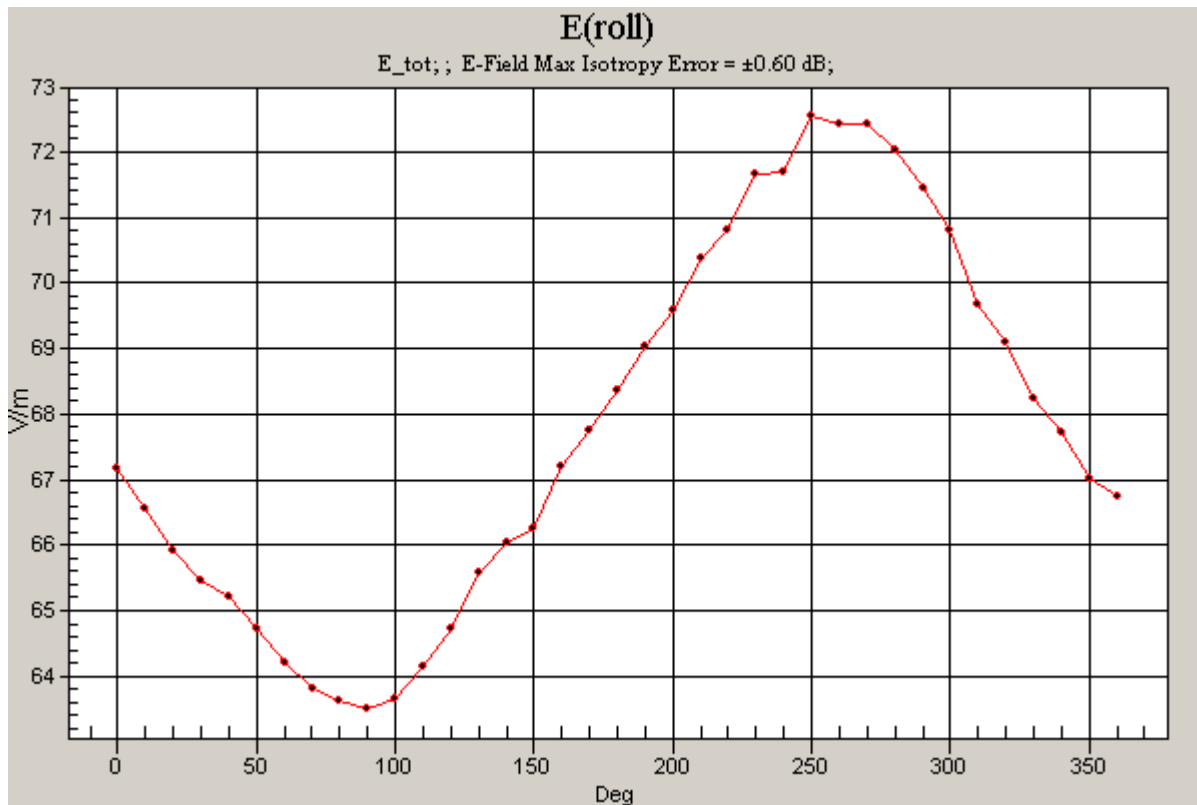
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

E in V/m (Time averaged) E in V/m (Slot averaged)

Grid 1 67.7	Grid 2 59.5	Grid 3 44.4	Grid 1 67.7	Grid 2 59.5	Grid 3 44.4
Grid 4 65.2	Grid 5 58.4	Grid 6 43.9	Grid 4 65.2	Grid 5 58.4	Grid 6 43.9
Grid 7 64.4	Grid 8 53.9	Grid 9 38.4	Grid 7 64.4	Grid 8 53.9	Grid 9 38.4

HAC Procedure/Rotation (1D): 37 rotation steps; E-Field Max Isotropy Error = 0.60 dB;





Date/Time: 5/27/2005 4:27:49 PM

Test Laboratory: TCC Dallas

RM-19, CDMA800, Ch777, Whip Extend position, E field

Communication System: CDMA800; Frequency: 848.31 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = 0.0138 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

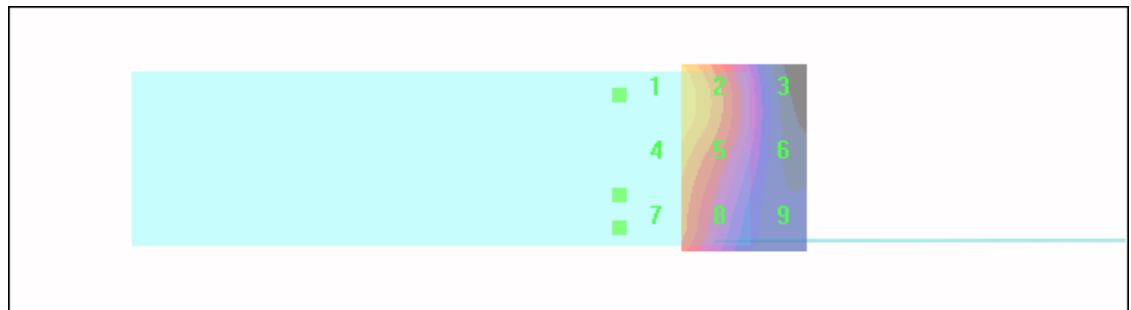
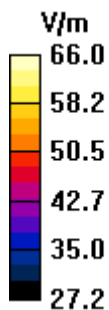
Maximum value of Total field (slot averaged) = 58.0 V/m

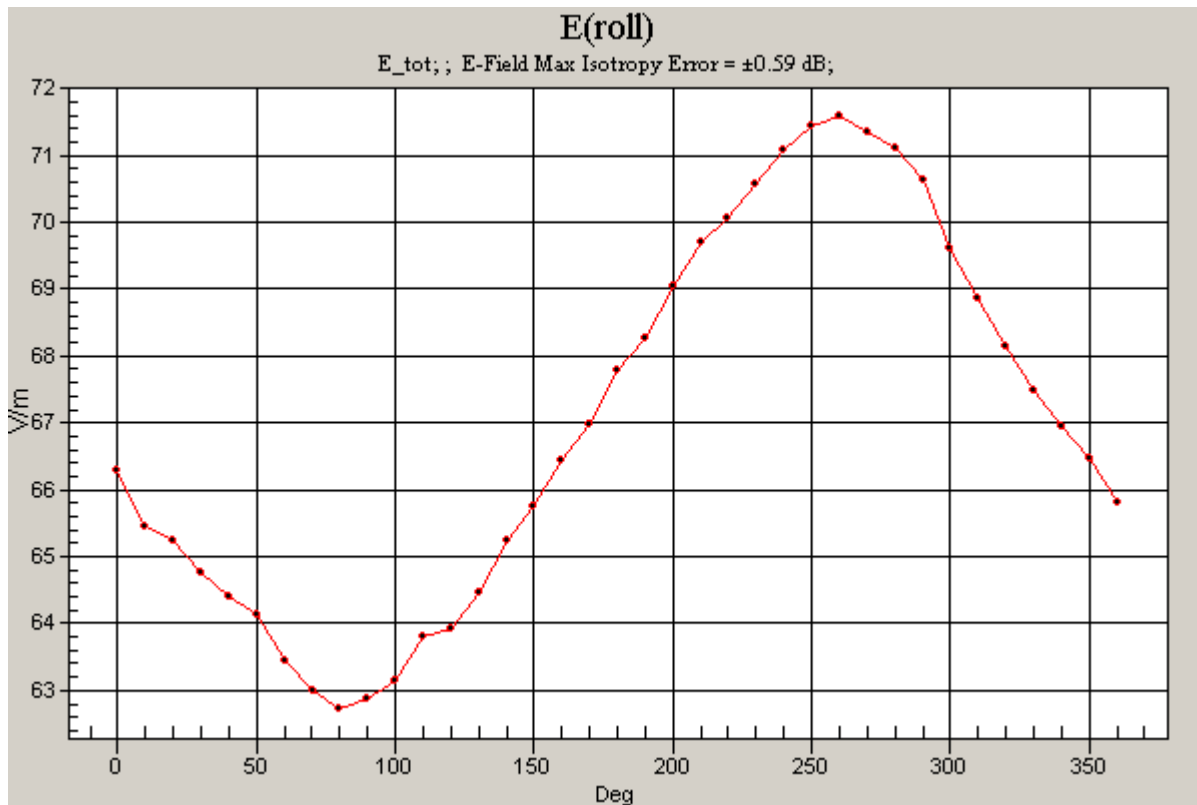
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

E in V/m (Time averaged) E in V/m (Slot averaged)

Grid 1 66.0	Grid 2 58.0	Grid 3 44.1	Grid 1 66.0	Grid 2 58.0	Grid 3 44.1
Grid 4 64.4	Grid 5 57.2	Grid 6 43.8	Grid 4 64.4	Grid 5 57.2	Grid 6 43.8
Grid 7 62.1	Grid 8 52.7	Grid 9 38.9	Grid 7 62.1	Grid 8 52.7	Grid 9 38.9

HAC Procedure/Rotation (1D): 37 rotation steps; E-Field Max Isotropy Error = 0.59 dB;





Date/Time: 5/27/2005 2:02:21 PM

Test Laboratory: TCC Dallas

RM-19, CDMA800, Ch1013, Whip Extend position, H field

Communication System: CDMA800; Frequency: 824.7 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: H3DV6 - SN6058; Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.0605 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

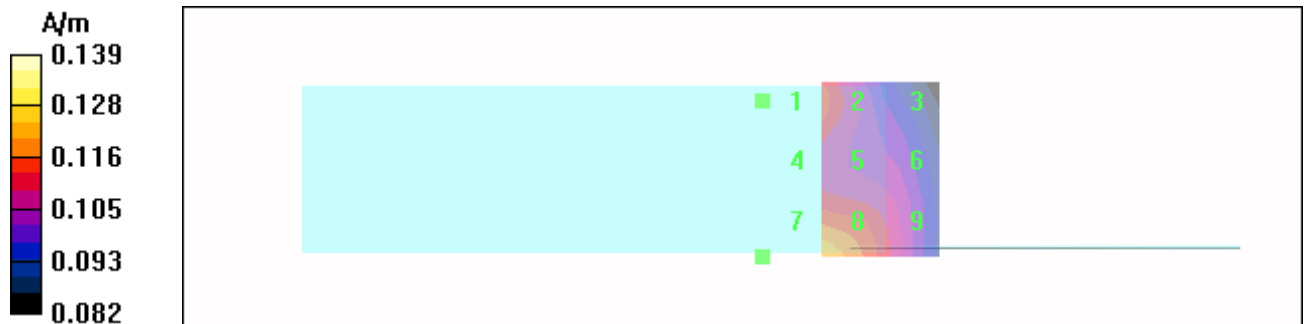
Maximum value of Total field (slot averaged) = 0.125 A/m

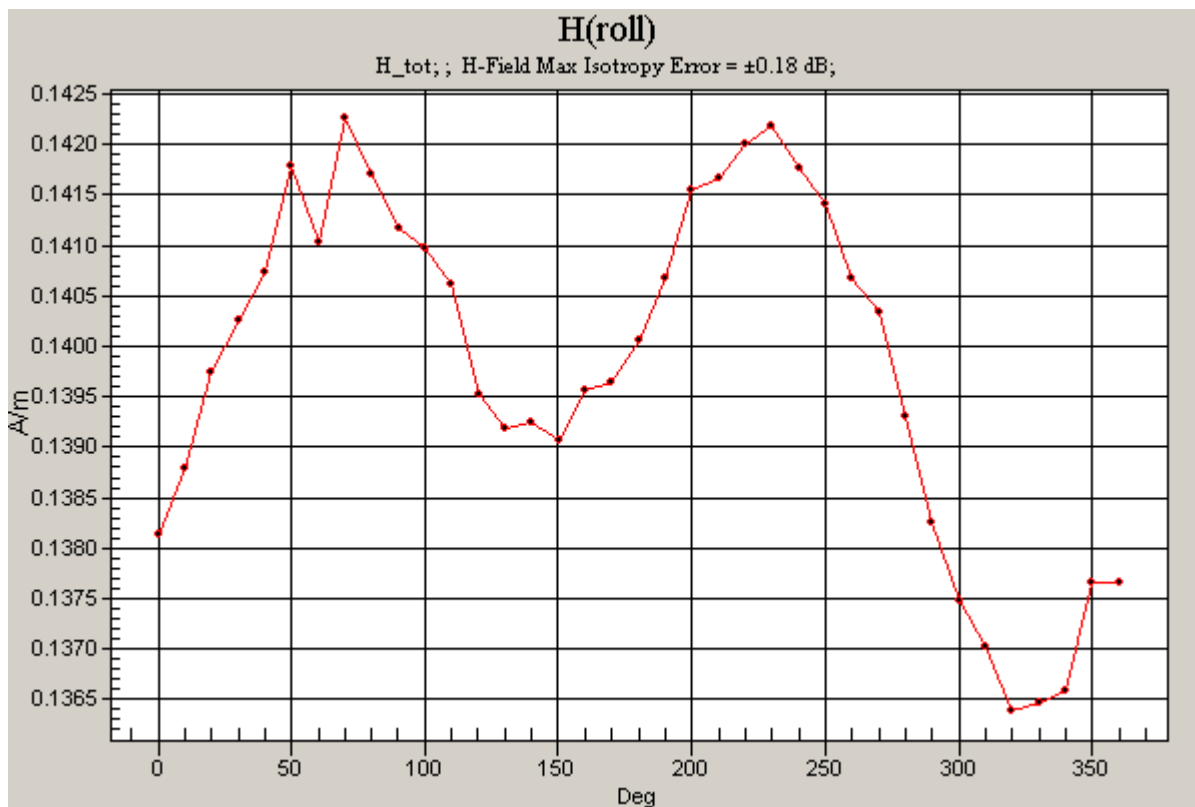
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

H in A/m (Time averaged) H in A/m (Slot averaged)

Grid 1 0.128	Grid 2 0.115	Grid 3 0.101	Grid 1 0.128	Grid 2 0.115	Grid 3 0.101
Grid 4 0.118	Grid 5 0.110	Grid 6 0.107	Grid 4 0.118	Grid 5 0.110	Grid 6 0.107
Grid 7 0.139	Grid 8 0.125	Grid 9 0.112	Grid 7 0.139	Grid 8 0.125	Grid 9 0.112

HAC Procedure/Rotation (1D): 37 rotation steps; H-Field Max Isotropy Error = 0.18 dB;





Date/Time: 5/27/2005 2:08:53 PM

Test Laboratory: TCC Dallas

RM-19, CDMA800, Ch384, Whip Extend position, H field

Communication System: CDMA800; Frequency: 836.52 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: H3DV6 - SN6058; Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = 0.0865 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

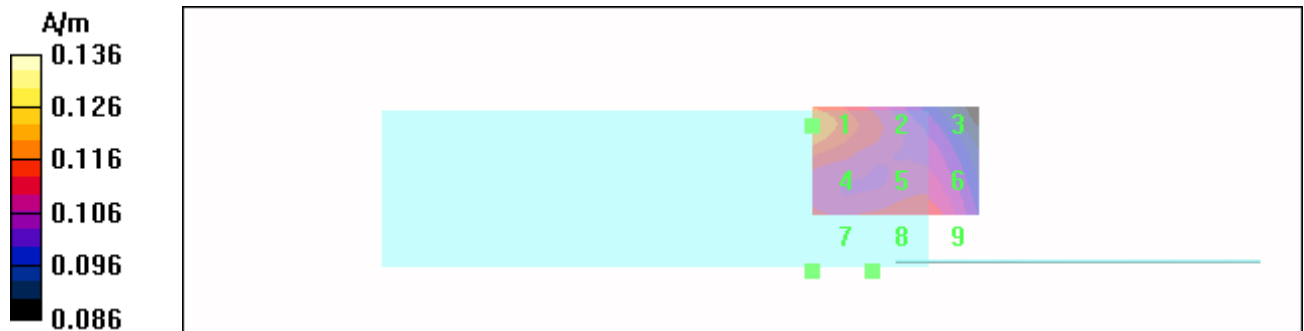
Maximum value of Total field (slot averaged) = 0.119 A/m

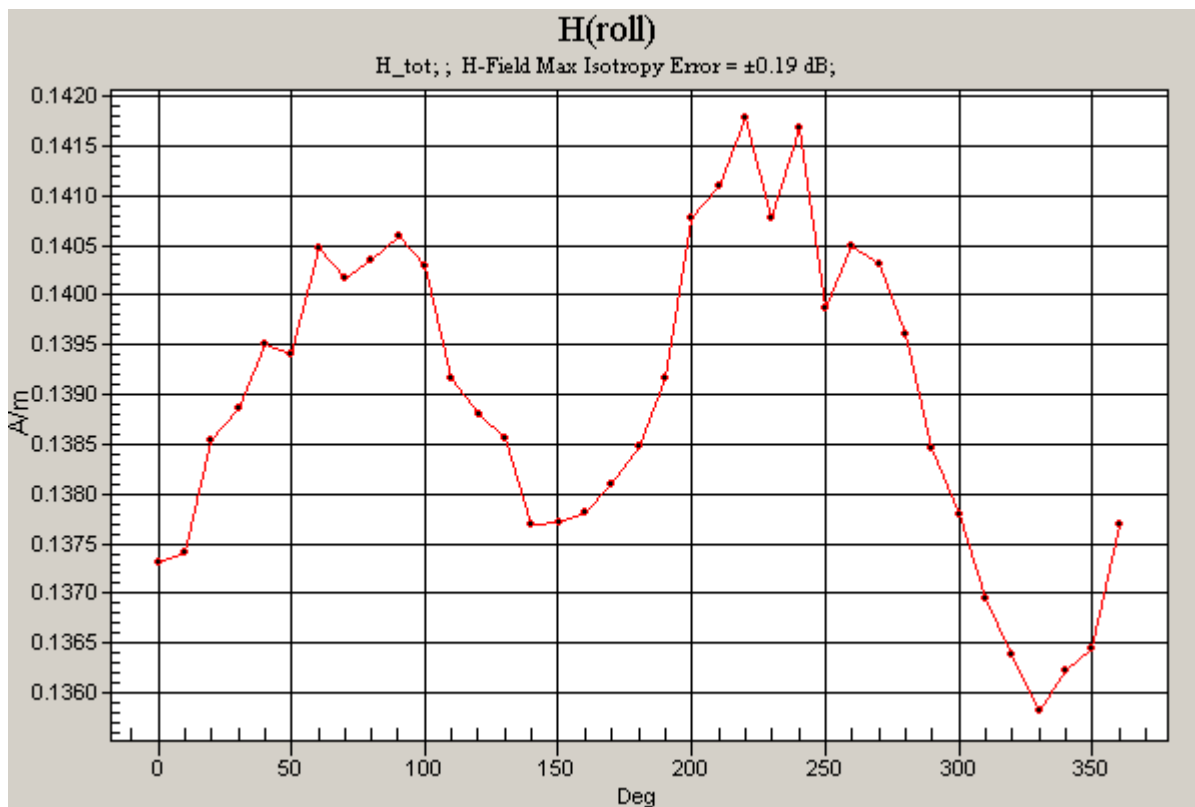
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H in A/m (Time averaged) H in A/m (Slot averaged)

Grid 1 0.119	Grid 2 0.112	Grid 3 0.106	Grid 1 0.119	Grid 2 0.112	Grid 3 0.106
Grid 4 0.112	Grid 5 0.113	Grid 6 0.112	Grid 4 0.112	Grid 5 0.113	Grid 6 0.112
Grid 7 0.136	Grid 8 0.126	Grid 9 0.118	Grid 7 0.136	Grid 8 0.126	Grid 9 0.118

HAC Procedure/Rotation (1D): 37 rotation steps; H-Field Max Isotropy Error = 0.19 dB;





Date/Time: 5/27/2005 2:15:01 PM

Test Laboratory: TCC Dallas

RM-19, CDMA800, Ch777, Whip Extend position, H field

Communication System: CDMA800; Frequency: 848.31 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: H3DV6 - SN6058; Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.0297 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

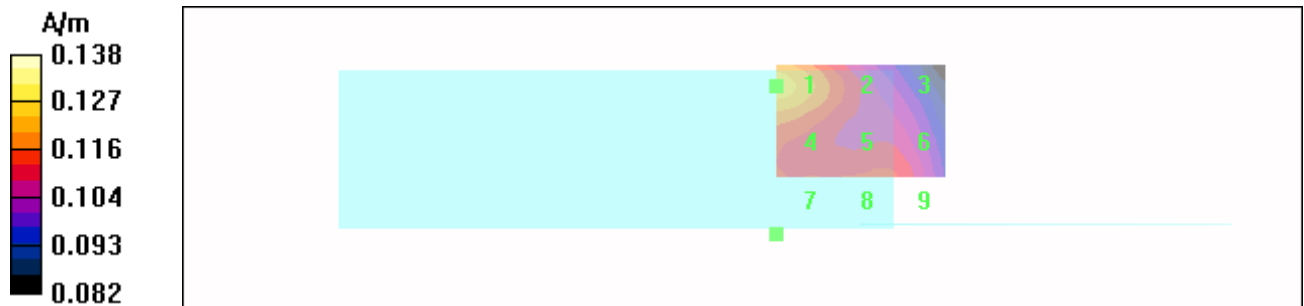
Maximum value of Total field (slot averaged) = 0.126 A/m

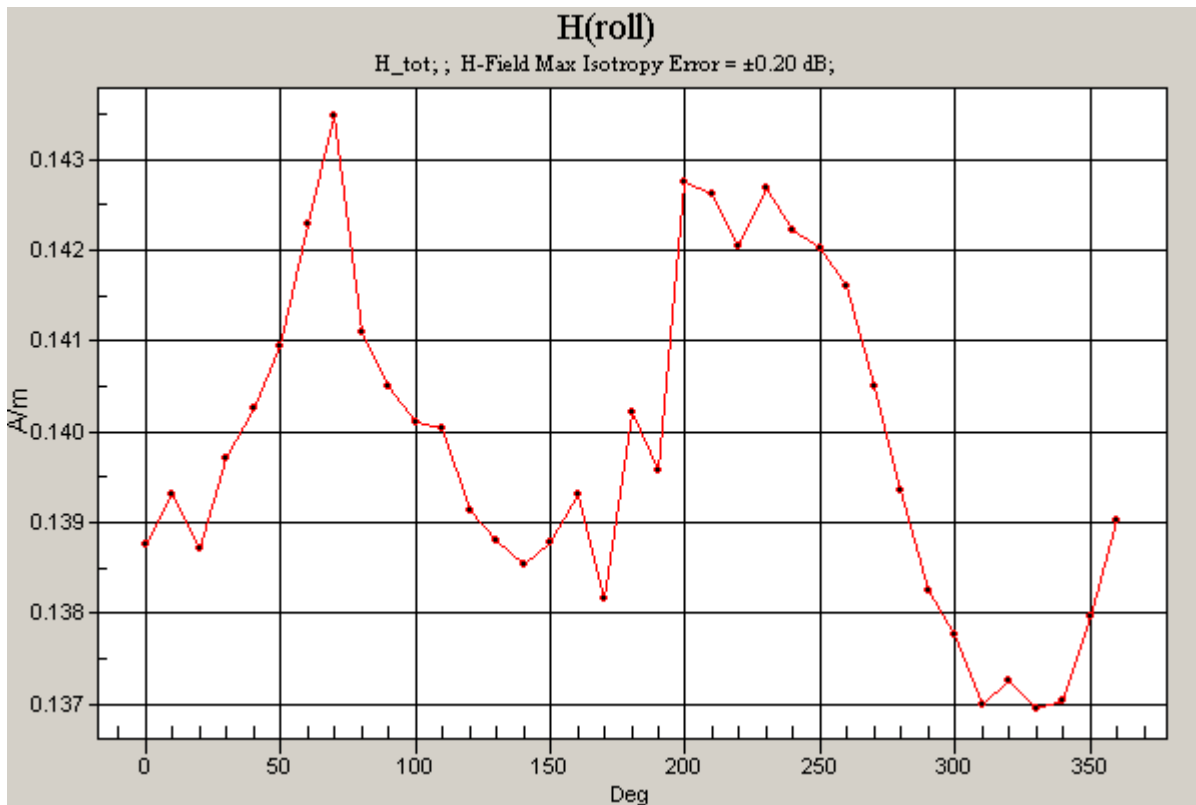
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

H in A/m (Time averaged) H in A/m (Slot averaged)

Grid 1 0.126	Grid 2 0.115	Grid 3 0.106	Grid 1 0.126	Grid 2 0.115	Grid 3 0.106
Grid 4 0.117	Grid 5 0.113	Grid 6 0.113	Grid 4 0.117	Grid 5 0.113	Grid 6 0.113
Grid 7 0.138	Grid 8 0.127	Grid 9 0.117	Grid 7 0.138	Grid 8 0.127	Grid 9 0.117

HAC Procedure/Rotation (1D): 37 rotation steps; H-Field Max Isotropy Error = 0.20 dB;





Date/Time: 5/27/2005 3:24:53 PM

Test Laboratory: TCC Dallas

RM-19, CDMA1900, Ch25, Whip Extend position, E field

Communication System: CDMA1900; Frequency: 1851.25 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.0207 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of Total field (slot averaged) = 44.3 V/m

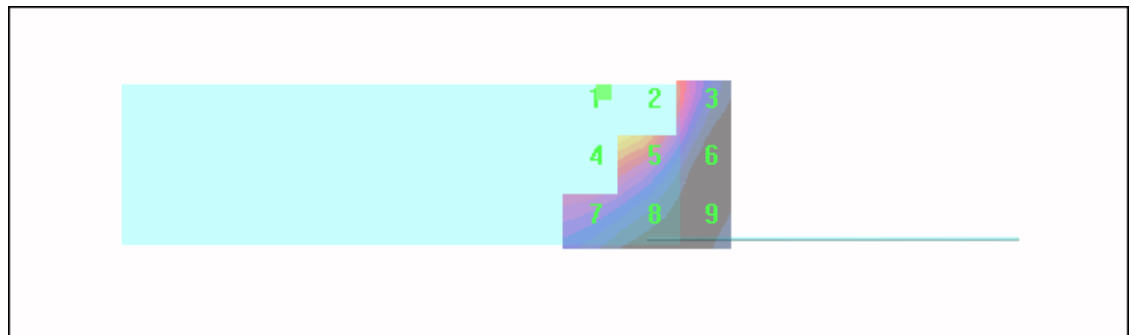
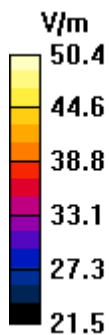
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

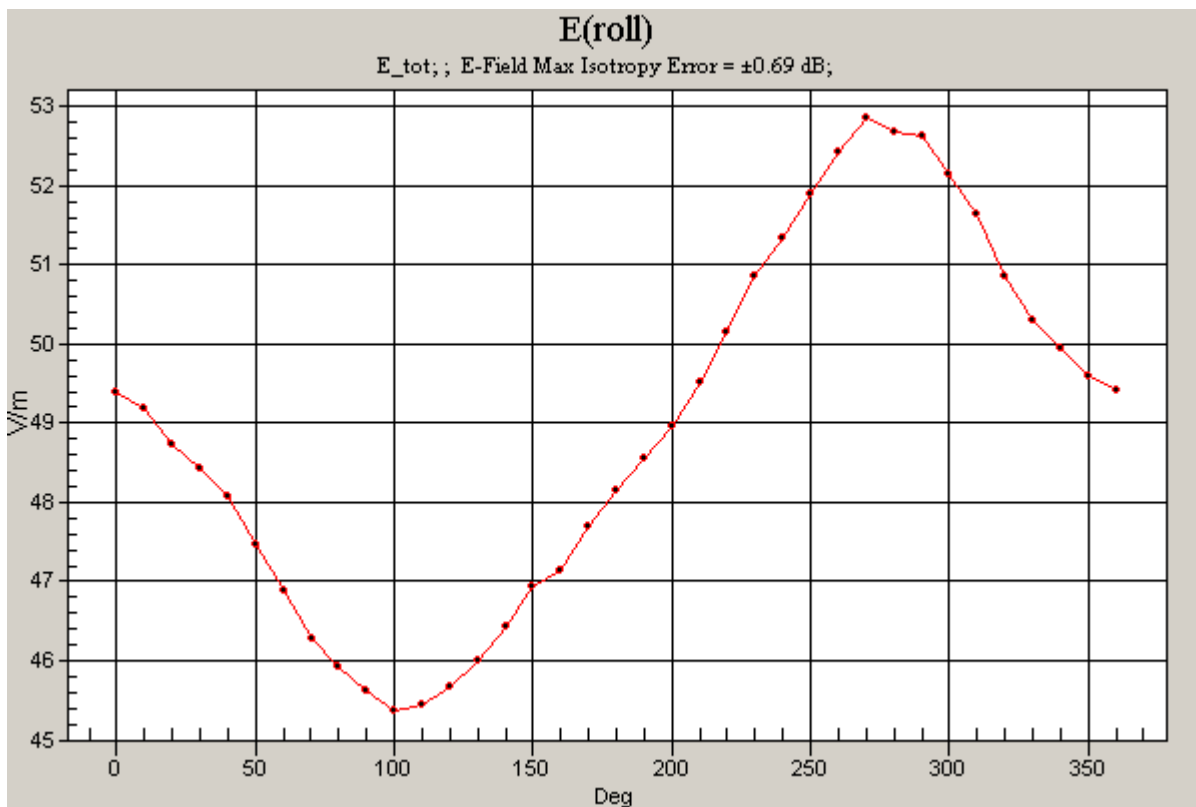
E in V/m (Time averaged) E in V/m (Slot averaged)

Grid 1	Grid 2	Grid 3
50.4	50.1	38.7
Grid 4	Grid 5	Grid 6
45.5	44.3	32.1
Grid 7	Grid 8	Grid 9
34.8	31.8	24.5

Grid 1	Grid 2	Grid 3
50.4	50.1	38.7
Grid 4	Grid 5	Grid 6
45.5	44.3	32.1
Grid 7	Grid 8	Grid 9
34.8	31.8	24.5

HAC Procedure/Rotation (1D): 37 rotation steps; E-Field Max Isotropy Error = 0.69 dB;





Date/Time: 5/27/2005 3:18:32 PM

Test Laboratory: TCC Dallas

RM-19, CDMA1900, Ch600, Whip Extend position, E field

Communication System: CDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = 0.235 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of Total field (slot averaged) = 46.4 V/m

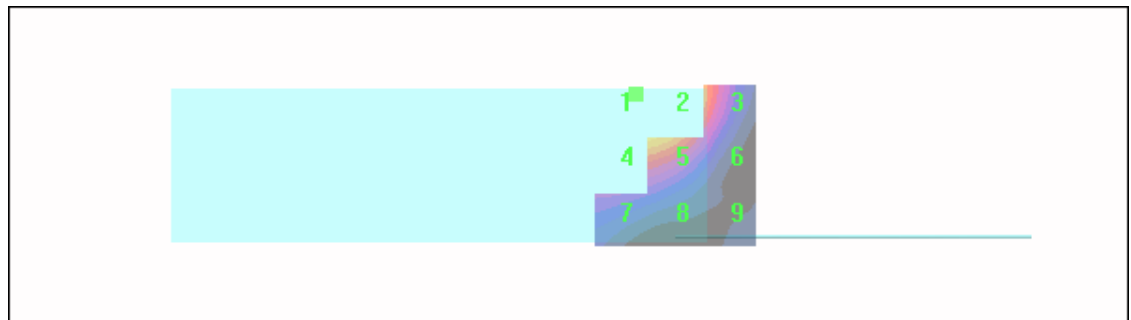
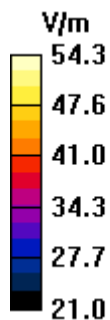
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

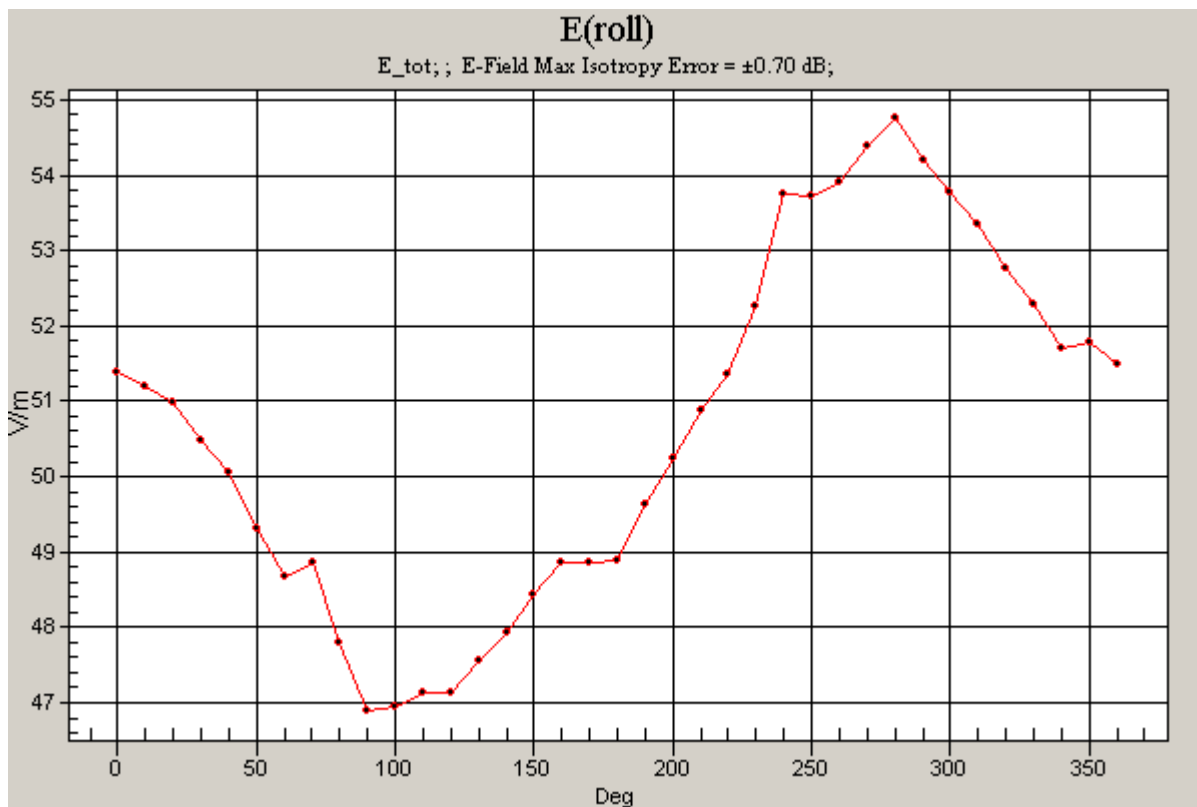
E in V/m (Time averaged) E in V/m (Slot averaged)

Grid 1	Grid 2	Grid 3
54.3	54.1	43.0
Grid 4	Grid 5	Grid 6
46.9	46.4	35.0
Grid 7	Grid 8	Grid 9
33.1	30.6	24.8

Grid 1	Grid 2	Grid 3
54.3	54.1	43.0
Grid 4	Grid 5	Grid 6
46.9	46.4	35.0
Grid 7	Grid 8	Grid 9
33.1	30.6	24.8

HAC Procedure/Rotation (1D): 37 rotation steps; E-Field Max Isotropy Error = 0.70 dB;





Date/Time: 5/27/2005 3:31:28 PM

Test Laboratory: TCC Dallas

RM-19, CDMA1900, Ch1175, Whip Extend position, E field

Communication System: CDMA1900; Frequency: 1908.75 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: ER3DV4R - SN2240; ConvF(1, 1, 1); Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.139 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of Total field (slot averaged) = 42.5 V/m

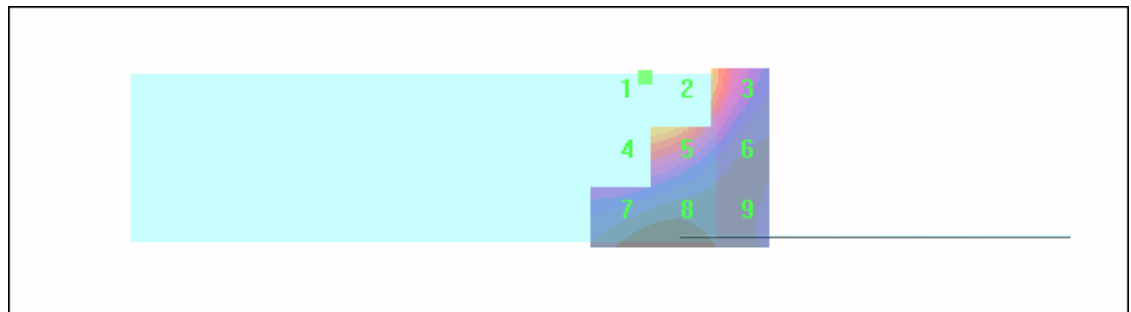
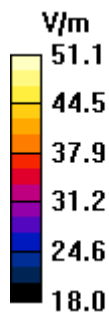
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

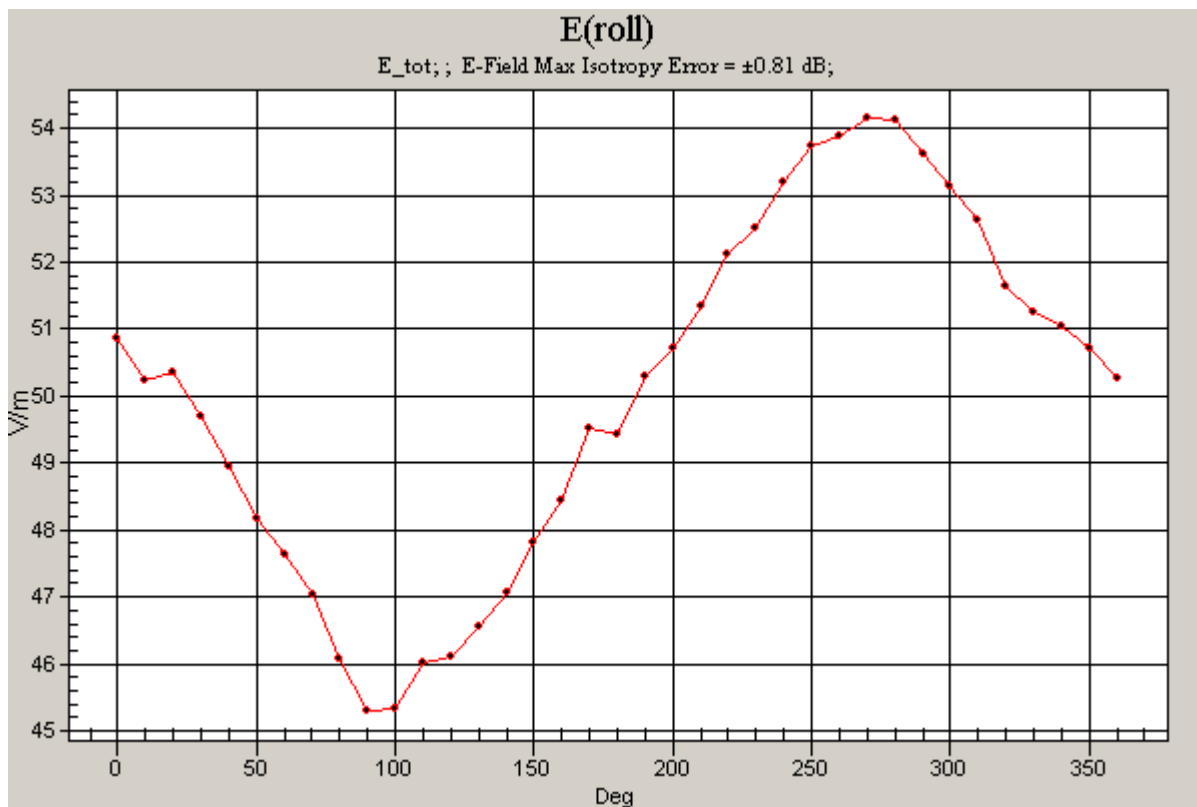
E in V/m (Time averaged) E in V/m (Slot averaged)

Grid 1	Grid 2	Grid 3
51.1	51.1	40.8
Grid 4	Grid 5	Grid 6
42.8	42.5	32.3
Grid 7	Grid 8	Grid 9
28.9	26.7	23.0

Grid 1	Grid 2	Grid 3
51.1	51.1	40.8
Grid 4	Grid 5	Grid 6
42.8	42.5	32.3
Grid 7	Grid 8	Grid 9
28.9	26.7	23.0

HAC Procedure/Rotation (1D): 37 rotation steps; E-Field Max Isotropy Error = 0.81 dB;





Date/Time: 5/27/2005 2:30:27 PM

Test Laboratory: TCC Dallas

RM-19, CDMA1900, Ch25, Whip Extend position, H field

Communication System: CDMA1900; Frequency: 1851.25 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: H3DV6 - SN6058; Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.0249 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

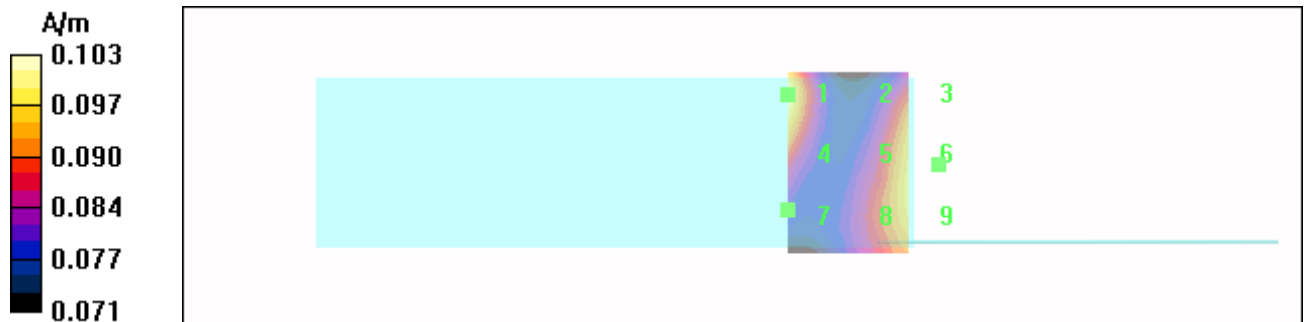
Maximum value of Total field (slot averaged) = 0.101 A/m

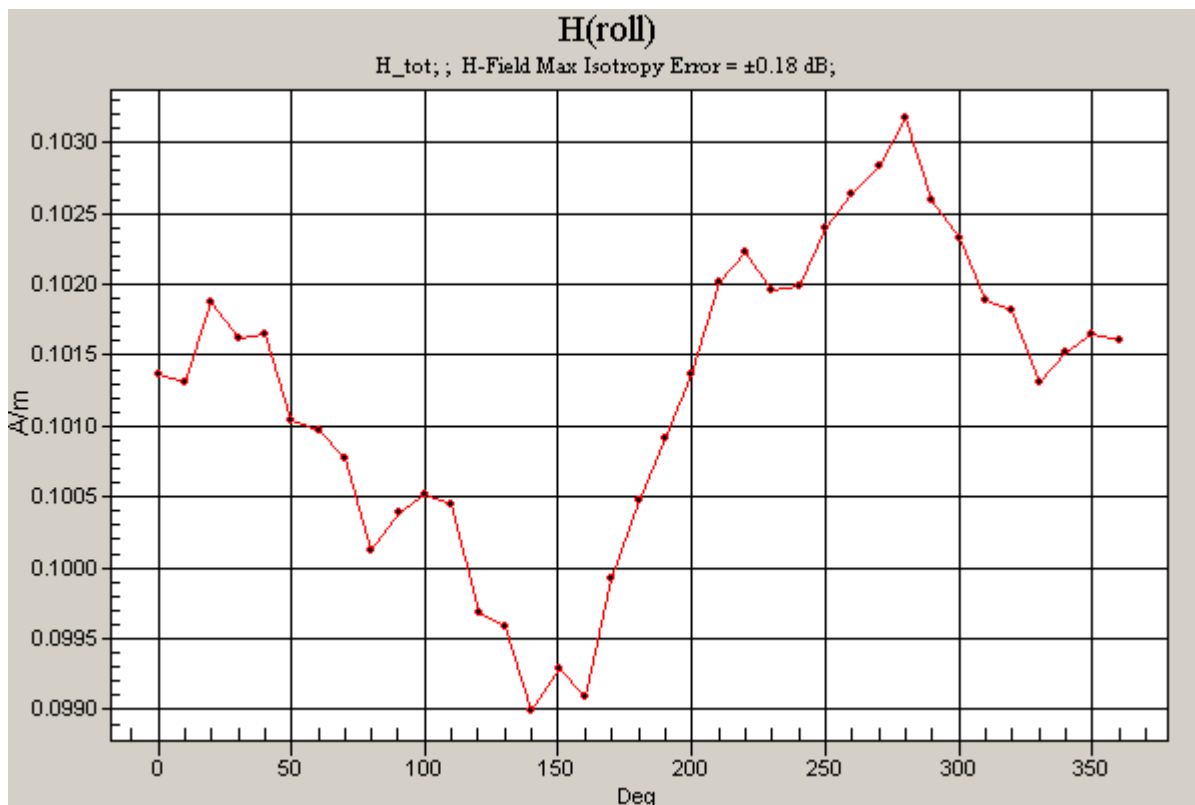
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

H in A/m (Time averaged) H in A/m (Slot averaged)

Grid 1 0.101	Grid 2 0.095	Grid 3 0.100	Grid 1 0.101	Grid 2 0.095	Grid 3 0.100
Grid 4 0.095	Grid 5 0.097	Grid 6 0.103	Grid 4 0.095	Grid 5 0.097	Grid 6 0.103
Grid 7 0.081	Grid 8 0.097	Grid 9 0.101	Grid 7 0.081	Grid 8 0.097	Grid 9 0.101

HAC Procedure/Rotation (1D): 37 rotation steps; H-Field Max Isotropy Error = 0.18 dB;





Date/Time: 5/27/2005 2:24:32 PM

Test Laboratory: TCC Dallas

RM-19, CDMA1900, Ch600, Whip Extend position, H field

Communication System: CDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: H3DV6 - SN6058; ; Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Power Drift = -0.0935 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

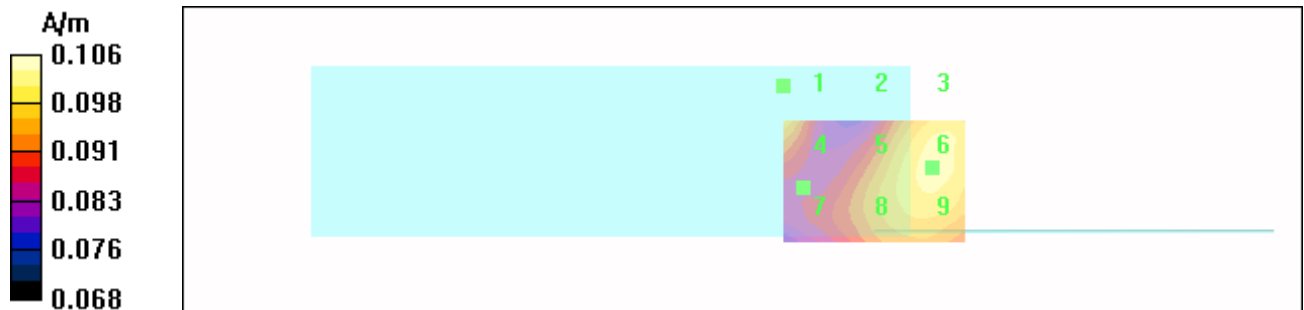
Maximum value of Total field (slot averaged) = 0.102 A/m

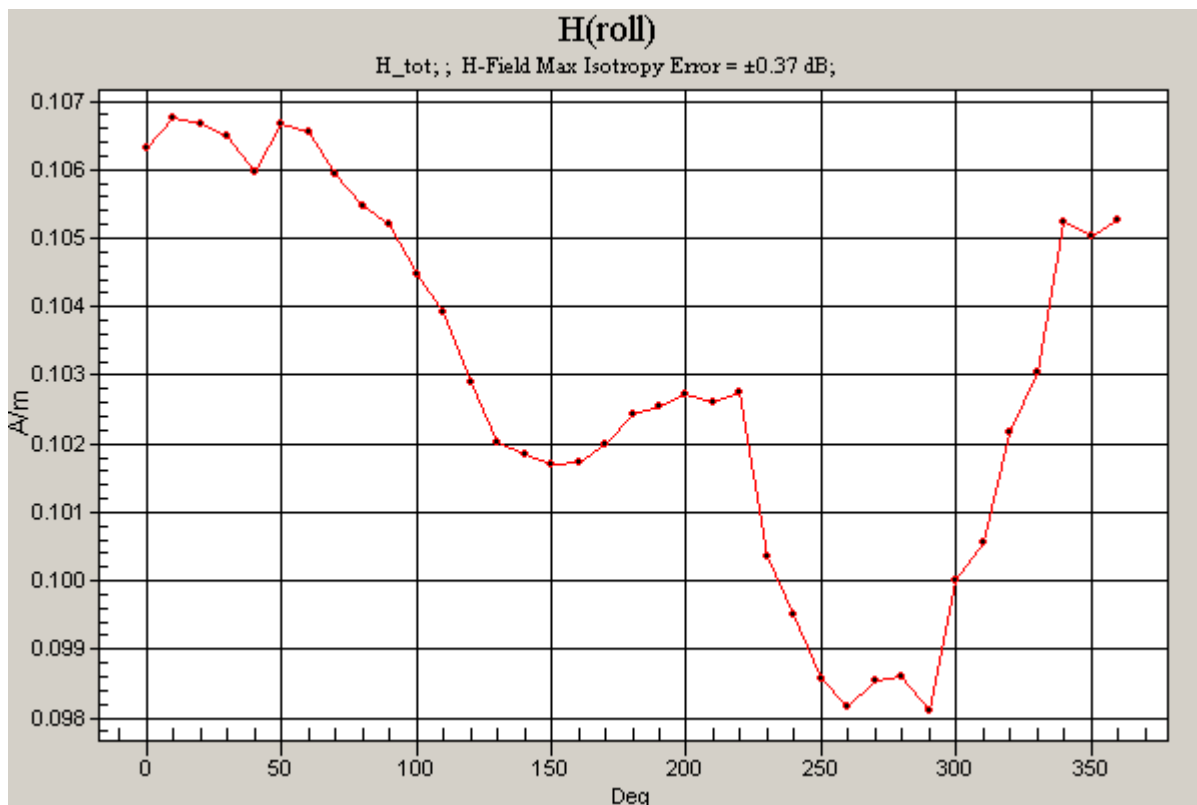
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H in A/m (Time averaged) H in A/m (Slot averaged)

Grid 1	Grid 2	Grid 3	Grid 1	Grid 2	Grid 3
0.106	0.093	0.099	0.106	0.093	0.099
Grid 4	Grid 5	Grid 6	Grid 4	Grid 5	Grid 6
0.099	0.099	0.102	0.099	0.099	0.102
Grid 7	Grid 8	Grid 9	Grid 7	Grid 8	Grid 9
0.090	0.099	0.102	0.090	0.099	0.102

HAC Procedure/Rotation (1D): 37 rotation steps; H-Field Max Isotropy Error = 0.37 dB;





Date/Time: 5/27/2005 2:36:41 PM

Test Laboratory: TCC Dallas

RM-19, CDMA1900, Ch1175, Whip Extend position, H field

Communication System: CDMA1900; Frequency: 1908.75 MHz; Duty Cycle: 1:1

DASY4 Configuration:

- Probe: H3DV6 - SN6058; ; Calibrated: 1/20/2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn389; Calibrated: 1/12/2005
- Phantom: SAM3 Cover FreeSpace Only; Phantom section: Table Section
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146.

Power Drift = -0.0238 dB

HAC Procedure/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of Total field (slot averaged) = 0.100 A/m

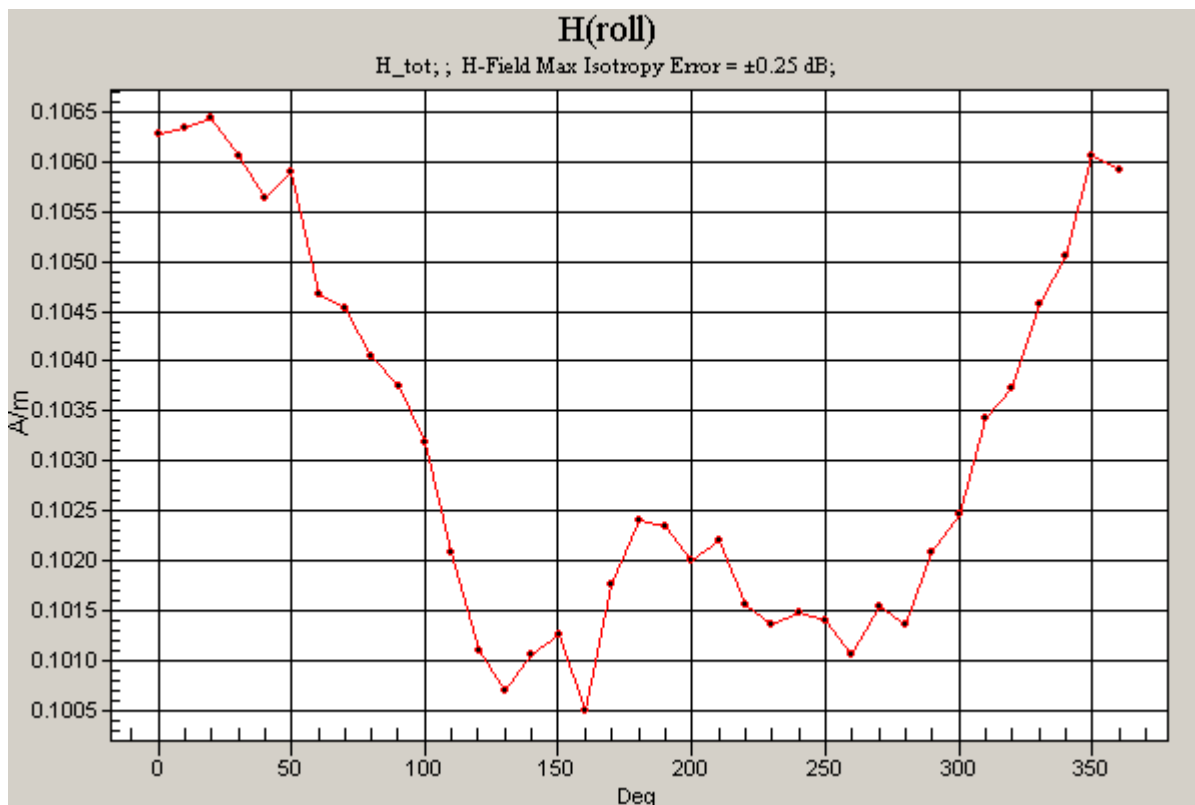
Hearing Aid Near-Field Category: **M4 (AWF 0 dB)**

H in A/m (Time averaged) H in A/m (Slot averaged)

Grid 1 0.105	Grid 2 0.095	Grid 3 0.098	Grid 1 0.105	Grid 2 0.095	Grid 3 0.098
Grid 4 0.098	Grid 5 0.099	Grid 6 0.100	Grid 4 0.098	Grid 5 0.099	Grid 6 0.100
Grid 7 0.082	Grid 8 0.097	Grid 9 0.099	Grid 7 0.082	Grid 8 0.097	Grid 9 0.099

HAC Procedure/Rotation (1D): 37 rotation steps; H-Field Max Isotropy Error = 0.25 dB;





TCC

Test & Certification Center (TCC) - Dallas

Company Confidential

WR-812.003

20 July 2005



40 (40)

Accredited Laboratory Certificate
Number: 1819-01

Ver 3.0

APPENDIX C: PROBE CALIBRATION REPORTS



Accredited by the Swiss Federal Office of Metrology and Accreditation
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 TX**

Certificate No: **ER3-2240_Jan05/2**

CALIBRATION CERTIFICATE (Replacement of No: ER3-2240_Jan05)

Object **ER3DV4R - SN:2240**

Calibration procedure(s) **QA CAL-02.v4
Calibration procedure for E-field probes optimized for close near field
evaluations in air**

Calibration date: **January 20, 2005**

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	5-May-04 (METAS, No. 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No. 251-00388)	May-05
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-04 (METAS, No. 251-00403)	Aug-05
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-04 (METAS, No. 251-00389)	May-05
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-04 (METAS, No. 251-00404)	Aug-05
Reference Probe ER3DV6	SN: 2328	6-Oct-04 (SPEAG, No. ER3-2328_Oct04)	Oct-05
DAE4	SN: 617	29-Sep-04 (SPEAG, No. DAE4-617_Sep04)	Sep-05

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

Calibrated by: **Nico Vetterli** Name: **Nico Vetterli** Function: **Laboratory Technician** Signature:

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager** Signature:

Issued: April 12, 2005

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

NORM _{x,y,z}	sensitivity in free space
DCP	diode compression point
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1309-1996, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", 1996.

Methods Applied and Interpretation of Parameters:

- *NORM_{x,y,z}*: Assessed for E-field polarization $\vartheta = 0$ for XY sensors and $\vartheta = 90$ for Z sensor ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide).
- *NORM(f)_{x,y,z}* = *NORM_{x,y,z}* * *frequency_response* (see Frequency Response Chart).
- *DCP_{x,y,z}*: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency.
- *Spherical isotropy (3D deviation from isotropy)*: in a locally homogeneous field realized using an open waveguide setup.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORM_x* (no uncertainty required).

Probe ER3DV4R

SN:2240

Manufactured:	October 1, 1999
Last calibrated:	February 17, 2004
Recalibrated:	January 20, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ER3DV4R SN:2240Sensitivity in Free Space [$\mu\text{V}/(\text{V}/\text{m})^2$]Diode Compression^ANormX **2.87 $\pm$ 10.1 % (k=2)**DCP X **92 mV**NormY **2.70 $\pm$ 10.1 % (k=2)**DCP Y **92 mV**NormZ **6.22 $\pm$ 10.1 % (k=2)**DCP Z **94 mV**

Frequency Correction

X **0.0**Y **0.0**Z **0.0**

Sensor Offset

(Probe Tip to Sensor Center)

X **2.5 mm**Y **2.5 mm**Z **2.5 mm**

Connector Angle

20 °

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

^A numerical linearization parameter: uncertainty not required

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



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

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 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 TX**

Certificate No: **H3-6058_Jan05**

CALIBRATION CERTIFICATE

Object **H3DV6 - SN:6058**

Calibration procedure(s) **QA CAL-03.v4**
Calibration procedure for H-field probes optimized for close near field evaluations in air

Calibration date: **January 20, 2005**

Condition of the calibrated item **In Tolerance**

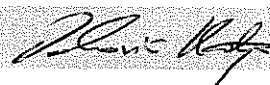
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ 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	5-May-04 (METAS, No. 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No. 251-00388)	May-05
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-04 (METAS, No. 251-00403)	Aug-05
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-04 (METAS, No. 251-00389)	May-05
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-04 (METAS, No. 251-00404)	Aug-05
Reference Probe H3DV6	SN: 6182	6-Oct-04 (SPEAG, No. H3-6182_Oct04)	Oct-05
DAE4	SN: 617	29-Sep-04 (SPEAG, No. DAE4-617_Sep04)	Sep-05
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

Calibrated by:	Name Nico Vetterli	Function Laboratory Technician	Signature 
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Approved by:	Name Katja Pokovic	Function Technical Manager	Signature 
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Issued: January 20, 2005

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



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

Accreditation No.: **SCS 108**

Glossary:

NORM _{x,y,z}	sensitivity in free space
DCP	diode compression point
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1309-1996, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", 1996.

Methods Applied and Interpretation of Parameters:

- X, Y, Z_{a0a1a2} : Assessed for E-field polarization $\vartheta = 90$ for XY sensors and $\vartheta = 0$ for Z sensor ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide).
- $X, Y, Z(f)_{a0a1a2} = X, Y, Z_{a0a1a2} * \text{frequency_response}$ (see Frequency Response Chart).
- $DCP_{x,y,z}$: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency.
- *Spherical isotropy (3D deviation from isotropy)*: in a locally homogeneous field realized using an open waveguide setup.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the X_{a0a1a2} (no uncertainty required).

Probe H3DV6

SN:6058

Manufactured:	October 15, 1999
Last calibrated:	February 17, 2004
Recalibrated:	January 20, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: H3DV6 SN:6058Sensitivity in Free Space [A/m / $\sqrt{\mu\text{V}}$]

	a0	a1	a2
X	2.707E-03	-4.652E-5	7.140E-6 $\pm$ 5.1 % (k=2)
Y	2.566E-03	-3.251E-5	1.098E-5 $\pm$ 5.1 % (k=2)
Z	2.897E-03	-2.415E-4	1.963E-5 $\pm$ 5.1 % (k=2)

Diode Compression¹

DCP X	86 mV
DCP Y	86 mV
DCP Z	85 mV

Sensor Offset (Probe Tip to Sensor Center)

X	3.0 mm
Y	3.0 mm
Z	3.0 mm

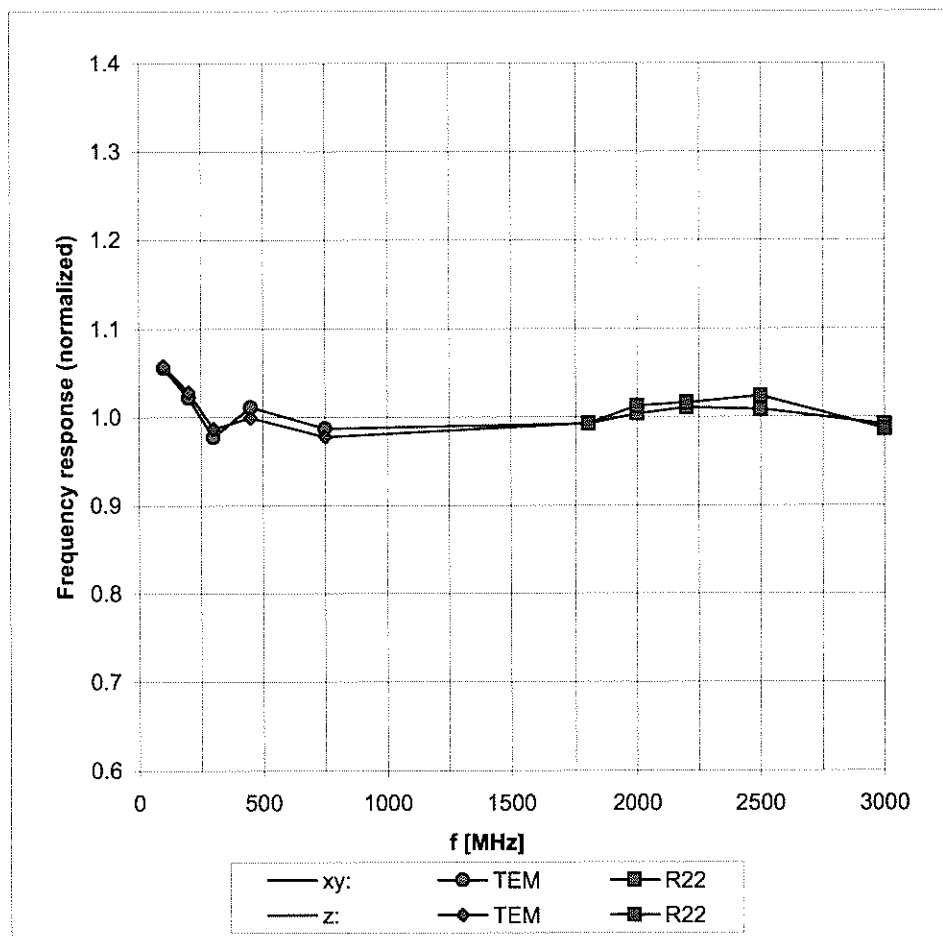
Connector Angle 87 °

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

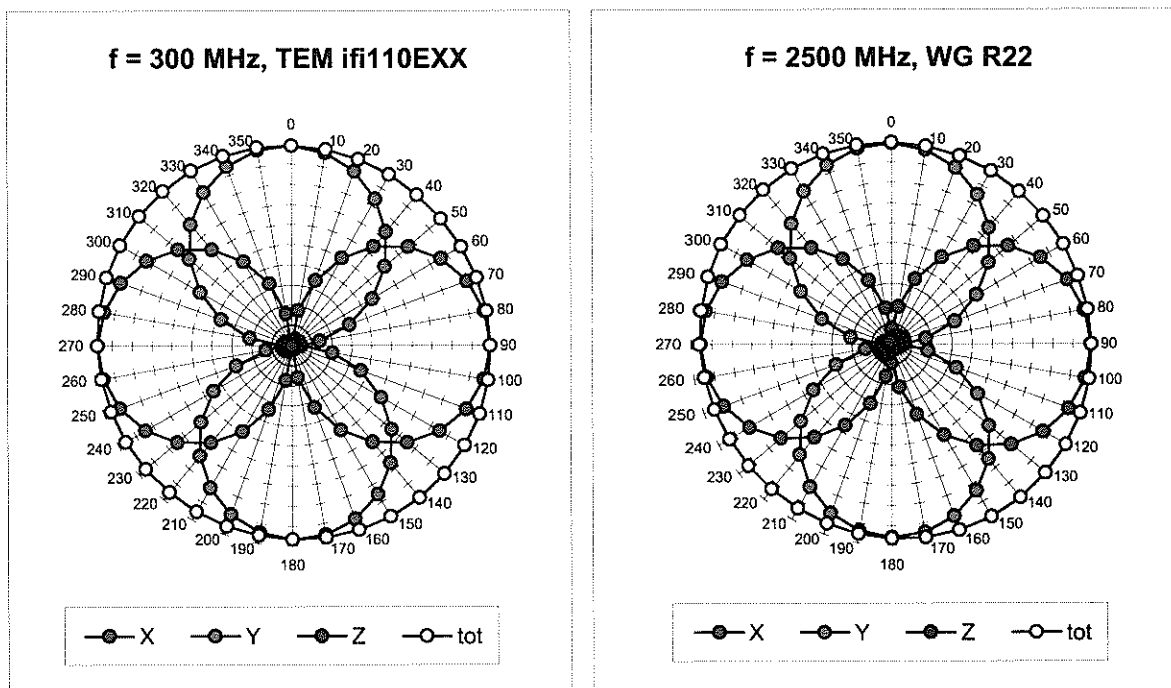
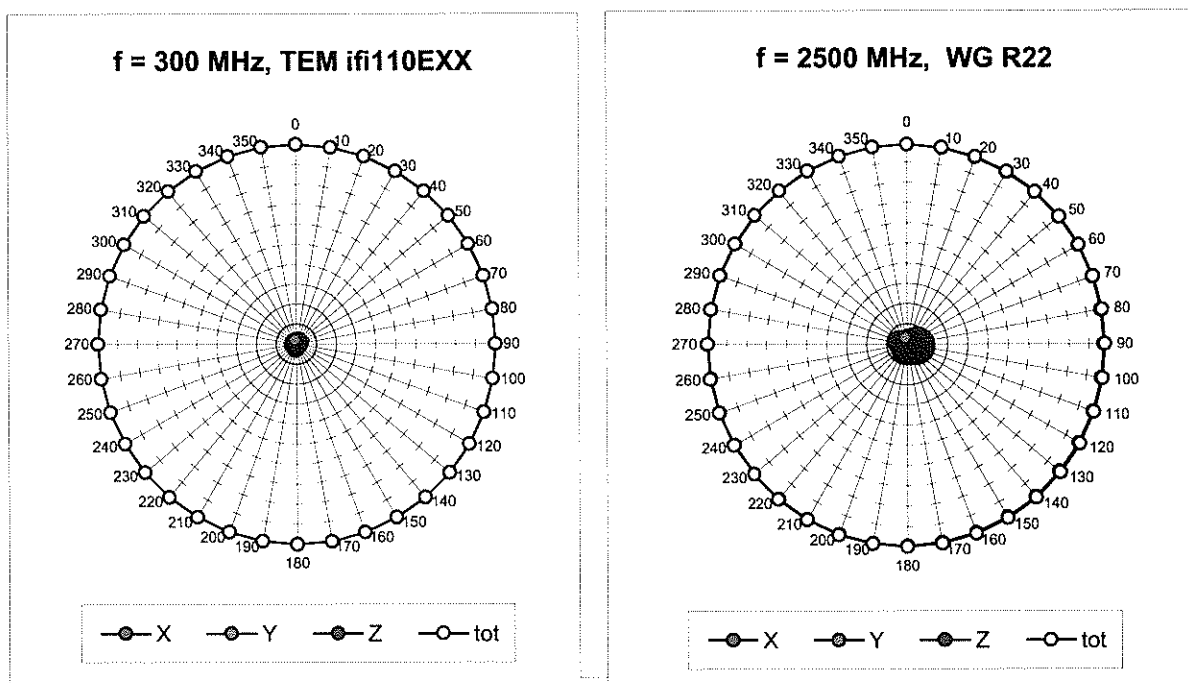
¹ numerical linearization parameter: uncertainty not required

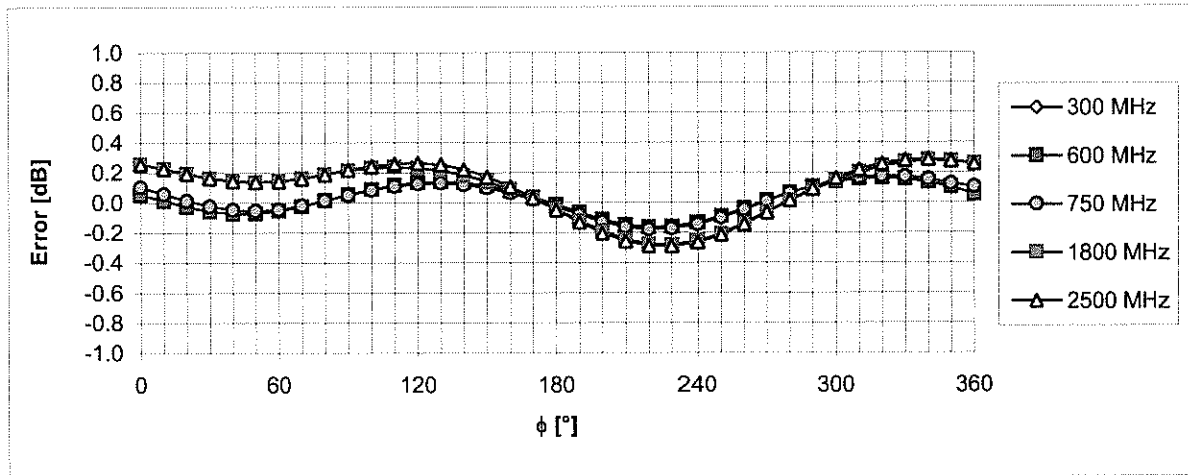
Frequency Response of H-Field

(TEM-Cell:ifi110, Waveguide R22)

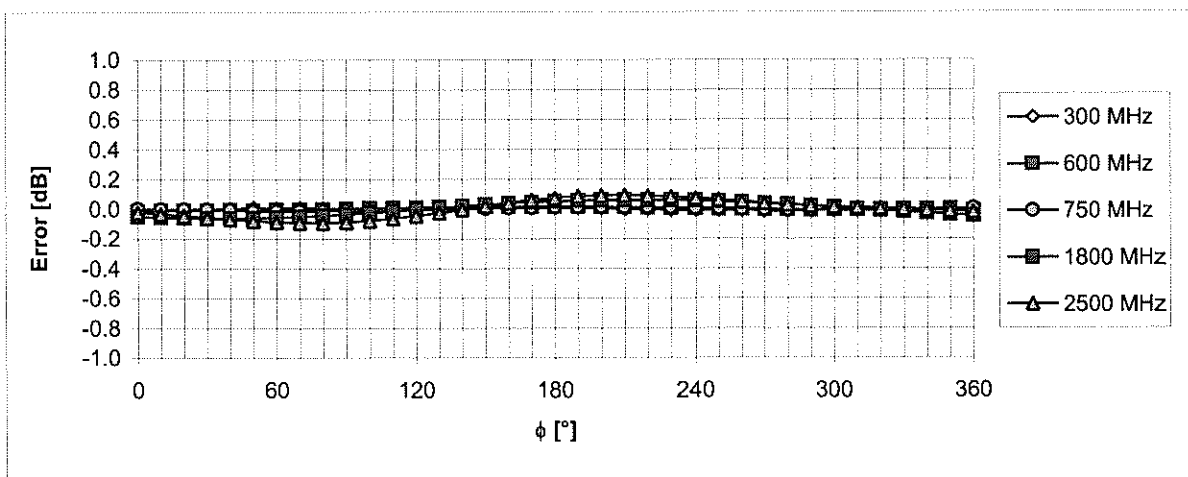


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 90^\circ$ Receiving Pattern (ϕ), $\vartheta = 0^\circ$ 

Receiving Pattern (ϕ), $\vartheta = 90^\circ$ 

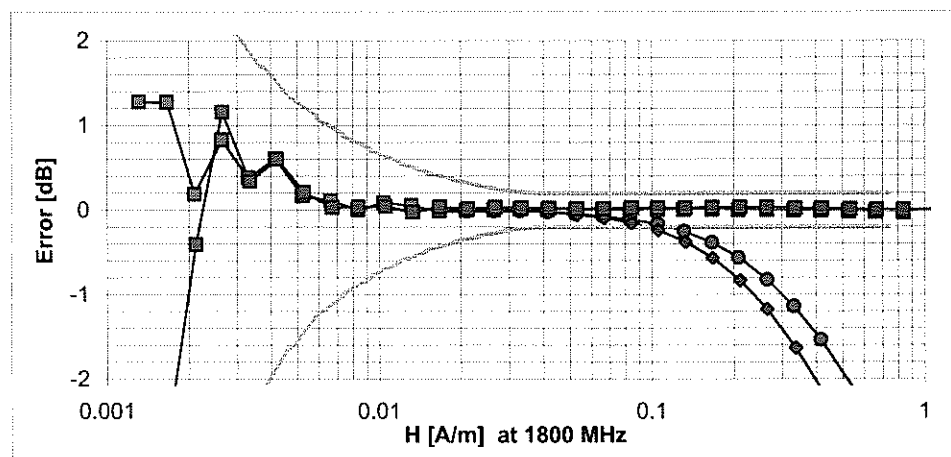
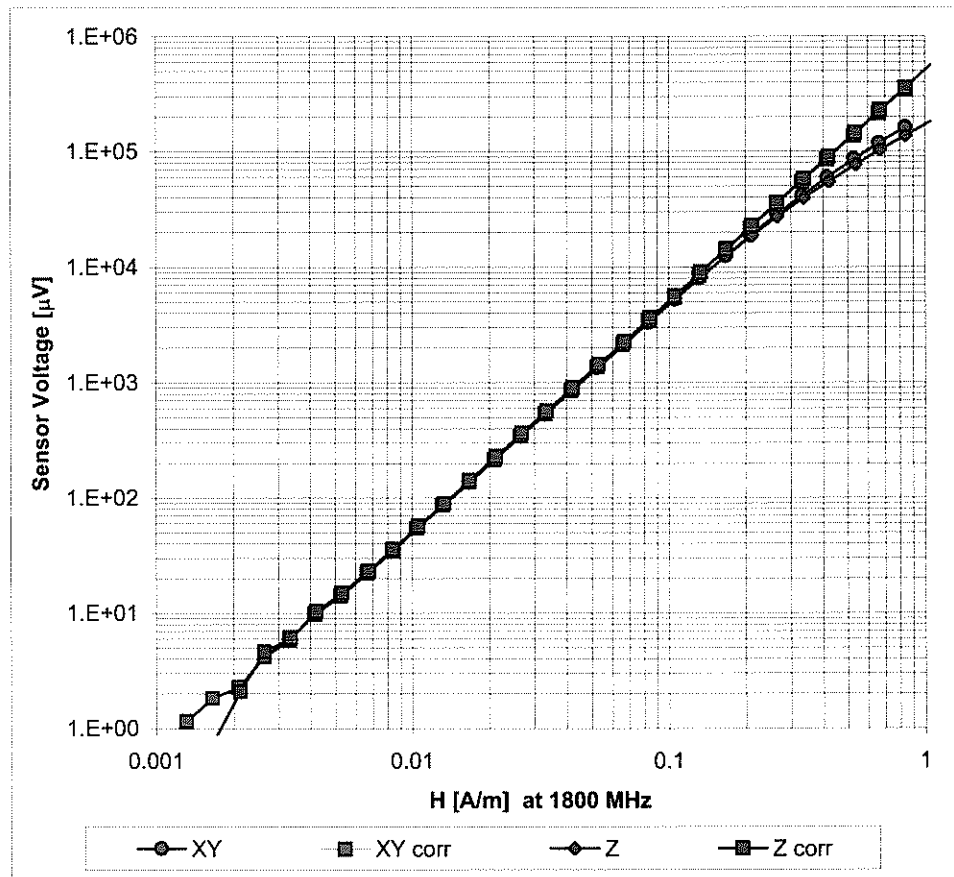
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$ 

Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(H-field)

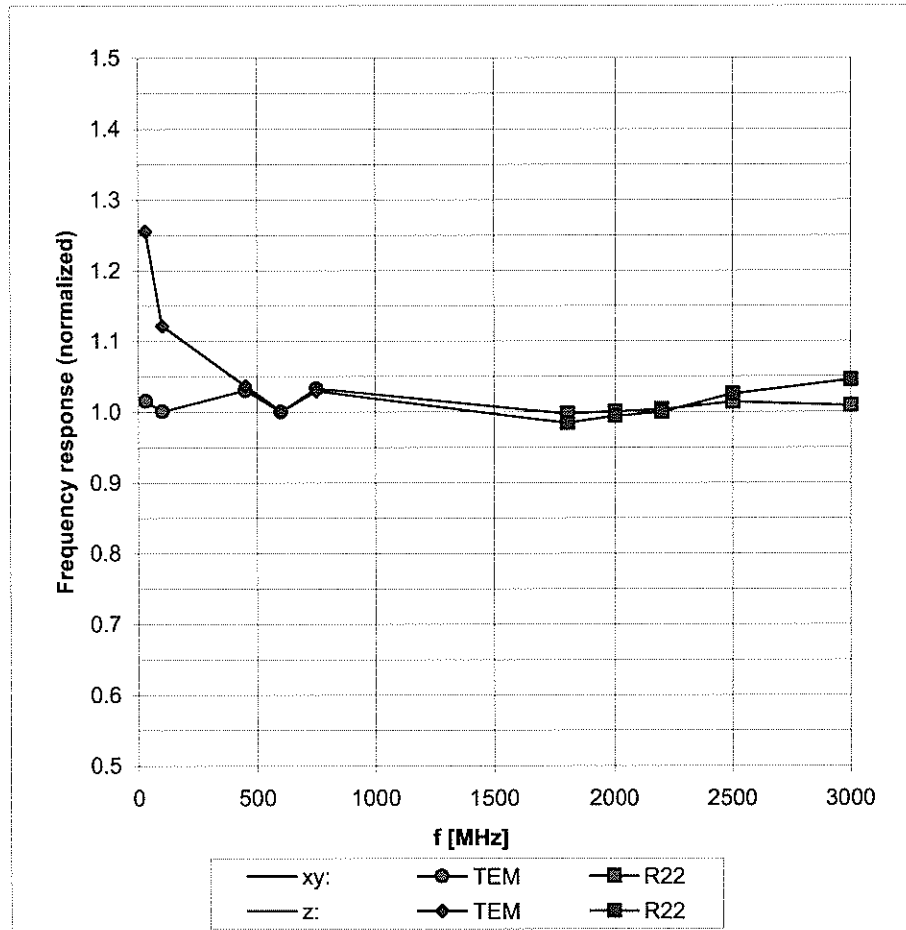
(Waveguide R22, $f = 1800$ MHz)



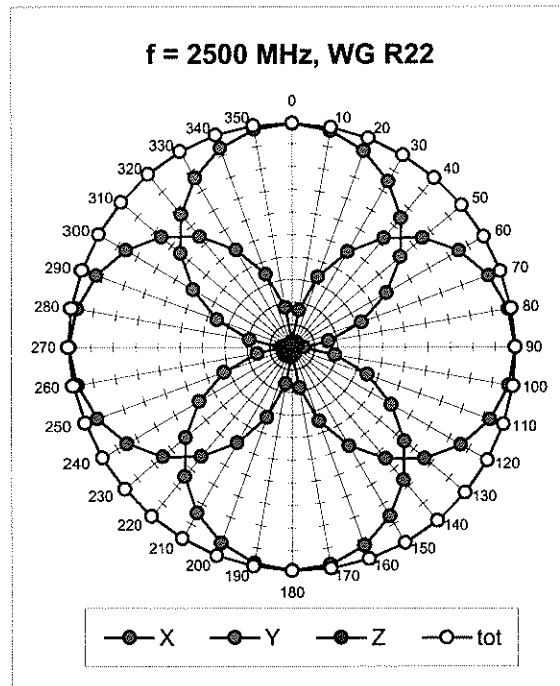
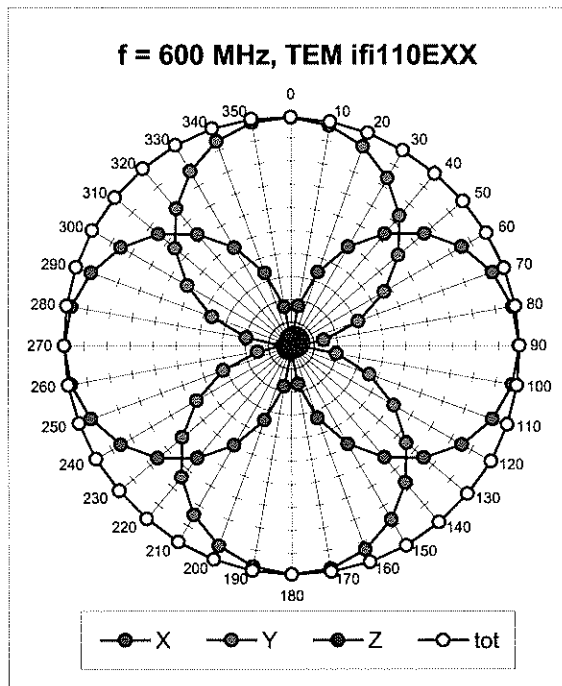
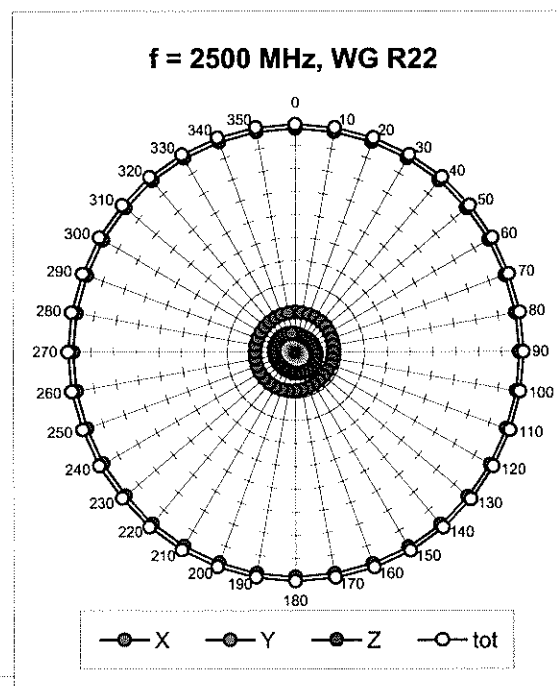
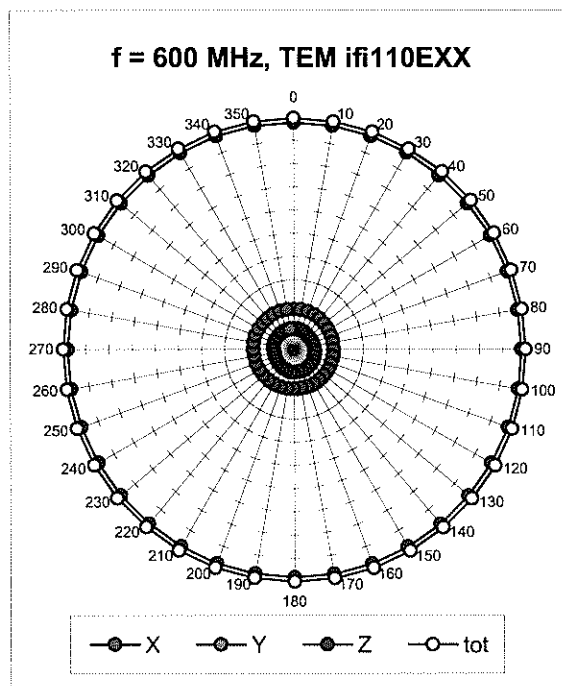
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Frequency Response of E-Field

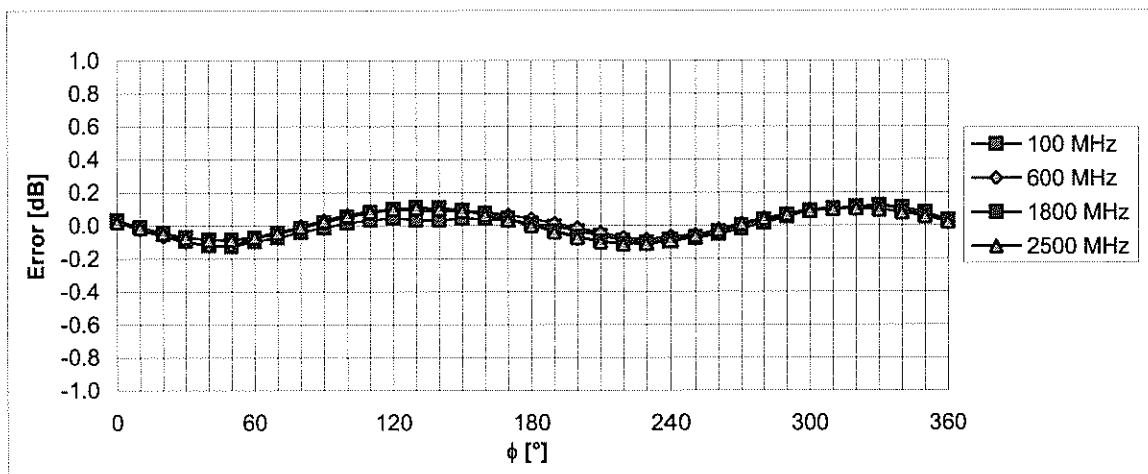
(TEM-Cell:ifi110 EXX, Waveguide R22)



Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

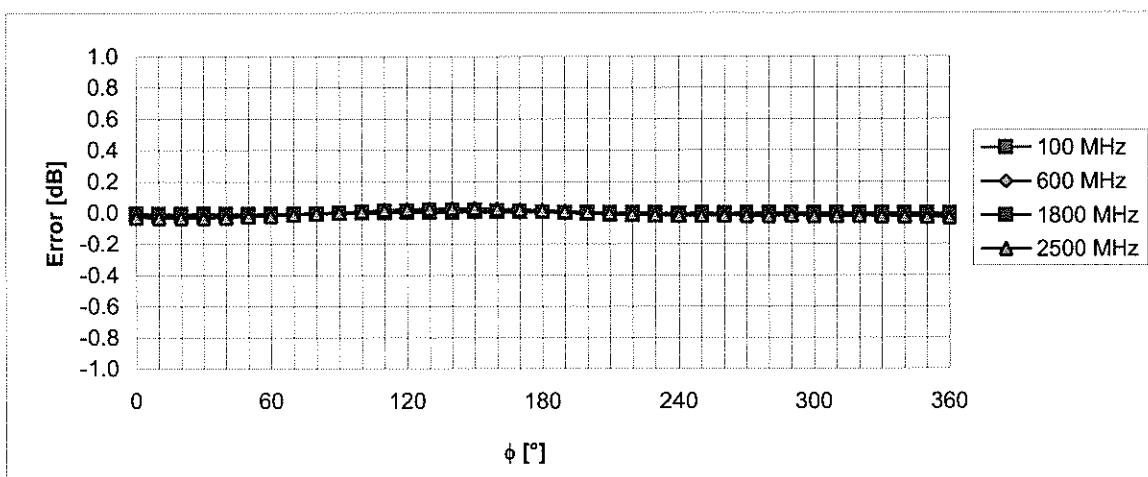
Receiving Pattern (ϕ), $\vartheta = 0^\circ$ Receiving Pattern (ϕ), $\vartheta = 90^\circ$ 

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

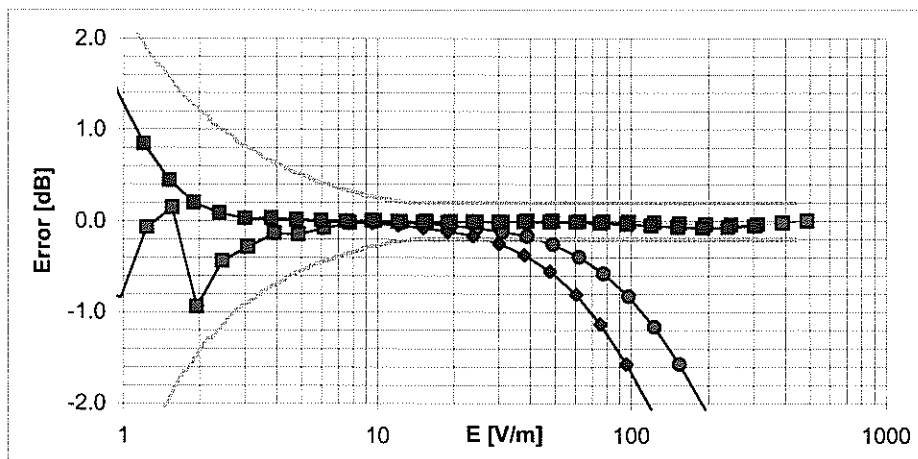
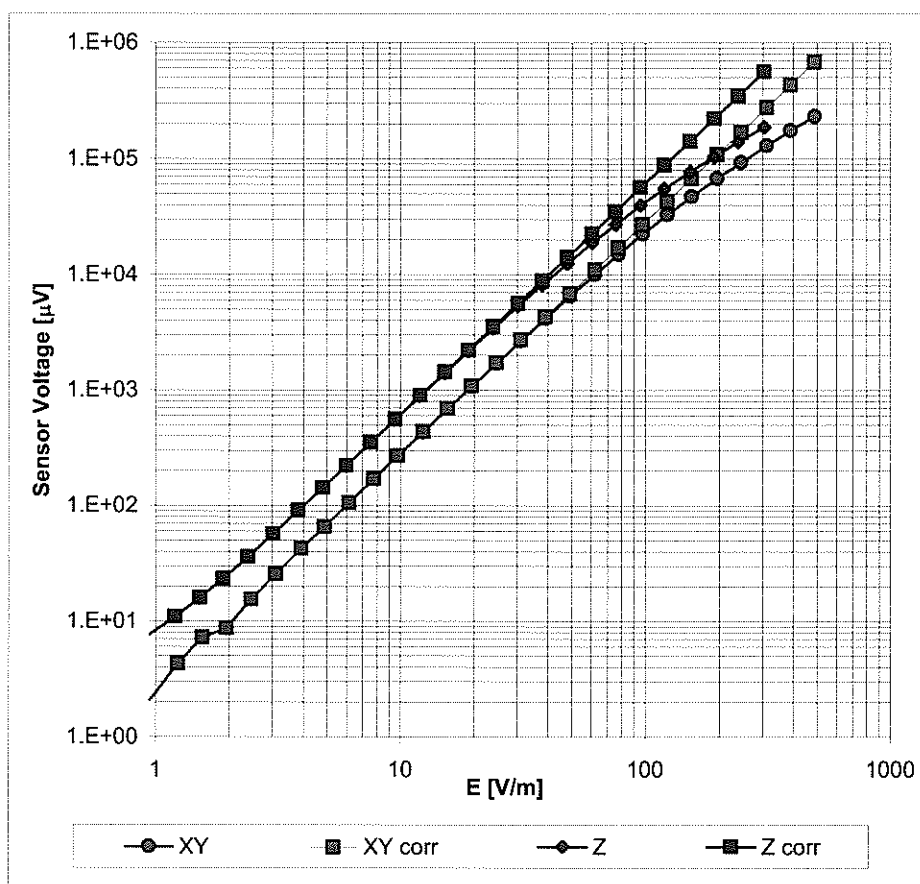
Receiving Pattern (ϕ), $\vartheta = 90^\circ$



Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(E-field)

(Waveguide R22, $f = 1800$ MHz)



Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)