



Sony Ericsson

REPORT

54(65)

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

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



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C Service suisse d'étalonnage
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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sony Ericsson USA**

Certificate No: **H3-6095_May09**

CALIBRATION CERTIFICATE

Object	H3DV6 - SN:6095
Calibration procedure(s)	QA CAL-03.v5 Calibration procedure for H-field probes optimized for close near field evaluations in air
Calibration date:	May 22, 2009
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 (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	1-Oct-08 (No. H3-6182_Oct08)	Oct-09
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-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

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

Issued: May 25, 2009

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



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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 1309-2005, " IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

Methods Applied and Interpretation of Parameters:

- 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).
- $X, Y, Z(f)_{a0a1a2} = X, Y, Z_{a0a1a2} * frequency_response$ (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).

APPLICANT: Sony Ericsson Mobile Communications Inc.

FCC ID: **PY7A3880044**



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Probe H3DV6

SN:6095

Manufactured: December 10, 2001
Last calibrated: May 16, 2008
Recalibrated: May 22, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



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DASY - Parameters of Probe: H3DV6 SN:6095

Sensitivity in Free Space [A/m / $\sqrt{(\mu V)}$]

	a0	a1	a2
X	2.813E-03	2.141E-5	-9.199E-6 ± 5.1 % (k=2)
Y	2.902E-03	1.093E-5	-9.374E-6 ± 5.1 % (k=2)
Z	3.279E-03	-1.393E-4	4.027E-5 ± 5.1 % (k=2)

Diode Compression¹

DCP X	89 mV
DCP Y	82 mV
DCP Z	84 mV

Sensor Offset (Probe Tip to Sensor Center)

X	3.0 mm
Y	3.0 mm
Z	3.0 mm

Connector Angle -54 °

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



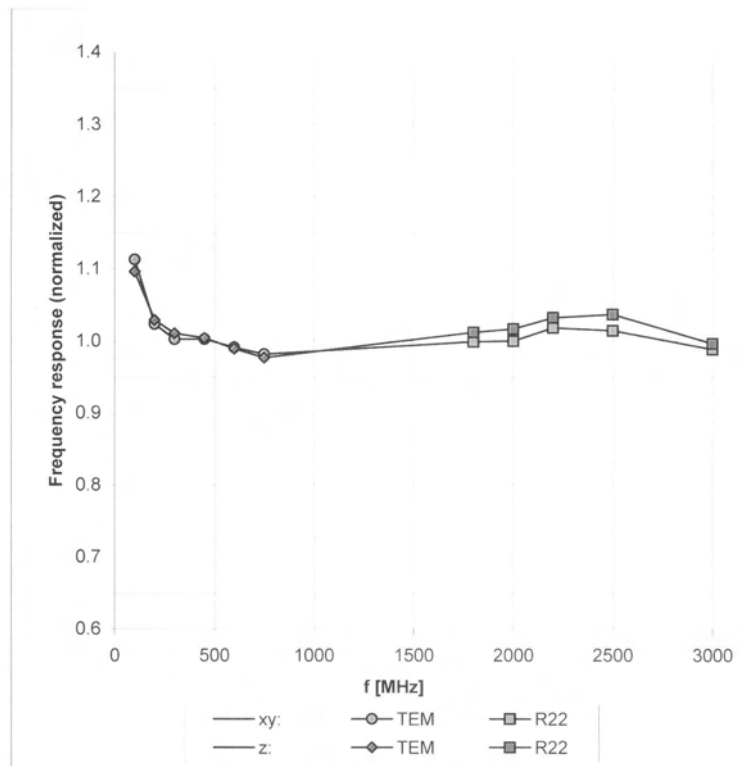
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Frequency Response of H-Field

(TEM-Cell:ifi110 EXX, Waveguide R22)



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

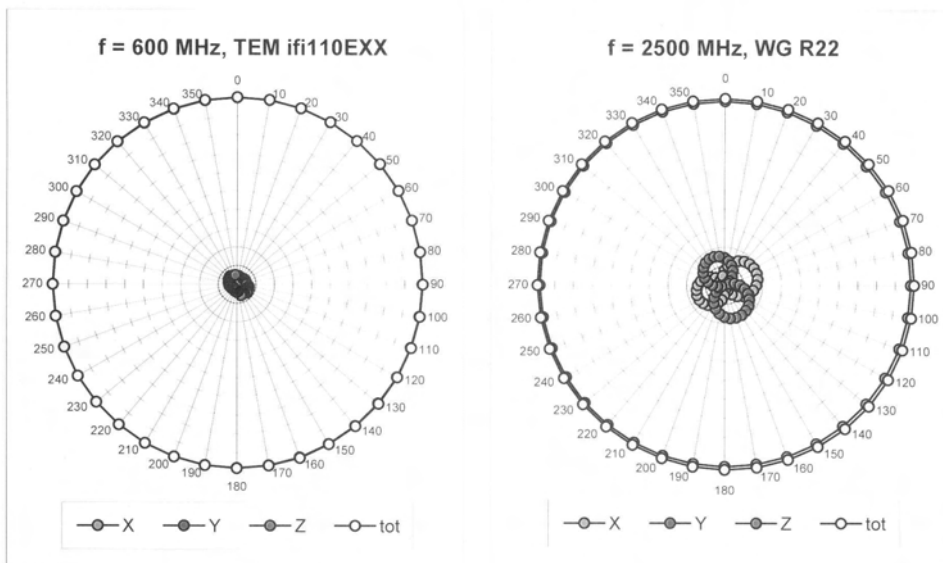


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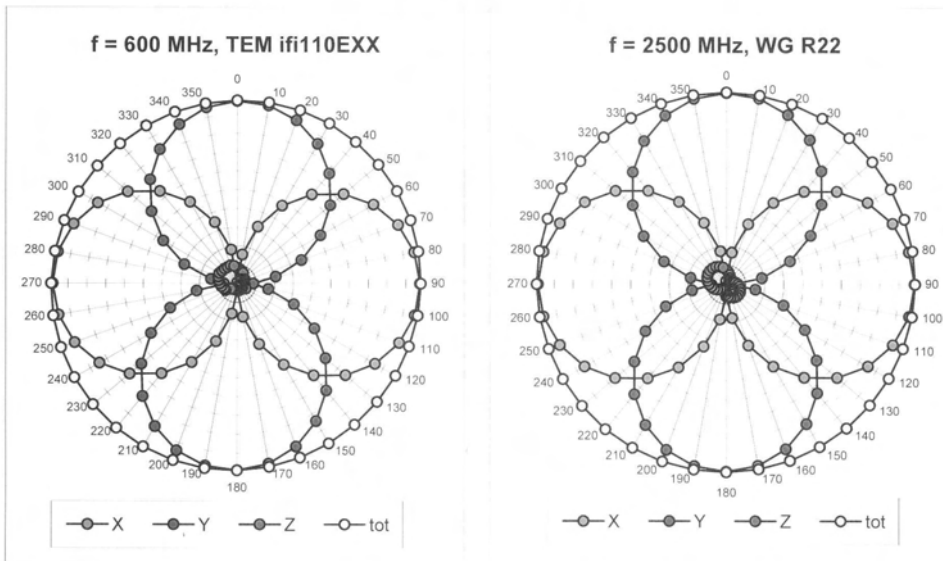
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Receiving Pattern (ϕ), $\vartheta = 90^\circ$



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



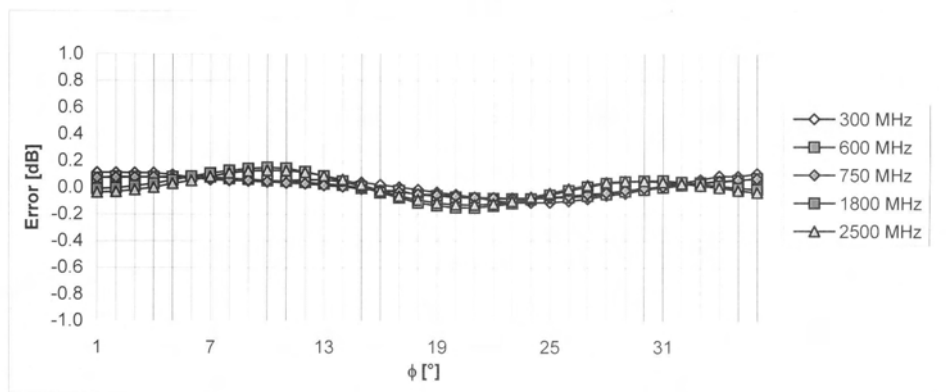


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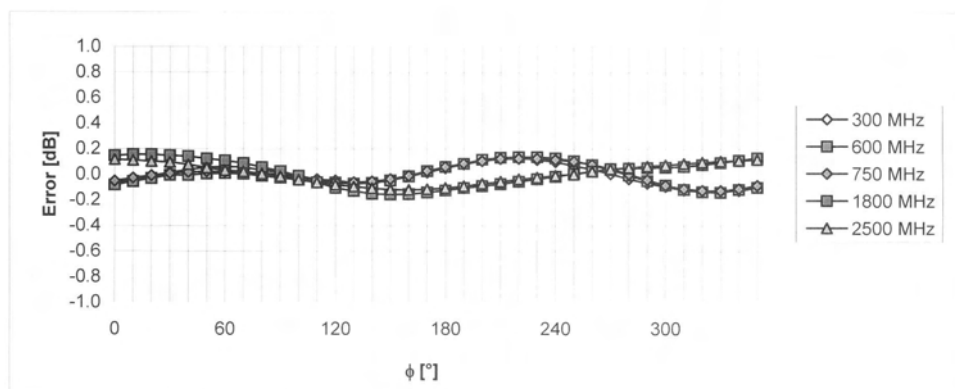
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Receiving Pattern (ϕ), $\vartheta = 90^\circ$



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

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



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

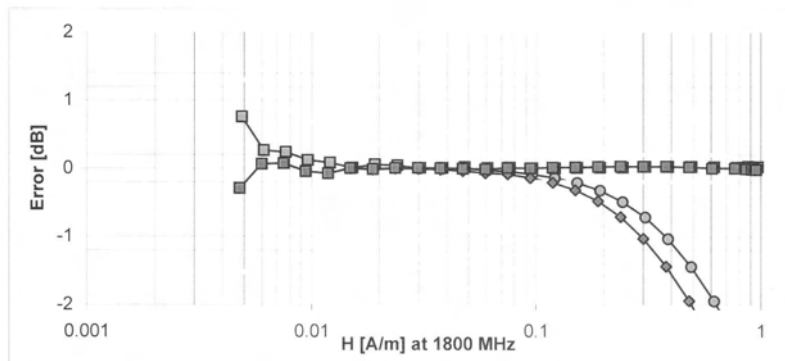
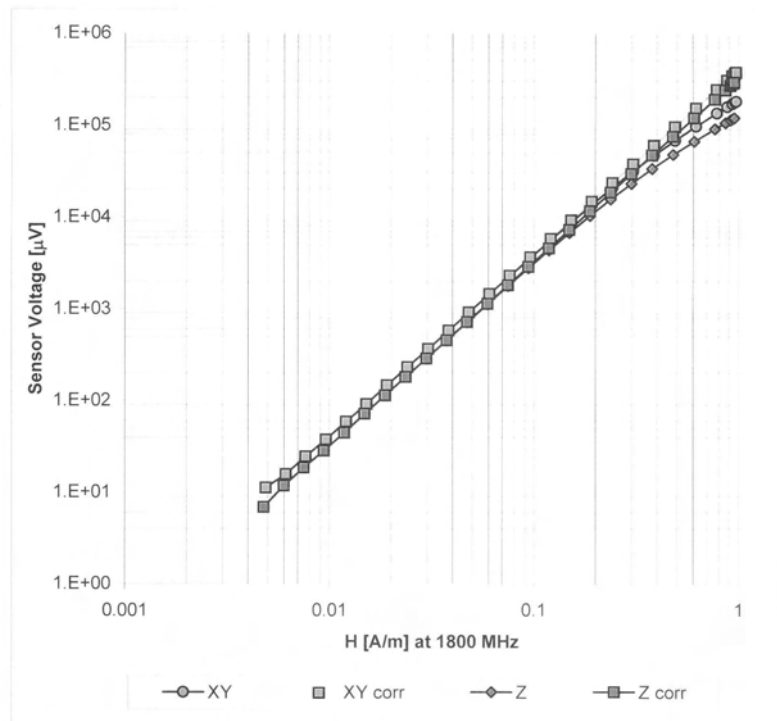


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Dynamic Range f(H-field) (Waveguide R22, f = 1800 MHz)



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

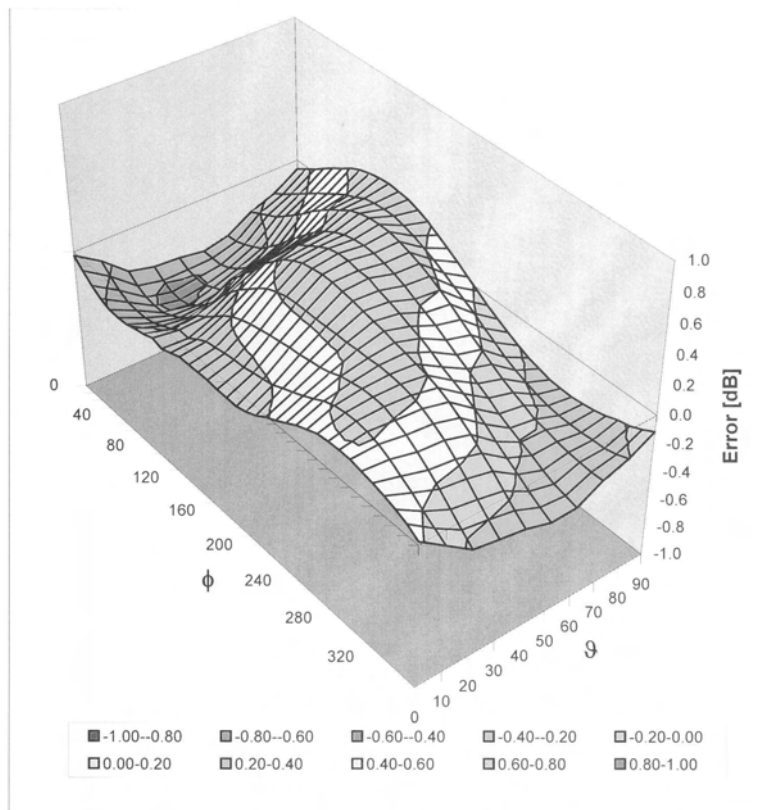


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Deviation from Isotropy in Air Error (ϕ, ϑ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)



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Appendix 10: Measurement Uncertainty Budget

**Table 1
Uncertainty Estimation Table**

Contribution	Data +/- %	Data +/- dB	Data Type	Probability Distribution	Divisor	Standard uncertainty	Standard Uncertainty (dB)
ABM Noise			Std. Dev.	Normal k=1	1.00		
RF Reflections			Specification	Rectangular	1.73		
Reference Signal Level			Specification	Rectangular	1.73		
Positioning Accuracy			Uncertainty	Rectangular	1.73		
Probe Coil Sensitivity			Specification	Rectangular	1.73		
Probe Linearity			Std. Dev.	Normal k=1	1.00		
Cable Loss			Specification	Rectangular	1.73		
Frequency Analyzer			Specification	Rectangular	1.73		
System Repeatability			Std. Dev.	Normal k=1	1.00		
WD Repeatability			Std. Dev.	Normal k=1	1.00		
Positioner Accuracy			Specification	Rectangular	1.73		
Combined standard uncertainty, uc (k=1)							
Expanded uncertainty (k=2), 95% confidence level							

Notes:

1. Test equipments are calibrated according to techniques outlined in NIS81, NIS3003 and NIST Tech Note 1297.
2. All equipments have a traceability according to NIST. Measurement Uncertainties are defined in further detail in NIS 81 and NIST Tech Note 1297 and UKAS M3003.

Measurement uncertainty reflects the quality and accuracy of a measured result as compared to the true value. Such statements are generally required when stating results of measurements so that it is clear to the intended audience that the results may differ when reproduced by different facilities. Measurement results vary due to the measurement uncertainty of the instrumentation, measurement technique, and test engineer. Most uncertainties are calculated using the tolerances of the instrumentation used in the measurement, the measurement setup variability, and the technique used in performing the test. While not generally included, the variability of the equipment under test also figures into the overall measurement uncertainty. Another component of the overall uncertainty is based on the variability of repeated measurements (so-called Type A uncertainty). This may mean that the Hearing Aid compatibility tests may have to be repeated by taking down the test setup and resetting it up so that there are a statistically significant number of repeat measurements to identify the measurement uncertainty. By combining the repeat measurement results with that of the instrumentation chain using the technique contained in NIS 81 and NIS 3003, the overall measurement uncertainty was estimated.



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Appendix 11: Photographs of the Device Under Test



Figure 1. Front View



Figure 2. Rear View



Figure 1. Side View

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References

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