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## Annex B: Probe and dipole description and calibration certificates

B.1 Probe, measurement chain description, specification and calibration certificate

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DASY Dosimetric Assessment System by Schmid & Partner Engineering AG

DASY Schmid & Partner Engineering AG News Sales Contact		A CONTRACT OF A
Applications	ER3DV6 ISOTRO MEASUREMENTS	PIC E-FIELD PROBE FOR GENERAL NEAR-FIELD
Support & Downloads Products DASY4 Packages	Download Produ	<u>zt Flyer</u> (PDF, 192kB)
EASV4     Probes     ET3DV6 - Isotropic Dos-Probe     ES3DV3 - Isotropic Dos-Probe	Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
EX3DV4 - Isotropic Dos-Probe ET1DV3 - D-Probe	Calibration	In air from 100 MHz to 3.0 GHz (absolute accuracy $\pm 6.0\%,k{=}2)$
EUV3 - Universal Vector E-Probe H3DV6 - Isotropic H-Probe	Frequency	100 MHz to > 6 GHz; Linearity: $\pm$ 0.2 dB (100 MHz to 3 GHz)
HUV4 - Universal Vector H-Probe T1V3 - Temp-Probe DP1 - Dummy-Probe	Directivity	± 0.2 dB in air (rotation around probe axis) ± 0.4 dB in air (rotation normal to probe axis)
Data Acquisition System	Dynamic Range	2 V/m to > 1000 V/m; Linearity: $\pm$ 0.2 dB
Software     Phantoms     Robots	Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm
Validation Kits & Calibration Dipoles     Hearing Aid Compatibility (HAC) Ext     Tissue Simulating Liquids     SPEAG Home	Application	General near-field measurements up to 6 GHz Field component measurements Fast automatic scanning in phantoms

http://www.dasy4.com/er3.htm

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DASY Dosimetric Assessment System by Schmid & Partner Engineering AG

DASY Schmid & Partner Engineering AG News Sales Contact		
Applications	H3DV6 3-DIMENSIO APPLICATIONS	NAL H-FIELD PROBE FOR SMALL BAND
Support & Downloads	APPLICATIONS	
	Download Product Fl	<u>ver</u> (PDF, 192kB)
Products     DASV4 Packages		
• EASY4	Construction	Three concentric loop sensors with 3.8 mm loop diameters
Probes     ET3DV6 - Isotropic Dos-Probe     ES3DV3 - Isotropic Dos-Probe     EX3DV4 - Isotropic Dos-Probe	Construction	Resistively loaded detector diodes for linear response Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
ET1DV3 - D-Probe ER3DV6 - Isotropic E-Probe	Frequency	200 MHz to 3 GHz (absolute accuracy ± 6.0%, k=2); Outout linearized
EUV3 - Universal Vector E-Probe	Directivity	± 0.25 dB (spherical isotropy error)
HUV4 - Universal Vector H-Probe	Dynamic Range	10 mA/m to 2 A/m at 1 GHz
T1V3 - Temp-Probe	E-Field Interference	< 10% at 3 GHz (for plane wave)
DP1 - Dummy-Probe • Data Acquisition System	Dimensions	Overall length: 330 mm (Tip: 40 mm)
• Software		Tip diameter: 6 mm (Body: 12 mm) Distance from probe tip to dipole centers: 3 mm
• Phantoms	Application	General magnetic near-field measurements up to 3 GHz
• Robots		Field component measurements Surface current measurements
<ul> <li>Validation Kits &amp; Calibration Dipoles</li> <li>Hearing Aid Compatibility (HAC) Ext</li> </ul>		Measurements in air or liquids
Tissue Simulating Liquids		Low interaction with the measured field
SPEAG Home		
SPEAG Home		

http://www.dasy4.com/h3d.htm

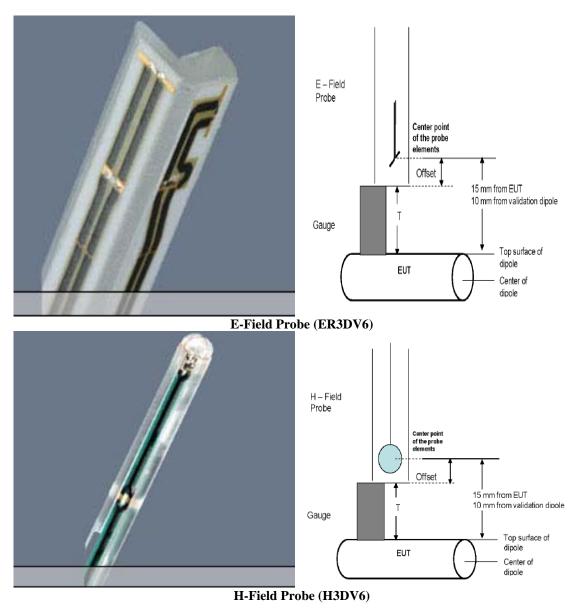
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All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY4 software so that the measurement was to the nearest element.

Figures 1 and 2, provided by the manufacturer, illustrate detail of the probe tip and its dimensions.

**ER3DV6** E-Field probe: The distances from the probe tip to the closest points on the dipole sensors are 1.45mm for X and Y and 1.25mm for Z. From the probe tip to the center of the sensors is 2.5mm.

**H3DV6** H-Field probe: The distance from the probe tip to the closest point of the X, Y and Z loop sensors is 1.1mm. From the probe tip to the center of the sensor is 3.00mm.



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The following information is from the system manufacturer user manual describing the process chain:

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$
(20.1)

with	$V_i$	= compensated signal of channel i	(i = x, y, z)
	$U_i$	= input signal of channel i	(i = x, y, z)
	cf	= crest factor of exciting field	(DASY parameter)
	$dcp_i$	= diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

	$\mathrm{E-field probes}$ :	$E_i = \sqrt{\frac{V_i}{Norm_i}}$	ConvF
	$\mathbf{H}-\mathbf{fieldprobes}$ :	$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_i}{2}$	$\frac{1}{f} \frac{f + a_{i2}f^2}{f}$
with	= compensated signal of $\alpha$ = sensor sensitivity of cha $\mu V/(V/m)^2$ for E-field = sensitivity enhancement = sensor sensitivity factor = carrier frequency [GHz] = electric field strength of = magnetic field strength	nnel i 1 Probes t in solution rs for H-field probes f channel i in V/m	$\begin{array}{l} (i=x,y,z)\\ (i=x,y,z) \end{array}$

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$
(20.2)

The measurement / integration time per point is > 500 ms, as per the system manufacturer:

The time response of the field probes has been assessed by exposing the probe to a well-controlled field producing signals larger than HAC E- and H-fields of class M4. The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/off switch of the power source with an integration time of 500 ms and a probe response time of <5 ms. In the current implementation, DASY4 waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization. The tolerances for the different systems had the worst-case of 2.6%.

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ata <b>ew</b>	Becker	Dates of Test Jan. 12-13, A 2011	Apr 5, July 13,	Report No <b>RTS-3640-1</b> 1	102-01B	FCC ID L6ARDM70 L6AREN70	
:	<b>Calibration Laborator</b> Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zuric	-			hweizerischer Kalili rvice sulsse d'étalo rvizio svizzero di ta iss Calibration Ser	nnage ratura	
	Accredited by the Swiss Accredita The Swiss Accreditation Servic	ation Service (SAS)	ies to the EA	Accreditation No.:	SCS 108		
	Multilateral Agreement for the r	-		Cartilizate No: El	R3-2285 Mar1	0	
	CALIBRATION		E		······		
	Object	ER3DV6 - SN:2				14915B	
	Calibration procedure(s)	Calibration proc	and QA CAL-25.v2 edure for E-field pro ir		close near fiek		
	Calibration date:	March 8, 2010				najiri kwa Miliki kwa	
	This calibration certificate docum The measurements and the unce						
	All calibrations have been condu			perature (22 ± 3)°C and	humidity < 70%.		
	Calibration Equipment used (M&						
	Primary Standards Power meter E4419B	ID # GB41293874	Cal Date (Certificate No 1-Apr-09 (No. 217-010)		Scheduled Calibra Apr-10	tion	
	Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-010)		Apr-10		
	Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-010)	0)	Apr-10		
	Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01		Mar-10		
	Reference 20 dB Attenuator Reference 30 dB Attenuator	SN: S5086 (20b) SN: S5129 (30b)	31-Mar-09 (No. 217-01 31-Mar-09 (No. 217-01		Mar-10 Mar-10		
	Reference Probe ER3DV6	SN: 2328	3-Oct-09 (No. ER3-232		Oct-10		
	DAE4	SN: 789	23-Dec-09 (No. DAE4-		Dec-10		
	Secondary Standards	ID #	Check Date (in house)		Scheduled Check		
	erer and ere	US3642U01700	4-Aug-99 (in house che		In house check: O		
	RF generator HP 8648C					ct-11	
		US37390585	18-Oct-01 (in house ch	eck Oct-09)	In house check: O		
	RF generator HP 8648C		T8-Oct-01 (in house ch Function Laboratory	· · · · · · · · · · · · · · · · · · ·	In house check: O Signature		
	RF generator HP 8648C Network Analyzer HP 8753E	US37390585 Name Jeton Kastrati	Function	Téchnician			

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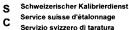
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

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

#### Glossary:

NORMx,y,z	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\phi$	φ rotation around probe axis
Polarization 9	θ rotation around an axis that is in the plane normal to probe axis (at measurement center),
	i.e., $9 = 0$ 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:

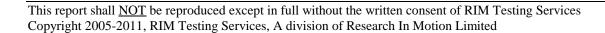
a) IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

#### Methods Applied and Interpretation of Parameters:

- NORMx 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 = NORMx, y, z \* frequency\_response (see Frequency Response Chart). ٠
- DCPx, y, z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW ٠ signal (no uncertainty required). DCP does not depend on frequency nor media.
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- 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 NORMx (no uncertainty required).

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March 8, 2010

# Probe ER3DV6

## SN:2285

Manufactured: Last calibrated: Recalibrated: September 20, 2002 March 2, 2009 March 8, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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#### March 8, 2010

## DASY - Parameters of Probe: ER3DV6 SN:2285

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm $(\mu V/(V/m)^2)$	1.26	1.42	1.61	± 10.1%
DCP (mV) <sup>A</sup>	92.1	94.2	96.0	

### **Modulation Calibration Parameters**

uid	Communication System Name	PAR		A dB	B dBuV	с	VR mV	Unc <sup>E</sup> (k=2)
10000	cw	0.00	х	0.00	0.00	1.00	300	± 1.5 %
			Y	0.00	0.00	1.00	300	
			z	0.00	0.00	1.00	300	

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

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

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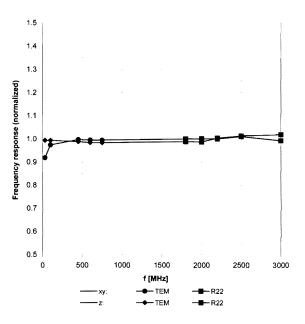
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## March 8, 2010

## **Frequency Response of E-Field**

(TEM-Cell:ifi110 EXX, Waveguide R22)



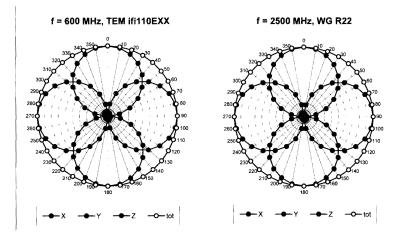
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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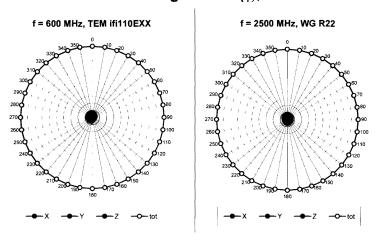
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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$

Receiving Pattern ( $\phi$ ),  $\vartheta$  = 90°

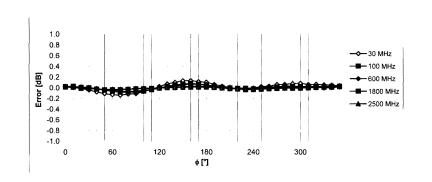


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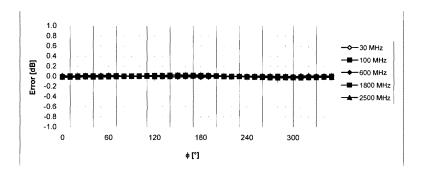
March 8, 2010



Receiving Pattern ( $\phi$ ),  $\vartheta = 0^{\circ}$ 

Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Receiving Pattern ( $\phi$ ),  $\vartheta$  = 90°



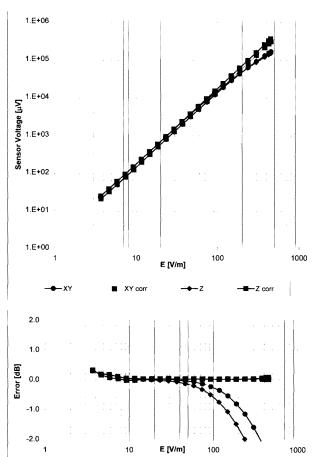
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

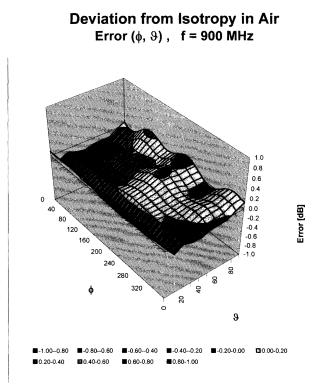
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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## **Other Probe Parameters**

Sensor Arrangement	Rectangular
Connector Angle (°)	78.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overail Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	8.0 mm
Probe Tip to Sensor X Calibration Point	2.5 mm
Probe Tip to Sensor Y Calibration Point	2.5 mm
Probe Tip to Sensor Z Calibration Point	2.5 mm

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ew Becker	Dates of Test Jan. 12-13, A 2011	Apr 5, July 13,	Report No RTS-364	0-1102-01B	FCC ID L6ARDM70 L6AREN70U	
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Zeughausstrasse 43, 8004 Zuric	ch, Switzerland	Malahahaha	BRA	S Swiss Calibration S	ervice	
Accredited by the Swiss Accredita The Swiss Accreditation Servic	e is one of the signatori		Accreditati	on No.: SCS 108		
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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

Accreditation No.: SCS 108

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

#### Glossary:

sensitivity in free space
diode compression point
crest factor (1/duty_cycle) of the RF signal
modulation dependent linearization parameters
φ rotation around probe axis
9 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
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:

- NORMx, y, z: Assessed for E-field polarization 9 = 0 for XY sensors and 9 = 90 for Z sensor (f ≤ 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).
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C are numerical linearization parameters assessed based on the data of
  power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the
  maximum calibration range expressed in RMS voltage across the diode.
- 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).

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	2011 L6AREN70UV			W

March 12, 2010

# Probe H3DV6

## SN:6168

Manufactured: Last calibrated: Recalibrated: July 9, 2003 March 3, 2009 March 12, 2010

Calibrated for DASY Systems (Note: non-compatible with DASY2 system!)

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	2011		L6AREN70U	W

#### March 12, 2010

## DASY - Parameters of Probe: H3DV6 SN:6168

#### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / √(µV)) a0	2.76E-3	2.64E-3	3.14E-3	± 5.1%
Norm (A/m / √(µV)) a1	-1.81E-4	-8.57E-5	-2.18E-4	± 5.1%
Norm (A/m / √(μV)) a2	-2.18E-5	-3.81E-5	3.05E-5	± 5.1%
DCP (mV) <sup>A</sup>	81.4	94.7	83.2	

#### **Modulation Calibration Parameters**

UID	Communication System Name	PAR		A dB	B dBuV	с	VR mV	Unc <sup>€</sup> (k=2)
10000	cw	0.00	х	0.00	0.00	1.00	300	±1.5%
			Y	0.00	0.00	1.00	300	
			z	0.00	0.00	1.00	300	

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

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

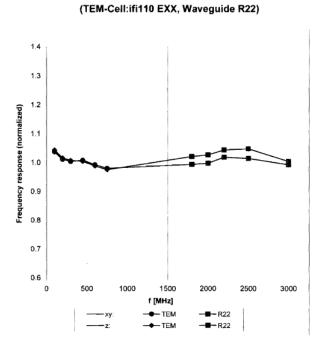
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	2011		LOAKEN/UU	VV

March 12, 2010

## **Frequency Response of H-Field**



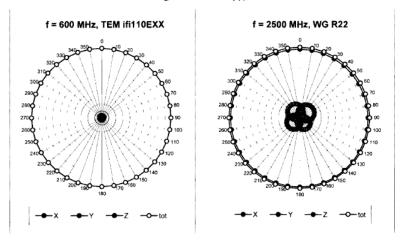
Uncertainty of Frequency Response of H-field: ± 6.3% (k=2)

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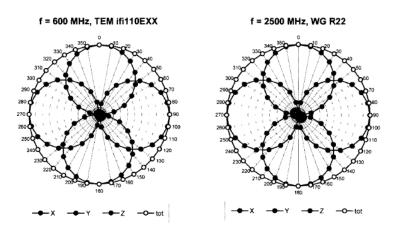
Testing Services™	Document Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RDM71UW/REN71UW			Page 21(45)
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#### March 12, 2010



## Receiving Pattern ( $\phi$ ), $\vartheta$ = 90°

Receiving Pattern ( $\phi$ ),  $\vartheta = 0^{\circ}$ 

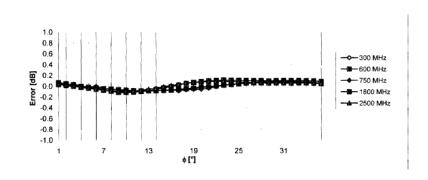


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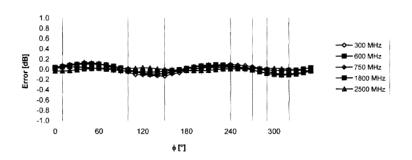
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Receiving Pattern ( $\phi$ ),  $\vartheta$  = 90°

Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Receiving Pattern ( $\phi$ ),  $\vartheta = 0^{\circ}$ 



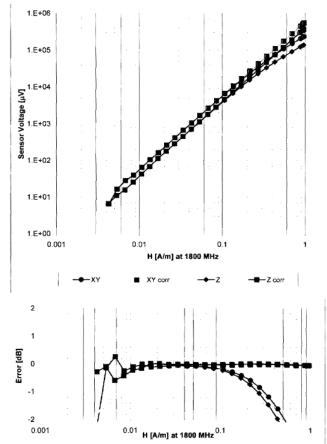
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

Uncertainty of Linearity Assessment: ± 0.6% (k=2)

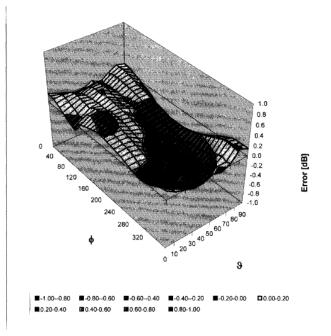
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## Deviation from Isotropy in Air Error ( $\phi$ , $\vartheta$ ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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	2011		L6AREN70U	W

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## **Other Probe Parameters**

Sensor Arrangement	Rectangular
Connector Angle (°)	-232.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	20 mm
Tip Diameter	6.0 mm
Probe Tip to Sensor X Calibration Point	3 mm
Probe Tip to Sensor Y Calibration Point	3 mm
Probe Tip to Sensor Z Calibration Point	3 mm

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or Data drew Becker	Dates of Test Jan. 12-13, 2011	Apr 5, July 13, RTS-3640-1	102-01B L6ARDM70 L6AREN70	
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CALIBRATION	CERTIFICAT			
Object	ER3DV6 - SN:22	<b>86</b> 00407 - 2 <b>3</b> 488700 - 1		
Calibration procedure(s)		DA CAL-25.v3 idure for E-field probes optimized f	<ul> <li>A state of the sta</li></ul>	
Calibration date: This calibration certificate docur		onal standards, which realize the physical units		
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## Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RDM71UW/REN71UW

Page

Author Data Andrew Becker

#### Dates of Test Jan. 12-13, Apr 5, July 13, 2011

Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



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

Accreditation No.: SCS 108

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

## Glossary:

olossary.	
NORMx,y,z	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\phi$	φ rotation around probe axis
Polarization 8	9 rotation around an axis that is in the plane normal to probe axis (at measurement center),
	i.e., 9 = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system
0	, , , , , , , , , , , , , , , , , , , ,

### Calibration is Performed According to the Following Standards:

 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:

- NORMx,y,z: Assessed for E-field polarization 9 = 0 for XY sensors and 9 = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
- NORM(f)x,y,z = NORMx,y,z \* frequency\_response (see Frequency Response Chart).
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C are numerical linearization parameters assessed based on the data of
  power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the
  maximum calibration range expressed in RMS voltage across the diode.
- 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 NORMx (no uncertainty required).

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	2011		L6AREN70U	W

January 14, 2011

# Probe ER3DV6

# SN:2286

Manufactured: Septem Calibrated: Januar

September 18, 2002 January 14, 2011

Calibrated for DASY/EASY Systems (Note: non-compatible with DASY2 system!)

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	2011		L6AREN70U	W

January 14, 2011

## DASY/EASY - Parameters of Probe: ER3DV6 - SN:2286

### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)2)	2.23	1.48	1.51	± 10.1 %
DCP (mV) <sup>8</sup>	97.6	98.4	97.6	

## Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	179.3	±3.0 %
			Y	0.00	0.00	1.00	145.0	
			Z	0.00	0.00	1.00	180.1	

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%.

\* Numerical linearization parameter: uncertainty not required. <sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

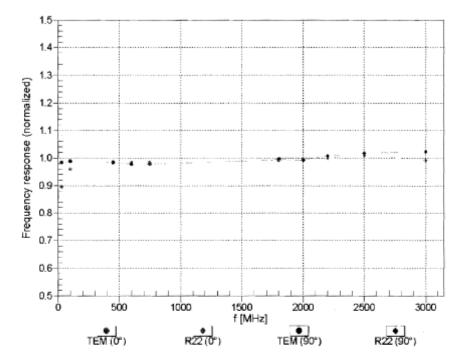
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## Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

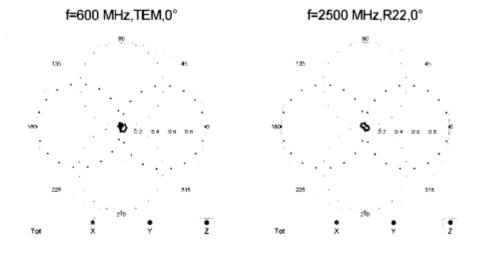
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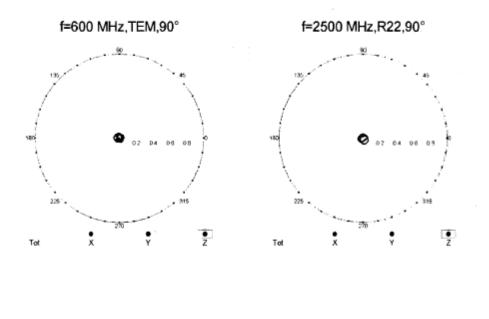
Testing Services™	Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RDM71UW/REN71UW			Page <b>31(45)</b>
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## Receiving Pattern ( $\phi$ ), $\vartheta$ = 0°



Receiving Pattern ( $\phi$ ),  $\vartheta$  = 90°



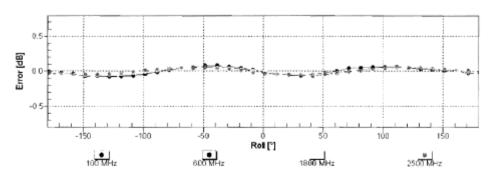
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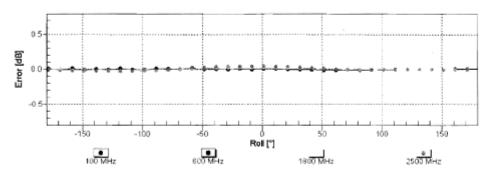
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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

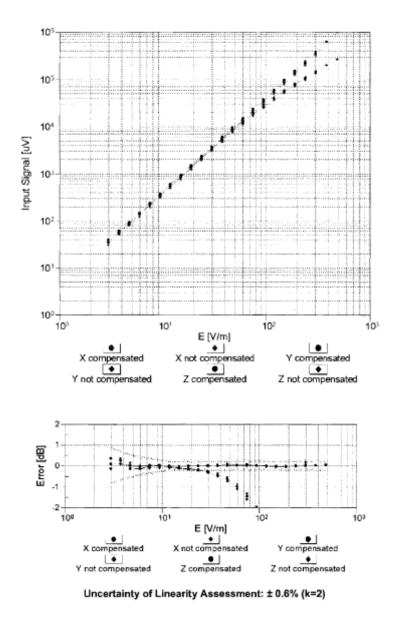
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## Dynamic Range f(E-field) (TEM cell , f = 900 MHz)

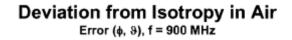


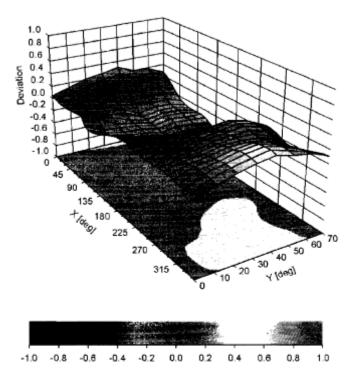
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Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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	2011		L6AREN70U	W

January 14, 2011

## DASY/EASY - Parameters of Probe: ER3DV6 - SN:2286

### **Other Probe Parameters**

Sensor Arrangement	Rectangular
Connector Angle (°)	171.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	8 mm
Probe Tip to Sensor X Calibration Point	2.5 mm
Probe Tip to Sensor Y Calibration Point	2.5 mm
Probe Tip to Sensor Z Calibration Point	2.5 mm

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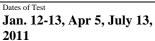
ata	Dates of Test	Report No		FCC ID	
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tien: <b>Ritu</b>		Certificate	na: H3-6105_Nov	r10	
CALIBRATION	CERTIFICATI				
Object	H3DV8 - SN:610	5			
Calibration procedure(s)	QA CAL-03.v5, C Calibration proce evaluations in air	dure for H-field probes optimize	d for close near f	ield	
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## Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RDM71UW/REN71UW

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Author Data Andrew Becker



Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausakasse 43, 8004 Zurich, Switzerland 
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 Sohwoizerischer Kalibrierdienst

 C
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 S
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 Swiss Calibration Service

Assereditation No.: SCS 108

Accredited by the 5-visa Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

## Glossary:

NORMx.y.2	sensitivity in free space
DCP	diede compression point
CF	creat factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\odot$	o rotation around probe axis
Polarization 9	9 rotation around an axis that is in the plane normal to probe axis (at measurement center).
	i.e., $\theta = 0$ 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:

 IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kH2 to 40 GH2", December 2005.

#### Methods Applied and Interpretation of Parameters:

- NORMX γ.2: Assessed for E-field polarization 9 = 0 for XY sensors and 9 = 90 for Z sensor (f ≤ 900 MHz in TEM-cell: f > 1800 MHz: R22 waveguide).
- X,Y,Z(f)\_adla1a2= X,Y,Z\_a0a1a2\* frequency\_response (see Frequency Response Chart).
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- Ax,y,z; 8x,y,z; Cx,y,z; VRx,y,z; A, B, C are numerical linearization parameters assessed based on the data of
  power sweep for specific medulation signal. The parameters do not depend on frequency nor media. VR is th
  maximum call bration range expressed in RMS voltage across the diode.
- 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).

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	2011		L6AREN70U	W

H3DV6 - SN:6105

November 16, 2010

# Probe H3DV6

# SN:6105

Manufactured: Calibrated:

January 5, 2002 November 18, 2010

Calibrated for DASY/EASY Systems (Note: non-compatible with DASY2 system!)

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H3DV6- \$N:6105

November 18, 2010

## DASY/EASY - Parameters of Probe: H3DV6 - SN:6105

#### **Basic Calibration Parameters**

		Sensor X	Sensor Y	Sensor Z	Une (k=2)
Norm (A/m / √(mV))	a0	2.94E-003	2.71E-003	3.01E-003	±5.1 %
Norm (A/m / √(mV))	at	2.83E-005	2.25E-005	-8.45E-005	± 5.1 %
Norm (A/m / √(mV))	a2	1.08E-005	2.19E-006	6.61E-006	± 5.1 %
DCP (mV) <sup>B</sup>		90.4	91.6	92.6	

#### Modulation Calibration Parameters

ÜID	Communication System Nama	PAR	Γ	A	8	C	VR	Unc <sup>E</sup>
l		L.	_	d8	dB	dB	mV	(k=2)
10000	ĠŴ.	0.00	×	0.00	0.00	1.00	211.2	±2.96 %
			Υ	0.00	0.00	1.00	Z33.0	
			Z	0.00	0.00	1.00	239.4	

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%.

<sup>9</sup> Numerical incartablish parameter: uncertainty not required <sup>1</sup> Uncertainty is determined using the max, deviation from timoar response applying rectangular distribution and is expressed for the square of the field value.

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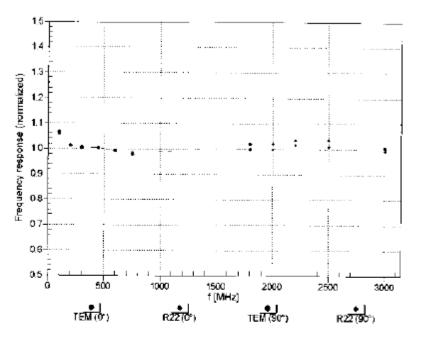
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H3DV6-SN:6105

November 18, 2010

## Frequency Response of H-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of H-field: ± 6.3% (k=2)

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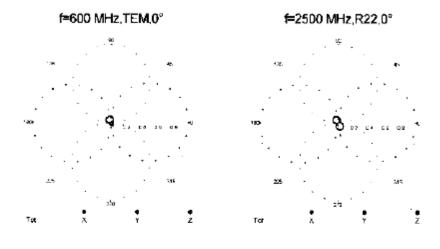
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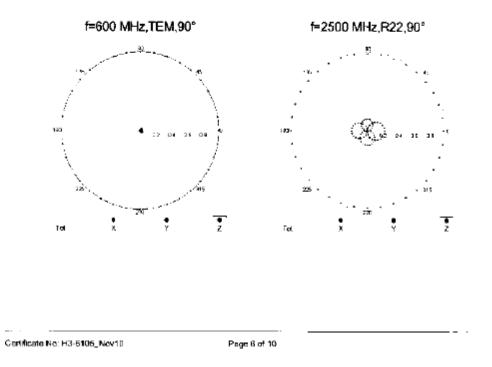
H3DV6-- SN:6105

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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$



Receiving Pattern (\$), 9 = 90°

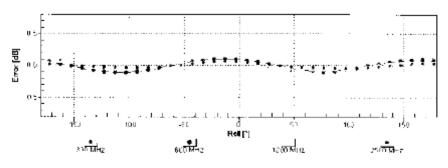


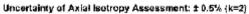
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	2011			

H3DV8- SN:6105

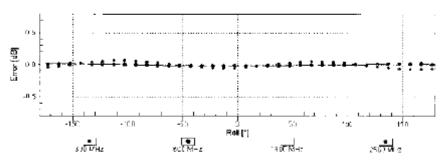
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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$





## Receiving Pattern ( $\phi$ ), $\vartheta$ = 90°



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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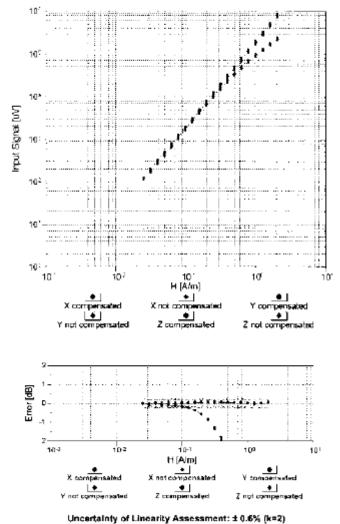
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H3DV6-- SN:6105

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## Dynamic Range f(H-field) (TEM cell, f = 900 MHz)

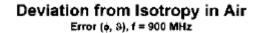


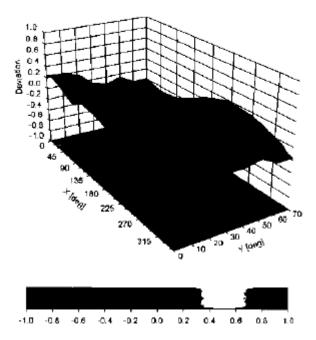
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Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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H3DV6-- SN:6105

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## DASY/EASY - Parameters of Probe: H3DV6 - SN:6105

## Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (*)	-62.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	mm ar
Tip Length	20 mm
Tip Diameter	
Proba Tip to Sensor X Calibration Point	
Probe Tip to Sensor Y Calibration Point	
Probe Tip to Sensor Z Galibration Point	3 mm

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