

# Annex B: Probe and dipole description and calibration certificates

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

	esting ervices™	Annex B to Hearing Aid Compatib Report for the BlackBerry® Smart		I	Page 2(25)
Author Data Dates of Test Daoud Attayi Feb. 17		June 28, Dec. 17-18, 2012	Report No RTS-6026-1302-03	FCC ID	RFL110LW

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 Produc	<u>ct Flyer</u> (PDF, 192kB)
EASY4     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 ±6.0%, k=2)
EUV3 - Universal Vector E-Probe	Frequency	100 MHz to > 6 GHz; Linearity: $\pm$ 0.2 dB (100 MHz to 3 GHz)
H3DV6 - Isotropic H-Probe 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	NAL H-FIELD PROBE FOR SMALL BAND
Support & Downloads	_	
Products	Download Product Fl	<u>ver</u> (PDF, 192kB)
DASY4 Packages		
EASY4     Probes ET3DV6 - Isotropic Dos-Probe ES3DV3 - Isotropic Dos-Probe EX3DV4 - Isotropic Dos-Probe	Construction	Three concentric loop sensors with 3.8 mm loop diameters Resistively loaded detector diodes for linear response Built-in shielding against static charges PEEK enclosure material (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); Output 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 DP1 - Dummy-Probe	E-Field Interference	< 10% at 3 GHz (for plane wave)
• Data Acquisition System • Software	Dimensions	Overall length: 330 mm (Tip: 40 mm) Tip diameter: 6 mm (Body: 12 mm) Distance from probe tip to dipole centers: 3 mm
Phantoms     Robots     Validation Kits & Calibration Dipoles     Hearing Aid Compatibility (HAC) Ext     Tissue Simulating Liquids	Application	General magnetic near-field measurements up to 3 GHz Field component measurements Surface current measurements Measurements in air or liquids Low interaction with the measured field
SPEAG Home		

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

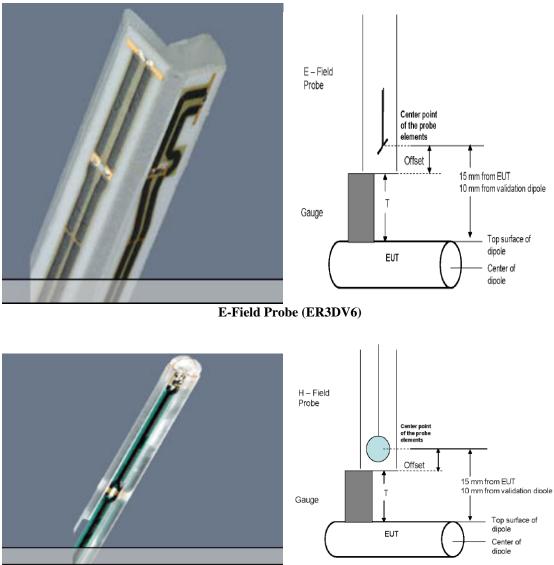
	esting ervices™	Annex B to Hearing Aid Compatibil Report for the BlackBerry® Smartp			Page 4(25)
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All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY5 software so that the 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.



H-Field Probe (H3DV6)

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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:

	$\mathbf{E}-\mathbf{field probes}$ :	$E_i = \sqrt{\frac{V_i}{Norm_i \cdot c}}$	ConvF
	$\mathbf{H}-\mathbf{fieldprobes}$ :	$H_{\rm i} = \sqrt{V_i} \cdot \frac{a_{i0} + a_{\rm i1}}{2}$	$\frac{f + a_{i2}f^2}{f}$
with	= compensated signal of $c$ = 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 l 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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Accredited by the Swiss Accre The Swiss Accreditation Ser Multilateral Agreement for th	vice is one of the signatories	s to the EA	No.: SCS 108	
Client RTS (RIM Te	sting Services)	Certificate No	ER3-2286_Jan12	
CALIBRATION	CERTIFICATE		У	
Object	ER3DV6 - SN:22	86		5
Calibration procedure(s)		A CAL-25.v4 dure for E-field probes optimized	for close near field	8
	evaluations in air	and the second secon	Second second second	¥
Calibration date:	January 9, 2012			
This calibration certificate doc The measurements and the u	January 9, 2012 uments the traceability to nation neertainties with confidence pro- inducted in the closed laborator	onal standards, which realize the physical unit obability are given on the following pages and y facility: environment temperature (22 ± 3)°C	are part of the certificate.	
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Author Data Daoud Attayi Dates of Test Feb. 17, June 28, Dec. 17-18, 2012

Document

#### Report No RTS-6026-1302-03

FCC ID

## Calibration Laboratory of

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



- CP CP Z S
- Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura
- 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	8 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:

 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 8 = 0 for XY sensors and 8 = 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.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- 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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# Probe ER3DV6

# SN:2286

Manufactured: Calibrated:

September 18, 2002 January 9, 2012

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

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

#### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m) <sup>2</sup> )	2.19	1.48	1.51	± 10.1 %
DCP (mV) <sup>8</sup>	98.8	100.1	98.9	

#### 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	х	0.00	0.00	1.00	107.7	±3.0 %
			Y	0.00	0.00	1.00	107.0	
			Z	0.00	0.00	1.00	93.5	
10011	UMTS-FDD (WCDMA)	3.40	х	3.54	66.3	18.9	116.1	±0.7 %
			Y	3.38	65.4	18.2	114.7	
			Z	3.58	66.5	18.9	138.6	
10021	GSM-FDD (TDMA, GMSK)	9.20	х	16.11	100.0	28.4	105.3	±1.4 %
			Y	4.39	79.8	20.9	135.3	
			Z	5.62	83.0	23.2	123.8	
10039	CDMA2000 (1xRTT, RC1)	5.30	Х	5.37	67.3	20.2	118.3	±1.4 %
			Y	4.87	65.7	19.1	113.6	
			Z	5.10	66.4	19.5	137.9	
10081	CDMA2000 (1xRTT, RC3)	4.60	Х	4.41	66.3	19.5	115.0	±0.9 %
			Y	4.07	64.9	18.5	112.0	
			Ζ	4.30	65.9	19.1	135.1	
10151	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	7.73	x	8.16	72.5	24.6	117.6	±4.1 %
			Y	6.86	68.2	21.9	111.8	
			Z	7.47	69.9	22.7	138.4	

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>b</sup> Numerical linearization parameter: uncertainty not required.

<sup>6</sup> Uncertainty is determined using the max, deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

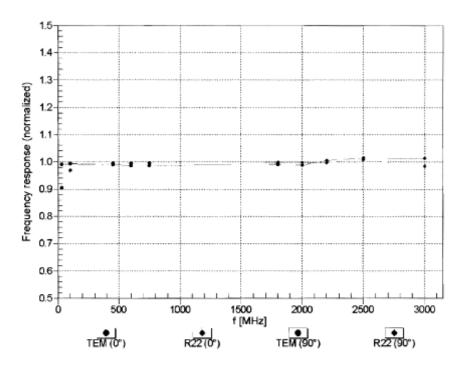
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### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



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

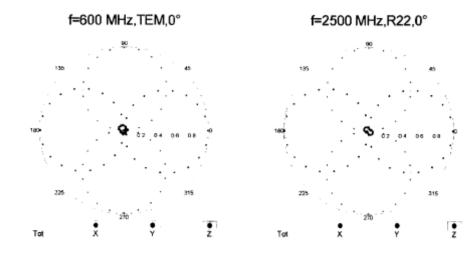
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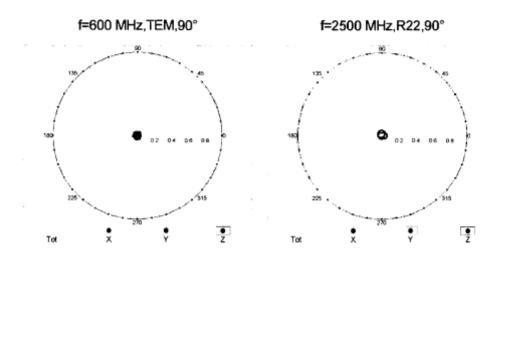


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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$



Receiving Pattern ( $\phi$ ),  $\vartheta = 90^{\circ}$ 



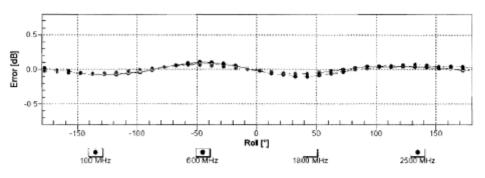
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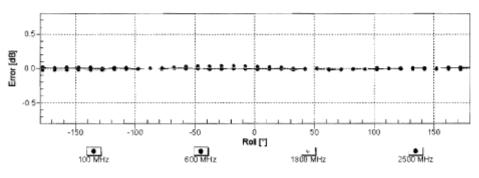
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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$



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

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



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

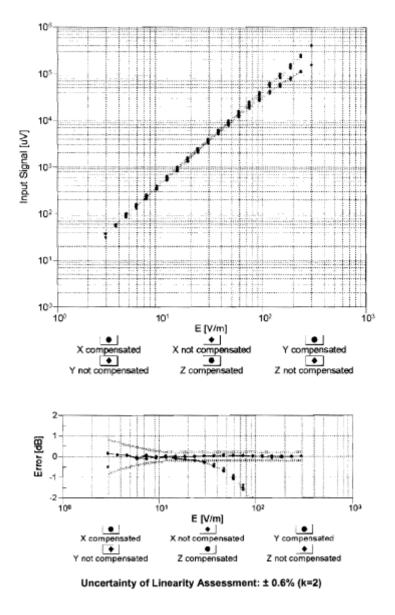
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Dynamic Range f(E-field) (TEM cell , f = 900 MHz)



Certificate No: ER3-2286\_Jan12

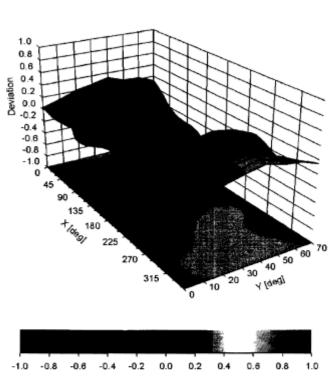
Page 8 of 10



Deviation from Isotropy in Air Error (\u00f3, 9), f = 900 MHz

ER3DV6- SN:2286

January 9, 2012



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

Certificate No: ER3-2286\_Jan12

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January 9, 2012

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

#### Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (*)	-7.6
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

Certificate No: ER3-2286\_Jan12

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Author Data     Dates of Test     Proof     Proof     Proof     Proof       Data and Attayi     Feb. 17, June 28, Dec. 17-18, 2012     RTS-6026-1302-03     FC: 10 LGARFL110LV       Calibration Laboratory of Schmid & Partner Engineering AG Zequesterines AS. Mod Arrins, suitariand     Image: Schwidzing Schwidzing Schwidzing Schwidzing Schwidzing Schwidz		Testing Services™		ring Aid Compatibility IackBerry® Smartpho		
<text><text><text><text><text><text><text><text></text></text></text></text></text></text></text></text>			June 28, Dec. 17	-18, 2012		FCC ID L6ARFL110LW
<text><text><text><text><text><text><text><text><text><text><text></text></text></text></text></text></text></text></text></text></text></text>		Schmid & Partner Engineering AG	-		Service suisse d'étalonnage Servizio svizzero di taratura	
Test (RIM Testing Service)       Private Mark Mark Mark Mark Mark Mark Mark Mark		Accredited by the Swiss Ac The Swiss Accreditation	creditation Service (SAS) Service is one of the signatorie	s to the EA		
Object     H3DV6 - SN:6105       Catibration procedure(s)     QA CAL-03.v6, QA CAL-25.v4 Catibration procedure for H-field probas optimized for close near field evaluations in air       Catibration date:     NoVember 9, 2012       This catibration catficate documents the traceability or egimen standards, which resize the physical units of measurements (SI) The measurements and the uncertainties with confidence probability are gimen on the following pages and are part of the certificate.       All calibrations have been conducted in the closed latoratory facility environment temperature (22 ± 3)°C and humidity < 70%.					No: H3-6105_Nov12	
Calibration procedure(s)       QA CAL-03 y6; QA CAL-25 y4 Calibration procedure for H-field probes optimized for close near field evaluations in air         Calibration date:       November 9; 2012         This calibration certificate documents the traceability to mational standards, which realize the physicial units of measurements (3). 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 dosed laboratory facility: environment temperature (22 ± 3)*C and humidity < 70%. Calibration Equipment used (MATE critical for calibration)         Primary Standards       10       Cal Date (Certificate toc.)       Scheduled Calibration         Prover meter E44190       6841293874       29-Mart 12 (No. 217.01508)       Apr-13         Reference 3 dis Manuator       5N: 5004 (3c)       27-Mart 12 (No. 217.01508)       Apr-13         Reference 3 dis Manuator       5N: 5004 (3c)       27-Mart 12 (No. 217.01508)       Apr-13         Reference 3 dis Manuator       5N: 5026 (2c)       27-Mart 12 (No. 217.01508)       Apr-13         Reference 3 dis Manuator       5N: 5026 (2c)       27-Mart 12 (No. 217.01508)       Apr-13         Reference 7 Probe 18020%       5N: 6182       12-Och 12 (No. 127.01508)       Apr-13         Reference 7 Probe 18020%       5N: 6182       12-Och 12 (No. 127.01508)       Apr-13         Reference 7 Probe 18020%       5N: 6182	l	CALIBRATIC	N CERTIFICATI	Ξ.		
Calibration procedure for H-field probes optimized for close near field evaluations in air       Calibration dete:     November 9, 2012       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 calibration have been conducted in the closed laboratory facility: environment temperature (22 ± 3)*C and humidity < 70%.		Object	H3DV6 - SN:610	5		
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (31).         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 procedure(s)	Calibration proce	dure for H-field probes optimize	d for close near field	
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 E44198       GB41293874       29-Mar 12 (No. 217-01508)       Apr-13         Power sensor E412A       MY41496087       29-Mar 12 (No. 217-01508)       Apr-13         Reference 3 dB Attenuator       SN: S5054 (3c)       27-Mar 12 (No. 217-01529)       Apr-13         Reference 20 dB Attenuator       SN: S5056 (20b)       27-Mar 12 (No. 217-01529)       Apr-13         Reference 20 dB Attenuator       SN: S5056 (20b)       27-Mar 12 (No. 217-01532)       Apr-13         Reference 20 dB Attenuator       SN: S5129 (30b)       27-Mar 12 (No. 217-01532)       Apr-13         Reference Probe H3DV6       SN: 6182       12-Oct-12 (No. H3-6182 Oct12)       Oct-13         DAE4       SN: 789       18-Sep 12 (No. DAE4-789 Sep 12)       Sep-13         Secondary Standards       ID       Check Date (in house)       Scheduled Check: Apr-13         Network Analyzer HP 8753E       US37300585       18-Oct-01 (in house check Apr-11)       In house check: Apr-13         Network Analyzer HP 8753E       US37300585       18-Oct-01 (in house check Cot-12)		This calibration certificate	documents the traceability to nati	onal standards, which realize the physical u		
Primary Standards     ID     Cel Date (Certificate No.)     Scheduled Calibration       Power meter E44198     GB41293874     29-Mar.12 (No. 217-01508)     Apr-13       Power sensor E4412A     MY41496087     29-Mar.12 (No. 217-01508)     Apr-13       Reference 3 dB Attenuator     SN: S5054 (3c)     27-Mar.12 (No. 217-01508)     Apr-13       Reference 20 dB Attenuator     SN: S5056 (2b)     27-Mar.12 (No. 217-01529)     Apr-13       Reference 20 dB Attenuator     SN: S5129 (30b)     27-Mar.12 (No. 217-01529)     Apr-13       Reference Probe H3DV6     SN: 6182     12-Oct-12 (No. 143-6182 Oct12)     Oct-13       DAE4     SN: 789     18-Sep12 (No DAE4-789_Sep12)     Sep-13       Secondary Standards     ID     Check Date (in house)     Scheduled Check       RF generator HP 8648C     US3642U01700     4-Aug-99 (in house check Apr-11)     In house check: Apr-13       Natwork Analyzer HP 8753E     U837390585     18-Oct-01 (in house check Apr-11)     In house check: Oct-13       Name     Function     Signature       Calibrated by:     Jeton Kastrati     Laboratory Technician     Math.4ug       Approved by:     Katja Pokovic     Technical Manager     Math.4ug						
Power meter E4419B         GB41293874         29-Mar-12 (No. 217-01508)         Apr-13           Power sensor E4412A         MY41496087         29-Mar-12 (No. 217-01508)         Apr-13           Reference 3 dB Attenuator         SN: S5054 (3c)         27-Mar-12 (No. 217-01508)         Apr-13           Reference 3 dB Attenuator         SN: S5086 (20b)         27-Mar-12 (No. 217-01529)         Apr-13           Reference 30 dB Attenuator         SN: S5086 (20b)         27-Mar-12 (No. 217-01532)         Apr-13           Reference 30 dB Attenuator         SN: S5086 (20b)         27-Mar-12 (No. 217-01532)         Apr-13           Reference 30 dB Attenuator         SN: S5086 (20b)         27-Mar-12 (No. 217-01532)         Apr-13           Reference 7hote H3DV%         SN: 6182         12-Oct-12 (No. H3-6182, Oct12)         Oct-13           DAE4         SN: 789         18-Sep-12 (No. DAE4-789_Sep12)         Sep-13           Secondary Standards         ID         Check Date (in house)         Scheduled Check           RF generator HP 8648C         US3642U01700         4-Aug-99 (in house check Oct-12)         In house check: Oct-13           Name         Function         Signature         Calibrated by:         Jeton Kashrati         Laboratory Technician         Jeton Kashrati           Approved by:         Katja Pokovic <td< th=""><th></th><th>Calibration Equipment use</th><th>ed (M&amp;TE critical for calibration)</th><th></th><th></th><th></th></td<>		Calibration Equipment use	ed (M&TE critical for calibration)			
Power meter E4419B         GB41293874         29-Mar-12 (No. 217-01508)         Apr-13           Power sensor E4412A         MY41496087         29-Mar-12 (No. 217-01508)         Apr-13           Reference 3 dB Attenuator         SN: S5054 (3c)         27-Mar-12 (No. 217-01508)         Apr-13           Reference 20 dB Attenuator         SN: S5054 (3c)         27-Mar-12 (No. 217-01531)         Apr-13           Reference 30 dB Attenuator         SN: S5129 (30b)         27-Mar-12 (No. 217-01532)         Apr-13           Reference 7brobe H3DV%         SN: 6182         12-Oct-12 (No. H3-6182, Oct12)         Oct-13           DAE4         SN: 789         18-Sep-12 (No. DAE4-789_Sep12)         Sep-13           Secondary Standards         ID         Check Date (in house)         Scheduled Check           RF generator HP 6648C         US3642U01700         4-Aug-99 (in house check Apr-11)         In house check: Apr-13           Network Analyzer HP 8753E         US37390585         18-Oct-01 (in house check Oct-12)         In house check: Oct-13           Calibrated by:         Jeton Kastrall         Laboratory Technician         Jeton Kastrall         Laboratory Technician           Approved by:         Katja Pokovic         Technical Manager         Jesued: November 13, 2012		Primary Standards	n n	Cal Date (Certificate No.)	Scheduled Calibration	
Power sensor E4412A         MY41498087         29-Mar-12 (No. 217-01508)         Apr-13           Reference 3 dB Attenuator         SN: 55054 (3c)         27-Mar-12 (No. 217-01531)         Apr-13           Reference 20 dB Attenuator         SN: 55056 (20b)         27-Mar-12 (No. 217-01529)         Apr-13           Reference 20 dB Attenuator         SN: 55056 (20b)         27-Mar-12 (No. 217-01532)         Apr-13           Reference 20 dB Attenuator         SN: 55056 (20b)         27-Mar-12 (No. 217-01532)         Apr-13           Reference 20 dB Attenuator         SN: 55129 (30b)         27-Mar-12 (No. 217-01532)         Apr-13           Reference Probe H3DV6         SN: 5182         12-Oct-12 (No. R5-6182, Oct12)         Oct-13           DAE4         SN: 789         18-Sep-12 (No. DAE4-789_Sep12)         Sep-13           Secondary Standards         ID         Check Date (in house)         Scheduled Check           RF generator HP 8648C         US3642U01700         4-Aug-98 (in house check Apr-11)         In house check. Oct-13           Network Analyzer HP 8753E         US37390585         18-Oct-01 (in house check Oct-12)         In house check. Oct-13           Calibrated by:         Jeton Kastrati         Laboratory Technician         Japaret           Approved by:         Katja Pokovic         Technical Manager         Japr-13						
Reference 3 dB Attenuator     SN: S5054 (3c)     27-Mar-12 (No. 217-01531)     Apr-13       Reference 20 dB Attenuator     SN: S5086 (20b)     27-Mar-12 (No. 217-01529)     Apr-13       Reference 30 dB Attenuator     SN: S5129 (30b)     27-Mar-12 (No. 217-01532)     Apr-13       Reference Probe H3DV6     SN: 6182     12-Oct-12 (No. H3-6182, Oct12)     Oct-13       DAE4     SN: 789     18-Sep-12 (No. DAE4-789_Sep12)     Sep-13       Secondary Standards     ID     Check Date (in house)     Scheduled Check       RF generator HP 8648C     US3642U01700     4-Aug-99 (in house check Apr-11)     In house check: Apr-13       Network Analyzer HP 8753E     US37390585     18-Oct-01 (in house check Oct-12)     In house check: Oct-13       Approved by:     Katja Pokovic     Technical Manager     Jack Manager       Approved by:     Katja Pokovic     Technical Manager     Jack Manager						
Reference 30 dB Attenuator       SN: S5129 (30b)       27-Mar-12 (No. 217-01532)       Apr-13         Reference Probe H3DV6       SN: 6182       12-Oct-12 (No. H3-6182, Oct12)       Oct-13         DAE4       SN: 789       18-Sep-12 (No. DAE4-789_Sep12)       Sep-13         Secondary Standards       ID       Check Date (in house)       Scheduled Check         RF generator HP 8648C       US3642U01700       4-Aug-99 (in house check Apr-11)       In house check: Apr-13         Network Analyzer HP 8753E       US37390585       18-Oct-01 (in house check Oct-12)       In house check: Oct-13         Name       Function       Signature         Calibrated by:       Jeton Kastrati       Laboratory Technician         Approved by:       Kalja Pokovic       Technical Manager         Issued: November 13, 2012       Issued: November 13, 2012			or SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13	
Reference Probe H3DV6     SN: 6182     12-Oct-12 (No. H3-6182_Oct12)     Oct-13       DAE4     SN: 789     18-Sep-12 (No_DAE4-789_Sep12)     Sep-13       Secondary Standards     ID     Check Date (in house)     Scheduled Check       RF generator HP 8648C     US3642U01700     4-Aug-99 (in house check Apr-11)     In house check: Apr-13       Network Analyzer HP 8753E     US37390585     18-Oct-01 (in house check Oct-12)     In house check: Oct-13       Calibrated by:     Jeton Kastrati     Laboratory Technician     Signature       Approved by:     Katja Pokovic     Technical Manager     July 14		Reference 20 dB Attenua	tor SN: S5086 (20b)			
DAE4     SN: 789     18-Sep.12 (No. DAE4-789_Sep12)     Sep.13       Secondary Standards     ID     Check Date (in house)     Scheduled Check       RF generator HP 8646C     US3642U01700     4-Aug-99 (in house check Apr-11)     In house check: Apr-13       Network Analyzer HP 8753E     US37390585     18-Oct-01 (in house check Oct-12)     In house check: Oct-13       Calibrated by:     Jeton Kastrati     Laboratory Technician     Jeton Kastrati       Approved by:     Katja Pokovic     Technical Manager     Jeton Kustrati				····		
Secondary Standards     ID     Check Date (in house)     Scheduled Check       RF generator HP 8648C     US3642U01700     4-Aug-99 (in house check Apr-11)     In house check: Apr-13       Network Analyzer HP 8753E     US37390585     18-Oct-01 (in house check Oct-12)     In house check: Oct-13       Name     Function     Signature       Calibrated by:     Jeton Kastrati     Laboratory Technician       Approved by:     Katja Pokovic     Technical Manager       Issued: November 13, 2012						
RF generator HP 8646C     US3642U01700     4-Aug-99 (in house check Apr-11)     In house check: Apr-13       Network Analyzer HP 8753E     US37390585     18-Oct-01 (in house check Oct-12)     In house check: Oct-13       Name     Function     Signature       Calibrated by:     Jeton Kastrati     Laboratory Technician       Approved by:     Kalja Pokovic     Technical Manager       Issued: November 13, 2012		DAE4	SN: 789	18-Sep-12 (No. DAE4-789_Sep12	)Sep-13	
RF generator HP 8646C     US3642U01700     4-Aug-99 (in house check Apr-11)     In house check: Apr-13       Network Analyzer HP 8753E     US37390585     18-Oct-01 (in house check Oct-12)     In house check: Oct-13       Name     Function     Signature       Calibrated by:     Jeton Kastrati     Laboratory Technician       Approved by:     Kalja Pokovic     Technical Manager       Issued: November 13, 2012		Secondary Standards	O	Check Date (in house)	Scheduled Check	
Network Analyzer HP 8753E     US37390585     18-Oct-01 (in house check Oct-12)     In house check: Oct-13       Name     Function     Signature       Calibrated by:     Jeton Kastrati     Laboratory Technician       Approved by:     Katja Pokovic     Technical Manager       Issued: November 13, 2012		3				
Name     Function     Signature       Calibrated by:     Jeton Kastrati     Laboratory Technician       Approved by:     Katja Pokovic     Technical Manager       Issued: November 13, 2012     Issued: November 13, 2012						
issued: November 13, 2012			Name	construction of the second	Signature	
		Approved by:	Katją Pokovic	Technical Manager	Self.	
		This calibration certificate	shall not be reproduced except in	n full without written approval of the laborate		

Certificate No: H3-6105\_Nov12

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#### Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RFL111LW

Author Data Daoud Attavi Dates of Test Feb. 17, June 28, Dec. 17-18, 2012

Document

L6ARFL110LW

FCC ID

Page

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



Schweizerischer Kalibrierdienst S Service suisse d'étalonnage

- С Servizio svizzero di taratura S
  - 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.

Giossaiy.	
NORMx,y,z	sensitivity in free space
DCP	diode compression point
ĊF	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

#### 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.

b) CTIA Test Plan for Hearing Aid Compatibility, April 2010.

#### 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).

- 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.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- 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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Testing		Annex B to Hearing Aid Compatibility RF Emissions Test		Page
Services™		Report for the BlackBerry® Smartphone model RFL111LW		18(25)
Author DataDates of TestReport NoDaoud AttayiFeb. 17, June 28, Dec. 17-18, 2012RTS-60			FCC ID	RFL110LW

November 9, 2012

# Probe H3DV6

# SN:6105

Manufactured: Calibrated: January 5, 2002 November 9, 2012

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

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

#### **Basic Calibration Parameters**

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / √(mV))	a0	2.92E-003	2.69E-003	2.98E-003	± 5.1 %
Norm (A/m / √(mV))	ai	4.61E-005	4.09E-005	-6.60E-005	± 5.1 %
Norm (A/m / √(mV))	a2	-8.67E-006	3.24E-006	4.02E-006	± 5.1 %
DCP (mV) <sup>B</sup>		93.7	97.1	88.7	

#### **Modulation Calibration Parameters**

UID	Communication System Name	PAR		А	В	C	VR	Unc <sup>E</sup>
			1	dB	dB	dB	mV	(k=2)
0	CW	0.00	X	0.0	0.0	1.0	118.6	±3.3 %
	·····		Y	0.0	0.0	1.0	130.1	]
			Z	0.0	0.0	1.0	135.8	

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>8</sup> Numerical linearization parameter: uncertainty not required. <sup>6</sup> Uncertainty is determined using the max, deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

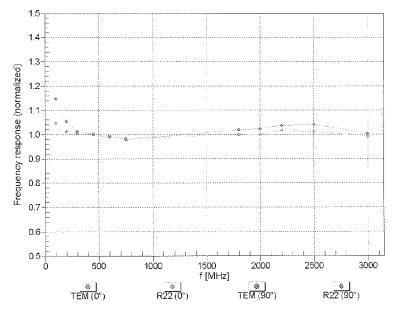
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Testing Services™		Annex B to Hearing Aid Compat Report for the BlackBerry® Sma	Page 20(25)		
Author Data Daoud Attayi	yi Feb. 17, June 28, Dec. 17-18, 2012		Report No RTS-6026-1302-03	FCC ID	RFL110LW

November 9, 2012

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



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

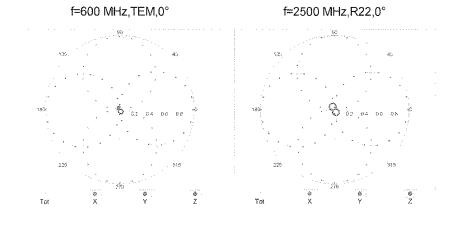
Certificate No: H3-6105\_Nov12

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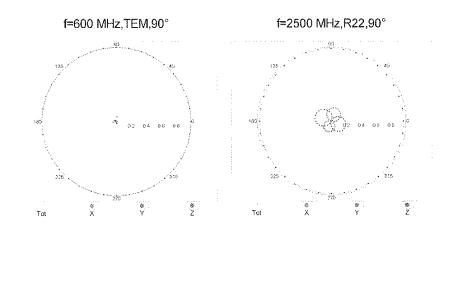


November 9, 2012

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



Receiving Pattern ( $\phi$ ),  $\vartheta = 90^{\circ}$ 



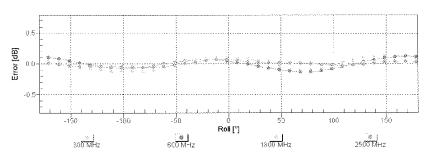
Certificate No: H3-6105\_Nov12

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Testing Services™		Annex B to Hearing Aid Compate Report for the BlackBerry® Small	Page 22(25)		
Author Data Daoud Attayi	Dates of Test	June 28, Dec. 17-18, 2012	Report No RTS-6026-1302-03		RFL110LW
Daouu Allayi	rep. 17,	Julie 20, Dec. 17-18, 2012	K13-0020-1302-03	LUAR	

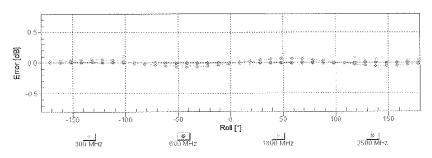
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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$



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

### Receiving Pattern ( $\phi$ ), $\vartheta = 90^{\circ}$



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

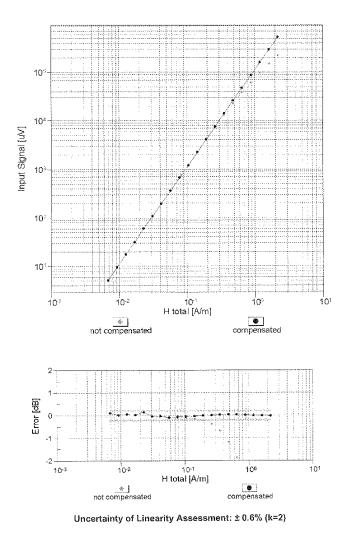
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#### Dynamic Range f(H-field) (TEM cell, f = 900 MHz)



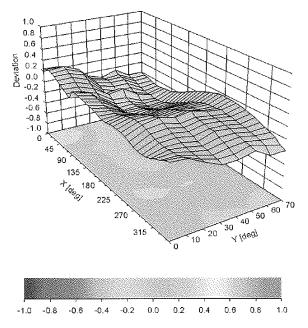
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### Deviation from Isotropy in Air Error (φ, θ), f = 900 MHz



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

Certificate No: H3-6105\_Nov12

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

#### Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-61.6
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 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

Certificate No: H3-6105\_Nov12

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