Testing Services™	Annex B to Hearing Aid Report for the BlackBer	Page 1(24)			
Author Data	Dates of Test				
Daoud Attayi	Jan. 12-13, 2011	· · · · · · · · · · · · · · · · · · ·			

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



Applications	ER3DV6 ISOTROPIC E-FIELD PROBE FOR GENERAL NEAR-FIELD MEASUREMENTS					
Support & Downloads	_					
Products	Download Produce	<u>ct Flyer</u> (PDF, 192kB)				
DASY4 Packages						
• EASY4	Construction	One dipole parallel, two dipoles normal to probe axis				
Probes ET3DV6 - Isotropic Dos-Probe ES3DV3 - Isotropic Dos-Probe ES3DV3 - Isotropic Dos-Probe		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 H3DV6 - Isotropic H-Probe	Frequency	100 MHz to > 6 GHz; Linearity: ± 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: ± 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	Application	General near-field measurements up to 6 GHz Field component measurements Fast automatic scanning in phantoms				
SPEAG Home						

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 Fly	<u>ver</u> (PDF, 192kB)
DASV4 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

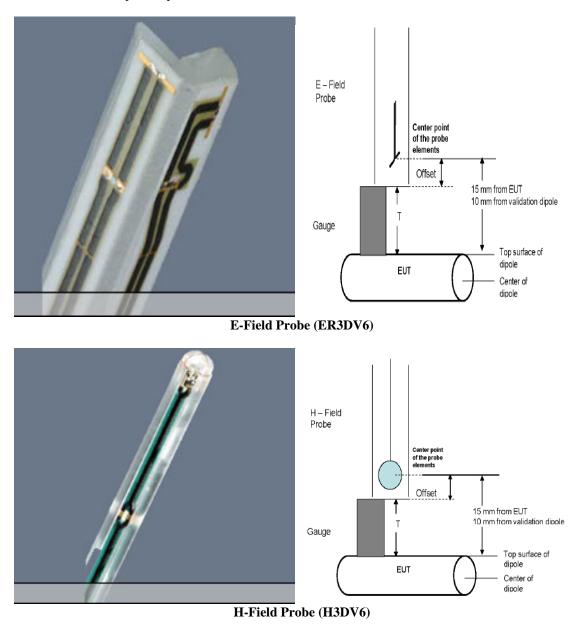
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All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY4 software so that the measurement was to the nearest element.

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:

	$\mathbf{E}-\mathbf{field probes}$:	$E_i = \sqrt{\frac{V_i}{Norm_i \cdot C}}$	onvF
	$\mathbf{H} - \mathbf{field probes}$:	$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}}{f}$	$\frac{f + a_{i2}f^2}{r}$
with	= compensated signal of α = 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	unnel i d 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):

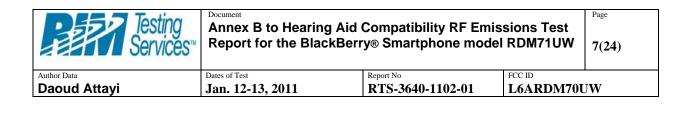
$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$
(20.2)

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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^{ta} d Attayi	Dates of Test Jan. 12-13, 2	011	Report No RTS-3640-	1102-01	FCC ID L6ARDM70	IIW
Calibration Laboratory Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich	-		C S	Schweizerischer Ka Service suisse d'éta Servizio svizzero di Swiss Calibration S	alonnage taratura	
Accredited by the Swiss Accreditate The Swiss Accreditation Service Multilateral Agreement for the re-	is one of the signatorie cognition of calibration	certificates	Accreditation N	lo.: SCS 108		
Client RTS (RIM Testi	ng Services)		Certificate No:	ER3-2285_Ma	r10	
CALIBRATION C	ERTIFICAT	E				
Object	ER3DV6 - SN:2	285			- Antonio	
Calibration procedure(s)		nd QA CAL-25.v2 edure for E-field prol r	CONTRACTOR OF CONTRACTOR	or close near fie	ild	
	and and an					
Calibration date:	March 8, 2010		a sent for a series of the ser			
This calibration certificate docume The measurements and the uncer	ents the traceability to nat tainties with confidence p	ional standards, which reali probability are given on the f	te the physical units ollowing pages and a	are part of the certifica		
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



 S
 Schweizerischer Kalibrierdienst

 C
 Service suisse d'étalonnage

 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:	
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 φ	ϕ 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., $9 = 0$ 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 θ = 0 for XY sensors and θ = 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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Probe ER3DV6

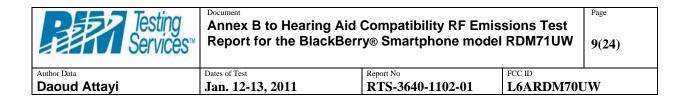
SN:2285

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

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

Certificate No: ER3-2285_Mar10

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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) ^A	<u>92.</u> 1	94.2	96.0	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	с	VR mV	Unc ^E (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

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

Certificate No: ER3-2285_Mar10

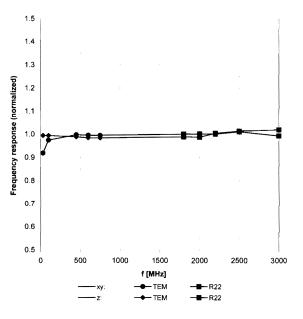
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March 8, 2010

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide R22)



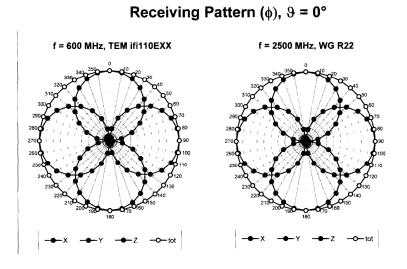
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: ER3-2285_Mar10

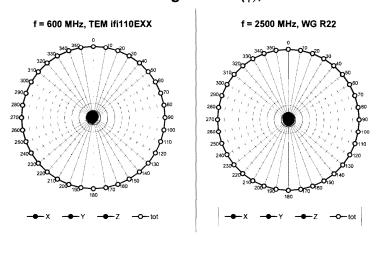
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March 8, 2010



Receiving Pattern (ϕ), ϑ = 90°

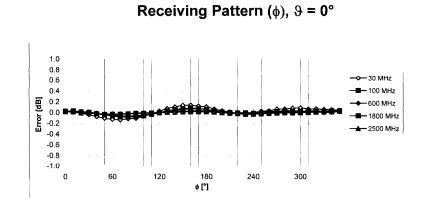


Certificate No: ER3-2285_Mar10

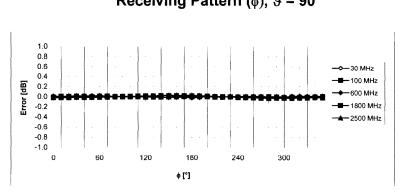
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Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)



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

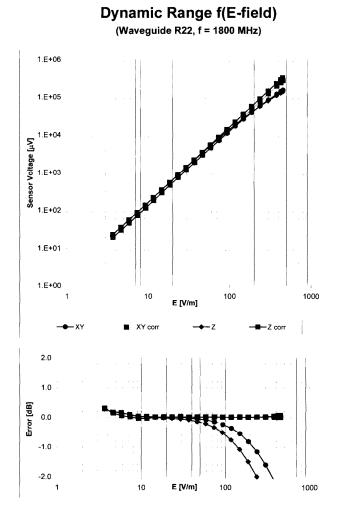
Certificate No: ER3-2285_Mar10

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Receiving Pattern (ϕ), ϑ = 90°

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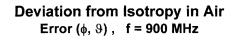


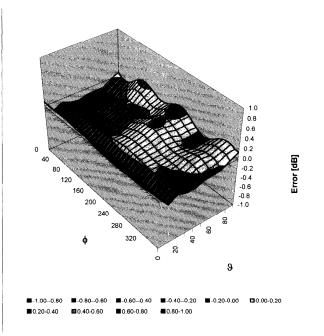
Certificate No: ER3-2285_Mar10

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Author Data	Dates of Test	Report No	FCC ID			
Daoud Attayi	Jan. 12-13, 2011	RTS-3640-1102-01	L6ARDM70UW			

March 8, 2010



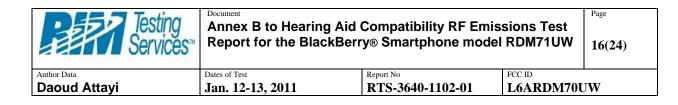


Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ER3-2285_Mar10

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l Attayi	Dates of Test Jan. 12-13, 20		eport No XTS-3640-1102		FCC ID L6ARDM70	UW
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Accredited by the Swiss Accred	itation Service (SAS)	to the EA	Accreditation No.: S			
Multilateral Agreement for the Client RTS (RIM Tes	recognition of calibration sting Services)	certificates	Certificate No: H3-6	168_Mar10	$\sum_{i=1}^{m} \sum_{j=1}^{n} y_{j}$	
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Object	H3DV6 - SN:616	S. States and the second s	····· In	keya ^{na} Nora	فتخيره	
Calibration procedure(s)	Calibration proce	nd QA CAL-25.v2 dure for H-field probe	e optimized for cle	ose near field	ni jaz Antos	
	evaluations in air			Phone Phone Reports of		
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Calibration date: This calibration certificate docu The measurements and the un All calibrations have been conc	March 12, 2010	onal standards, which realize	the physical units of mea	asurements (SI). t of the certificate.	(1995) 2005 1996	
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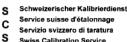


Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



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- 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

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ologguly.	
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 ϕ	φ 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., $\vartheta = 0$ 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:

- 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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March 12, 2010

Probe H3DV6

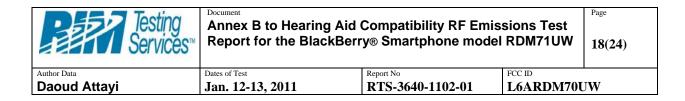
SN:6168

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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DASY - Parameters of Probe: H3DV6 SN:6168

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / \(\mathcal{V}\)) 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 / \(\mu\V)) a2	-2.18E-5	-3.81E-5	3.05E-5	± 5.1%
DCP (mV) ^A	81.4	94.7	83.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	с	VR mV	Unc ^e (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

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

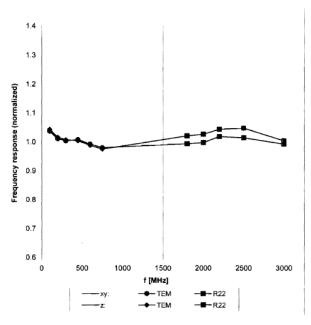
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Frequency Response of H-Field (TEM-Cell:ifi110 EXX, Waveguide R22)



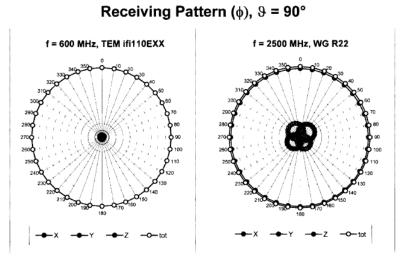
Uncertainty of Frequency Response of H-field: ± 6.3% (k=2)

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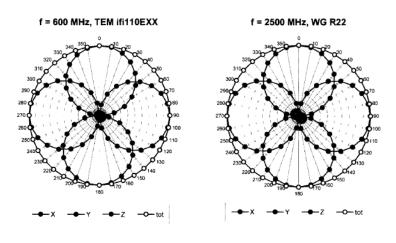
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Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$

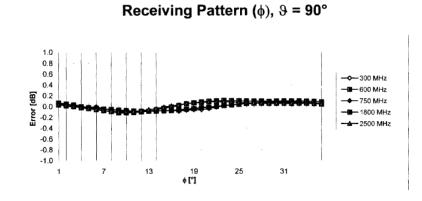


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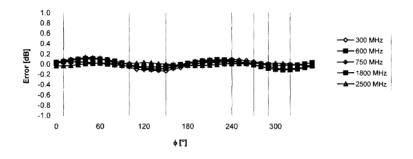
Testing Services™	Annex B to Hearing Aid Report for the BlackBerr	Page 21(24)		
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Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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



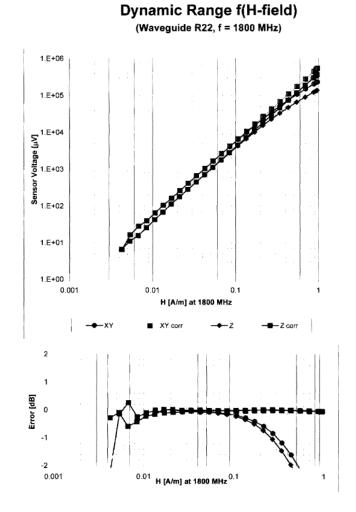
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

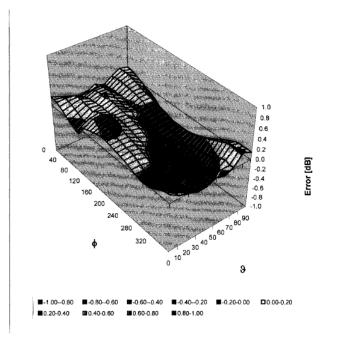
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Author Data	Dates of Test	Report No	FCC ID	
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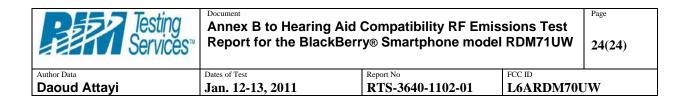
Deviation from Isotropy in Air Error (ϕ , ϑ), f = 900 MHz



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

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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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