RTS RIM Testing Services		Aid Compatibility RF Emis kBerry® Smartphone model		Page 1(23)
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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



Applications	ER3DV6 ISOTROPIC E-FIELD PROBE FOR GENERAL NEAR-FIELD MEASUREMENTS				
Support & Downloads	-				
Products	Download Produ	ict Flyer (PDF, 192kB)			
DASV4 Packages					
• EASV4	Construction	One dipole parallel, two dipoles normal to probe axis			
Probes ET3DV6 - 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 $\pm 6.0\%,k{=}2)$			
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: ± 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 APPLICATIONS	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 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	E-Field Interference	< 10% at 3 GHz (for plane wave)
DP1 - Dummy-Probe • 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

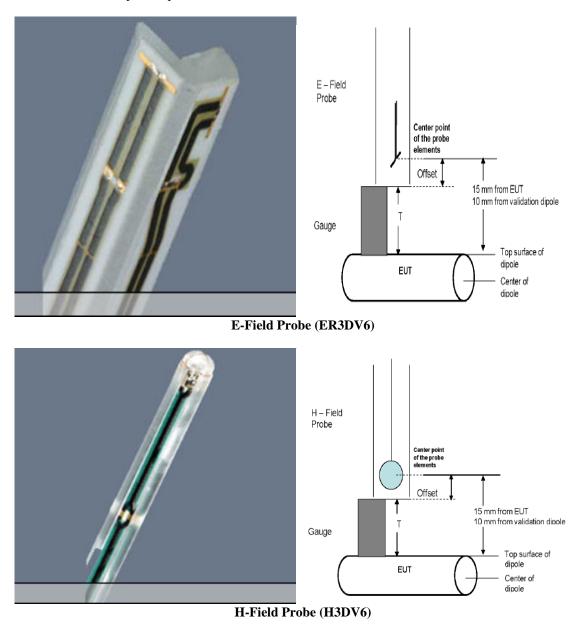
RTS RIM Testing Services		id Compatibility RF Emissio erry® Smartphone model R		Page 4(23)
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All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY4 software so that the measurement 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:

	${\rm E-field probes}$:	$E_i = \sqrt{\frac{V_i}{Norm_i \cdot C}}$	ConvF
	$\mathbf{H}-\mathbf{fieldprobes}$:	$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}}{j}$	$\frac{f + a_{i2}f^2}{f}$
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 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%.

TS Testing Services		earing Aid Compatibilit BlackBerry® Smartph		
a d Attayi	Dates of Test Mar 20-24, 2009	Report No RTS-1528-090	-	CC ID L 6ARCF70CW
Calibration Labo Schmid & Partne Engineering AC Zeughausstrasse 43, 80	r B	Hac MEA	Comico sulses d'étalano	lage tura
The Swiss Accreditation	Accreditation Service (SAS) n Service is one of the signator for the recognition of calibratio	ies to the EA	on No.: SCS 108	
The second se	I Testing Services)		to: ER3-2286_Jan09	
CALIBRATI	ON CERTIFICAT	TE		
Object	ER3DV6 - SN:2	2286		
Calibration procedure(s)		edure for E-field probes optimize lir	d for close near field	
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Calibration date:	January 8, 200	9	The second second second	8
Calibration date:		9		
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Author Data	Dates of Test	Report No	FCC ID	
Daoud Attavi	Mar 20-24, 2009 RTS-1528-0903-38 L6ARCF70CW		W	

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



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

Servizio svizzero di taratura Swiss Calibration Service

S

Accreditation No.: SCS 108

Accredited by the Dwise Accreditation Service (SAS) The Swise 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
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 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 (no uncertainty required). DCP does not depend on frequency.
- Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

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RTS RIM Testing Services		Aid Compatibility RF Emi kBerry® Smartphone mod		Page 8(23)
Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70	CW

January 8, 2009

Probe ER3DV6

SN:2286

Manufactured: Last calibrated: Recalibrated: September 19, 2002 January 21, 2008 January 8, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ER3-2286_Jan09

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January 8, 2009

DASY - Parameters of Probe: ER3DV6 SN:2286

Sensitivity in Free	ensitivity in Free Space $[\mu V/(V/m)^2]$		ompression ^A
NormX	2.24 ± 10.1 % (k=2)	DCP X	95 mV
NormY	1.47 ± 10.1 % (k=2)	DCP Y	94 mV
NormZ	1.54 ± 10.1 % (k=2)	DCP Z	96 mV

Frequency Correction

×	0.0
Y	0.0
Z	0.0
Sensor Offset	(Probe Tip to Sensor Center)
x	2.5 mm
Y	2.5 mm
Z	2.5 mm
Connector Angle	-10 °

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

Certificate No: ER3-2286_Jan09

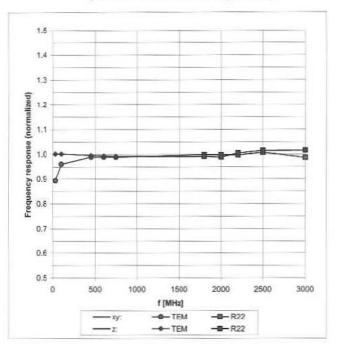
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RTS RIM Testing Services		d Compatibility RF Emissic erry® Smartphone model R		Page 10(23)
Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70C	W

January 8, 2009

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide R22)



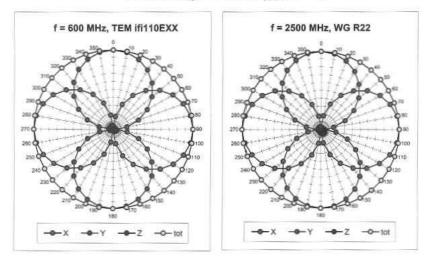
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: ER3-2286_Jan09

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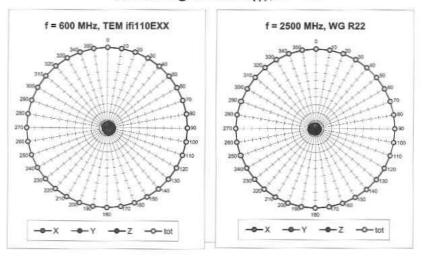
RTS RIM Testing Services		d Compatibility RF Emissic erry® Smartphone model R		Page 11(23)
Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70C	W

January 8, 2009



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

Receiving Pattern (φ), θ = 90°



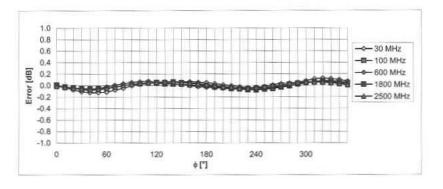
Certificate No: ER3-2286_Jan09

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RTS RIM Testing Services		d Compatibility RF Emissic erry® Smartphone model R		Page 12(23)
Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70C	W

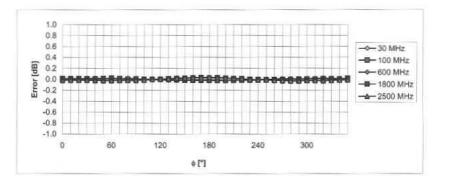
January 8, 2009

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



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

Receiving Pattern (ϕ), ϑ = 90°



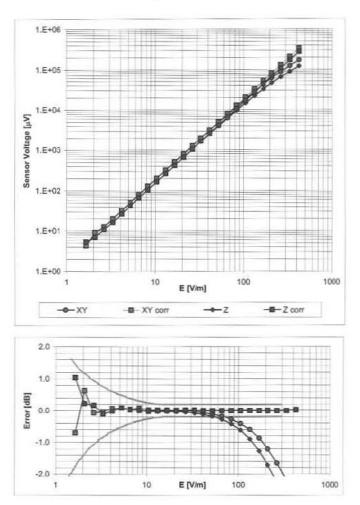
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Certificate No: ER3-2286_Jan09

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RTS RIM Testing Services		d Compatibility RF Emissic erry® Smartphone model R		Page 13(23)
Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70C	W

January 8, 2009



Dynamic Range f(E-field)

(Waveguide R22, f = 1800 MHz)

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

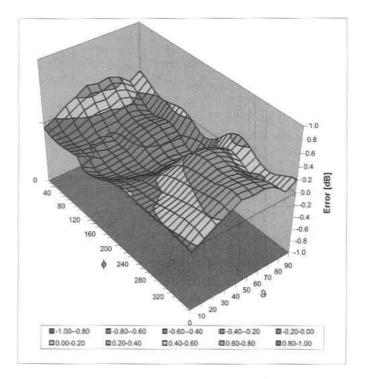
Certificate No: ER3-2286_Jan09

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Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF700	CW

January 8, 2009

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



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

Certificate No: ER3-2286_Jan09

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TS Testing Service	Report for th	learing Aid Compatibil e BlackBerry® Smartp		s Test	Page 15(23
Jata Jd Attayi	Dates of Test Mar 20-24, 200	Report No RTS-1528-0		FCC ID L6ARCF70CV	v
Calibration Lab Schmid & Partne Engineering A Zeughausstrasse 43, 8	er		S Schweizerischer Kalibrie Service suisse d'étalonna Servizio svizzero di tarati S swiss Calibration Service	ige ira	
The Swiss Accreditation Multilateral Agreement	Accreditation Service (SAS) on Service is one of the signato for the recognition of calibratic M Testing Services)	ries to the EA on certificates	on No.: SCS 108 No: H3-6105_Nov08		
CALIBRATI	ON CERTIFICA	12			
C/ LEIDIG (11					
Object	H3DV6 - SN:61	105			
Calibration procedure(s		cedure for H-field probes optimize air	ed for close near field		
Calibration date:	November 10,	2008			
Condition of the calibra	ted item In Tolerance				
		ational standards, which realize the physical u probability are given on the following pages a			
	en conducted in the closed labora used (M&TE critical for calibration	tory facility: environment temperature (22 ± 3)	°C and humidity < 70%.		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration		
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09		
Power sensor E4412A Power sensor E4412A	MY41495277 MY41498087	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788)	Apr-09 Apr-09		
Reference 3 dB Attenua		1-Jul-08 (No. 217-00865)	-00-10L		
Reference 20 dB Attenu	,	31-Mar-08 (No. 217-00787)	Apr-09		
Reference 30 dB Attenu Reference Probe H3DV		1-Jul-08 (No. 217-00866) 1-Oct-08 (No. H3-6182 Oct08)	Jul-09		
DAE4	5 SN: 6182 SN: 789	1-Oct-08 (No. H3-6182_Oct08) 5-Dec-07 (No. DAE4-789_Dec07)	Oct-09 Dec-08		
Secondary Standards	ID #	Check Date (in house)	Scheduled Check		
RF generator HP 86480 Network Analyzer HP 8		4-Aug-99 (in house check Oct-07) 18-Oct-01 (in house check Oct-08)	In house check: Ocl-0 In house check: Ocl-0		
Network Analyzer HP 6	1032 0337340565	To-Oct-OT (IN house check Oct-Oo)	In house check. Oci-o	9	
Calibrated by:	Name Katja Pokovic	Function Technical Manager	Signature	4	
	Niels Kuster	Quality Manager	VILO	S	
Approved by:	Design of the second second second				
	te shall not be reproduced except	in full without written approval of the laborator	Issued: November 11, ry.	2008	
		in full without written approval of the laborator		2008	

RTS RIM Testing Services		d Compatibility RF Emissic erry® Smartphone model R		Page 16(23)
Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70C	W

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



Schweizerischer Kallbrierdienst

C Service suisse d'étalonnage

S

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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
Polarization ϕ	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., $\vartheta = 0$ 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:

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

Methods Applied and Interpretation of Parameters:

- X, Y,Z_a0a1a2: Assessed for E-field polarization θ = 90 for XY sensors and θ = 0 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 (no uncertainty required). DCP does not depend on frequency.
- Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the X_a0a1a2 (no uncertainty required).

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RTS RIM Testing Services		y Aid Compatibility RF Emi kBerry® Smartphone mod		Page 17(23)
Author Data	Dates of Test	Report No	FCC ID	
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70	CW

November 10, 2008

Probe H3DV6

SN:6105

Manufactured: Last calibrated: Recalibrated: January 5, 2002 November 9, 2007 November 10, 2008

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

Certificate No: H3-6105_Nov08

Page 3 of 9

November 10, 2008

DASY - Parameters of Probe: H3DV6 SN:6105

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

a0 a1 a2 X 2.901E-03 5.009E-5 -1.322E-5 ± 5.1 % (k=2) Y 2.678E-03 4.795E-5 1.964E-6 ± 5.1 % (k=2) Z 3.002E-03 -8.521E-5 4.621E-6 ± 5.1 % (k=2) Diode Compression¹

DCP X	83 mV	
DCP Y	91 mV	
DCP Z	84 mV	
Sensor Of	fset	(Probe Tip to Sensor Center)
х		3.0 mm
Y		3.0 mm
Z		3.0 mm
Connector	Angle	-239 °

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

¹ numerical linearization parameter: uncertainty not required

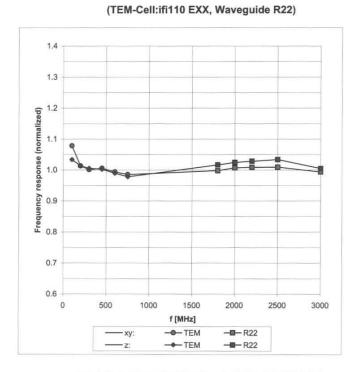
Certificate No: H3-6105_Nov08

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Author Data	Dates of Test	Report No	FCC ID		
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF700	L6ARCF70CW	

November 10, 2008

Frequency Response of H-Field



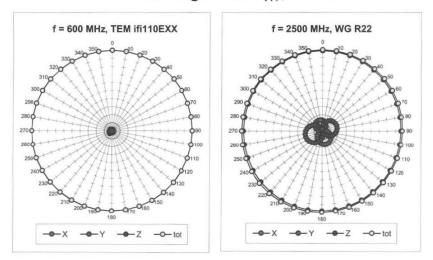
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: H3-6105_Nov08

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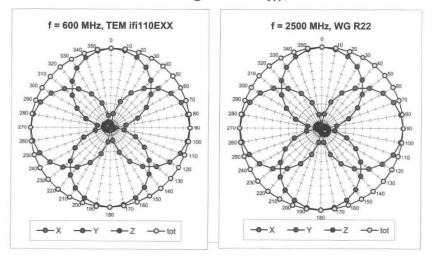
RTS RIM Testing Services	Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RCF71CW			Page 20(23)	
Author Data	Dates of Test	Report No	FCC ID		
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70	L6ARCF70CW	

November 10, 2008



Receiving Pattern (ϕ), ϑ = 90°

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



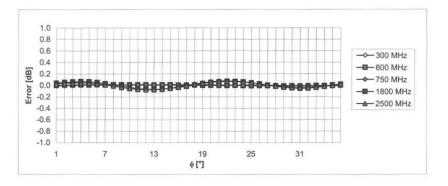
Certificate No: H3-6105_Nov08

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RTS RIM Testing Services	Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RCF71CW			Page 21(23)	
Author Data	Dates of Test	Report No	FCC ID		
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70	L6ARCF70CW	

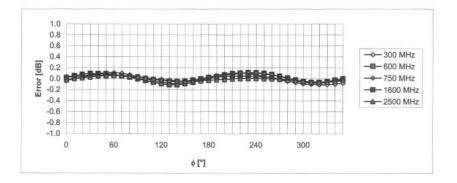
November 10, 2008

Receiving Pattern (ϕ), ϑ = 90°



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

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



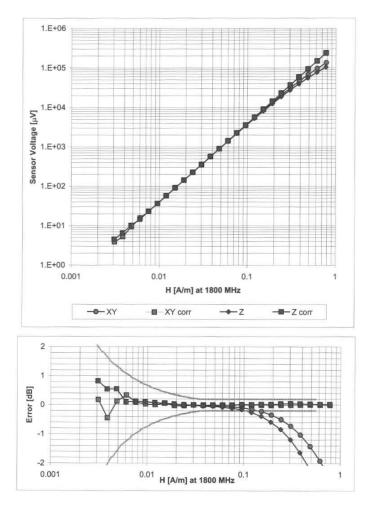
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Certificate No: H3-6105_Nov08

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RTS RIM Testing Services	Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RCF71CW			Page 22(23)	
Author Data	Dates of Test	Report No	FCC ID		
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF700	L6ARCF70CW	

November 10, 2008



Dynamic Range f(H-field)

(Waveguide R22, f = 1800 MHz)

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

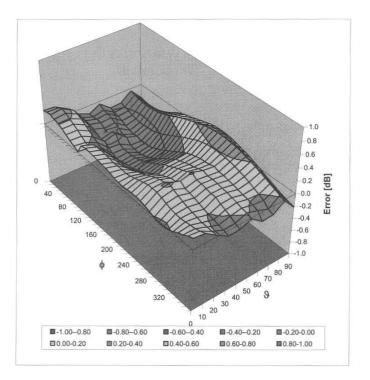
Certificate No: H3-6105_Nov08

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RTS RIM Testing Services	Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RCF71CW				
Author Data	Dates of Test	Report No	FCC ID		
Daoud Attayi	Mar 20-24, 2009	RTS-1528-0903-38	L6ARCF70	L6ARCF70CW	

November 10, 2008

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



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

Certificate No: H3-6105_Nov08

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