RTS RIM Testing Services		Annex B to Hearing Aid Compatibility RF Emissions Test Report for BlackBerry® Smartphone Model RCE21CW					
Author Data	Dates Report No FCC ID						
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Annex B: Probe and dipole descriptions and calibration certificates

**B.1** Probe and measurement chain descriptions and specifications

RTS RIM Testing Services		Document       Page         Annex B to Hearing Aid Compatibility RF Emissions Test       2(35)         Report for BlackBerry® Smartphone Model RCE21CW       2(35)					
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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	<u>ct Flyer</u> (PDF, 192kB)				
DASY4 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 ±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				
<ul> <li>Validation Kits &amp; Calibration Dipoles</li> <li>Hearing Aid Compatibility (HAC) Ext</li> <li>Tissue Simulating Liquids</li> </ul>	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 Flyer (PDF, 192kB)		
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		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  SPEAG Home	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	

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

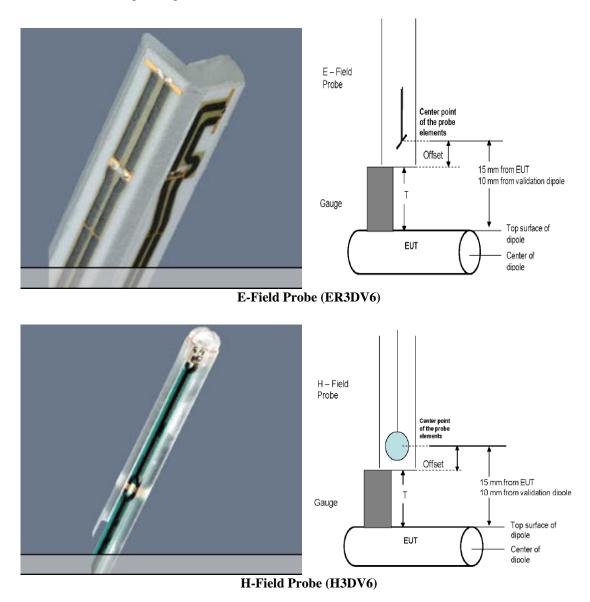
RTS RIM Testing Services	Document Annex B to Hearing Aid C Report for BlackBerry® S						
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All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY4 software so that the measurement 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
	H-field probes:	$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f}{f}$	$f + a_{i2}f^2$
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 s 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:

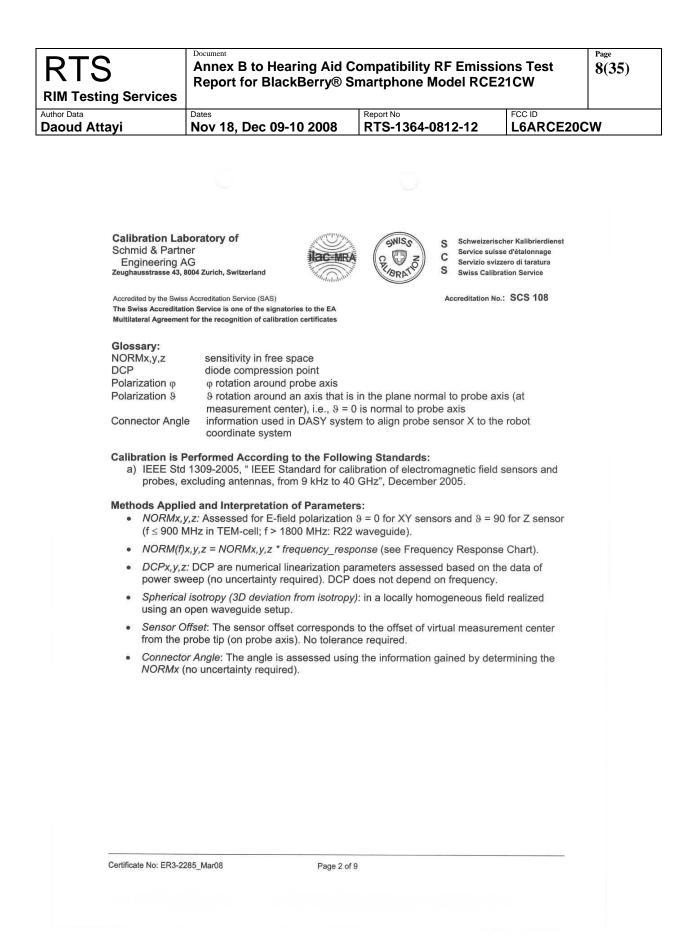
The time response of the field probes has been assessed by exposing the probe to a well-controlled field producing signals larger than HAC E- and H-fields of class M4. The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/off switch 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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## **B.2** Probe and dipole calibration certificates

sting Services	Report for Blac		Report No		FCC ID
Attayi	Nov 18, Dec 09-	10 2008	RTS-1364-0	812-12	L6ARCE20CW
Calibration Lab Schmid & Partne Engineering A0 Zeughausstrasse 43, 80	r G	BC-MEA	SWISS S C C Z C C Z C S	Schweizerischer K Service suisse d'é Servizio svizzero o Swiss Calibration	talonnage li taratura
The Swiss Accreditatio	Accreditation Service (SAS) n Service is one of the signator for the recognition of calibration		Accreditation	No.: SCS 108	
Client RIM			Certificate No	: ER3-2285_Ma	ar08
CALIBRATI	ON CERTIFICAT	TE			
Object	ER3DV6 - SN:	2285			
Calibration procedure(s)			probes optimized	for close near fi	eld
Calibration date:	March 7, 2008			and the states of	
Condition of the calibrate	ed item In Tolerance			The Mary We	
The measurements and All calibrations have bee	e documents the traceability to n the uncertainties with confidence in conducted in the closed labora sed (M&TE critical for calibration ID # GB41293874	e probability are given o tory facility: environmer ) Cal Date (Calibrat	n the following pages and	d are part of the certifi	cate.
Power sensor E4412A Power sensor E4412A Reference 3 dB Attenua Reference 20 dB Attenua Reference 30 dB Attenua Reference Probe ER3D/ DAE4	MY41495277 MY41498087 tor SN: S5054 (3c) ator SN: S5086 (20b) ator SN: S5129 (30b)	29-Mar-07 (META 29-Mar-07 (META 8-Aug-07 (META 29-Mar-07 (META 8-Aug-07 (META 2-Oct-07 (SPEAG	S, No. 217-00670) S, No. 217-00670) S, No. 217-00719) S, No. 217-00671)	Mar-08 Mar-08 Aug-08 Mar-08 Aug-08 Oct-08	
Secondary Standards RF generator HP 8648C	ID # US3642U01700	Check Date (in ho 4-Aug-99 (SPEAG	use) 6, in house check Oct-07)	Scheduled Che	
Network Analyzer HP 87	CONTRACTOR OF THE OWNER OF		G, in house check Oct-07		
Calibrated by:	Name Katja Pokovic	Funct Tech	ion nical Manager	Signature	- Kal
	Niels Kuster	Quali	ty Manager	X.)\$	200
Approved by:	A REAL PROPERTY AND A REAL PROPERTY A REAL PROPERTY AND A REAL PRO				2
	e shall not be reproduced except	in full without written ap	oproval of the laboratory.	Issued: March	8, 2008



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March 7, 2008

# Probe ER3DV6

# SN:2285

Manufactured: Last calibrated: Recalibrated: September 20, 2002 March 12, 2007 March 7, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ER3-2285\_Mar08

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

Sensitivity in Free Space $[\mu V/(V/m)^2]$		Diode Co	ompression <sup>A</sup>
NormX	1.24 ± 10.1 % (k=2)	DCP X	<b>93</b> mV
NormY	1.40 ± 10.1 % (k=2)	DCP Y	<b>93</b> mV
NormZ	1.59 ± 10.1 % (k=2)	DCP Z	<b>98</b> mV

Frequency Correction

х	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	-278 °

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: ER3-2285\_Mar08

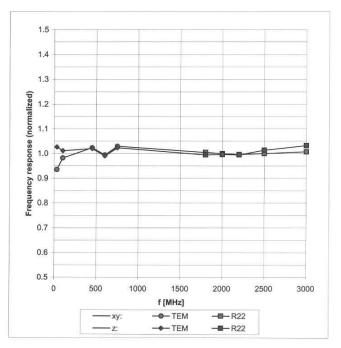
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March 7, 2008

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

(TEM-Cell:ifi110 EXX, Waveguide R22)



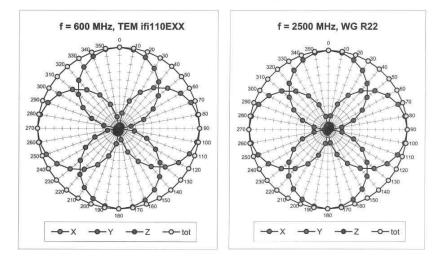
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: ER3-2285\_Mar08

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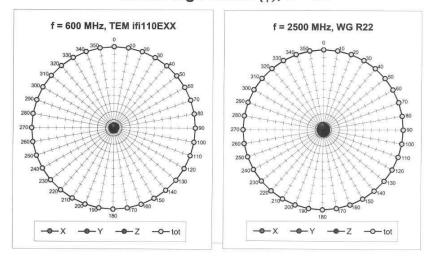
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## Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$

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



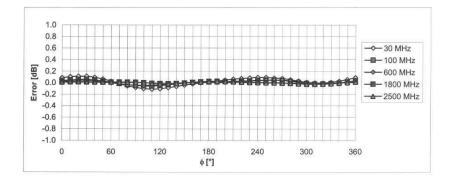
Certificate No: ER3-2285\_Mar08

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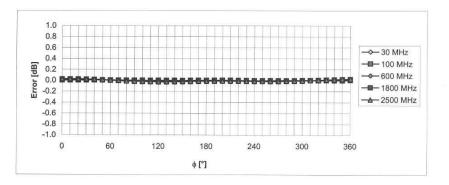
March 7, 2008

## **Receiving Pattern (** $\phi$ **),** $\vartheta$ = 0°



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

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



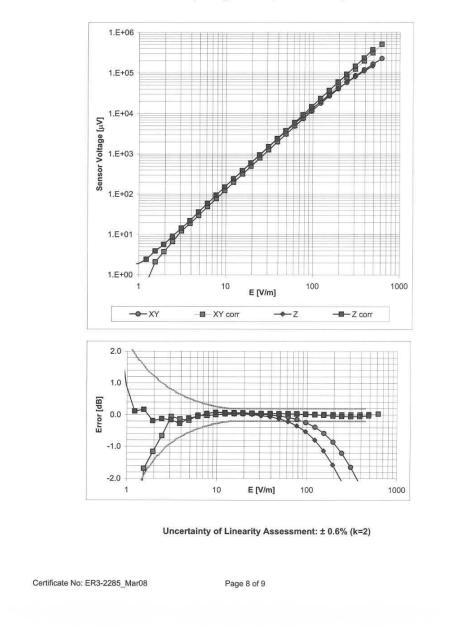
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Certificate No: ER3-2285\_Mar08

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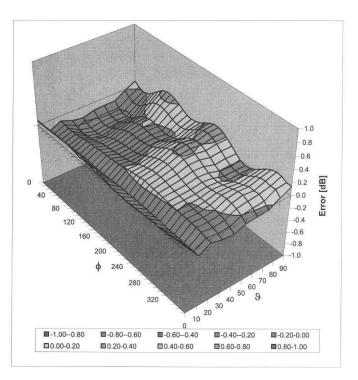


## Dynamic Range f(E-field) (Waveguide R22, f = 1800 MHz)

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

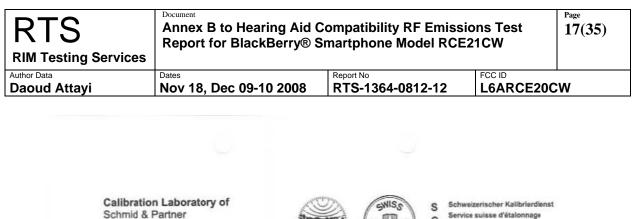


Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ER3-2285 Mar08

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			Dec 09-10 20	Report No RTS-1364-0812-12		2-12	FCC ID L6ARCE20	CW
			a		Ū			
	Schmid & F Engineeri					C Service su Servizio s	rischer Kallbrierdienst Jisse d'étalonnage vizzero di taratura Jibration Service	
	The Swiss Acc		ion Service (SAS) Is one of the signatoric cognition of calibration			ion No.: SCS		
	Client RI	1259 1258 238 7 15 1	ERTIFICAT		Certificate	No: H3-616	8_Mar08	
	Object	ATION	H3DV6 - SN:610					
	Calibration proc	edure(s)	QA CAL-03.v5 Calibration proc evaluations in al		eld probes optimiz	ed for close	near field	
	Calibration date	K-1	March 7, 2008					
	Condition of the	calibrated item	In Tolerance					
	The measurem	ants and the uncer have been conduct ipment used (M&T rds 44198 4412A 4412A 4412A Attenuator B Attenuator B Attenuator B Attenuator B Attenuator B Attenuator B Attenuator	tainties with confidence	Cal Date (Cal 29-Mar-07 (M 29-Mar-07 (M 29-Mar-07 (M 29-Mar-07 (M 29-Mar-07 (M 29-Mar-07 (M 29-Mar-07 (M 2-Aug-07 (ME 2-Oct-07 (SP)	which realize the physical en on the following pages imment temperature (22 ± 3 brated by, Certificate No. ETAS, No. 217-00670) ETAS, No. 217-00670) ETAS, No. 217-00670 TAS, No. 217-00671) TAS, No. 217-00720 ETAS, No. 217-00720 EAG, No. DAE4-654_Ap n house)	and are part of i )*C and humidit ) Sche Mar-( Mar-( Mar-( Aug-( Aug-( ) Oct-0 ) Apr-0	the cartificate. y < 70%. duled Calibration 08 08 08 08 08 08 08 08 08 08	
	RF generator H Network Analyz	P 8648C	US3642U01700 US37390585	4-Aug-99 (SP	EAG, in house check Oct PEAG, in house check Oct	07) In ho	use check: Oct-09 use check: Oct-08	
	Calibrated by:		Name. Katja Pokovic	and the still in some the still in some	unction Technical Manager	Sign	ature Grant Mark	
	Approved by:		Niels Kuster		Quality Manager	N	.18	
	This calibration	certificate shall no	t be reproduced except is	n fuli without writte	en approval of the laborate		d: March 8, 2008	
	Certificate No:	H3-6168_Mar08		Page 1 o	f 8	07.4		



Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



Service suisse d'étalonnage

- С Servizio svizzero di taratura
- Swiss Calibration Service Accreditation No.: SCS 108

S

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 o	φ rotation around probe axis
Polarization &	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:

- X, Y, Z\_a0a1a2: Assessed for E-field polarization 9 = 90 for XY sensors and 9 = 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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March 7, 2008

# Probe H3DV6

# SN:6168

Manufactured: Last calibrated: Recalibrated: July 9, 2003 March 12, 2007 March 7, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: H3-6168\_Mar08

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March 7, 2008

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

Sensitivity in	n Free Space	[A/m / √(µV)	]
	a0	a1	a2
×	2.735E-03	-2.114E-4	0.000E0 ± 5.1 % (k=2)
Y	2.571E-03	-3.732E-5	-5.217E-5 ± 5.1 % (k=2)
Z	3.086E-03	-1.441E-4	9.695E-6 ± 5.1 % (k=2)
Diode Comp	pression1		
DCP X	86 mV		
DCP Y	86 mV		
DCP Z	85 mV		
Sensor Offs	et	(Probe Tip to	Sensor Center)
x		3.0	mm
Y		3.0	mm
Z		3.0	mm
Connector A	Angle	-232	0

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>1</sup> numerical linearization parameter: uncertainty nol required

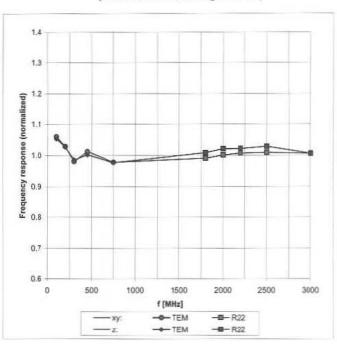
Certificate No: H3-6168\_Mar08

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Daoud Attayi	Nov 18, Dec 09-10 2008					

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## Frequency Response of H-Field



(TEM-Cell:ifi110, Waveguide R22)

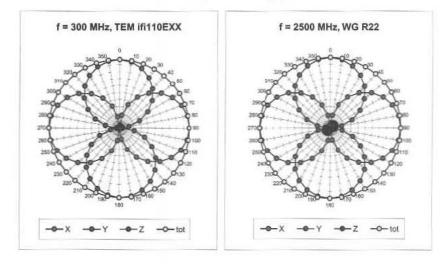
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: H3-6168\_Mar08

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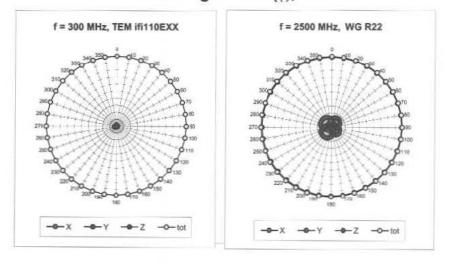
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March 7, 2008



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

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



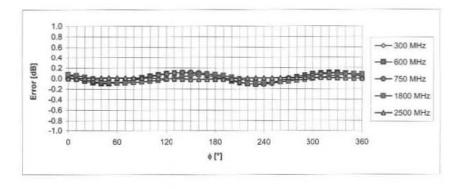
Certificate No: H3-6168\_Mar08

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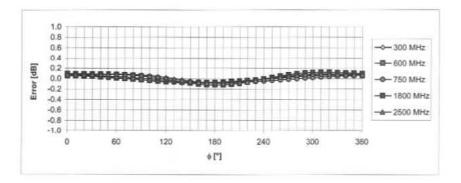
March 7, 2008

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



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

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



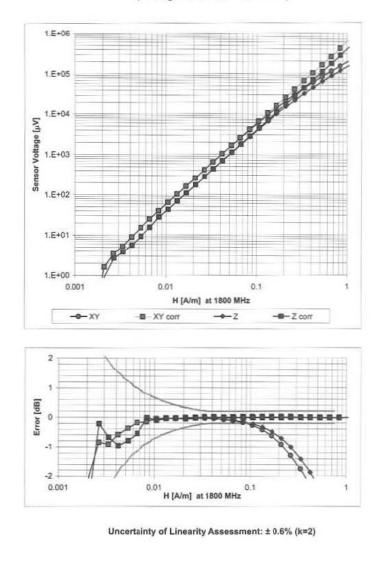
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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March 7, 2008



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

Certificate No: H3-6168\_Mar08

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Data	Report for BlackBerry® Smartphone Model RCE21CW           Dates         Report No			24(35
<sup>Data</sup> ud Attayi	Nov 18, Dec 09-10			20CW
Calibration Laborat Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Z		BC MRA BC MRA	<ul> <li>S Schweizerischer Kalibr</li> <li>Service suisse d'étalor</li> <li>Servizio svizzero di tar</li> <li>Swiss Calibration Servizio</li> </ul>	nnage ratura
	creditation Service (SAS) rvice is one of the signatories he recognition of calibration of	to the EA	tion No.: SCS 108	
Client RIM		Certificate	• No: CD835V3-1011_N	Nov07
CALIBRATION	CERTIFICATE			
Object	CD835V3 - SN: 1	011		
Calibration procedure(s)	QA CAL-20.v4 Calibration procee	QA CAL-20.v4 Calibration procedure for dipoles in air		
Calibration date:	November 7, 200	7		
Condition of the calibrated ite	In Tolerance			
	and the second of the second sec			2019/02/04
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All calibrations have been co Calibration Equipment used ( Primary Standards	nducted in the closed laboratory (M&TE critical for calibration)	r facility: environment temperature (22 ±	<ol> <li>3)°C and humidity &lt; 70%.</li> <li>Scheduled Calibrat</li> </ol>	tion
All calibrations have been co Calibration Equipment used ( Primary Standards Power meter EPM-442A	nducted in the closed laboratory (M&TE critical for calibration) ID # GB37480704	Cal Date (Calibrated by, Certificate No 04-Oct-07 (METAS, No. 217-00736)	3)°C and humidity < 70%. .) Scheduled Calibrat Oct-08	tion
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All calibrations have been co Calibration Equipment used ( Primary Standards Power meter EPM-442A Power sensor HP 8481A	nducted in the closed laboratory (M&TE critical for calibration) ID # GB37480704 US37292783	Cal Date (Calibrated by, Certificate No 04-Oct-07 (METAS, No. 217-00736) 04-Oct-07 (METAS, No. 217-00736)	3)°C and humidity < 70%. a) Scheduled Calibrat Oct-08 Oct-08 ec06) Dec-07 66) Dec-07	tion
All calibrations have been co Calibration Equipment used ( Primary Standards Power meter EPM-442A Power sensor HP 8481A Probe ER3DV6	nducted in the closed laboratory (M&TE critical for calibration) ID # GB37480704 US37292783 SN: 2336	Cal Date (Calibrated by, Certificate Not 04-Oct-07 (METAS, No. 217-00736) 04-Oct-07 (METAS, No. 217-00736) 27-Dec-06 (SPEAG, No. ER3-2336_D	3)°C and humidity < 70%. .) Scheduled Calibrat Oct-08 Oct-08 ec06) Dec-07 :06) Dec-07	tion
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Author Data	Dates	Report No	FCC ID	
Daoud Attayi	Nov 18, Dec 09-10 2008	RTS-1364-0812-12	L6ARCE20C	W .

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





S

Schweizerischer Kalibrierdlenst

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

#### References

 ANSI-C63.19-2006 American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

#### Methods Applied and Interpretation of Parameters:

- Coordinate System: y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with standard [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the top edge of the dipole arms.
- Measurement Conditions: Further details are available from the hardcopies at the end of the certificate. All
  figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole
  connector is set with a calibrated power meter connected and monitored with an auxiliary power meter
  connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to
  the same level.
- Antenna Positioning: The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY4 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- Feed Point Impedance and Return Loss: These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- E- field distribution: E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (in z) above the top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, 10mm above the dipole surface.
- H-field distribution: H-field is measured with an isotropic H-field probe with 100mW forward power to the
  antenna feed point, in the x-y-plane. The scan area and sensor distance is equivalent to the E-field scan. The
  maximum of the field is available at the center (subgrid 5) above the feed point. The H-field value stated as
  calibration value represents the maximum of the interpolated H-field, 10mm above the dipole surface at the
  feed point.

#### 1 Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.7 B55
DASY PP Version	SEMCAD	V1.8 B176
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 180 mm
Frequency	835 MHz ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

#### 2 Maximum Field values

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW forward power	0.458 A/m
Incertainty for H-field measurement: 8.2% (k=2)		

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end-	100 mW forward power	167.1 V/m
Maximum measured above low end	100 mW forward power	160.1 V/m
Averaged maximum above arm	100 mW forward power	163.6 V/m

Uncertainty for E-field measurement: 12.8% (k=2)

#### 3 Appendix

#### 3.1 Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	16.2 dB	(42.9 – j12.6) Ohm
835 MHz	26.3 dB	( 51.2 + j4.8 ) Ohm
900 MHz	16.5 dB	(56.7 – j14.6) Ohm
950 MHz	19.8 dB	(43.9 + j7.4) Ohm
960 MHz	16.3 dB	( 50.3 + j15.5 ) Ohm

#### 3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

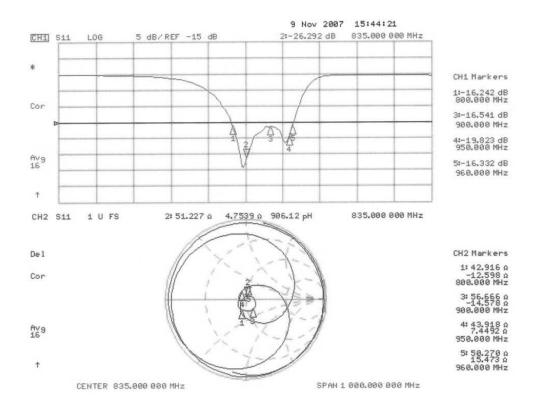
Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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#### 3.3 Measurement Sheets

## 3.3.1 Return Loss and Smith Chart



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#### 3.3.2 DASY4 H-field result

Date/Time: 07.11.2007 12:08:55

Test Laboratory: SPEAG Lab 2

**DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: 1011** Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used:  $\sigma = 0$  mho/m,  $\varepsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup> Phantom section: H Dipole Section Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

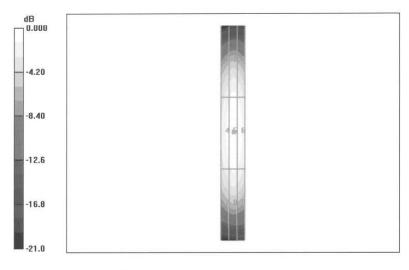
- Probe: H3DV6 SN6065; Calibrated: 27.12.2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - Sensor Center 10mm above CD835 Dipole/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.458 A/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, 354.7 mm Reference Value = 0.484 A/m; Power Drift = 0.007 dB Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1	Grid 2	Grid 3
0.378 M4	0.409 M4	0.394 M4
Grid 4	Grid 5	Grid 6
0.424 M4	0.458 M4	0.442 M4
Grid 7	Grid 8	Grid 9
0.373 M4	0.401 M4	<b>0.386 M4</b>



0 dB = 0.458 A/m

#### 3.3.3 DASY4 E-Field result

Test Laboratory: SPEAG Lab 2

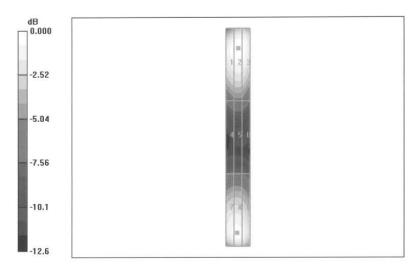
Date/Time: 07.11.2007 14:04:24

**DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1011** Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used:  $\sigma = 0$  mho/m,  $\varepsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: E Dipole Section Measurement Standard: DASY4 (High Precision Assessment) DASY4 Configuration:

- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 27.12.2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - Sensor Center 10mm above CD835 Dipole/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm Maximum value of peak Total field = 167.1 V/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, 354.7 mm Reference Value = 103.6 V/m; Power Drift = 0.012 dB Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Grid 1	Grid 2	Grid 3
162.5 M4	167.1 M4	163.4 M4
Grid 4	Grid 5	Grid 6
<b>87.2 M4</b>	<b>89.4 M4</b>	<b>87.1 M4</b>
Grid 7	Grid 8	Grid 9
1 <b>56.2 M4</b>	160.1 M4	1 <b>52.8 M</b> 4



 $0 \, dB = 167.1 \, V/m$ 

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or Data Dud Attayi	Dates Nov 18, De	ec 09-10 2008		FCC ID L6ARCE20	CW
Zeughausstra	ering AG Isse 43, 8004 Zuric		C C Z Z	C Service suis Servizio sviz	cher Kalibrierdiens se d'étalonnage zzero di taratura ration Service
The Swiss Ac	ccreditation Servic	litation Service (SAS) e is one of the signatori ecognition of calibration	es to the EA		
Client	NIM		Certificate	No: CD1880V	3-1008_Nov07
CALIB	RATION	CERTIFICAT	E		
Object		CD1880V3 - SN			
Calibration pr	rocedure(s)	QA CAL-20.v4 Calibration proce	edure for dipoles in air		
Calibration da	ate:	November 8, 20	07		
Condition of t	the calibrated item	In Tolerance	tional standards, which realize the physical	units of measurem 3)°C and humidity •	nents (SI). < 70%.
Condition of t This calibration All calibration	the calibrated item on certificate docum is have been conduc	In Tolerance		units of measurem	nents (SI). < 70%.
Condition of t This calibration All calibration	the calibrated item on certificate docum is have been condu quipment used (M&	In Tolerance	tional standards, which realize the physical ory facility: environment temperature (22 ± 3 Cal Date (Calibrated by, Certificate No.)	<ul> <li>)°C and humidity</li> <li>) Schedu</li> </ul>	nents (SI). < 70%. led Calibration
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Condition of t This calibration All calibration Calibration Ed Primary Stand Power meter Power sensor Probe ER3D\	the calibrated item on certificate docum is have been conduc quipment used (M& dards EPM-442A r HP 8481A V6	In Tolerance	tional standards, which realize the physical ory facility: environment temperature (22 ± 3 <u>Cal Date (Calibrated by, Certificate No.)</u> 04-Oct-07 (METAS, No. 217-00736) 04-Oct-07 (METAS, No. 217-00736) 27-Dec-06 (SPEAG, No. ER3-2336_Dec	<ul> <li>)*C and humidity</li> <li>) Schedu</li> <li>Oct-08</li> <li>Oct-08</li> <li>Coct-08</li> <li>Coct-07</li> <li>Dec-07</li> <li>Dec-07</li> </ul>	< 70%.
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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

Accreditation No.: SCS 108

5 Swiss Calibration Service

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

#### References

- [1] ANSI-C63.19-2006
  - American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

#### Methods Applied and Interpretation of Parameters:

- Coordinate System: y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with standard [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the top edge of the dipole arms.
- Measurement Conditions: Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- Antenna Positioning: The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY4 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is ensor offset. The vertical distance to the probe is ensor offset. The vertical distance to the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- Feed Point Impedance and Return Loss: These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- E- field distribution: E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (in z) above the top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, 10mm above the dipole surface.
- H-field distribution: H-field is measured with an isotropic H-field probe with 100mW forward power to the
  antenna feed point, in the x-y-plane. The scan area and sensor distance is equivalent to the E-field
  scan. The maximum of the field is available at the center (subgrid 5) above the feed point. The H-field
  value stated as calibration value represents the maximum of the interpolated H-field, 10mm above the
  dipole surface at the feed point.

RTS	Annex B to Hearing Aid Compatibility RF Emissions Test			
RIM Testing Services	Report for BlackBerry® Smartphone Model RCE21CW			
Author Data Daoud Attayi	Dates Nov 18, Dec 09-10 2008	Report No RTS-1364-0812-12	FCC ID L6ARCE20C	W

#### **1 Measurement Conditions**

DASY system configuration, as far as not given on page 1

DASY Version	DASY4	V4.7 B55
DASY PP Version	SEMCAD	V1.8 B176
Phantom	HAC Test Arch	SD HAC P01 BA, #1070
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 90 mm
Frequency	1880 MHz ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

#### 2 Maximum Field values

vard power 0.465 A/m
^

ertainty for H-field measurement: 8.2% (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum	
Maximum measured above high end	100 mW forward power	133.7 V/m	
Maximum measured above low end	100 mW forward power	133.5 V/m	
Averaged maximum above arm	100 mW forward power	133.6 V/m	

Uncertainty for E-field measurement: 12.8% (k=2)

#### **3** Appendix

#### 3.1 Antenna Parameters

Frequency	Return Loss	Impedance
1710 MHz	22.2 dB	( 52.3 + j7.6 ) Ohm
1880 MHz	20.5 dB	( 49.7 + j9.4 ) Ohm
1900 MHz	20.7 dB	(52.2 + j9.2 ) Ohm
1950 MHz	27.8 dB	(52.4 + j3.4) Ohm
2000 MHz	19.2 dB	(43.7 + j8.2) Ohm

#### 3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

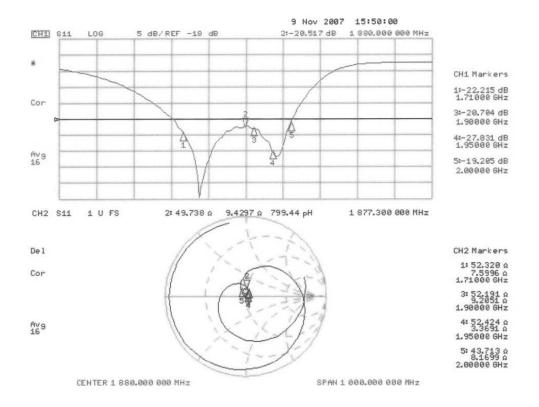
Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

RTS RIM Testing Services		Annex B to Hearing Aid Compatibility RF Emissions Test Report for BlackBerry® Smartphone Model RCE21CW			
Author Data	Dates	Report No	FCC ID		
Daoud Attayi	Nov 18, Dec 09-10 2008	RTS-1364-0812-12	L6ARCE200	CW	

#### 3.3 Measurement Sheets

#### 3.3.1 Return Loss and Smith Chart



.

#### 3.3.2 DASY4 H-Field Result

Date/Time: 08.11.2007 11:15:44

Test Laboratory: SPEAG Lab 2

**DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1008** Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1 Medium parameters used:  $\sigma = 0$  mho/m,  $\varepsilon_r = 1$ ;  $\rho = 1$  kg/m<sup>3</sup> Phantom section: H Dipole Section Measurement Standard: DASY4 (High Precision Assessment)

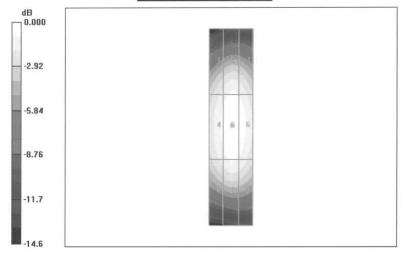
DASY4 Configuration:

- Probe: H3DV6 SN6065; Calibrated: 27.12.2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

H Scan - Sensor Center 10mm above CD1880V3 Dipole/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm Maximum value of peak Total field = 0.465 A/m Probe Modulation Factor = 1.00

Device Reference Point: 0.000, 0.000, 354.7 mm Reference Value = 0.490 A/m; Power Drift = -0.001 dB Hearing Aid Near-Field Category: M2 (AWF 0 dB)

> Peak H-field in A/m Grid 1 Grid 2 Grid 3 0.428 M2 0.415 M2 0.395 M2 Grid 4 Grid 5 Grid 6 0.465 M2 0.451 M2 0.434 M2 Grid 8 Grid 9 Grid 7 0.394 M2 0.423 M2 0.409 M2



 $0 \, dB = 0.465 \, A/m$ 

#### 3.3.2 DASY4 E-Field Result

Date/Time: 07.11.2007 15:57:04

Test Laboratory: SPEAG Lab 2

**DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: 1008** Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1 Medium parameters used:  $\sigma = 0$  mho/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: E Dipole Section Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 SN2336; ConvF(1, 1, 1); Calibrated: 27.12.2006
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 02.10.2007
- Phantom: HAC Test Arch with Coil; Type: SD HAC P01 BA; Serial: 1070
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

E Scan - Sensor Center 10mm above CD1880V3 Dipole/Hearing Aid Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 133.7 V/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, 354.7 mm Reference Value = 149.2 V/m; Power Drift = 0.031 dB Hearing Aid Near-Field Category: M2 (AWF 0 dB)

 Grid 1
 Grid 2
 Grid 3

 128.8 M2
 133.7 M2
 132.1 M2

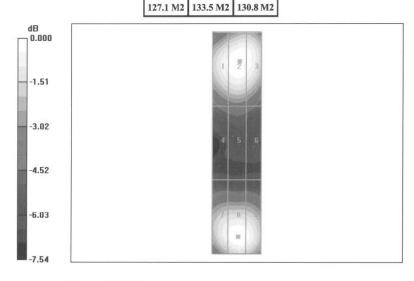
 Grid 4
 Grid 5
 Grid 6

 88.1 M3
 90.8 M3
 87.7 M3

Grid 8

Grid 9

Grid 7



 $0 \, dB = 133.7 V/m$