SlackB	erry		npatibility RF Emissions Test Smartphone model RHD131LV		Page 1(14)
Author Data Daoud Attayi	Dates of Test Feb. 02-	17, 2015	Report No RTS-6063-1503-11	FCC ID	RHD130LW

# Annex B: Probe and dipole description and calibration certificates

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

SlackB	erry		npatibility RF Emissions Test Smartphone model RHD131LV		Page 2(14)
Author Data Daoud Attayi	Dates of Test Feb. 02-	-17, 2015	Report No RTS-6063-1503-11	FCC ID	RHD130LW

DASY Dosimetric Assessment System by Schmid & Partner Engineering AG

DASY Schmid & Partner Engineering AG News Sales Contact		A CONTRACT OF A
Applications	ER3DV6 ISOTRO	PIC E-FIELD PROBE FOR GENERAL NEAR-FIELD
Support & Downloads Products DASY4 Packages		<u>t Flyer</u> (PDF, 192kB)
EASY4     Probes     ET3DV6 - Isotropic Dos-Probe     ES3DV3 - Isotropic Dos-Probe	Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
EX3DV4 - Isotropic Dos-Probe ET1DV3 - D-Probe	Calibration	In air from 100 MHz to 3.0 GHz (absolute accuracy ±6.0%, k=2)
EUV3 - Universal Vector E-Probe H3DV6 - Isotropic H-Probe	Frequency	100 MHz to > 6 GHz; Linearity: $\pm$ 0.2 dB (100 MHz to 3 GHz)
HUV4 - Universal Vector H-Probe T1V3 - Temp-Probe DP1 - Dummy-Probe	Directivity	± 0.2 dB in air (rotation around probe axis) ± 0.4 dB in air (rotation normal to probe axis)
Data Acquisition System	Dynamic Range	2 V/m to > 1000 V/m; Linearity: $\pm$ 0.2 dB
Software     Phantoms     Robots	Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm
Validation Kits & Calibration Dipoles     Hearing Aid Compatibility (HAC) Ext     Tissue Simulating Liquids     SPEAG Home	Application	General near-field measurements up to 6 GHz Field component measurements Fast automatic scanning in phantoms

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

SlackB	erry		npatibility RF Emissions Test Smartphone model RHD131LV		Page 3(14)
Author Data	Dates of Test		Report No	FCC ID	
Daoud Attayi	Feb. 02-	17, 2015	RTS-6063-1503-11	L6AF	RHD130LW

All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY5 software so that the measurement was to the nearest element.

Figures 1, 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.



E-Field Probe (ER3DV6)

SlackB	erry	Annex B to Hearing Aid Co Report for the BlackBerry® (STR100-1)	mpatibility RF Emissions Test Smartphone model RHD131L		Page 4(14)
Author Data	Dates of Test		Report No	FCC ID	
Daoud Attayi	Feb. 02-	·17, 2015	RTS-6063-1503-11	L6A	RHD130LW

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

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

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

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

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

	$\mathrm{E-field probes}$ :	$E_i = \sqrt{\frac{V_i}{Norm_i \cdot c}}$	ConvF
	$\mathbf{H}-\mathbf{fieldprobes}$ :	$H_{\rm i} = \sqrt{V_i} \cdot \frac{a_{i0} + a_{\rm i1}}{2}$	$\frac{f + a_{i2}f^2}{f}$
with	= compensated signal of $c$ = sensor sensitivity of cha $\mu V/(V/m)^2$ for E-field = sensitivity enhancement = sensor sensitivity factor = carrier frequency [GHz] = electric field strength of = magnetic field strength	nnel i l Probes t in solution rs for H-field probes f channel i in V/m	$\begin{array}{l} (i=x,y,z) \\ (i=x,y,z) \end{array}$

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

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

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

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

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

Data	Dates of Test	(STR100-1)	Report No		5(14)
ud Attayi	Feb. 02-	17, 2015	RTS-6063	-1503-11	L6ARHD130L
				TST-SARL-00	0006
Sch	libration Labor nmid & Partner ingineering AG phausstrasse 43, 8004			Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service	
The S	Swiss Accreditation S	reditation Service (SAS) ervice is one of the signatories the recognition of calibration of	to the EA	reditation No.: SCS 0108	
Clier	Blackberry	Waterloo	Centificate No:	ER3-2286_Jan15	
CA	ALIBRATIO	N CERTIFICATE			
Obje	ect	ER3DV6 - SN:22	86		
Cali	bration procedure(s)	QA CAL-02.v8, G Calibration proce evaluations in air	dure for E-field probes optimized	for close near field	
Cali	ibration date:	January 19, 2015			
The	measurements and the	e uncertainties with confidence pr	cohability are given on the following pages and	are part of the certificate.	
		conducted in the closed laborator d (M&TE critical for calibration)	y facility: environment temperature (22 $\pm$ 3)°C		
Cali	ibration Equipment use				
Cali		d (M&TE critical for calibration)	y facility: environment temperature (22 ± 3)°C Cal Date (Certificate No.) 03:Apr-14 (No. 217-01911)	and humidity < 70%.	
Cali Pri Po Po	ibration Equipment use many Standards wer meter E44198 wer sensor E4412A	ID GE41293874 NY41498087	y facility: environment temperature (22 ± 3)°C Cal Data (Certificate No.) 03:Apr-14 (No. 217-01911) 03:Apr-14 (No. 217-01911)	and humidity < 70%. Scheduled Calibration Jan-15 Jan-15	
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughaussmass 43, 8004 Zunch, Switzerland       Image: Comparison of Com	ithor Data aoud Attayi	Dates of Tes Feb. 02	-17, 2015	Report No RTS-606	3-1503-11	FCC ID L6ARHD130LW
<ul> <li>The Swiss Accredition Service is one of the signatorias to the EA Multilateral Agreement for the recognition of calibration cartificates</li> <li>Glossary:</li> <li>NORMX, y, z sensitivity in free space</li> <li>DCP dide compression point</li> <li>CF creat factor (1/duty_cycle) of the RF signal</li> <li>A, B, C, D modulation dependent linearization parameters</li> <li>Polarization 0 optication around probe axis</li> <li>Polarization 3 s rotation around probe axis</li> <li>Polarization 3 s rotation around probe axis</li> <li>Connector Angle informatio probe axis</li> <li>Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system</li> <li>Calibration 1s Performed According to the Following Standards: <ul> <li>a) IEEE Stat 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz, December 2005.</li> <li>b) CTIA Test Plan for Hearing Aid Compatibility, April 2010.</li> </ul> </li> <li>Methods Applied and Interpretation of Parameters: <ul> <li>NORM/ky,z: Assessed for E-field polarization 9 = 0 tor XY sensors and 9 = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f &gt; 1800 MHz; rs2 waveguida).</li> <li>NORM/ky,z: Assessed for E-field polarization 9 = 0 tor XY sensors and 9 = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f &gt; 1800 MHz; rs2 waveguida).</li> </ul> </li> <li>NORM/ky,z: Assessed for E-field polarization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.</li> <li>PAR: bit he Peak to Average Ratio that is net calibrated but determined based on the signal characteristics.</li> <li>Ax,y;z: Bx,yz; Cx,yz; Dx,yz; VX,yz; A, B, C, D are numerical linearization parameters do not depend on frequency nor media.</li> <li>Ax,y;z: Bx,yz; Cx,yz; Dx,yz; VX,YX,Y;A, B, C, D are numerical linearization parameters do not depend on frequency nor media. We is the maximum calibration from isodropy): in a locally homogeneous field</li></ul>	Sch	mid & Partne	lac		C Service suisse d'étalonne Servizio svizzero di tarat	age tura
<ul> <li>DCP diode compression point</li> <li>CF creat factor (1/duty, cycle) of the RF signal</li> <li>A, B, C, D modulation dependent linearization parameters</li> <li>Polarization 0 optication around probe axis</li> <li>Polarization 3 3 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</li> <li>Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system</li> <li>Calibration is Performed According to the Following Standards: <ul> <li>a) IEEE Stal 1309-2005. IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz<sup>2</sup>, December 2005</li> <li>b) CTIA Test Plan for Hearing Aid Compatibility, April 2010.</li> </ul> </li> <li>Methods Applied and Interpretation of Parameters: <ul> <li>NORM(n, 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 &gt; 1800 MHz; n2 required, response (see Frequency Response Chart).</li> <li>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.</li> <li>PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics</li> <li>Ax, y.z: Bx, y.z: Cx, y.z: Dx, y.z, VRx, y.z: A, B, C, D 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.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> </ul> </li> </ul>	The S Multi Glo	wiss Accreditation lateral Agreement SSary:	n Service is one of the signatories to the E for the recognition of calibration contificate		Accreditation No.: SCS 0	108
<ul> <li>i.e., 9 = 0 is normal to probe axis information used in DASY system to align probe sensor X to the robot coordinate system</li> <li>Calibration is Performed According to the Following Standards:         <ul> <li>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.</li> <li>b) CTIA Test Plan for Hearing Aid Compatibility, April 2010.</li> </ul> </li> <li>Methods Applied and Interpretation of Parameters:         <ul> <li>NORMA, 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 &gt; 1800 MHz; R22 waveguide).</li> <li>NORMA(y,y,z' = NORMA, y,z * frequency_response (see Frequency Response Chart).</li> <li>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.</li> <li>PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics</li> <li>Ax, y,z; Bx, y,z; Cx, y,z; Nx,y; X, B, C, D 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.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> <li>Sonsor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.</li> <li>Connector Angle: The angle is assessed using the information gained by determining the NORMx (no</li> </ul> </li> </ul>	DCP CF A, B, Pola	C, D rization o	diode compression point crest factor (1/duty_cycle) of the modulation dependent linearizat or rotation around probe axis	ion parameters		
<ul> <li>Calibration is Performed According to the Following Standards: <ul> <li>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</li> <li>b) CTIA Test Plan for Hearing Aid Compatibility, April 2010.</li> </ul> </li> <li>Methods Applied and Interpretation of Parameters: <ul> <li>NORM/x,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 &gt; 1800 MHz: R22 waveguide).</li> <li>NORM/(f)x,y.z = NORM/x,y.z * frequency_response (see Frequency Response Chart).</li> <li>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.</li> <li>PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics</li> <li>Ax,y.z: Bx,y.z: Cx,y.z: Dx,y.z, VRx,y.z: A, B, C, D 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.</li> <li>PAR: pAR is the maximum calibration range expressed in RMS voltage across the diode.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> <li>Sorisor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.</li> </ul> </li> </ul>			i.e., 9 = 0 is normal to probe axis	5	erron electron of some ser	
<ul> <li>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 &gt; 1800 MHz: R22 waveguide).</li> <li>NORM(f)x, y, z = NORMx, y, z * frequency_response (see Frequency Response Chart).</li> <li>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.</li> <li>PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics</li> <li>Ax, y, z: Bx, y, z; Cx, y, z; Dx, y, z; VRx, y, z: A, B, C, D 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.</li> <li>Spherical isotropy (3D deviation range expressed in RMS voltage across the diode.</li> <li>Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.</li> <li>Connector Angle: The angle is assessed using the information gained by determining the NORMx (no</li> </ul>	2	<ul> <li>a) IEEE Std 13 antennas, fr</li> <li>b) CTIA Test P</li> </ul>	09-2005, " IEEE Standard for calibra om 9 kHz to 40 GHz", December 200 lan for Hearing Aid Compatibility, Ap	ttion of electromagnetic field 05 ril 2010.	d sensors and probes, excl	luding
<ul> <li>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.</li> <li>PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics</li> <li>Ax, y,z: Bx, y,z; Cx, y,z; Dx, y,z; VRx, y,z; A, B, C, D 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.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> <li>Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.</li> <li>Connector Angle: The angle is assessed using the information gained by determining the NORMx (no</li> </ul>		NORMX, y, z:	Assessed for E-field polarization 9 =		90 for Z sensor (f $\leq$ 900 MI	Hz in
<ul> <li>signal (no uncertainty required). DCP does not depend on frequency nor media.</li> <li><i>PAR</i>: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics</li> <li><i>Ax.y.z: Bx.y.z: Cx.y.z: Dx.y.z: VRx.y.z: A</i>, <i>B</i>, <i>C</i>, <i>D</i> 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.</li> <li><i>Spherical isotropy (3D deviation from isotropy):</i> in a locally homogeneous field realized using an open waveguide setup.</li> <li><i>Sensor Offset:</i> The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.</li> <li><i>Connector Angle:</i> The angle is assessed using the information gained by determining the <i>NORMx</i> (no</li> </ul>		NORM(f)x,y	z = NORMx,y,z * frequency_respons	se (see Frequency Respon	se Chart).	
<ul> <li>characteristics</li> <li>Ax, y, z; Bx, y, z; Cx, y, z; Dx, y, z; VRx, y, z; A, B, C, D 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.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> <li>Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.</li> <li>Connector Angle: The angle is assessed using the information gained by determining the NORMx (no</li> </ul>						with CW
<ul> <li>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.</li> <li>Spherical isotropy (3D deviation from isotropy): in a locally homogeneous field realized using an open waveguide setup.</li> <li>Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.</li> <li>Connector Angle: The angle is assessed using the information gained by determining the NORMx (no</li> </ul>				ot calibrated but determine	d based on the signal	
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				the offset of virtual measur	ement center from the prol	be tip
				ne information gained by de	etermining the NORMx (no	

Certificate No: ER3-2286\_Jan15

Page 2 of 10

SlackB	erry		id Compatibility RF Emissions erry® Smartphone model RHD1		Page 7(14)
Author Data	Dates of Test		Report No	FCC ID	
Daoud Attayi	Feb. 02-	·17, 2015	RTS-6063-1503-11	L6A	RHD130LW

January 19, 2015

# Probe ER3DV6

## SN:2286

Manufactured: Calibrated: September 18, 2002 January 19, 2015

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

Certificate No: ER3-2286\_Jan15

Page 3 of 10

SlackB	erry	Annex B to Hearing Ai Report for the BlackBe (STR100-1)	id Compatibility RF Emissions T erry® Smartphone model RHD13		Page 8(14)
Author Data	Dates of Test		Report No	FCC ID	
Daoud Attayi	Feb. 02-	17, 2015	RTS-6063-1503-11	L6A	RHD130LW

January 19, 2015

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

#### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm $(\mu V/(V/m)^2)$	2.23	1.47	1.51	± 10.1 %
DCP (mV) <sup>8</sup>	98.9	100.3	99.7	

#### **Modulation Calibration Parameters**

UID	Communication System Name		A	B dBõV	C	D dB	VR mV	Unc <sup>L</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	182.8	±3.8 %
		Y	0.0	0.0	1.0		197.2	
		Z	0.0	0.0	1.0		175.9	

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

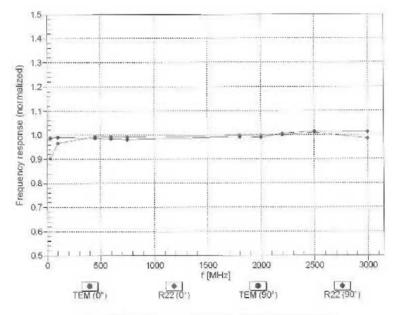
Certificate No: ER3-2286 Jan15

Page 4 of 10

*** BlackBerry			Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHD131LW (STR100-1)		
Author Data Daoud Attayi	Dates of Test Feb. 02	-17, 2015	Report No RTS-6063-1503-11	FCC ID L6A	RHD130LW

January 19, 2015

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



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

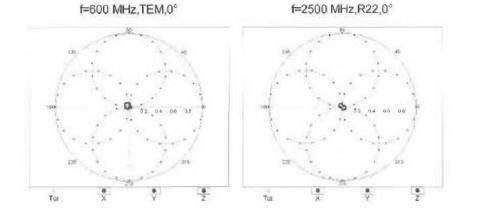
Certificate No: ER3-2286\_Jan15

Page 5 of 10

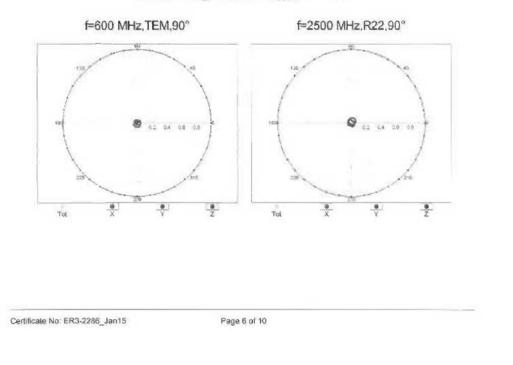
SlackBerry		Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHD131LW (STR100-1)			Page 10(14)
Author Data         Dates of Test           Daoud Attayi         Feb. 02-17, 2			Report No RTS-6063-1503-11	FCC ID	RHD130LW

January 19, 2015

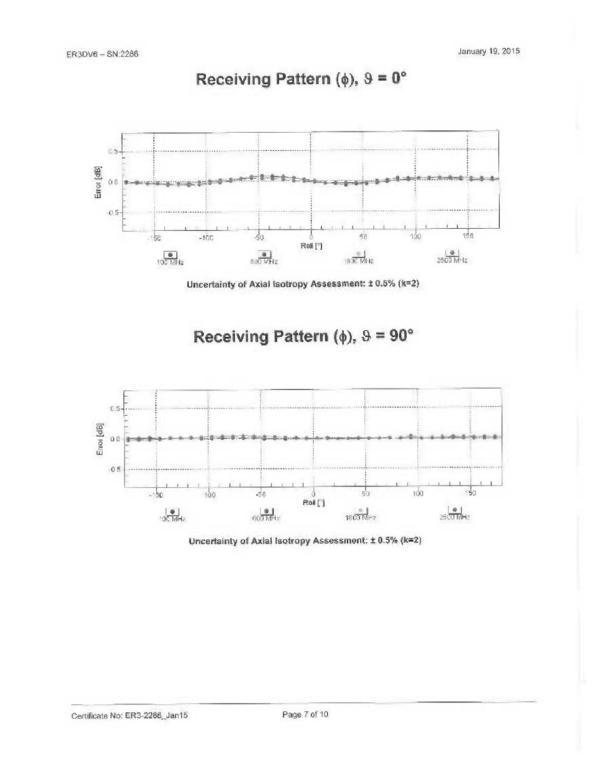
### Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$



Receiving Pattern (\$), & = 90°



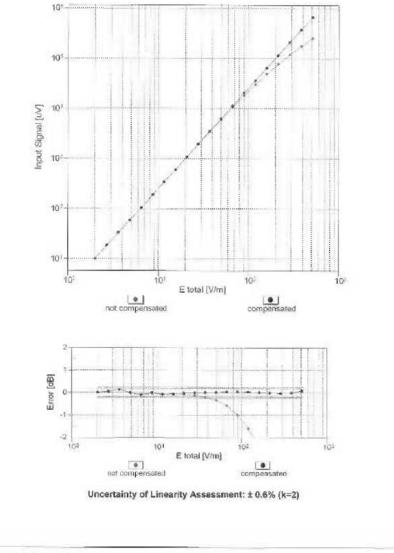
SlackBerry		(STR100-1)			Page 11(14)
Author Data Dates of Test Feb. 02-17			Report No RTS-6063-1503-11	FCC ID	RHD130LW



SlackBerry			nex B to Hearing Aid Compatibility RF Emissions Test port for the BlackBerry® Smartphone model RHD131LW R100-1)		Page 12(14)
Author Data Daoud Attayi	Dates of Test Feb. 02-	17, 2015	Report No RTS-6063-1503-11	FCC ID	RHD130LW

January 19, 2015

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

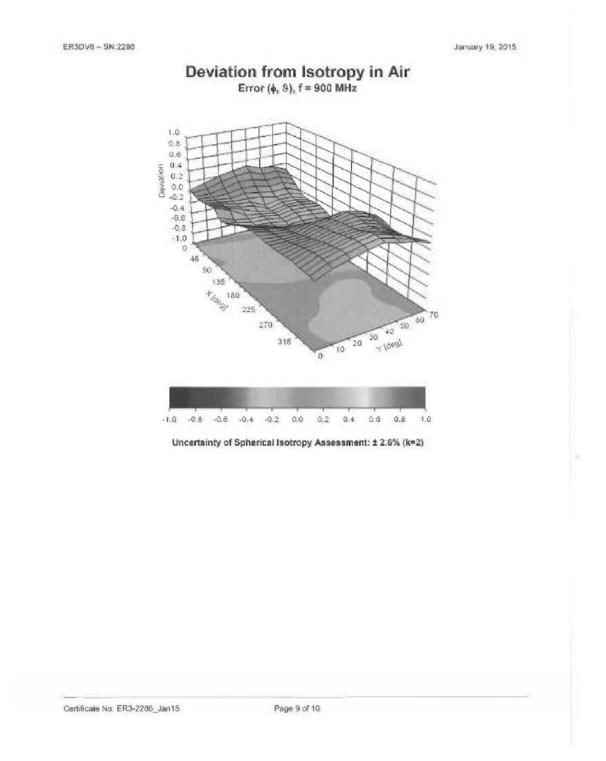


Certificate No: ER3-2286\_Jan15

Page 8 of 10

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SlackBerry		Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHD131LW (STR100-1)			Page 13(14)
Author Data	Dates of Test		Report No	FCC ID	
Daoud Attayi Feb. 02-		17, 2015	RTS-6063-1503-11 L6AI		RHD130LW



SlackBerry		Document Annex B to Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RHD131LW (STR100-1)			Page 14(14)
Author Data Dates of Test			Report No	FCC ID	1
Daoud Attayi Feb. 02-17, 2015		17, 2015	RTS-6063-1503-11 L6		RHD130LW

January 19, 2015

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

#### Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-6.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	dīsabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	8 mm
Probe Tip to Sensor X Calibration Point	2.5 mm
Probe Tip to Sensor Y Calibration Point	2.5 mm
Probe Tip to Sensor Z Calibration Point	2.5 mm

Certificate No: ER3-2286 Jan15

Page 10 of 10

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