
	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>1(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

## APPENDIX D: PROBE & DIPOLE CALIBRATION DATA

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>2(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

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



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

Accreditation No.: **SCS 108**

Client **RTS (RIM Testing Services)**

Certificate No: **ES3-3225\_Jan12**

## CALIBRATION CERTIFICATE

Object **ES3DV3 + SN:3225**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes**



Calibration date: **January 11, 2012**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.


Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	<b>Jeton Kastrati</b>	Laboratory Technician	
Approved by:	<b>Katja Pokovic</b>	Technical Manager	
Issued: January 12, 2012			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

Certificate No: ES3-3225\_Jan12

Page 1 of 11

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>3(30)</b>
Author Data <b>Andrew Becker</b>		Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

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



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

Accreditation No.: **SCS 108**

#### Glossary:


TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ 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

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

#### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>4(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ES3DV3 – SN:3225


January 11, 2012

# Probe ES3DV3

## SN:3225

Manufactured: September 1, 2009  
Calibrated: January 11, 2012

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

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>5(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ES3DV3– SN:3225

January 11, 2012

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3225

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.26	1.20	1.30	± 10.1 %
DCP (mV) <sup>B</sup>	101.2	100.8	101.2	

### Modulation Calibration Parameters


UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>C</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	107.7	±1.7 %
			Y	0.00	0.00	1.00	113.4	
			Z	0.00	0.00	1.00	110.4	

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

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

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

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

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>6(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>	

ES3DV3– SN:3225

January 11, 2012

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3225


### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.42	6.42	6.42	0.27	2.04	± 12.0 %
900	41.5	0.97	6.06	6.06	6.06	0.35	1.74	± 12.0 %
1810	40.0	1.40	5.23	5.23	5.23	0.73	1.21	± 12.0 %
1950	40.0	1.40	4.98	4.98	4.98	0.58	1.41	± 12.0 %
2450	39.2	1.80	4.50	4.50	4.50	0.79	1.26	± 12.0 %
2600	39.0	1.96	4.32	4.32	4.32	0.77	1.32	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.



		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>7(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ES3DV3– SN:3225

January 11, 2012


## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3225

### Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>f</sup>	Conductivity (S/m) <sup>f</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.27	6.27	6.27	0.36	1.74	± 12.0 %
900	55.0	1.05	6.07	6.07	6.07	0.29	2.02	± 12.0 %
1810	53.3	1.52	4.92	4.92	4.92	0.50	1.57	± 12.0 %
1950	53.3	1.52	4.87	4.87	4.87	0.59	1.49	± 12.0 %
2450	52.7	1.95	4.30	4.30	4.30	0.68	1.16	± 12.0 %
2600	52.5	2.16	4.12	4.12	4.12	0.80	0.99	± 12.0 %

<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

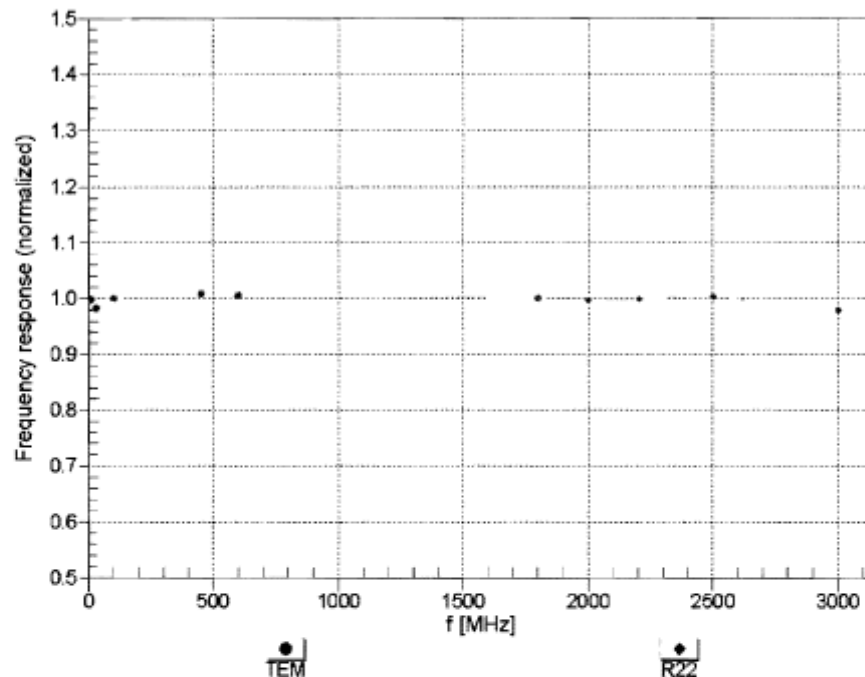
<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>8(30)</b>
	Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>
				IC ID <b>2503A-RFC30CW</b>

ES3DV3–SN:3225


January 11, 2012

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



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )



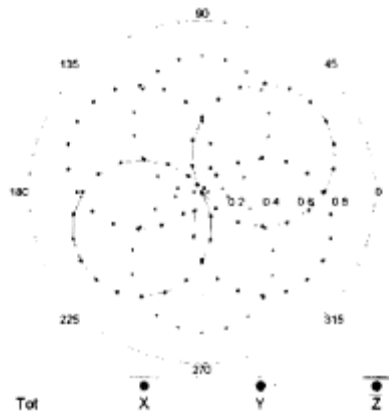
	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>9(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ES3DV3– SN:3225

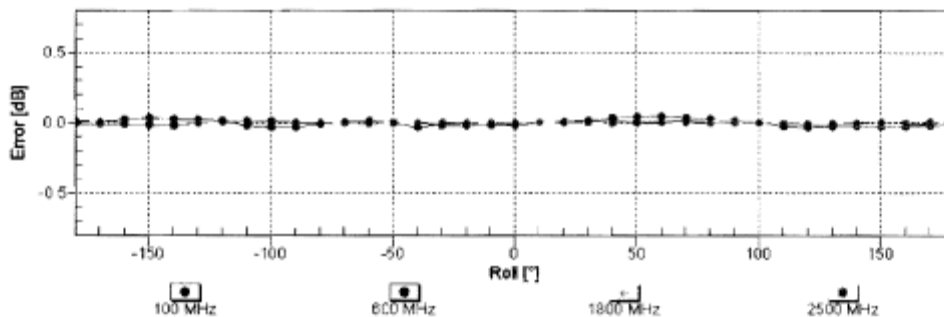
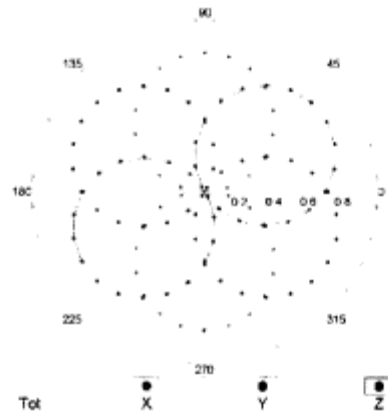
January 11, 2012

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$


$f=600$  MHz,TEM



$f=1800$  MHz,R22



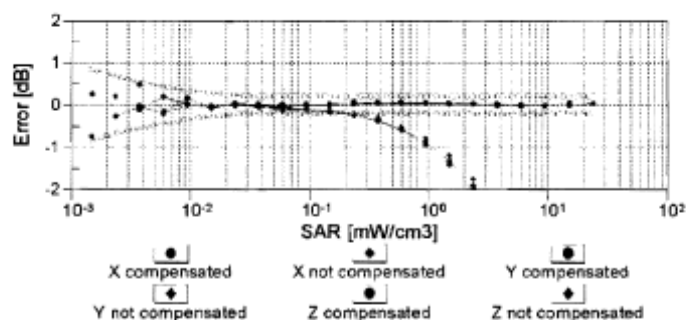
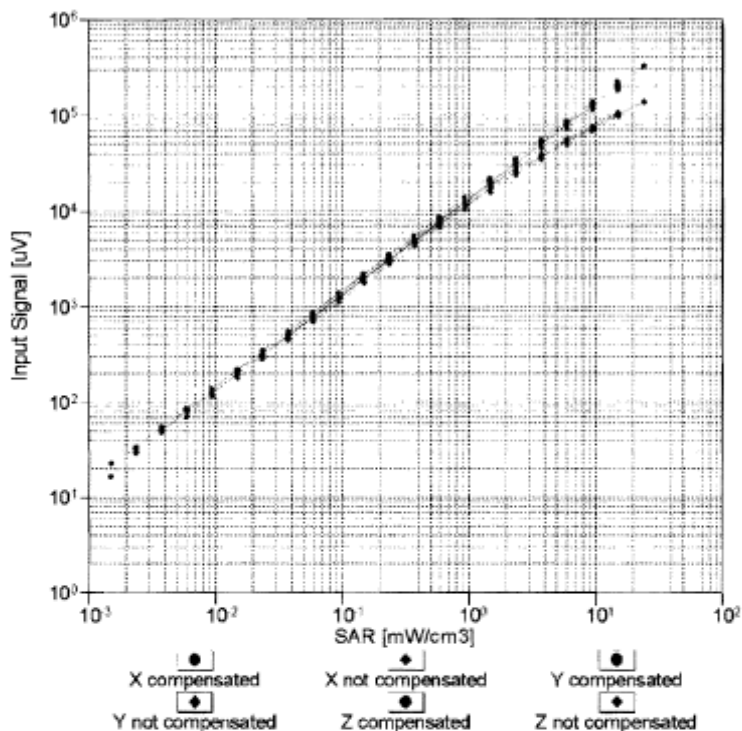
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>10(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>


ES3DV3- SN:3225

January 11, 2012

## Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f = 900 MHz)



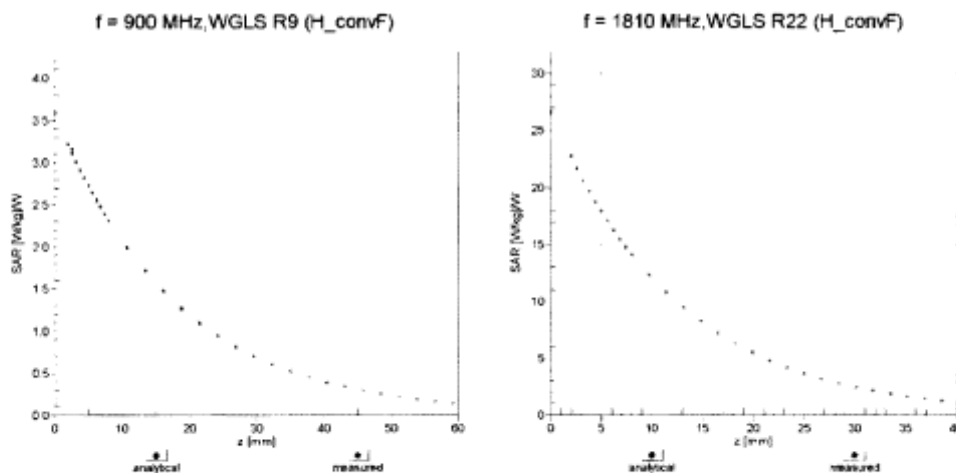
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  (k=2)

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>11(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ES3DV3– SN:3225

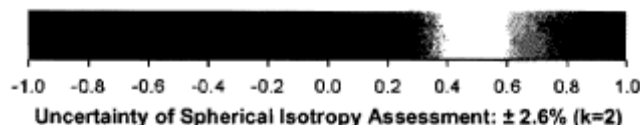
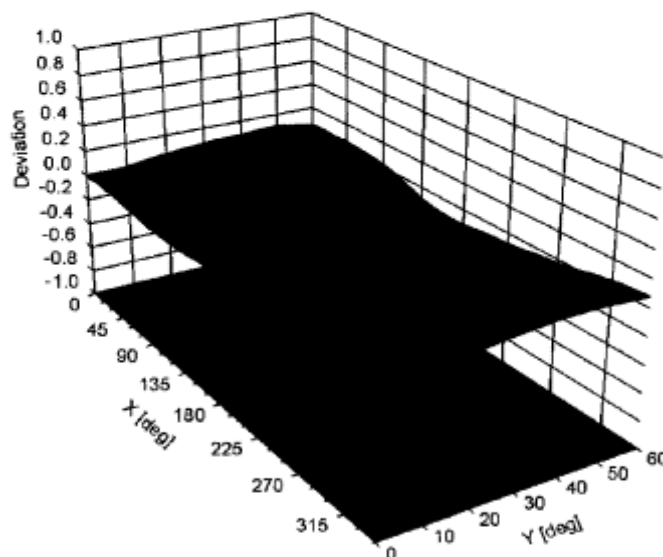
January 11, 2012


## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ), f = 900 MHz



	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>12(30)</b>
	Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>
				IC ID <b>2503A-RFC30CW</b>


ES3DV3– SN:3225

January 11, 2012

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3225

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>13(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

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



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

Accreditation No.: **SCS 108**

Client **RTS (RIM Testing Services)**

Certificate No: **ET3-1644\_Nov11**

## CALIBRATION CERTIFICATE

Object: **ET3DV6 - SN:1644**

Calibration procedure(s): **QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4**  
**Calibration procedure for dosimetric E-field probes**

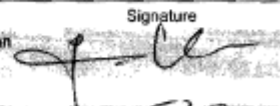
Calibration date: **November 15, 2011**


This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&E critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12


Calibrated by: **Jeton Kastrati** (Name) **Laboratory Technician** (Function)  (Signature)

Approved by: **Katja Pokovic** (Name) **Technical Manager** (Function)  (Signature)

Issued: November 17, 2011

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>14(30)</b>	
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

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



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

Accreditation No.: **SCS 108**

#### Glossary:


TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ 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

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

#### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>, B<sub>x,y,z</sub>, C<sub>x,y,z</sub>, VR<sub>x,y,z</sub>**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>15(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ET3DV6 – SN:1644

November 15, 2011


# Probe ET3DV6

## SN:1644

Manufactured: November 7, 2001  
Calibrated: November 15, 2011

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



	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>16(30)</b>
	Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>

ET3DV6– SN:1644

November 15, 2011

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1644

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V/m})^2$ ) <sup>A</sup>	1.71	1.97	1.98	± 10.1 %
DCP (mV) <sup>B</sup>	98.3	98.4	98.1	

### Modulation Calibration Parameters


UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	140.4	±2.2 %
			Y	0.00	0.00	1.00	118.6	
			Z	0.00	0.00	1.00	145.5	

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>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

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

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

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>17(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ET3DV6– SN:1644

November 15, 2011


## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1644

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>f</sup>	Conductivity (S/m) <sup>f</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.28	6.28	6.28	0.67	1.99	± 12.0 %
900	41.5	0.97	5.96	5.96	5.96	0.72	1.88	± 12.0 %
1810	40.0	1.40	5.10	5.10	5.10	0.63	2.36	± 12.0 %
2450	39.2	1.80	4.34	4.34	4.34	0.89	1.73	± 12.0 %

<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>18(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ET3DV6– SN:1644

November 15, 2011


## DASY/EASY - Parameters of Probe: ET3DV6- SN:1644

### Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.18	6.18	6.18	0.79	1.86	± 12.0 %
900	55.0	1.05	5.92	5.92	5.92	0.61	2.26	± 12.0 %
1810	53.3	1.52	4.69	4.69	4.69	0.65	2.60	± 12.0 %
2450	52.7	1.95	4.14	4.14	4.14	1.00	1.37	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

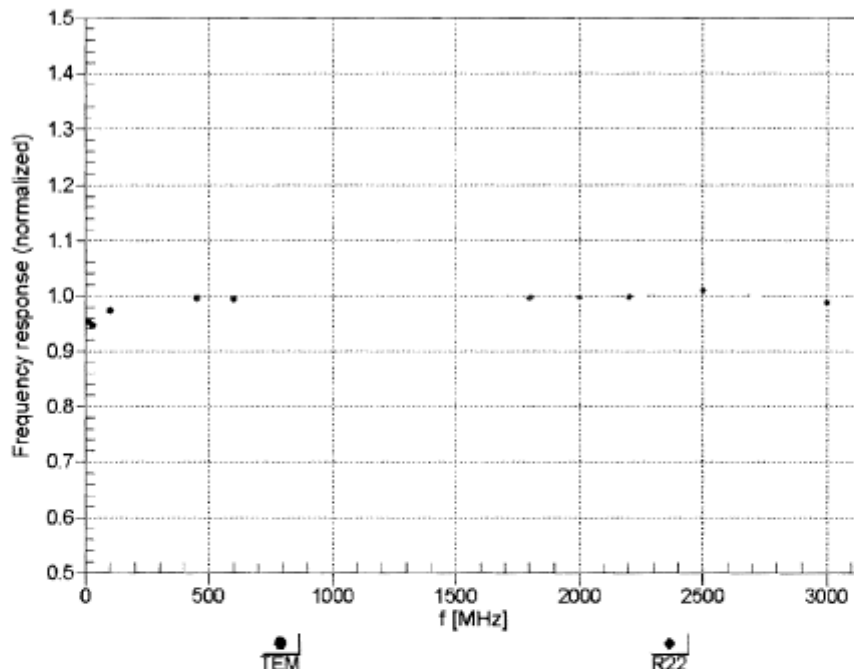
<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>19(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>


ET3DV6– SN:1644

November 15, 2011

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



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

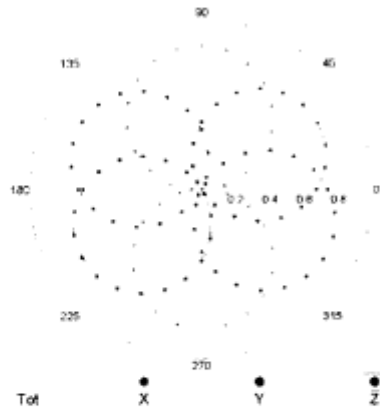
	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>20(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ET3DV6– SN:1644

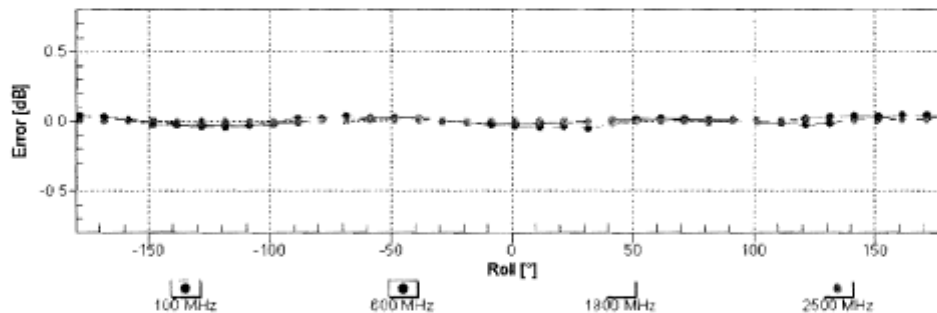
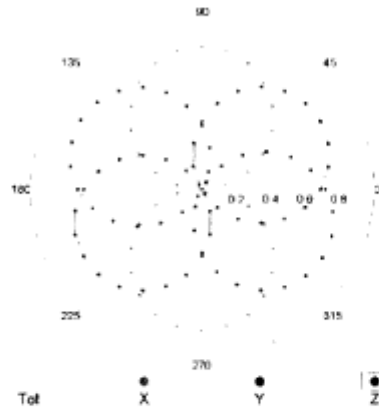
November 15, 2011


## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM



f=1800 MHz,R22

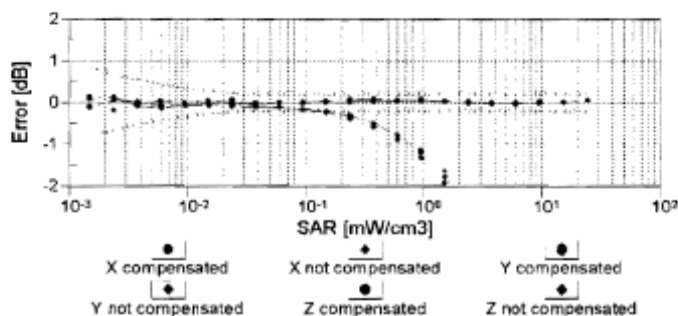
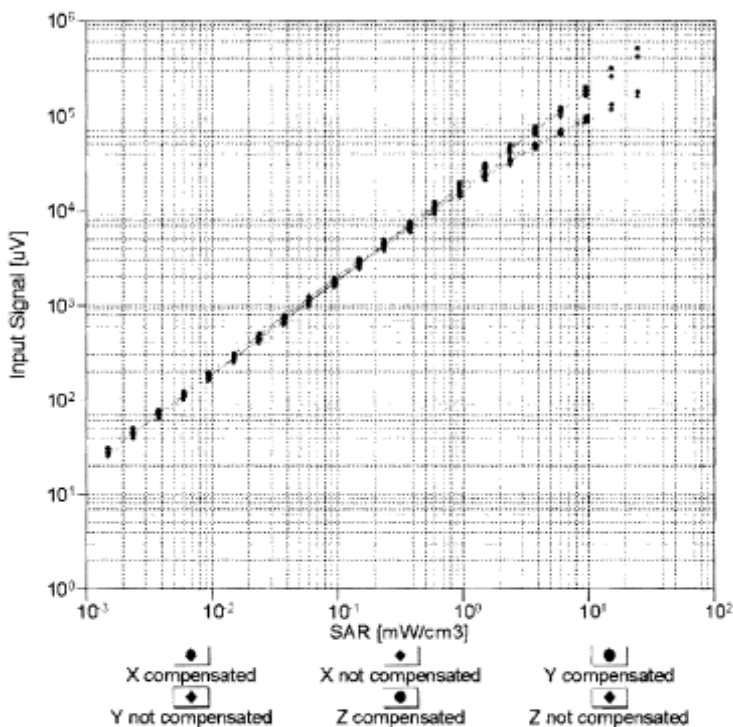

Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>21(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>


ET3DV6– SN:1644

November 15, 2011

## Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f = 900 MHz)



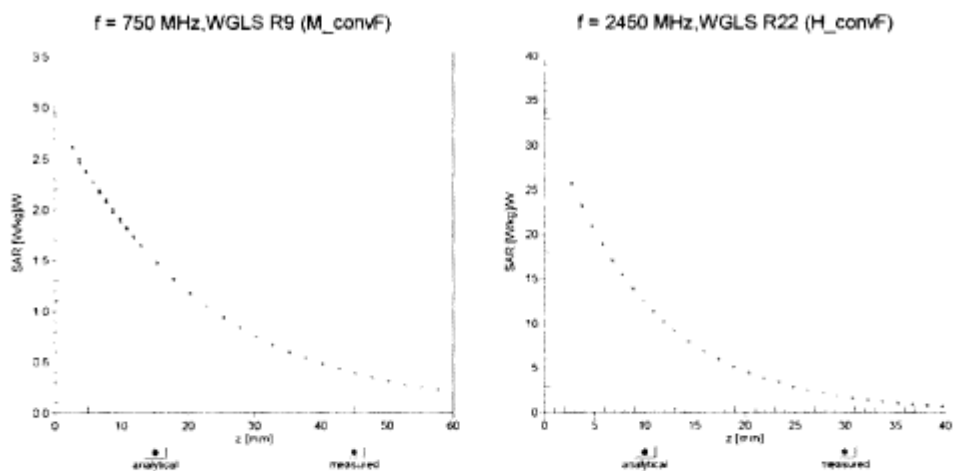
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>22(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

ET3DV6–SN:1644

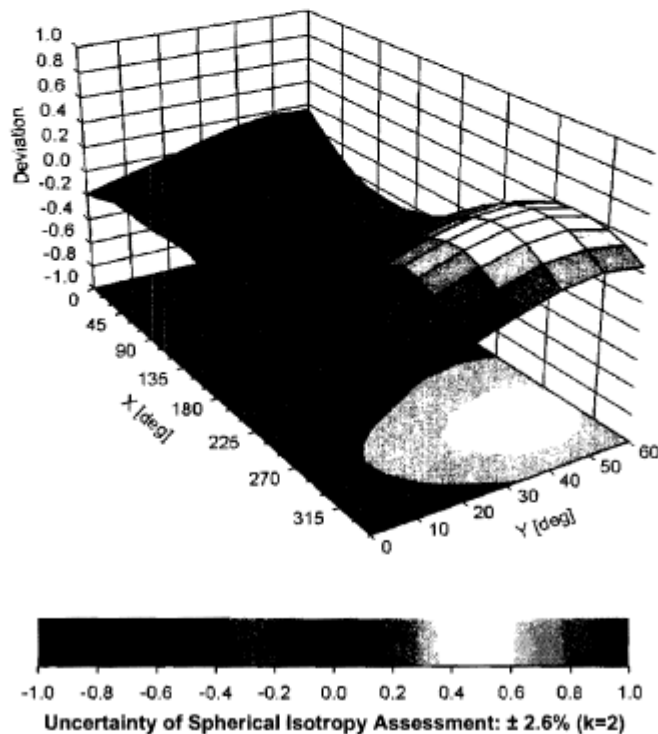
November 15, 2011

## Conversion Factor Assessment




## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$





		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>23(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>


ET3DV6– SN:1644


November 15, 2011

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1644

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	enabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>24(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>25(30)</b>
	Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>

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



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

Accreditation No.: **SCS 108**

Client **RTS (RIM Testing Services)**

Certificate No: **D1800V2-2d020\_Jan11**

## CALIBRATION CERTIFICATE

Object **D1800V2 - SN: 2d020**

Calibration procedure(s) **QA CAL-05.v8**  
**Calibration procedure for dipole validation kits**

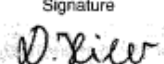
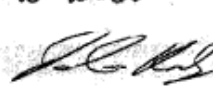
Calibration date: **January 13, 2011**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11


	Name	Function	Signature
Calibrated by:	<b>Dimce Iliev</b>	<b>Laboratory Technician</b>	
Approved by:	<b>Katja Pokovic</b>	<b>Technical Manager</b>	

Issued: January 13, 2011

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1800V2-2d020\_Jan11

Page 1 of 6

		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>26(30)</b>
Author Data <b>Andrew Becker</b>		Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

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



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

Accreditation No.: **SCS 108**

#### Glossary:

TSL tissue simulating liquid  
ConvF sensitivity in TSL / NORM x,y,z  
N/A not applicable or not measured

#### Calibration is Performed According to the Following Standards:


- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>27(30)</b>	
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

### Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.6
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1800 MHz ± 1 MHz	

### Head TSL parameters


The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	38.6 ± 6 %	1.38 mho/m ± 6 %
<b>Head TSL temperature during test</b>	(21.3 ± 0.2) °C	----	----

### SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	9.78 mW / g
SAR normalized	normalized to 1W	39.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>39.2 mW /g ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	5.13 mW / g
SAR normalized	normalized to 1W	20.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>20.5 mW /g ± 16.5 % (k=2)</b>

	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>28(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.5 $\Omega$ - 7.3 $j\Omega$
Return Loss	- 21.5 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.216 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.


The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 07, 2001



	Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>			Page <b>29(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

## DASY5 Validation Report for Head TSL

Date/Time: 13.01.2011 12:34:12

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d020**

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL U12 BB

Medium parameters used:  $f = 1800 \text{ MHz}$ ;  $\sigma = 1.38 \text{ mho/m}$ ;  $\epsilon_r = 38.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.05, 5.05, 5.05); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

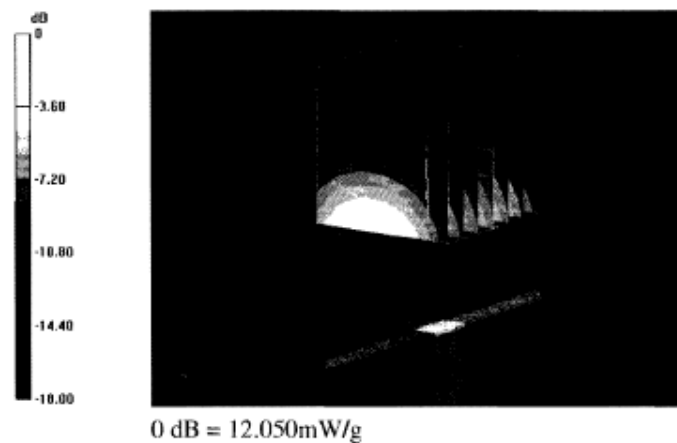
**Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement**  
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.654 V/m; Power Drift = 0.04 dB


Peak SAR (extrapolated) = 17.902 W/kg

**SAR(1 g) = 9.78 mW/g; SAR(10 g) = 5.13 mW/g**

Maximum value of SAR (measured) = 12.051 mW/g





		Document <b>Appendix D for the BlackBerry® Smartphone Model RFC31CW SAR Report</b>		Page <b>30(30)</b>
Author Data <b>Andrew Becker</b>	Dates of Test <b>February 23 – March 13, 2012</b>	Test Report No <b>RTS-5994-1203-76</b>	FCC ID: <b>L6ARFC30CW</b>	IC ID <b>2503A-RFC30CW</b>

### Impedance Measurement Plot for Head TSL

