

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 1(19)
Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05	FCC ID: L6A RBY40GW

APPENDIX D1: PROBE CALIBRATION DATA

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 2(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

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 **RIM**

Certificate No: **ET3-1644_Nov07**

CALIBRATION CERTIFICATE

Object: **ET3DV6 - SN:1644**
 Calibration procedure(s): **QA CAL-01.v6
 Calibration procedure for dosimetric E-field probes**
 Calibration date: **November 12, 2007**
 Condition of the calibrated item: **In Tolerance**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: November 12, 2007

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

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 3(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

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
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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_{x,y,z}:** Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * 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_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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_{x,y,z} * 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 ± 50 MHz to ± 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.

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 4(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

ET3DV6 SN:1644

November 12, 2007

Probe ET3DV6

SN:1644

Manufactured: November 7, 2001
Last calibrated: November 16, 2006
Recalibrated: November 12, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 5(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05
			FCC ID: L6A RBY40GW

ET3DV6 SN:1644

November 12, 2007

DASY - Parameters of Probe: ET3DV6 SN:1644

Sensitivity in Free Space ^A			Diode Compression ^B	
NormX	1.82 ± 10.1%	μV/(V/m) ²	DCP X	93 mV
NormY	1.92 ± 10.1%	μV/(V/m) ²	DCP Y	92 mV
NormZ	1.88 ± 10.1%	μV/(V/m) ²	DCP Z	95 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL	900 MHz	Typical SAR gradient: 5 % per mm		
	Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
	SAR _{be} [%] Without Correction Algorithm		7.1	3.7
	SAR _{be} [%] With Correction Algorithm		0.1	0.4
TSL	1810 MHz	Typical SAR gradient: 10 % per mm		
	Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
	SAR _{be} [%] Without Correction Algorithm		13.3	9.0
	SAR _{be} [%] With Correction Algorithm		0.5	1.6

Sensor Offset

Probe Tip to Sensor Center **2.7 mm**

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 The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

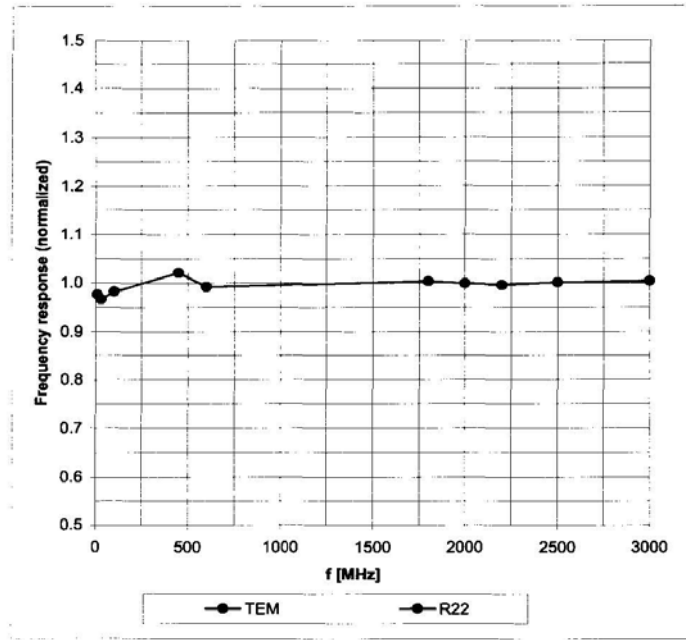
RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 6(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

ET3DV6 SN:1644

November 12, 2007

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



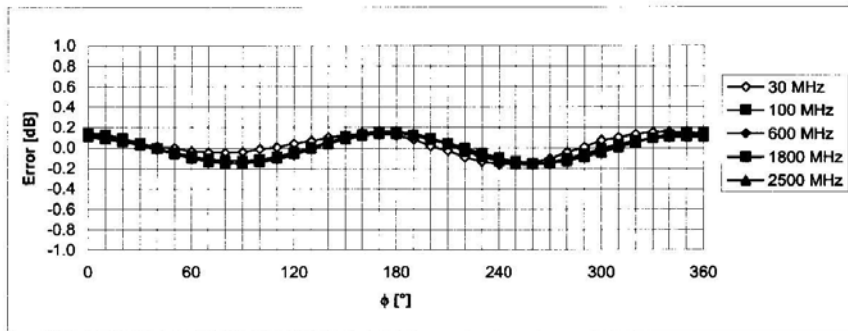
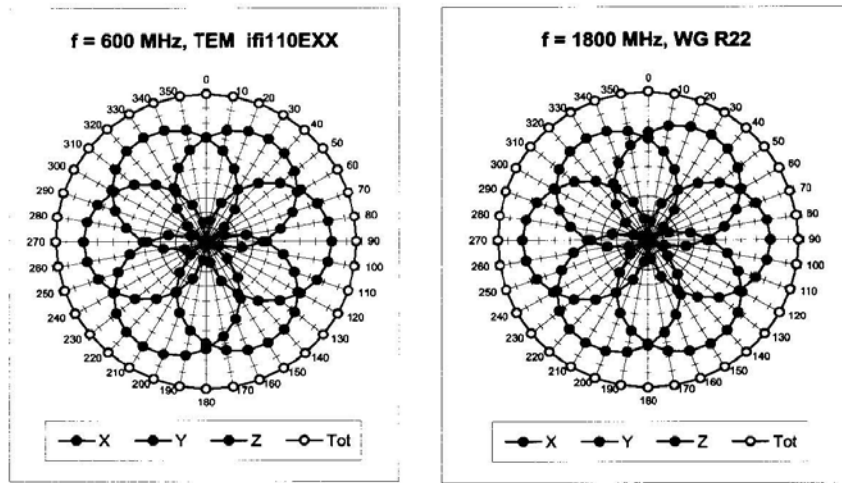
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 7(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

ET3DV6 SN:1644

November 12, 2007

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



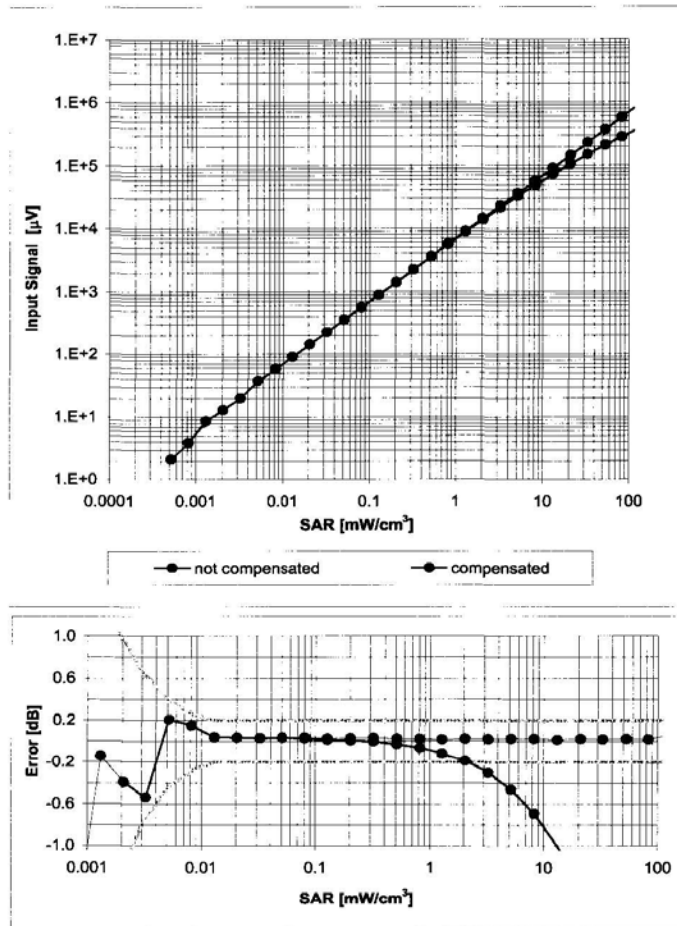
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 8(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

ET3DV6 SN:1644

November 12, 2007

Dynamic Range $f(SAR_{head})$
(Waveguide R22, $f = 1800$ MHz)

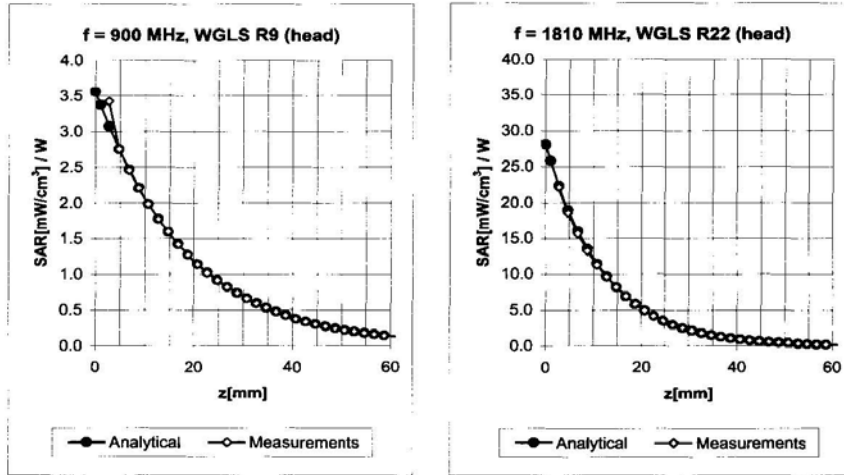


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6 SN:1644

November 12, 2007

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.21	4.04	6.41 ± 11.0%	(k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.71	2.01	5.24 ± 11.0%	(k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.32	2.97	5.97 ± 11.0%	(k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.73	2.27	4.75 ± 11.0%	(k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

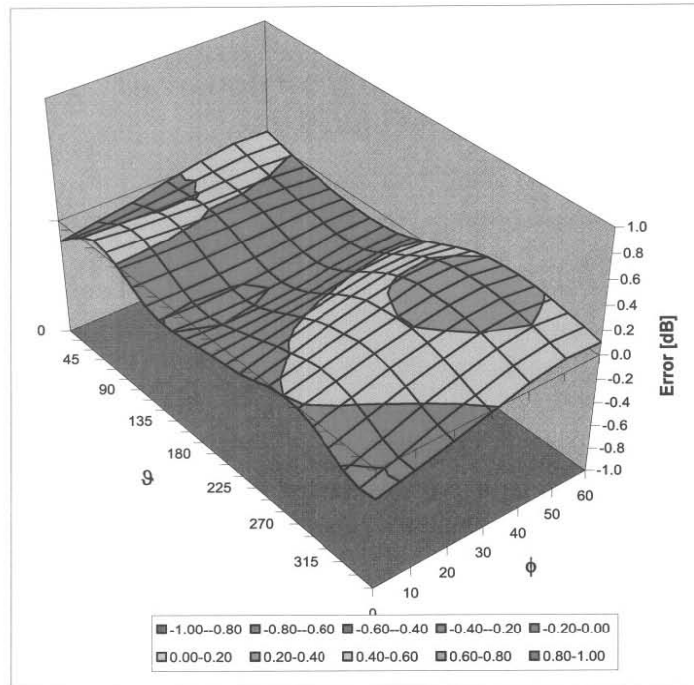
RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 10(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

ET3DV6 SN:1644

November 12, 2007

Deviation from Isotropy in HSL

Error (ϕ, θ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

RTS RIM Testing Services	Document	Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page	11(19)
	Author Data	Dates of Test	Test Report No	FCC ID:	
Shahriar Ninad	June 02-24, 2008	RTS-1114-0806-05	L6A RBY40GW		

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 RIM

Certificate No: EX3-3592_Nov07

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3592

Calibration procedure(s): QA CAL-01.v6 and QA CAL-14.v3
Calibration procedure for dosimetric E-field probes

Calibration date: November 6, 2007

Condition of the calibrated item: In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

Name	Function	Signature
Calibrated by: Katja Pokovic	Technical Manager	
Approved by: Niels Kuster	Quality Manager	

Issued: November 12, 2007

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

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 12(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

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



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
C 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
NORM_{x,y,z} sensitivity in free space
ConF sensitivity in TSL / NORM_{x,y,z}
DCP diode compression point
Polarization φ φ rotation around probe axis
Polarization ϑ ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- a) 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
- b) 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_{x,y,z}: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(*f*)_{x,y,z} = NORM_{x,y,z} * 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_{x,y,z}: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *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_{x,y,z} * *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 ± 50 MHz to ± 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.

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 13(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

EX3DV4 SN:3592

November 6, 2007

Probe EX3DV4

SN:3592

Manufactured:	September 18, 2006
Last calibrated:	December 14, 2006
Recalibrated:	November 6, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 14(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

EX3DV4 SN:3592

November 6, 2007

DASY - Parameters of Probe: EX3DV4 SN:3592

Sensitivity in Free Space^A

Diode Compression^B

NormX	0.490 ± 10.1%	$\mu V/(V/m)^2$	DCP X	89 mV
NormY	0.460 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	88 mV
NormZ	0.390 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	88 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 2450 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		2.0 mm	3.0 mm
SAR _{be} [%]	Without Correction Algorithm	5.0	2.8
SAR _{be} [%]	With Correction Algorithm	0.3	1.5

TSL 5200 MHz Typical SAR gradient: 25 % per mm

Sensor Center to Phantom Surface Distance		2.0 mm	3.0 mm
SAR _{be} [%]	Without Correction Algorithm	11.7	5.6
SAR _{be} [%]	With Correction Algorithm	0.0	0.0

Sensor Offset

Probe Tip to Sensor Center **1.0 mm**

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 The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

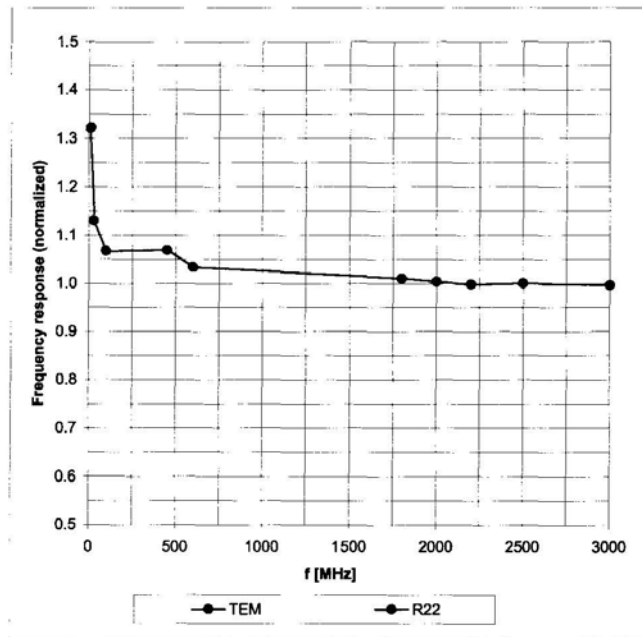
RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 15(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

EX3DV4 SN:3592

November 6, 2007

Frequency Response of E-Field

(TEM-Cell:if110 EXX, Waveguide: R22)



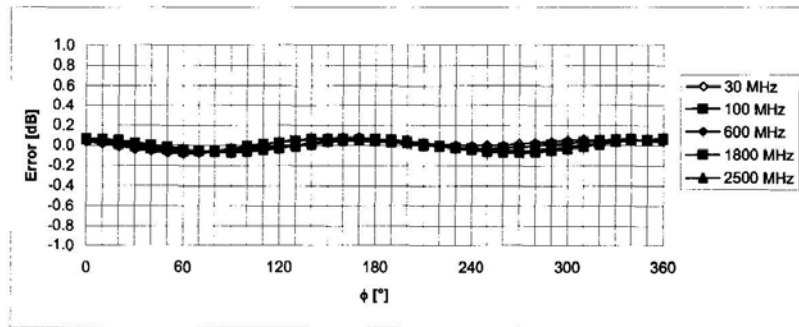
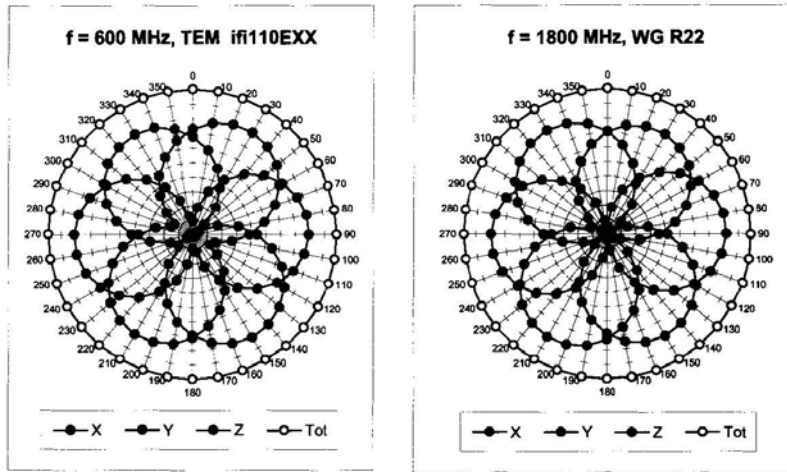
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 16(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

EX3DV4 SN:3592

November 6, 2007

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



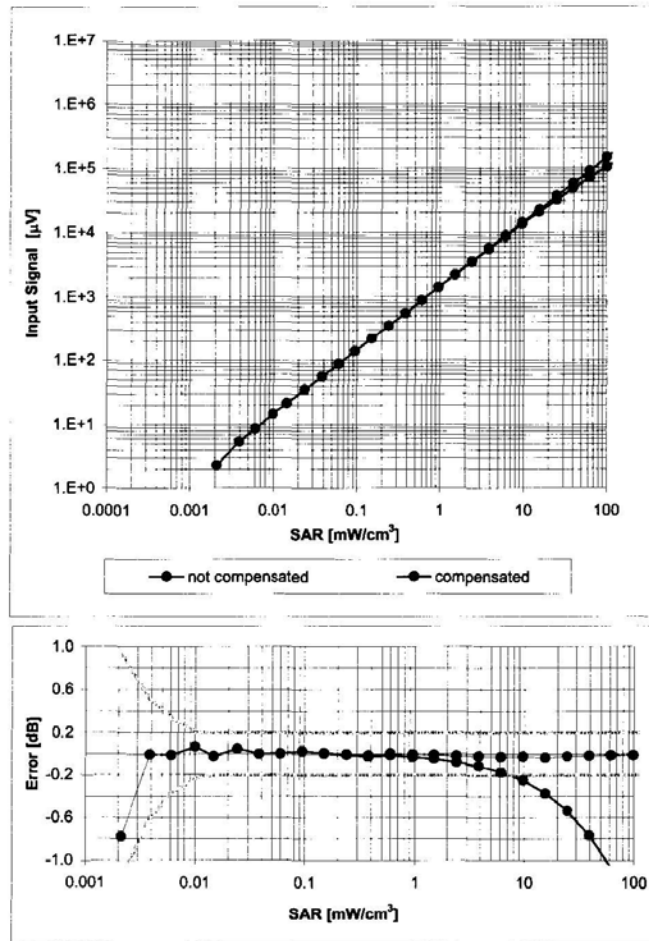
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 17(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

EX3DV4 SN:3592

November 6, 2007

Dynamic Range $f(SAR_{head})$
(Waveguide R22, $f = 1800$ MHz)

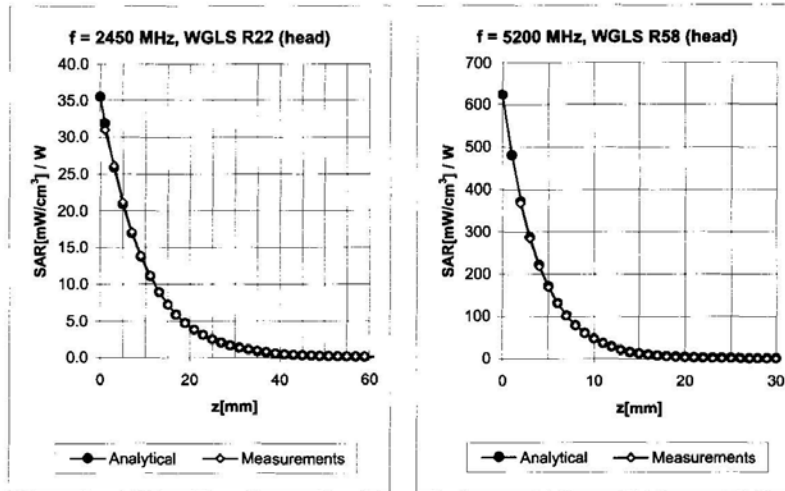


Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

EX3DV4 SN:3592

November 6, 2007

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.57	0.78	6.65 ± 11.8% (k=2)
5200	± 50 / ± 100	Head	36.0 ± 5%	4.66 ± 5%	0.37	1.70	4.77 ± 13.1% (k=2)
5500	± 50 / ± 100	Head	35.6 ± 5%	4.96 ± 5%	0.38	1.70	4.54 ± 13.1% (k=2)
5800	± 50 / ± 100	Head	35.3 ± 5%	5.27 ± 5%	0.47	1.70	4.25 ± 13.1% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.58	0.78	6.53 ± 11.8% (k=2)
5200	± 50 / ± 100	Body	49.0 ± 5%	5.30 ± 5%	0.38	1.60	4.26 ± 13.1% (k=2)
5500	± 50 / ± 100	Body	48.6 ± 5%	5.65 ± 5%	0.46	1.60	3.98 ± 13.1% (k=2)
5800	± 50 / ± 100	Body	48.2 ± 5%	6.00 ± 5%	0.28	1.60	4.04 ± 13.1% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

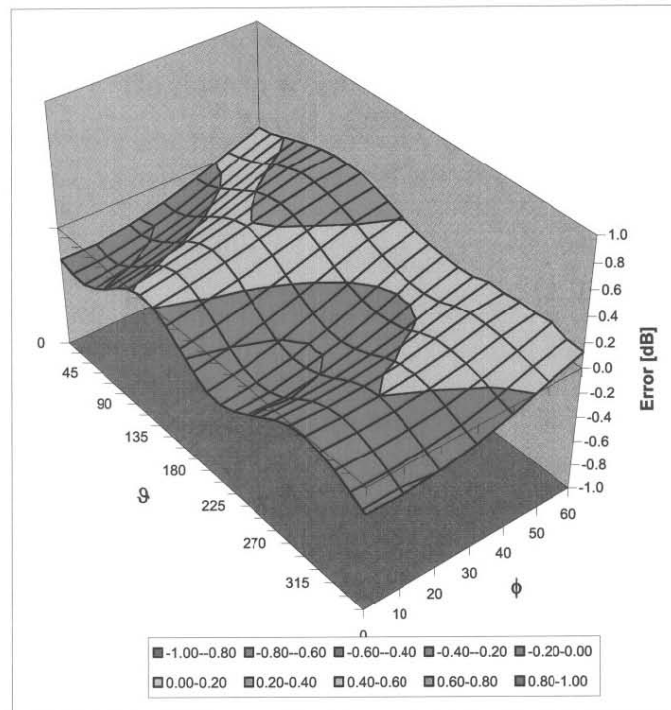
RTS RIM Testing Services	Document Appendix for the BlackBerry® Smartphone Model RBY41GW SAR Report		Page 19(19)
	Author Data Shahriar Ninad	Dates of Test June 02-24, 2008	Test Report No RTS-1114-0806-05

EX3DV4 SN:3592

November 6, 2007

Deviation from Isotropy in HSL

Error (ϕ , θ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)