| ≅ BlackBerry  | ′ | Appendix D for the BlackBe<br>Report Rev 2 | Page <b>1(63)</b> |             |                |
|---------------|---|--|-------------------|-------------|----------------|
| Author Data   | D | ates of Test                               | Test Report No    | FCC ID:     | IC             |
| Andrew Becker | A | Apr 02 - May 14, 2013                      | RTS-6026-1305-18  | L6ARFQ110LW | 2503A-RFQ110LW |
|               | N | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3             |             |                |

# APPENDIX D: PROBE & DIPOLE CALIBRATION DATA

|                          | Revision History |   |  |  |  |  |
|--------------------------|------------------|---|--|--|--|--|
| Rev. Number Date Changes |                  |   |  |  |  |  |
| Initial                  | May 31, 2013     |   |  |  |  |  |
| Rev 2                    | Dec 17, 2014     | Added equipment used for 802.11a Hotspot mode SAR testing 1. Page 14-24 |  |  |  |  |

| ≅ BlackBerry | Appendix D for the BlackBe<br>Report Rev 2             | erry® Smartphone Mo       | del RFQ111LW SAR | Page <b>2(63)</b> |
|--------------|--|---------------------------|------------------|-------------------|
| Author Data  | Dates of Test  | Test Report No            | FCC ID:          | IC                |
|              | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW      | 2503A-RFQ110LW    |

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





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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client RTS (RIM Testing Services)

Certificate No: ES3-3225\_Jan13

Accreditation No.: SCS 108

C

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 10, 2013

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

All calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | 10              | Car Date (Certificate No.)         | Scheduled Calibration  |
|----------------------------|-----------------|------------------------------------|------------------------|
| Power moter E44198         | 0841293874      | 29-Mar-12 (No. 217-01508)          | Apr-13                 |
| Power sensor E4412A        | MY41498087      | 29-Mar-12 (No. 217-01508)          | Apr-13                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 27-Mar-12 (No. 217-01531)          | Apr-13                 |
| Reference 20 dB Altenuator | SN: 55086 (20b) | 27-Mar-12 (No. 217-01629)          | Apr.13                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 27-Mar-12 (No. 217-01532)          | Apr-13                 |
| Reference Probe ES3DV2     | SN: 3013        | 26-Dec-12 (No. ES3-3013_Dec12)     | Dec-13                 |
| DAE4                       | SN: 660         | 20-Jun-12 (No. DAE4-660 Jun12)     | Jun-13                 |
| Secondary Standards        | ID .            | Check Date (in house)              | Scheduled Check        |
| RF generator HP 6648C      | US3642U01700    | 4-Aug-99 (in house sheck April 11) | In house check: Apr-13 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-12)  | In house check: Ost-13 |

Californied by Jefon Kastratis Laboratory Technician Signature

Approved by: Katja Polkovio Technical Manager

Hassed January 14, 2013

This califoration certificate shall not be reproducted except in full without written approval of the laboratory.

Certificate No: ES3-3225\_Jan13

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| ≅ BlackBerry  | Appendix D for the BlackBo<br>Report Rev 2             | erry® Smartphone Mo       | odel RFQ111LW SAR | Page 3(63)     |
|---------------|--|---------------------------|-------------------|----------------|
| Author Data   | Dates of Test  | Test Report No            | FCC ID:           | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 - 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW |

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





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Swiss Calibration Service

Accreditation No.: SCS 108

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#### Glossary:

TSL NORMx.y,z ConvF DCP tissue simulating liquid sensitivity in free space sensitivity in TSL / NORMx,y,z diode compression point

CF A, B, C, D crest factor (1/duty\_cycle) of the RF signal modulation dependent linearization parameters

Polarization o

o rotation around probe axis

Polarization 9 9 rot

5 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

#### 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
- 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:

- NORMx,y,z: Assessed for E-field polarization 8 = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
   NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,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.
- 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.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- 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.
- 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 NORMocy.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.

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|-------------|--|--|
|             |  |  |

| **** BlackBerry | Appendix D for the BlackBo<br>Report Rev 2             | erry® Smartphone Mo       | odel RFQ111LW SAR | Page <b>4(63)</b> |
|-----------------|--|---------------------------|-------------------|-------------------|
| Author Data     | Dates of Test  | Test Report No            | FCC ID:           | IC                |
| Andrew Becker   | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW    |

ES3DV3 - SN:3225

January 10, 2013

# Probe ES3DV3

SN:3225

Manufactured: Calibrated: September 1, 2009 January 10, 2013

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

Certificate No: ES3-3225\_Jan13

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| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | erry® Smartphone Mo | odel RFQ111LW SAR | Page <b>5(63)</b> |
|---------------|--|---------------------|-------------------|-------------------|
| Author Data   | Dates of Test  | Test Report No      | FCC ID:           | IC                |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18    | L6ARFQ110LW       | 2503A-RFQ110LW    |

ES30V3-SN:3225 January 10, 2013

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

#### **Basic Calibration Parameters**

|  | Sensor X | Sensor Y | Sensor Z | Unc (k+2) |
|--|----------|----------|----------|-----------|
| Norm (µV/(V/m) <sup>2</sup> ) <sup>A</sup><br>DCP (m/V) <sup>B</sup> | 1.29     | 1.19     | 1.31     | ± 10.1 %  |
| DCP (m/V) <sup>B</sup>   | 100.5    | 101.5    | 99.9     | -         |

#### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dBõV | c   | D<br>dB    | VR<br>mV | Une*<br>(k=2) |
|-----|---------------------------|---|---------|-----------|-----|------------|----------|---------------|
| 0   | CW                        | X | 0.0     | 0.0       | 1.0 | 0.00 157.5 | ±2.7 %   |               |
|     | 1000                      | Y | 0.0     | 0.0       | 1.0 | 11 100000  | 158.4    |               |
|     |                           | Z | 0.0     | 0.0       | 1.0 | 100        | 165.9    |               |

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

Numerical linearization parameter: uncertainty not required.

\* Uncertainty is determined using the mix, deviation from linear response applying rectangular distribution and is expressed for the square of the field velve.

| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | erry® Smartphone Mo       | odel RFQ111LW SAR | Page <b>6(63)</b> |
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| Author Data   | Dates of Test  | Test Report No            | FCC ID:           | IC                |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW    |

January 10, 2013

ES30V3- SN:3225

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

# Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity | Conductivity<br>(S/m) | ConvF X | ConvF Y | ConvF Z | Alpha | Depth<br>(mm) | Unct.<br>(k×2) |
|----------------------|--------------------------|-----------------------|---------|---------|---------|-------|---------------|----------------|
| 750                  | 41.9                     | 0.89                  | 6.56    | 6.56    | 8.56    | 0.42  | 1.54          | ±12.0%         |
| 900                  | 41.5                     | 0.97                  | 6.19    | 6.19    | 6.19    | 0.43  | 1.52          | ± 12.0 %       |
| 1810                 | 40.0                     | 1.40                  | 5.35    | 5.35    | 5.35    | 0.63  | 1.39          | ± 12.0 %       |
| 1950                 | 40.0                     | 1.40                  | 5.09    | 5.09    | 5.09    | 0.80  | 1.23          | ± 12.0 %       |
| 2450                 | 39.2                     | 1.80                  | 4.65    | 4.65    | 4.65    | 0.61  | 1.63          | ±12.0%         |
| 2600                 | 39.0                     | 1.96                  | 4.43    | 4.43    | 4.43    | 0.80  | 1.32          | ±12.0 %        |

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

"All requencies below 3 GHz, the validity of issue parameters (i. and e) can be relaxed to ± 10% if liquid compensation formula is applied to reseased SAR values. All frequencies above 3 GHz, the validity of issue parameters (ii and e) is restricted to ± 5%. The uncertainty is the RSS of the Convil' uncertainty for indicated target fissue parameters.

Certificate No: ES3-3225, Jan13

| ≅BlackBerry   | Appendix D for the BlackB Report Rev 2                 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|---------------|--|--|-------------|----------------|--|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |  |

ES3DV3- SN:3225 January 10, 2013

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

# Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity <sup>F</sup> | Conductivity<br>(Sim) | ConvF X | ConvF Y | ConvF Z | Alpha | Depth<br>(mm) | Unct.<br>(k=2) |
|----------------------|---------------------------------------|-----------------------|---------|---------|---------|-------|---------------|----------------|
| 750                  | 55.5                                  | 0.96                  | 6.27    | 6.27    | 6.27    | 0.48  | 1.51          | ± 12.0 %       |
| 900                  | 55.0                                  | 1.05                  | 6.12    | 6.12    | 6.12    | 0.73  | 1.25          | ± 12.0 %       |
| 1810                 | 53.3                                  | 1.52                  | 5.04    | 5.04    | 5.04    | 0.57  | 1.47          | ± 12.0 %       |
| 1950                 | 53.3                                  | 1.52                  | 4.94    | 4.94    | 4.94    | 0.58  | 1.50          | ± 12.0 %       |
| 2450                 | 52.7                                  | 1.95                  | 4,35    | 4.35    | 4.35    | 0.70  | 1.16          | ± 12.0 %       |
| 2600                 | 52.5                                  | 2.16                  | 4.11    | 4.11    | 4.11    | 0.67  | 0.99          | ± 12.0 %       |

Forguency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), size it is restricted to ± 50 MHz. The uncertainty is the RSS of the ComiF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
"All frequencies before 3 CHz, the validity of tissue parameters (x and x) can be relaxed to ± 10% if fould compensation formula is applied to measured SAR values. At frequencies above 3 CHz, the validity of tissue parameters (x and x) is restricted to ± 5%. The uncertainty is the RSS of the Convif uncertainty for indicated target lissue parameters.

the Convertice to indicated target tissue parameters.

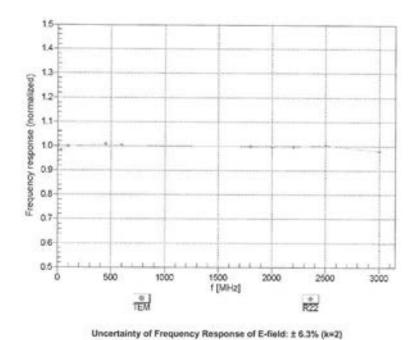
Certificate No: ES3-3225, Jan13

| *** BlackBerry | Appendix D for the BlackBo<br>Report Rev 2 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|----------------|--|--|-------------|----------------|--|
| Author Data    | Dates of Test                              | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker  | Apr 02 - May 14, 2013                      | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW |  |
|                | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3  |             |                |  |

ES3DV3- SN:3225

January 10, 2013

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



Certificate No: ES3-3225\_Jan13

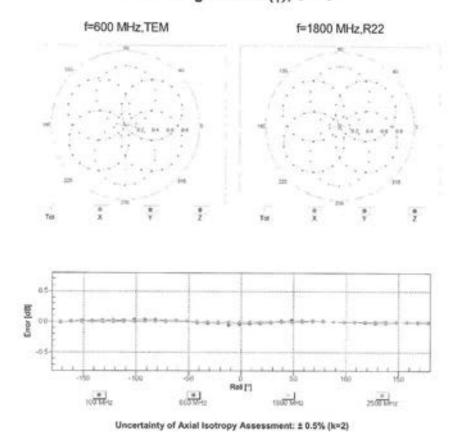
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| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|---------------|--|--|-------------|----------------|--|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |  |

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# Receiving Pattern (6), 9 = 0°



Certificate No: ES3-3225\_Jan13

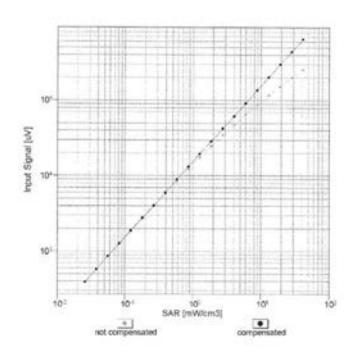
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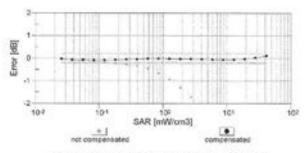
| **** BlackBerry | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|-----------------|--|--|-------------|----------------|--|
| Author Data     | Dates of Test  | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker   | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |  |

ES3DV3- SN:3225

January 10, 2013

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





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

Certificate No: ES3-3225\_Jan13

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| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
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| Author Data   | Dates of Test                              | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker | Apr 02 - May 14, 2013                      | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW |  |
|               | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3  |             |                |  |

ES30V3-SN:3225 January 10, 2013 Conversion Factor Assessment f = 900 MHz, WGLS R9 (H\_convF) f = 1810 MHz,WGLS R22 (H\_convF) 14 Deviation from Isotropy in Liquid Error (¢, 3), f = 900 MHz 1.0 0.8 0.6 0.4 0.0 -0.2 -0.4 -1.0 135 -1.0 -0.6 -0.6 -0.4 -0.2 0.0 0.2 0.4 0.6 0.8 Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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Certificate No: E83-3225\_Jan13

| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|---------------|--|--|-------------|----------------|--|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |  |

January 10, 2013

ES30V3- SN 3225

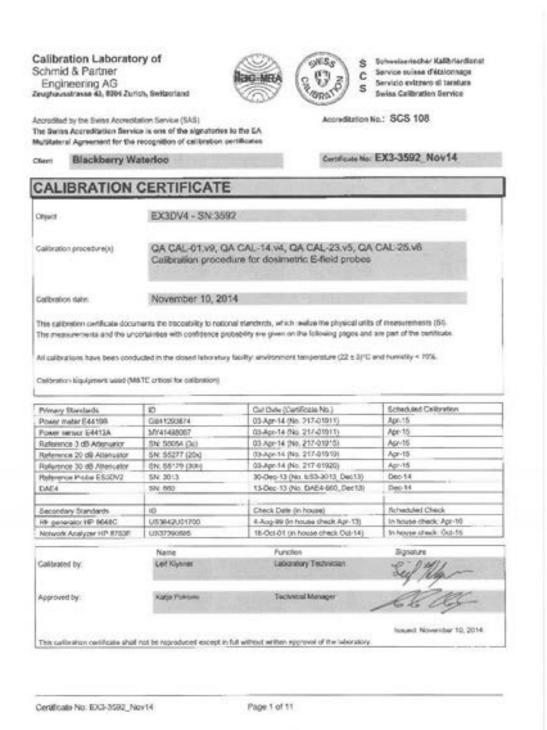
# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3225

#### Other Probe Parameters

| Sensor Arrangement.                           | Triangular |
|---|------------|
| Connector Angle (*)                           | 8.3        |
| 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       |

| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|---------------|--|--|-------------|----------------|--|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |  |

| ::: BlackBerry | Appendix D for the BlackBe<br>Report Rev 2             | erry® Smartphone Mo | del RFQ111LW SAR | Page 14(63)    |
|----------------|--|---------------------|------------------|----------------|
| Author Data    | Dates of Test  | Test Report No      | FCC ID:          | IC             |
| Andrew Becker  | Apr 02 - May 14, 2013<br>Mar 26 - 28, Dec. 10-12, 2014 | RTS-6026-1305-18    | L6ARFQ110LW      | 2503A-RFQ110LW |



| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2 | erry® Smartphone Mo | del RFQ111LW SAR | Page <b>15</b> (63) |
|---------------|--|---------------------|------------------|---------------------|
| Author Data   | Dates of Test                              | Test Report No      | FCC ID:          | IC                  |
| Andrew Becker | Apr 02 - May 14, 2013                      | RTS-6026-1305-18    | L6ARFQ110LW      | 2503A-RFQ110LW      |
|               | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3               |                  |                     |

Calibration Laboratory of Schmid & Partner Engineering AG

Engineering AG Zoughausstrasse 43, 2004 Zurich, Switzerland





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C Service suinze d'étalonnage
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Swiss Calibration Service

Accordingtion No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS)

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Glossary:

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CF crest factor (1/duty\_oycle) of the RF signal A, B, C, D modulation dependent linearization parameters

Polarization φ o rotation around probe axis

Polarization 3 3 rotation around an exist hat is in the plane normal to probe exis (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:

- iEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- EC 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

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- 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 sxis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the NORMs (no uncertainty required).

Contificate No. EX3-3592, Nov14

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| **** BlackBerry | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|-----------------|--|--|-------------|----------------|--|
| Author Data     | Dates of Test  | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker   | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW |  |

EX3DV4 - 8N:3592

November 10, 2014

# Probe EX3DV4

SN:3592

Manufactured: Calibrated: September 18, 2006 November 10, 2014

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

Certificate No. EX3-3592 Nov14

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| ≅ BlackBerry  | Appendix D for the BlackBo<br>Report Rev 2             | erry® Smartphone Mo       | odel RFQ111LW SAR | Page <b>17(63)</b> |
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| Author Data   | Dates of Test  | Test Report No            | FCC ID:           | IC                 |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 - 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW     |

EX3DV4-SN:3592

November 10, 2014

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3592

#### Basic Calibration Parameters

|  | Sensor X | Sensor Y | Sensor Z | Unc (k+2) |
|--|----------|----------|----------|-----------|
| Norm (µV/(V/m) <sup>7</sup> ) <sup>x</sup> | 0.48     | 0.47     | 0.40     | ± 10.1 %  |
| DCP (mV)*                                  | 95.2     | 98.0     | 98.8     | 7         |

#### Modulation Calibration Parameters

| UID  | Communication System Name |   | A<br>dB | B<br>⊲B√μV | С   | D dB  | VR<br>mV | Unc*<br>(k=2) |
|------|---------------------------|---|---------|------------|-----|-------|----------|---------------|
| 0 CW | CW                        | × | 0.0     | 0.0        | 1.0 | 0.00  | 145.9    | 23.3 %        |
|      |                           | Y | 0.0     | 0.0        | 1.0 |       | 155.9    |               |
|      | v —                       | Z | 0.0     | 0.0        | 1.0 | 1 1 1 | 140.1    |               |

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>&</sup>lt;sup>6</sup> The uncertainties of NormXYZ do not affect the E<sup>2</sup>-field uncertainty inside TSL (wer Pages 5 and 6).
<sup>8</sup> Numerical Recordation parameter: uncertainty not required.
<sup>8</sup> Uncurainty is determined using the max, deviation from linear response applying rectangular distribution and is expressed for the squire of the field variae.

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| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW |

EX3DV4-SN:3502

November 10, 2014

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3592

# Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity* | Conductivity<br>(5/m) | ConvF X | ConvF Y | ConvF Z | Alpha <sup>0</sup> | Depth <sup>G</sup><br>(mm) | Unot.<br>(k=2) |
|----------------------|---------------------------|-----------------------|---------|---------|---------|--------------------|----------------------------|----------------|
| 2800                 | 39.0                      | 1.98                  | 6.80    | 5.80    | 6.80    | 0.36               | 0.93                       | ±12.0 %        |
| 5250                 | 35.9                      | 4.71                  | 4.63    | 4.63    | 4.63    | 0.35               | 1,80                       | ±13.1%         |
| 5600                 | 35.5                      | 5.07                  | 4.20    | 4.20    | 4.20    | 0.40               | 1.80                       | ±13.1%         |
| 5750                 | 35.4                      | 5.22                  | 4.34    | 4.34    | 4.34    | 0.40               | 1.80                       | ±13.1%         |

Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v1.4 and higher (see Page 2), after it is restricted to a 50 MHz. The uncertainty in the HSS of the Conv5 incontainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for Conv5 associations of 30, 64, 128, 150 and 200 MHz respectively. Above 5 GHz thequency validity can be elektriced to ± 110 MHz.

At the parameters below 5 GHz, the validity of tinsue parameters (r and e) can be released to ± 10% if lepid companies on formula is applied to necessarily for advances above 3 GHz, the validity of tissue parameters (r and n) is restricted to a 15%. The uncertainty is the RSS of the Conv5 uncertainty for advanced strips from parameters.

AppliaDepth and observational during calibration. SPEAC was rures that the remaining deviation due to the boundary effect wife companisation is always less than ± 1% for frequencies bodow 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the protein to dismeter from the boundary.

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| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW     |

EX30V4 SN:3592

November 10, 2014

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3592

### Calibration Parameter Determined in Body Tissue Simulating Media

| r (MHz) <sup>c</sup> | Relative<br>Permittivity | Conductivity<br>(S/m) | Com/F X | CorvFY | ConvF Z | A)pha <sup>©</sup> | Depth <sup>Q</sup><br>(mm) | Unct.<br>(k=2) |
|----------------------|--------------------------|-----------------------|---------|--------|---------|--------------------|----------------------------|----------------|
| 2600                 | 52.5                     | 2.16                  | 6.84    | 6.84   | 6.84    | 0.78               | 0.62                       | ± 12.0 %       |
| 5250                 | 48.9                     | 5.36                  | 4.06    | 4.06   | 4.06    | 0.45               | 1.90                       | ± 13.1 %       |
| 5600                 | 48.5                     | 5.77                  | 3.78    | 3,78   | 3,78    | 0.45               | 1.90                       | ± 13.1 %       |
| 5750                 | 48.3                     | 5.94                  | 3.81    | 3.81   | 3.81    | 0.50               | 1.90                       | #13.1%         |

Firequency validity above 300 MHz of a 100 MHz only applied for DASY v4.4 and higher (see Page 2), whe it is restricted to a 50 MHz. The uncortainty is the PGS of the Const uncortainty at calibration frequency and the uncertainty for the endoated frequency limit. Frequency validity below 300 MHz is a 10, 25, 40, 50 and 70 MHz for Const assessments at 30, 64, 128, 150 and 200 MHz nespectively. Above 5 GHz frequency validity can be entended to a 110 MHz.
\*\*At Impurcises below 3 DHz, the validity of lissue paterneters (clerk s) can be released to a 10% if liquid compensation formula in applied to measured SAH values. At lisquencies above 3 GHz, the validity of tesse parameters is sentially a restricted to a 6%. The uncertainty is the RSS of the Const (uncertainty is involvable larged tesse parameters.)

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the Conf. undertainty is indicated larget takes parameters as the remaining deviacion due to the boundary effect after componential or a slauge loss than £ 1% for frequencies below 3. OHr and helice ± 2% for frequencies between 3.6 GHz at any distance larger from half the probe tip diameter from the boundary.

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Frequency Response of E-Field (TEM-Cell:Hi110 EXX, Waveguide: R22)

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

1500 f [MHz]

2000

2500

\* R22 3000

1000

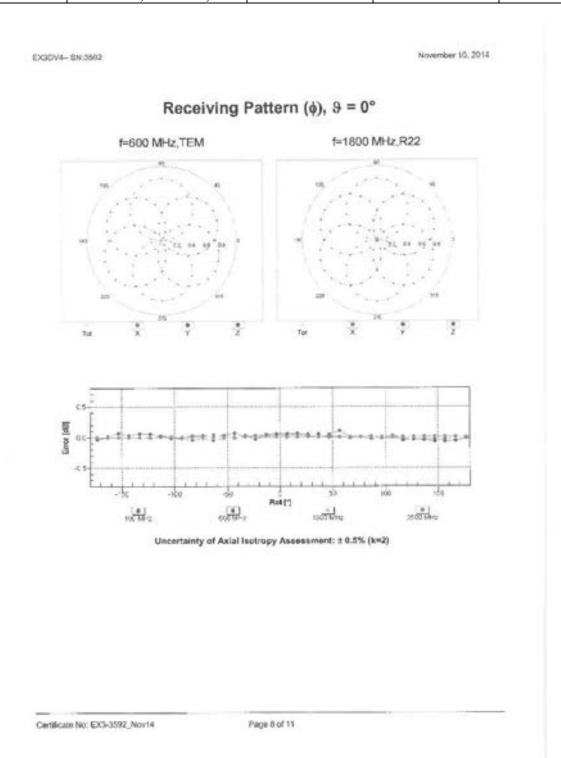
1EM

500

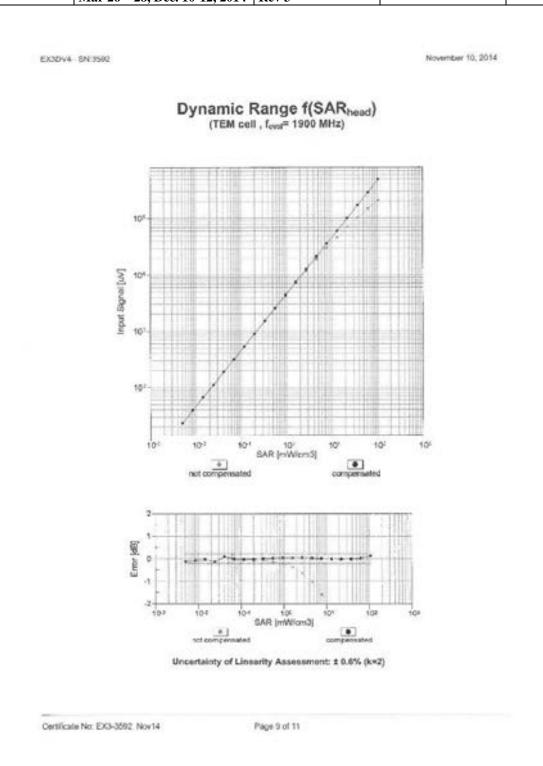
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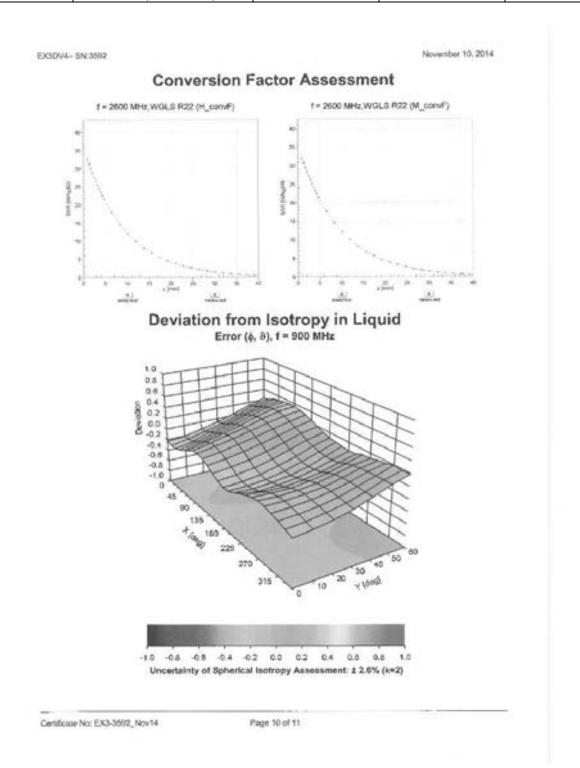
| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | erry® Smartphone Mo       | odel RFQ111LW SAR | Page <b>21(63)</b> |
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| Andrew Becker  | Apr 02 - May 14, 2013<br>Mar 26 - 28 Dec 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW |



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EX3DV4~ SN:3592

November 10, 2014

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3592

#### Other Probe Parameters

| Sensor Amangement                             | Triengular |
|---|------------|
| Connector Angle (*)                           | -13.3      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 nm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |
|   |            |

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| *** BlackBerry | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR<br>Report Rev 2 |             | Page <b>25(63)</b> |
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RTS (RIM Testing Services)

Accreditation No.: SCS 108

11141 - 211-

Certificate No: D835V2-446\_Jan13 CALIBRATION CERTIFICATE Object D835V2 - SN: 446 Calibration procedure(s) QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz January 07, 2013 Calibration date: 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 Cal Date (Certificate No.) Scheduled Calibration Power meter EPM-442A GB37480704 01-Nov-12 (No. 217-01640) Oct-13 01-Nov-12 (No. 217-01640) Power sensor HP 8481A US37292783 Oct-13 Reference 20 dB Attenuator SN: 5058 (20k) 27-Mar-12 (No. 217-01530) Apr-13 Type-N mismatch combination SN: 5047.3 / 06327 27-Mar-12 (No. 217-01533) Apr-13 Reference Probe ES3DV3 SN: 3205 28-Dec-12 (No. ES3-3205\_Dec12) Dec-13 27-Jun-12 (No. DAE4-601\_Jun12) DAE4 Jun-13 SN: 601 Secondary Standards ID# Check Date (in house) Scheduled Check MY41092317 18-Oct-02 (in house check Oct-11) In house check: Oct-13 Power sensor HP 8481A RF generator R&S SMT-06 04-Aug-99 (in house check Oct-11) In house check: Oct-13 100005 US37390585 S4206 18-Oct-01 (in house check Oct-12) In house check: Oct-13 Network Analyzer HP 6753E Function Name Calibrated by: Leif Klysner Laboratory Technician Katja Pokovic Technical Manager Approved by: Issued: January 8, 2013 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D835V2-446\_Jan13

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| **** BlackBerry | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             | Page <b>26(63)</b> |
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| Andrew Becker   | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW     |

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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:

- 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
- EC 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
- c) 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:

d) 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.

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%.

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| *** BlackBer  | ry | Appendix D for the BlackBe<br>Report Rev 2 | erry® Smartphone Mo | odel RFQ111LW SAR | Page <b>27</b> (63) |
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| Andrew Becker | A  | apr 02 - May 14, 2013                      | RTS-6026-1305-18    | L6ARFQ110LW       | 2503A-RFQ110LW      |
|               | N  | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3               |                   |                     |

#### Measurement Conditions

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

| DASY Version                 | DASY5                  | V52.8.4     |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 835 MHz a 1 MHz        |             |

#### Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 41.5         | 0.90 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 42.0 ± 6 %   | 0.92 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

#### SAR result with Head TSL

| SAR averaged over 1 cm3 (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                              | 250 mW input power | 2.38 W/kg                |
| SAR for nominal Head TSL parameters       | normalized to 1W   | 9.39 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.55 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.13 W/kg ± 16.5 % (k=2) |

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| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             | Page <b>28</b> (63) |
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| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC                  |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW      |

# Appendix

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 50.1 Ω - 6.5 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 23.7 dB       |

#### General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.385 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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 | October 24, 2001 |

Certificate No: D635V2-446\_Jan13

| ≅ BlackBerry | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
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|              | Apr 02 - May 14, 2013<br>Mar 26 - 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

#### DASY5 Validation Report for Head TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 446

Communication System: CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz;  $\sigma = 0.92 \text{ S/m}$ ;  $\epsilon_r = 42$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

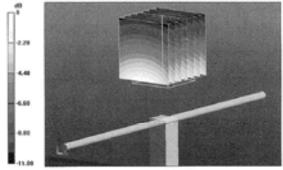
#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

#### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 56.650 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 3.61 W/kg SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.55 W/kg

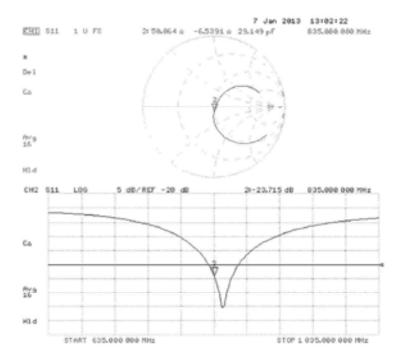
Maximum value of SAR (measured) = 2.79 W/kg



0 dB = 2.79 W/kg = 4.46 dBW/kg

| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
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| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

### Impedance Measurement Plot for Head TSL



| *** BlackBerry | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
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| Author Data    | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker  | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

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|  | ERTIFICATE  |  |  |
|--|---|--|--|
| Collect  | D1900V2 - SN: 5   | d075   |  |
| Calibration procedure(x)   | QA CAL-05.v8<br>Calibration proce   | dure for dipole validation kits  |  |
| Corbration date  | April 5, 2011   |  |  |
|  |   | onel standards, which resilte the physical s<br>robability are given on the lollowing pages i  |  |
| All culibrations have been conduc  | ted in the closed laborator   | y facility: environment temperature (22 × 3)   | °C and humidity < 70%.   |
| Calibration Equipment used (M&)  | (E critical for calibration)  |  |  |
|  | Tayle   |  |  |
| Primary Standards  | Di  | Call Date (Out ficate No.)   | Scheduled Calibration  |
| Power moter EPM-442A   | G007480794  | 06-Oct-16 (No. 217-01266)  | Oct-11   |
| Power meter EPM-442A<br>Power sensor HP 8461A  | G007480704<br>US37292783  | 06-Oct-10 (No. 217-01286)<br>08-Oct-10 (No. 217-01286)   | Oct-11<br>Oct-11   |
| Power moter EPM-442A<br>Power sensor HP 8461A<br>Pelenence 20 dB Attenuator  | G837480764<br>US37292783<br>SN: 5086 (20g)  | 06-Oct-16 (No. 217-01266)<br>06-Oct-10 (No. 217-01266)<br>29 Mar 11 (No. 217-01368)  | Oct-11<br>Oct-11<br>Apr-12   |
| Power mater EPM-442A<br>Power sensor HP 8461A<br>Pelenence 20 d8 Attenuator<br>Type-N miematich combination  | G007480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047 2 / 00327  | 06-Oct-10 (No. 217-01266<br>06-Oct-10 (No. 217-01266<br>29-Mar-11 (No. 217-01266)<br>29-Mar-11 (No. 217-01271)   | Oct-11<br>Oct-11<br>Apr-12<br>Apr-12   |
| Power meny EPM-442A<br>Power sensor HP 8461A<br>Pelerence 20 dB Attenuator<br>Type-N mismatch combination<br>Reference Probe ES30V3  | G837480764<br>US37292783<br>SN: 5086 (20g)  | 06-Oct-16 (No. 217-01266)<br>06-Oct-10 (No. 217-01266)<br>29 Mar 11 (No. 217-01368)  | Oct-11<br>Oct-11<br>Apr-12   |
| Power moter EPM-442A<br>Power sensor HP 8461A<br>Pelenince 20 dd Attanuator<br>Type N mismatch combination<br>Relevance Probe ES30V3<br>DA64   | G807480794<br>US37292783<br>59k 5986 (20g)<br>59k 5047 2 / 06027<br>59k 5026<br>59k 601   | 06-Oct-10 (No. 217-01286)<br>06-Oct-10 (No. 217-01286)<br>29-Mar-11 (No. 217-01381)<br>29-Mar-11 (No. 217-01371)<br>30-Apr-10 (No. ESS-3006, Aprill)<br>10-Aun-10 (No. DAE4-601, Junill)   | Oct-11<br>Oct-11<br>Apr-12<br>Apr-12<br>Apr-11<br>Jun-11   |
| Power moter EPM-442A Power sensor HP 8461A Pelenance 20 98 Altanuator Type-N mismatch combination Puterance Probe ES30V3 DAS4 Secondary Standards  | G807480794<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047 2 / 08027<br>SN: 3205<br>SN: 601   | 06-Oct-10 (No. 217-01286)<br>06-Oct-10 (No. 217-01286)<br>29-Mar-11 (No. 217-01388)<br>29-Mar-11 (No. 217-01371)<br>30-Apr-10 (No. ESS-3006_Apr10)<br>10-Aun-10 (No. DAE4-801_Aurili)<br>Check Date (in house)   | Oct-11 Oct-11 Apr-12 Apr-12 Apr-13 Jun-11 Scheduled Check  |
| Power moter EPM-442A Power sensor HP 8461A Polenence 20 d8 Attenuator Type-N mismatch combination Polenence Probe ES30V3 DA84 Secondary Standards Power sensor HP 8461A  | G007480794<br>US37292783<br>SN: 5086 (20g)<br>SN: 5087 2 / 08027<br>SN: 3256<br>SN: 601   | 06-Oct-10 (No. 217-01286)<br>06-Oct-10 (No. 217-01286)<br>29-Mar-11 (No. 217-01371)<br>30-Apr-10 (No. ESS-3006, Aprillo)<br>10-Aur-10 (No. DAE4-801_Aurillo)<br>Check Date (in house check Oct-09)   | Oct-11 Oct-11 Apr-12 Apr-12 Apr-11 Jun-11 Scheduled Check In house check Oct-11  |
| Power moter EPM-442A<br>Power sensor HP 8461A<br>Pelenince 20 dd Atlanuator<br>Type-N mismatch combination<br>Pulseannoi Probe ES30V3<br>DA64  | G807480794<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047 2 / 08027<br>SN: 3205<br>SN: 601   | 06-Oct-10 (No. 217-01286)<br>06-Oct-10 (No. 217-01286)<br>29-Mar-11 (No. 217-01388)<br>29-Mar-11 (No. 217-01371)<br>30-Apr-10 (No. ESS-3006_Apr10)<br>10-Aun-10 (No. DAE4-801_Aurili)<br>Check Date (in house)   | Oct-11 Oct-11 Apr-12 Apr-12 Apr-13 Jun-11 Scheduled Check  |
| Power moter EPM-442A Power sensor HP 8461A Poleninos 20 d8 Attenuator Typo-N mismatch combination Poleninos Probe ES30V3 DA64 Secondary Standards Power sensor HP 8461A RF generator R&S SMT-08                            | G807480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047 2 / 08027<br>SN: 5025<br>SN: 601<br>ID #<br>MY41092317<br>10095<br>US37396145 S4206  | 06-Oct-10 (No. 217-01266)<br>06-Oct-10 (No. 217-01266)<br>29-Mar-11 (No. 217-01369)<br>29-Mar-11 (No. 217-01371)<br>30-Apr-10 (No. ESS-0006, Aprillo)<br>10-Aun-10 (No. DAE4-601, Aunillo)<br>Check Date (in house check Oct-09)<br>4-Aug-99 (in house check Oct-09)<br>16-Oct-01 (in house check Oct-09)<br>16-Oct-01 (in house check Oct-09) | Oct-11 Oct-11 Apr-12 Apr-12 Apr-12 Apr-11 Jun-11 Scheduled Check In thouse check: Oct-11 In house check: Oct-11 In house check: Oct-11 |
| Power moner EPM-442A Power sensor HP 8461A Pelenance 20 d8 Attanuator Type-N mismatic combination Pelenance Protee ES30V3 DA64 Secondary Standards Power sensor HP 8461A RF generator PAS SMT-08 Network Analyzer HP 8753E | G807480794<br>US37292783<br>SN: 5086 (20g)<br>SN: 5086 (20g)<br>SN: 5047 2 / 08027<br>SN: 5026<br>SN: 601<br>ID #<br>MY41090317<br>10095    | 06-Oct-10 (No. 217-01286)<br>06-Oct-10 (No. 217-01286)<br>29-Mar-11 (No. 217-01371)<br>30-Apr-10 (No. ESS-3006, Apr10)<br>10-Jun-10 (No. DAE4-601, Jun10)<br>Check Date (in house)<br>18-Oct-07 (in house check Oct-09)<br>4-Aug-99 (in house check Oct-09)  | Oct-11 Oct-11 Apr-12 Apr-12 Apr-12 Apr-11 Jun-11 Scheduled Check In thouse check: Oct-11 In house check: Oct-11 In house check: Oct-11 |
| Power moter EPM-442A Power sensor HP 8461A Poleninos 20 d8 Attenuator Typo-N mismatch combination Poleninos Probe ES30V3 DA64 Secondary Standards Power sensor HP 8461A RF generator R&S SMT-08                            | G807480794<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047 2 / 08027<br>SN: 5025<br>SN: 601<br>ID #<br>MY41062317<br>100095<br>US37390145 S4296 | 06-Oct-10 (No. 217-01266)<br>06-Oct-10 (No. 217-01266)<br>29-Mar-11 (No. 217-01369)<br>29-Mar-11 (No. 217-01371)<br>30-Apr-10 (No. ESS-3006, Aprilli)<br>10-Aun-10 (No. DAS4-801, Aun10)<br>Check Date (in house check Oct-09)<br>4-Aug-99 (in house check Oct-09)<br>16-Oct-01 (in house check Oct-09)<br>16-Oct-01 (in house check Oct-09)   | Oct-11 Oct-11 Apr-12 Apr-12 Apr-12 Apr-11 Jun-11 Scheduled Check in trouse check Oct-11 In house check Oct-11 In house check Oct-11    |

Certificate No: 01900V2-5d075\_Apr11

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| **** BlackBerry | Appendix D for the BlackBo<br>Report Rev 2 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|-----------------|--|--|-------------|----------------|
| Author Data     | Dates of Test                              | Test Report No   | FCC ID:     | IC             |
| Andrew Becker   | Apr 02 - May 14, 2013                      | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW |
|                 | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3  |             |                |

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





Schweigerischer Keilbrierdienst Service sulsse d'étalonnage C Servizio svizzero di tareture **Swies Calibration Service** 

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS)

The Swise Accreditation Service is one of the eignatories to the EA Multileteral Agreement for the recognition of calibration certificates

Glossary:

tissue simulating liquid TSL

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

# 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
- c) 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:

d) 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
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

| Conflicate No. Custonya-Amiza, April 1 | From 3 of 5 |  |
|--|-------------|--|
|  |             |  |

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| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

# Measurement Conditions

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

| DASY Version                 | DASY5                     | V52.6.2     |
|------------------------------|---------------------------|-------------|
| Extrapolation                | Advanced Extrapolation    |             |
| Phantom                      | Modular Flat Phantom V5.0 | 1779-14     |
| Distance Dipole Center - TSL | 10 mm                     | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm         |             |
| Frequency                    | 1900 MHz ± 1 MHz          |             |

Head TSL parameters
The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL perameters      | 22.0 °C         | 40.0         | 1.40 mho/m       |
| Measured Head TSL parameters     | (22.0 ± 0.2) °C | 39.8 ± 6 %   | 1.41 mho/m ± 6 % |
| Head TSL temperature during test | (21.3 ± 0.2) °C | ****         | ****             |

# SAR result with Head TSL

| SAR averaged over 1 cm <sup>2</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 10.2 mW / g              |
| SAR normalized  | normalized to 1W   | 40.8 mW / g              |
| SAR for nominal Head TSL parameters                   | normelized to 1W   | 49.4 mW/g ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.29 WW / g              |
| SAR normalized  | normalized to 1W   | 21.2 mW / g              |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 21.0 mW/g ± 16.5 % (k=2) |

Certificate No: D1900V2-5d075\_Apr11

| ≅BlackBerry   | Appendix D for the BlackB Report Rev 2                 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |  |
|---------------|--|--|-------------|----------------|--|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |  |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |  |

# Appendix

# Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 53.5 Ω + 6.1 jΩ |  |  |
|--------------------------------------|-----------------|--|--|
| Return Loss                          | - 23.3 dB       |  |  |

# General Antenna Parameters and Design

| 1.197 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 | January 24, 2006 |  |  |

Certificate No: D1900V2-5d075\_Apr11

| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

# **DASY5 Validation Report for Head TSL**

Date/Time: 05.04:2011 12:41:39

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 1900 MHz; Type; D1900V2; Serial: D1900V2 - SN:5d075

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U12 BB

Medium parameters used: f = 1900 MHz;  $\sigma = 1.41 \text{ mho/m}$ ;  $\epsilon_r = 39$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY5 Configuration:

- Probe: ES3DV3 SN3205; Conv8(5.09, 5.09, 5.09); Calibrated, 30:04,3010
- Sensor-Surface: John (Mochanical Surface Detection)
- Electronics: DAE4 Set01; Calibrated: 10:06.2010
- Phanton: Plut Phanton 5.0 (front); Type: QD000P50AA: Senal: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

# Head / d=10mm, Pin=250 mW / Cube 0:

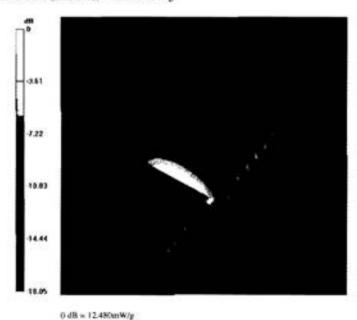
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.376 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 18.796 W/kg

SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.29 mW/g

Maximum value of SAR (measured) = 12.476 mW/g

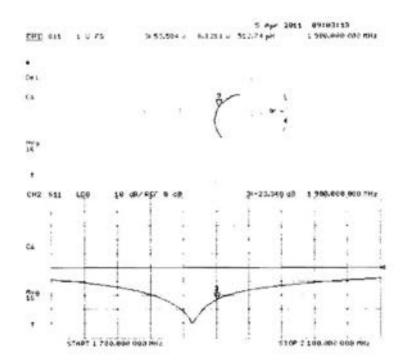


Certificate No: D1900V2-5d075\_Apr11

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| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
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| Author Data   | Dates of Test                              | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013                      | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW |
|               | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3  |             |                |

# Impedance Measurement Plot for Head TSL



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| *** BlackBerry | Appendix D for the BlackBe<br>Report Rev 2 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             | Page 37(63)    |
|----------------|--|--|-------------|----------------|
| Author Data    | Dates of Test                              | Test Report No   | FCC ID:     | IC             |
| Andrew Becker  | Apr 02 - May 14, 2013                      | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW |
|                | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3  |             |                |





S Schweizerischer Kalibrierdienst
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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA

Accreditation No.: SCS 108

Multilateral Agreement for the recognition of calibration certificates

Client RTS (RIM Testing Services)

Certificate No: D1900V2-545\_Jan13

|  | ERTIFICATE  |   |  |
|--|---|---|--|
| Object   | D1900V2 - SN: 5   | 45  |  |
| Calibration procedure(s)   | QA CAL-05.v9<br>Calibration proce   | dure for dipole validation kits abo   | ve 700 MHz   |
|  |   |   |  |
| Calibration date:  | January 09, 2013  | July 10 Life  |  |
| The measurements and the unce  | stainties with confidence protection the closed laborator   | onal standards, which realize the physical un<br>robability are given on the following pages an<br>ny facility: environment temperature (22 ± 3)*(  | d are part of the certificate.   |
|  | 1000  | 525 (20), 320 E00 (20)  |  |
| Nomen Standards  | 1 1D #  | Call Date (Certificate No.)   | -Scheduled Calibration   |
| Mary Control of the C | ID #<br>GB37480704  | Cal Date (Certificate No.)<br>01-Nov-12 (No. 217-01640)   | Scheduled Calibration<br>Oct-13  |
| Yower meter EPM-442A   |   | Cal Date (Certificate No.)<br>01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)  |  |
| Power meter EPM-442A<br>Power sensor HP 8481A  | GB37480704<br>U537292783  | 01-Nov-12 (No. 217-01640)   | Oct-13   |
| Power meter EPM-442A<br>Power sensor HP 8461A<br>Reference 20 dB Attenuator  | GB37480704<br>U537292783<br>SN: 5058 (204)  | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)   | Oct-13<br>Oct-13   |
| Power meter EPM-442A<br>Power sensor HP 8481A<br>Reference 20 d8 Attenuator<br>Type N mismatch combination   | GB37480704<br>U537292783  | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)  | Oct-13<br>Oct-13<br>Apr-13   |
| Power mater EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3   | G837480704<br>US37292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327  | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. 217-01533)  | Oct-13<br>Oct-13<br>Apr-13<br>Apr-13   |
| Power meter EPM-442A<br>Power sensor HP 8465A<br>Reference 20 dB Attenuation<br>Type N mismatch combination<br>Reference Probe ES3DV3<br>DAE/4   | G837480704<br>U537292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327<br>SN: 3005  | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. 217-01533)<br>28-Dec-12 (No. ES3-3205, Dec12)   | Oct-13<br>Oct-13<br>Apr-13<br>Apr-13<br>Dec-13   |
| Power meter EPM-442A Power sensor HP 8461A Reference 20 dB Attenuator Type N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards  | GB37480704<br>US37292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327<br>SN: 3035<br>SN: 601   | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. 217-01533)<br>28-Dec-12 (No. ES3-2005, Dec12)<br>27-Jun-12 (No. DAE4-601, Jun12)  | Oct-13<br>Oct-13<br>Apr-13<br>Apr-13<br>Dec-13<br>Jun-13   |
| Power meter EPM-442A Power sensor HP 8481A Reference 20 d8 Attenuator Type N mismatch contination Reference Probe ESI3DV3 DAE4 Secondary Standards Power sensor HP 8481A   | GB37480704<br>U537292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327<br>SN: 3006<br>SN: 601   | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. 217-01533)<br>28-Dec-12 (No. ES3-0205_Dec12)<br>27-Jun-12 (No. DAE4-601_Jun12)<br>Check Date (in house)   | Oct-13<br>Oct-13<br>Apr-13<br>Apr-13<br>Dec-13<br>Jun-13<br>Scheduled Check  |
| Power mater EPM-442A Power sensor HP 8461A Reference 20 d8 Attenuator Type N mismatch combination Reference Probe ES3DV3 CAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06  | GB37480704<br>U537292783<br>SN: 5058 (25k)<br>SN: 5057 3 / 06327<br>SN: 3006<br>SN: 601   | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01630)<br>27-Mar-12 (No. 217-01633)<br>28-Dec-12 (No. ES3-0205_Dec12)<br>27-Jun-12 (No. DAE4-601_Jun12)<br>Check Date (in house)   | Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check; Oct-13   |
| Power mater EPM-442A Power sensor HP 8461A Reference 20 d8 Attenuator Type N mismatch combination Reference Probe ES3DV3 CAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06  | GB37480704<br>US37292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327<br>SN: 3005<br>SN: 601<br>ID #<br>MY41092317<br>100005<br>US37390585 S4206                           | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. ES3-3205, Dec12)<br>28-Dec-12 (No. ES3-3205, Dec12)<br>27-Jun-12 (No. DAE4-601, Jun12)<br>Check Date (in house)<br>18-Oct-02 (in house check Oct-11)<br>04-Aug-99 (in house check Oct-12)   | Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13                        |
| Power meter EPM-442A Power sensor HP 8481A Reference 20 d8 Attenuator Type N mismatch combination Reference Probe ES3DV3 DAL4 Secondary Standards Power sensor HP 8481A RF generator R\$S SMT-05 Network Analyzer HP 8753E   | GBS7480704<br>US37292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327<br>SN: 3006<br>SN: 601<br>ID #<br>MY41092317<br>100006<br>US37390685 S4206                           | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. 217-01533)<br>28-Dec-12 (No. ES3-3205, Dec12)<br>27-Jun-12 (No. DAE4-601, Jun12)<br>Check Date (in house)<br>18-Oct-02 (in house check Oct-11)<br>04-Aug-99 (in house check Oct-11)<br>18-Oct-01 (in house check Oct-12)                                      | Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13 |
| Power meter EPM-442A Power sensor HP 8481A Reference 20 d8 Attenuator Type N mismatch combination Reference Probe ES3DV3 DAL4 Secondary Standards Power sensor HP 8481A RF generator R\$S SMT-05 Network Analyzer HP 8753E   | GB37480704<br>US37292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327<br>SN: 3005<br>SN: 601<br>ID #<br>MY41092317<br>100005<br>US37390585 S4206                           | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. ES3-3205, Dec12)<br>28-Dec-12 (No. ES3-3205, Dec12)<br>27-Jun-12 (No. DAE4-601, Jun12)<br>Check Date (in house)<br>18-Oct-02 (in house check Oct-11)<br>04-Aug-99 (in house check Oct-12)   | Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13 |
| Power mater EPM-442A Power sensor HP 8481A Reference 20 d8 Attenuator Type N mismatch continuation Reference Probe ES3DV3 CAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E Calibrated by:  | GBS7480704<br>US37292783<br>SN: 5058 (20k)<br>SN: 5047.3 / 06327<br>SN: 3006<br>SN: 601<br>ID #<br>MY41092317<br>100006<br>US37390685 S4206                           | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01530)<br>27-Mar-12 (No. 217-01533)<br>28-Dec-12 (No. ES3-3205, Dec12)<br>27-Jun-12 (No. DAE4-601, Jun12)<br>Check Date (in house)<br>18-Oct-02 (in house check Oct-11)<br>04-Aug-99 (in house check Oct-11)<br>18-Oct-01 (in house check Oct-12)                                      | Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13                        |
| Primary Standards Power series EPM-442A Power series EPM-442A Power series HP 8481A Reference 20 d8 Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R\$S SMT-05 Network Analyzor HP 8753E Calibrated by: Approved by:  | GB37480704<br>US37292783<br>SN: 5058 (25k)<br>SN: 5057.3 / 06327<br>SN: 3206<br>SN: 601<br>ID #<br>MY41092317<br>100005<br>US37390585 S4206<br>Name<br>Israe El-Naouq | 01-Nov-12 (No. 217-01640)<br>01-Nov-12 (No. 217-01640)<br>27-Mar-12 (No. 217-01630)<br>27-Mar-12 (No. 217-01530)<br>28-Dec-12 (No. ES3-0205, Dec12)<br>27-Jun-12 (No. DAE4-601, Jun12)<br>Check Date (in house)<br>18-Oct-02 (in house check Oct-11)<br>04-Aug-99 (in house check Oct-11)<br>18-Oct-01 (in house check Oct-12)<br>Function<br>Laboratory Technician | Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13 |

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Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS)

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#### 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
- EC 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
- c) 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:

d) 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.

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%.

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#### Measurement Conditions

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

| DASY Version                 | DASY5                  | V52.8.4     |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1900 MHz ± 1 MHz       |             |
|                              |                        |             |

# Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.0         | 1.40 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 39.4 ± 6 %   | 1.38 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ****         | ***              |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 10.0 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 40.2 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.26 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 21.1 W/kg = 16.5 % (k=2) |

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#### Appendix

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 51.0 Ω + 1.7 jΩ |  |
|--------------------------------------|-----------------|--|
| Return Loss                          | - 34.3 dB       |  |

## General Antenna Parameters and Design

| Electrical Delay (one direction) | 1,198 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 DG-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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 | November 15, 2001 |

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#### DASY5 Validation Report for Head TSL

Date: 09.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 545

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.38$  S/m;  $\epsilon_c = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

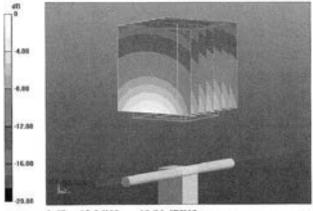
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

## Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

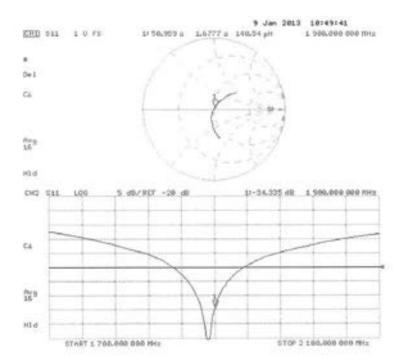
Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 95.493 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 18.1 W/kg SAR(1 g) = 10 W/kg; SAR(10 g) = 5.26 W/kg Maximum value of SAR (measured) = 12.2 W/kg



0 dB = 12.2 W/kg = 10.86 dBW/kg

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## Impedance Measurement Plot for Head TSL



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Service is one of the signatories to the EA

Client RTS (RIM Testing Services)

Certificate No: D2450V2-747\_Nov11

Accreditation No.: SCS 108

| Doject .   | D2450V2 - SN: 7   | <b>47</b> 15 15 30 30 30 30 30 30  | <b>国教的教育与教育的</b>  |
|--|---|--|---|
| Calibration procedure(s)   | QA CAL-05.v8<br>Calibration proce   | dure for dipole validation kits abo  | ove 700 MHz   |
| Calibration date:  | November 09, 20   | 11 10 10 10 10 10 10 10 10 10 10 10 10 1   |   |
|  |   | onal standards, which realize the physical un<br>robability are given on the following pages an  |   |
| All calibrations have been conduc  | cted in the closed laborator  | ry facility: environment temperature (22 x 3)*C  | C and humidity < 70%.   |
|  |   |  |   |
| Calibration Equipment used (M&)  | TE critical for calibration)  |  |   |
| Yimary Standards   | 10#   | Cal Date (Certificate No.)   | Scheduled Calibration   |
| Yimary Standards<br>Yower meter EPM-442A   | ID #<br>GB37480704  | 05-Oct-11 (No. 217-01451)  | Oct-12  |
| Yimary Standards<br>Yower meter EPM-442A<br>Yower sensor HP 8481A  | ID #<br>G837480704<br>US37292783  | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)   | Oct-12<br>Oct-12  |
| Yimary Standards<br>Yower meter EPM-442A<br>Yower sensor HP 8481A<br>Reference 20 dB Attenuator  | ID #<br>G837480704<br>US37292783<br>SN: 5086 (20g)  | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)  | Oct-12<br>Oct-12<br>Apr-12  |
| Yimary Standards Yower meter EPM-442A Yower sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination   | ID #<br>G837480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327  | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)<br>29-Mar-11 (No. 217-01371)   | Oct-12<br>Oct-12<br>Apr-12<br>Apr-12  |
| himary Standards Yower meter EPM-442A Yower sensor HP 8481A Ideference 20 dB Attenuator ype-N mismatch combination Inference Probe ES3DV3  | ID #<br>GB37480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327<br>SN: 3205  | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)<br>29-Mar-11 (No. 217-01371)<br>29-Apr-11 (No. ES3-3205_Apr11)   | Oct-12<br>Oct-12<br>Apr-12<br>Apr-12<br>Apr-12  |
| Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3   | ID #<br>G837480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327  | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)<br>29-Mar-11 (No. 217-01371)   | Oct-12<br>Oct-12<br>Apr-12<br>Apr-12  |
| Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3   | ID #<br>GB37480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327<br>SN: 3205  | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)<br>29-Mar-11 (No. 217-01371)<br>29-Apr-11 (No. ES3-3205_Apr11)   | Oct-12<br>Oct-12<br>Apr-12<br>Apr-12<br>Apr-12  |
| Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards  | ID #<br>GB37480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327<br>SN: 3205<br>SN: 601   | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)<br>29-Mar-11 (No. 217-01371)<br>29-Apr-11 (No. ES3-3205_Apr11)<br>04-Jul-11 (No. DAE4-601_Jul11)   | Oct-12<br>Oct-12<br>Apr-12<br>Apr-12<br>Apr-12<br>Jul-12  |
| Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 d8 Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A  | ID #<br>GB37480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327<br>SN: 3205<br>SN: 601   | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)<br>29-Mar-11 (No. 217-01371)<br>29-Apr-11 (No. ES3-3205_Apr11)<br>04-Jul-11 (No. DAE4-601_Jul11)<br>Check Date (in house)  | Oct-12<br>Oct-12<br>Apr-12<br>Apr-12<br>Apr-12<br>Jul-12<br>Scheduled Check                             |
| Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06  | ID #<br>GB37480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327<br>SN: 3205<br>SN: 601   | 05-Oct-11 (No. 217-01451)<br>05-Oct-11 (No. 217-01451)<br>29-Mar-11 (No. 217-01368)<br>29-Mar-11 (No. 217-01371)<br>29-Apr-11 (No. ESS-3205_Apr11)<br>04-Jul-11 (No. DAE4-601_Jul11)<br>Check Date (in house)  | Oct-12 Oct-12 Apr-12 Apr-12 Apr-12 Jul-12 Scheduled Check In house check: Oct-13                        |
| Calibration Equipment used (M&1 Primary Standards Prower meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E | ID #<br>GB37480704<br>US37292783<br>SN: 5086 (20g)<br>SN: 5047.2 / 06327<br>SN: 3205<br>SN: 601   | 05-Oct-11 (No. 217-01451) 05-Oct-11 (No. 217-01451) 29-Mar-11 (No. 217-01368) 29-Mar-11 (No. 217-01368) 29-Apr-11 (No. ES3-3205_Apr11) 04-Jul-11 (No. DAE4-601_Jul11) Check Date (in house) 18-Oct-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oct-01 (in house check Oct-11)                            | Oct-12 Oct-12 Apr-12 Apr-12 Apr-12 Jul-12 Scheduled Check In house check: Oct-13 In house check: Oct-13 |
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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 Mutiliateral Agreement for the recognition of calibration certificates

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
- EC 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
- c) 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:

d) 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.

| Contillinate May POST | COLOR TATE BLOOMS | Down Date |  |  |
|-----------------------|-------------------|-----------|--|--|

Certificate No: D2450V2-747\_Nov11 Page 2 of 6

| *** BlackBerr | y | Appendix D for the BlackBe<br>Report Rev 2 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             | Page <b>46(63)</b> |
|---------------|---|--|--|-------------|--------------------|
| Author Data   | D | ates of Test                               | Test Report No   | FCC ID:     | IC                 |
| Andrew Becker | A | Apr 02 - May 14, 2013                      | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW     |
|               | N | Mar 26 – 28, Dec. 10-12, 2014              | Rev 3  |             | -                  |

| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | erry® Smartphone Mo       | odel RFQ111LW SAR | Page <b>47</b> (63) |
|---------------|--|---------------------------|-------------------|---------------------|
| Author Data   | Dates of Test  | Test Report No            | FCC ID:           | IC                  |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3 | L6ARFQ110LW       | 2503A-RFQ110LW      |

## Measurement Conditions

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

| DASY Version                 | DASY5                  | V52.6.2     |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2450 MHz ± 1 MHz       |             |

nead TSL grameters

| _                                       | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| No Rinal Head TSL parameters            | 230°C           | 39.2         | 1.80 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 37.7 ± 6 %   | 1.84 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ****         |                  |

#### SAR result with Head TSL

| SAR averaged over 1 cm3 (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                              | 250 mW input power | 13.8 mW / g              |
| SAR for nominal Head TSL parameters       | normalized to 1W   | 54.1 mW/g ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 6.39 mW/g                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 25.3 mW/g a 16.5 % (k=2) |

Certificate No: D2450V2-747\_Nov11

| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

## Appendix

## Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 52.5 Ω + 1.3 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 31.2 dB       |

#### General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.161 ns |
|----------------------------------|----------|
|                                  |          |

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

The dipote 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 | December 01, 2003 |

Certificate No: D2450V2-747\_Nov11

| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
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| ≅BlackBerry   | Appendix D for the BlackBo<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 - 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

#### **DASY5 Validation Report for Head TSL**

Date: 09.11.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 747

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz;  $\sigma = 1.84 \text{ mho/m}$ ;  $\varepsilon_r = 37.7$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 29.04.2011

· Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 04.07.2011

Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001

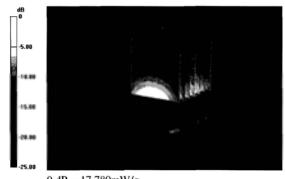
DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

## Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 102.1 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 28.853 W/kg

SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.39 mW/gMaximum value of SAR (measured) = 17.782 mW/g

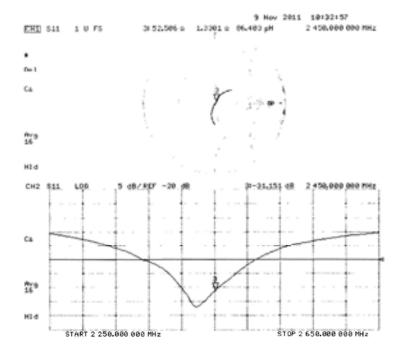


0 dB = 17.780 mW/g

| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

## Impedance Measurement Plot for Head TSL



| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

# Author Data Andrew Becker Document Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR Report Rev 2 Author Data Andrew Becker Dates of Test Apr 02 - May 14, 2013 Mar 26 - 28, Dec. 10-12, 2014 Rev 3 Apr 02 - May 14, 2013 Rev 3 Page 56(63) FCC ID: L6ARFQ110LW 2503A-RFQ110LW

Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstresse 43, 6004 Zurich, Switzerland





S Schweizerischer Kallbrierdianst C Service suisse d'étalendage Servizio svizzero di taratura S Swiss Calibration Service

According by the Swiss Accordington Service (SAS)

The Swiss Accordination Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Blackberry Waterloo

Certificate No: D5GHzV2-1033\_Nov13

| Object  | D5GHzV2 - SN: 1  | 1033   |   |
|---|--|--|---|
| Calibration procedure(s)  | QA CAL-22.v2<br>Calibration proce  | dure for dipole validation kits bet  | ween 3-6 GHz  |
| Calibration date:   | November 08, 20  | 113  |   |
| The recovernests and the unco   | utainties with confidence p  | onal standords, which realize the physical un<br>obsability are given on the following pages on<br>y taolity: environment temporature (22 a 3)*  | ad are part of the certificate.   |
|   |  |  |   |
| Calibration Equipment used (M&  | PERSONAL PROPERTY.   |  |   |
| albedien Equipment used (Miliniary Standards  | 01   | Cali Data (Certificate No.)  | Scheduled Calibration   |
| alibeation Equipment used (Milli<br>limery Standards<br>over meter EPM-442A   | ID 9<br>0807480704   | 08-Oct-13 (No. 217-01827)  | Oct-14  |
| slibeation Equipment used (Mili<br>imary Standards<br>over stater EPM-442A<br>over sensor HP 8481A  | ID #<br>0837480754<br>US0/289783   | 08-Oct-13 (No. 217-01827)<br>08-Oct-13 (No. 217-01827)   | Oct-14<br>Oct-14  |
| sibusion Equipment used (Mili-<br>imary Standards<br>over meter EPM-442A<br>over sensor HP 8481A<br>over sensor HP 8481A  | ID 9<br>0537480704<br>US37289783<br>MY41092317   | 08-Oct-13 (No. 217-01827)<br>08-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)  | Oct-14<br>Oct-14<br>Oct-14  |
| dibusion Equipment used (Mili-<br>nimary Standards<br>over senter EPM-442A<br>over sentor HP 8481A<br>over sentor HP 8481A<br>leference 20 dB Attenuator  | ID 9<br>0837480704<br>US07280783<br>MY41082317<br>SN: 5050 (20kg   | 08-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01738)   | Oct-14<br>Dot-14<br>Oct-14<br>Apr-14  |
| sibusion Equipment used (Mili-<br>vienery Standards<br>ower senter EPM-442A<br>ower senter HP 8461A<br>leverage 20 dtl Administer<br>ype-N mismatch combination   | ID 8<br>0807480704<br>US07289788<br>MY41082317<br>SN: 5050 (2080<br>SN: 5047.3 / 08027   | 08-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01738)<br>04-Apr-13 (No. 217-01739)  | Oct-14<br>Oct-14<br>Oct-14<br>Apr-14<br>Apr-14  |
| historifich Equipment unod (Mili-<br>hienery Standards<br>ower sentor HP 8461A<br>lower sentor HP 8461A<br>beference 20 dtl Attendator<br>ype-ti materiatch combinetion<br>telerience Probe ESSDV3  | ID 9<br>0837480704<br>US07280783<br>MY41082317<br>SN: 5050 (20kg   | 08-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01738)   | Oct-14<br>Dot-14<br>Oct-14<br>Apr-14  |
| Calibration Equipment used (M&<br>Namery Standards<br>Ower states EPM-442A<br>Ower sensor HP 8481A<br>Yower sensor HP 8481A<br>Selevance 20: 03 Absolutor<br>Type-N mismatch combination<br>televance Probe ESSDV3<br>0AE4  | ID 2<br>0837480704<br>US07289788<br>MY41082317<br>SN: 5040 (20k)<br>SN: 5047 3 / 08327<br>SN: 3205   | 09-Oct-12 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01788)<br>04-Apr-13 (No. 217-01789)<br>26-Occ-12 (No. 213-3215_Dec17)<br>25-Apr-13 (No. DAE4-601_Apr13)  | Oct-14<br>Oct-14<br>Oct-14<br>Apr-14<br>Apr-14<br>Dec-13                                |
| silbusion Equipment used (Mili-<br>nimary Standards<br>ower sweer EPM-442A<br>ower sensor HP 8481A<br>ower sensor HP 8481A<br>elevence 20 dtl Attenuator<br>ype-ti mismatch combination<br>elevence Probe ESCDV3<br>AE4<br>accordary Standards  | ID 9<br>0807480704<br>US0298798<br>MY41082317<br>SN: 5047.0 / 08327<br>SN: 5047.0 / 08327<br>SN: 5047.0 / 08327<br>SN: 601                           | 08-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01738)<br>04-Apr-13 (No. 217-01739)<br>26-Dec-12 (No. ESS-3205_Dec12)  | Oct-14<br>Cot-14<br>Cot-14<br>Apr-14<br>Apr-14<br>Dec-13<br>Apr-14<br>Scheduled Check   |
| Calibration Equipment used (Mili-<br>history Standards<br>Power sensor HP 8481A<br>Yower sensor HP 8481A<br>beference 20 dtl Attenuator<br>Type-N mismatch combinetion<br>telerence Probe ESSDV3<br>ME4<br>Secondary Standards<br>of generator R&S SMT-06   | ID 9<br>0807480704<br>US0289788<br>Mr/41082817<br>SN: 5047.8 / 08027<br>SN: 5047.8 / 08027<br>SN: 601  | 08-Oci-13 (No. 217-01827)<br>09-Oci-13 (No. 217-01827)<br>09-Oci-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01738)<br>04-Apr-13 (No. 217-01739)<br>28-Dec-12 (No. ESS-3285_Dec12)<br>25-Apr-13 (No. DAE4-601_Apr13)<br>Check Date (in house)   | Oct-14<br>Oct-14<br>Oct-14<br>Apr-14<br>Apr-14<br>Dec-13<br>Apr-14                      |
| Calibration Equipment used (Mili-<br>rolen inster EPM-942A<br>fower sensor HP 9491A<br>fower sensor HP 9491A<br>beference 20 dtl Attenuator<br>type-N internation combination<br>telerance Picce ESCDV3<br>IAE4<br>secondary Standards<br>of generator R&S SMT-06   | ID 2<br>0837480704<br>USQ2987983<br>MY41082317<br>595 5050 (206)<br>595 5047 3 / 08327<br>595 801<br>ID 4<br>100005<br>US37390585 54206              | 09-Oct-12 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01738)<br>04-Apr-13 (No. 217-01738)<br>26-Occ-12 (No. E33-3215, Dec12)<br>25-Apr-13 (No. DA64-601, Apr13)<br>Check Date (in house)<br>04-Aug-99 (in house check Oct-13)<br>18-Oct-01 (in house check Oct-12) | Oct-14 Oct-14 Oct-14 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check Is house check: Oct-15 |
| relibration Equipment used (Mail<br>himary Standards<br>ower stater EPM-442A<br>ower sensor HP 8481A<br>leterance 20 d0 Attenuator<br>ype-ti mismatch combination<br>leterance Probe ESCDV3<br>IAEA<br>secondary Standards<br>Er generator RAS SMT-06<br>leterance Analyzer HP ST/SE  | ID 2<br>0837480704<br>US02987983<br>MY41082317<br>SN: 5050 (20k)<br>SN: 5047.3 / 08327<br>SN: 3205<br>SN: 601<br>ID 4<br>100005<br>US37390585 \$4206 | 09-Oct-12 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01788)<br>04-Apr-13 (No. 217-01789)<br>26-Occ-12 (No. E33-3315, Dec17)<br>25-Apr-13 (No. DAE4-601, Apr13)<br>Check Date (in house)<br>04-Aug-98 (in house check Oct-13)<br>18-Oct-01 (in house check Oct-13) | Oct-14 Oct-14 Oct-14 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check Is house check: Oct-15 |
| Calibration Equipment used (M&<br>Inimary Standards<br>Cower stater EPM-442A<br>Cower servor HP 8481A<br>Inimary Standards<br>Inimary Probe ESSDV3<br>IAE4<br>Secondary Standards<br>6- generator RAS SMT-06<br>Betwork Analyzer HP SNSE  | ID 2<br>0837480704<br>USQ2987983<br>MY41082317<br>595 5050 (206)<br>595 5047 3 / 08327<br>595 801<br>ID 4<br>100005<br>US37390585 54206              | 09-Oct-12 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01738)<br>04-Apr-13 (No. 217-01738)<br>26-Occ-12 (No. E33-3215, Dec12)<br>25-Apr-13 (No. DA64-601, Apr13)<br>Check Date (in house)<br>04-Aug-99 (in house check Oct-13)<br>18-Oct-01 (in house check Oct-12) | Oct-14 Oct-14 Oct-14 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check Is house check: Oct-15 |
| Calibration Equipment used (M&<br>Primary Standards<br>Power state: EPM-442A<br>Power sensor HP 9481A<br>Power sensor HP 9481A<br>Reference 20 did Attendator<br>Type-N materiatch combination<br>televince Phote ESSDV3<br>DAE4<br>Secondary Standards<br>NP generator R&S SMT-06<br>Setudos Analyzer HP SPSSE<br>Calibrated by: | ID 2<br>0837480704<br>US02987983<br>MY41082317<br>SN: 5050 (20k)<br>SN: 5047.3 / 08327<br>SN: 3205<br>SN: 601<br>ID 4<br>100005<br>US37390585 \$4206 | 09-Oct-12 (No. 217-01827)<br>09-Oct-13 (No. 217-01827)<br>09-Oct-13 (No. 217-01828)<br>04-Apr-13 (No. 217-01788)<br>04-Apr-13 (No. 217-01789)<br>26-Occ-12 (No. E33-3315, Dec17)<br>25-Apr-13 (No. DAE4-601, Apr13)<br>Check Date (in house)<br>04-Aug-98 (in house check Oct-13)<br>18-Oct-01 (in house check Oct-13) | Oct-14 Oct-14 Oct-14 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check Is house check: Oct-15 |

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| ≅BlackBerry   | Appendix D for the BlackB<br>Report Rev 2 | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|---|--|-------------|----------------|
| Author Data   | Dates of Test                             | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013                     | RTS-6026-1305-18   | L6ARFQ110LW | 2503A-RFQ110LW |
|               | Mar 26 – 28, Dec. 10-12, 2014             | Rev 3  |             |                |





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C Service suisse d'étatonnage
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S Suries Calibration Service

Accreditation No.: SCS 108

Accredited by the Switz Accreditation Service (ILAS)
The Swiss Accreditation Service is one of the aignot

The Swiss Accreditation Service is one of the signatories to the EA. Multilateral Agreement for the recognition of calibration certificates.

#### 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:

- a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
- c) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

#### Additional Documentation:

d) 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.

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%.

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| ≅BlackBerry   | Appendix D for the BlackBe<br>Report Rev 2             | Appendix D for the BlackBerry® Smartphone Model RFQ111LW SAR |             |                |
|---------------|--|--|-------------|----------------|
| Author Data   | Dates of Test  | Test Report No   | FCC ID:     | IC             |
| Andrew Becker | Apr 02 - May 14, 2013<br>Mar 26 – 28, Dec. 10-12, 2014 | RTS-6026-1305-18<br>Rev 3                                    | L6ARFQ110LW | 2503A-RFQ110LW |

## Measurement Conditions

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

| DASY Version                 | DASY5  | V52.8.7                          |
|------------------------------|--|----------------------------------|
| Extrapolation                | Advanced Extrapolation                                   |                                  |
| Phantom                      | Modular Flat Phantom V5.0                                |                                  |
| Distance Dipole Center - TSL | 10 mm  | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 4.0 mm, dz = 1.4 mm                             | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 5200 MHz ± 1 MHz<br>5500 MHz ± 1 MHz<br>5800 MHz ± 1 MHz |                                  |

## Head TSL parameters at 5200 MHz

The following parameters and calculations were applied

|   | Temperature     | Permittivity   | Conductivity     |
|---|-----------------|--|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 36.0   | 4.66 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 35.0 ± 6 %   | 4,46 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | and the same of th |                  |

#### SAR result with Head TSL at 5200 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 100 mW input power | 7.99 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to TW   | 79.4 W/kg + 19.9 % (k=2) |

| SAR averaged over 10 cm2 (10 g) of Head TSL | condition          | - Control of             |
|---|--------------------|--------------------------|
| SAR measured                                | 100 mW input power | 2.28 W/kg                |
| SAR for nominal Head TSL parameters         | normalized to 1W   | 22.6 W/kg = 19.5 % (k=2) |

#### Head TSL parameters at 5500 MHz

he following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.6         | 4.96 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.6 × 6 %   | 4.75 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

## SAR result with Head TSL at 5500 MHz

| SAR averaged over 1 cm <sup>1</sup> (1 g) of Head TSL | Condition          |                            |
|---|--------------------|----------------------------|
| SAR measured  | 100 mW input power | 8.51 W/kg                  |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 84.4 W / kg ± 19.9 % (k+2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 100 mW input power | 2.41 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.9 W/kg ± 19.5 % (k=2) |

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## Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.3         | 5.27 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.2 × 6 %   | 5.06 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5°C         | -            | 100              |

## SAR result with Head TSL at 5800 MHz

| SAR averaged over 1 cm2 (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                              | 100 mW input power | 8.01 W/Avg               |
| SAR for nominal Head TSL parameters       | normalized to 1W   | 79.4 W/kg ± 19.9 % (k×2) |

| SAR averaged over 10 cm² (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                                | 100 mW input power | 2.28 W/kg                |
| SAR for nominal Head TSL parameters         | normalized to 1W   | 22.6 W/kg ± 19.5 % (k=2) |

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#### Appendix

#### Antenna Parameters with Head TSL at 5200 MHz

| Impedance, transformed to feed point | 49.1 \(\Omega - 9.6 \) |  |
|--------------------------------------|------------------------|--|
| Return Loss                          | - 20.3 dB              |  |

#### Antenna Parameters with Head TSL at 5500 MHz

| Impedance, transformed to feed point | 50.3 12 - 4.1 52 |
|--------------------------------------|------------------|
| Return Loss                          | - 27.7 oB        |

#### Antenna Parameters with Head TSL at 5800 MHz

| Impedance, transformed to feed point | 57.8 (2 - 4.0 j(2 |  |  |
|--------------------------------------|-------------------|--|--|
| Return Loss                          | -21.8 dB          |  |  |

#### General Antenna Parameters and Design

| Electrical Delay (one direc | tion)  | 1.213 ns    |     |
|-----------------------------|--|-------------|-----|
| mention want form ones      | and the same of th | 1,60,000.00 | - 1 |

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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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 | July 09, 2004 |  |

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#### DASY5 Validation Report for Head TSL

Date: 08.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

## DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1033

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800

MHz

Medium parameters used: f = 5200 MHz;  $\sigma = 4.46$  S/m;  $\epsilon_r = 35$ ;  $\rho = 1000$  kg/m³, Medium parameters used: f = 5500 MHz;  $\sigma = 4.75$  S/m;  $\epsilon_r = 34.6$ ;  $\rho = 1000$  kg/m³, Medium parameters used: f = 5800 MHz;  $\sigma = 5.06$  S/m;  $\epsilon_r = 34.2$ ;  $\rho = 1000$  kg/m³

Phantom section: Flat Section

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

#### DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001.
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64,635 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 18.4 W/kg

# Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.397 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 33.8 W/kg

SAR(1 g) = 8.51 W/kg; SAR(10 g) = 2.41 W/kg

Maximum value of SAR (measured) = 20.3 W/kg

# Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.128 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 33.0 W/kg

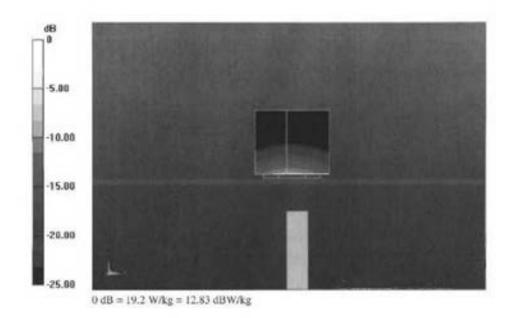
SAR(1 g) = 8.01 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 19.2 W/kg

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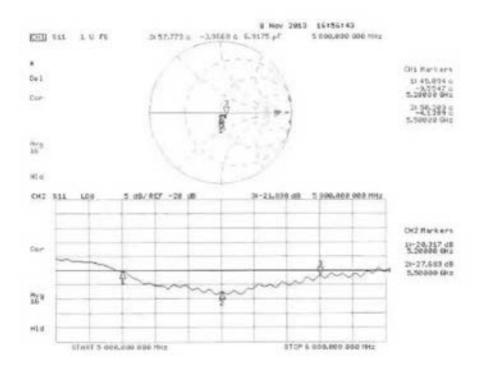
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## Impedance Measurement Plot for Head TSL



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