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Accreditation No.: **SCS 108**

Client **Motorola MDb**

Certificate No: **D2450V2-877\_Jan12**

**CALIBRATION CERTIFICATE**

Object **D2450V2 - SN: 877**

Calibration procedure(s) **QA CAL-05.v8  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **January 10, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by: **Name: Jeton Kastrati, Function: Laboratory Technician, Signature: [Signature]**

Approved by: **Name: Katja Pokovic, Function: Technical Manager, Signature: [Signature]**

Issued: January 10, 2012

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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
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

## Measurement Conditions

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

DASY Version	DASY5	V52.8.0
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 $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.2 $\pm$ 6 %	1.85 mho/m $\pm$ 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	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>52.1 mW / g <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.15 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>24.4 mW / g <math>\pm</math> 16.5 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	50.6 $\pm$ 6 %	2.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>52.3 mW / g <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.21 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>24.5 mW / g <math>\pm</math> 16.5 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 $\Omega$ + 2.9 j $\Omega$
Return Loss	- 26.9 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.5 $\Omega$ + 4.5 j $\Omega$
Return Loss	- 26.6 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.161 ns
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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	August 18, 2010

## DASY5 Validation Report for Head TSL

Date: 10.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 877**

Communication System: CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.85$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

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

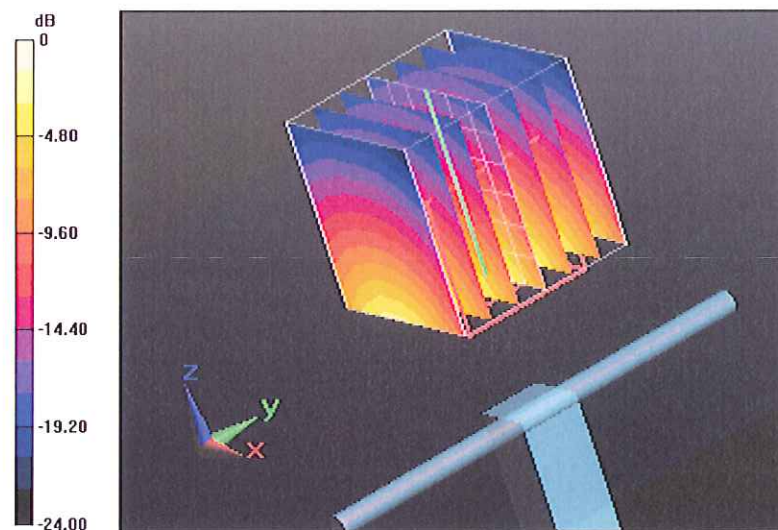
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.198 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 27.2410

**SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.15 mW/g**

Maximum value of SAR (measured) = 16.782 mW/g



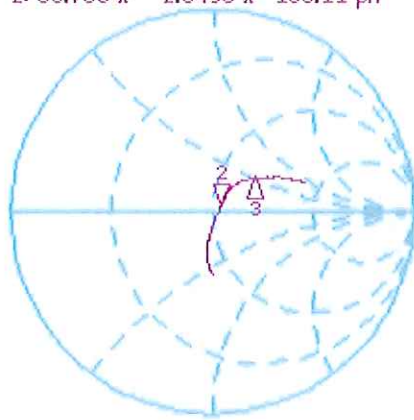
0 dB = 16.780mW/g = 24.50 dB mW/g

# Impedance Measurement Plot for Head TSL

10 Jan 2012 14:31:12

CH1 S11 1 U FS 2: 53.756  $\Omega$  2.8496  $\Omega$  185.11  $\mu\text{H}$  2 450.000 000 MHz

\*  
De1  
CA



CH1 Markers  
3: 70.133  $\Omega$   
25.355  $\Omega$   
2.60000 GHz

Avg  
16

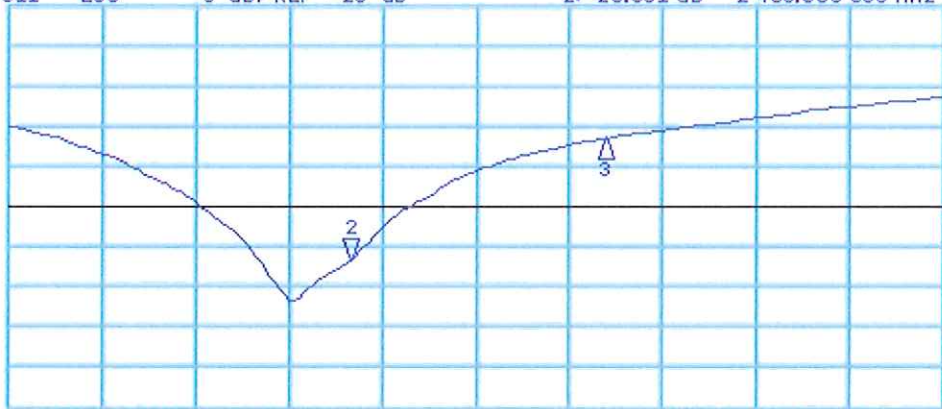
H1 d

CH2 S11 LOG 5 dB/REF -20 dB 2:-26.851 dB 2 450.000 000 MHz

CA

Avg  
16

H1 d



CH2 Markers  
3:-11.579 dB  
2.60000 GHz

START 2 250.000 000 MHz

STOP 2 800.000 000 MHz

## DASY5 Validation Report for Body TSL

Date: 06.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 877**

Communication System: CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.01$  mho/m;  $\epsilon_r = 50.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

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

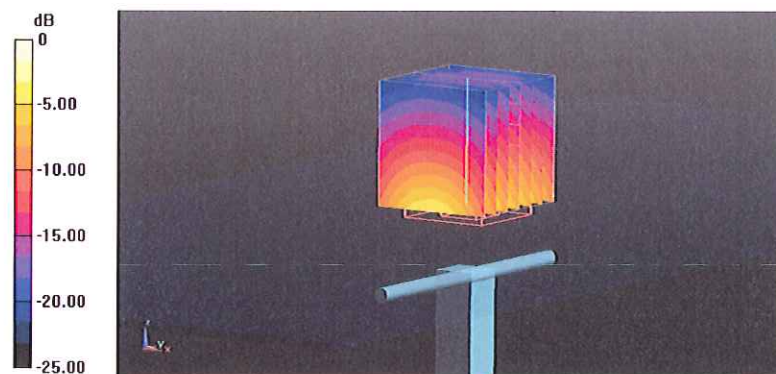
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.385 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.9360

**SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.21 mW/g**

Maximum value of SAR (measured) = 17.740 mW/g



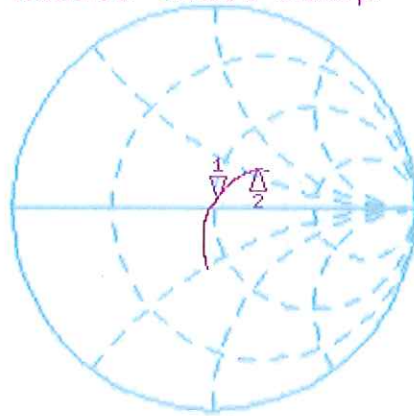
0 dB = 17.740mW/g = 24.98 dB mW/g

# Impedance Measurement Plot for Body TSL

6 Jan 2012 13:52:32

CH1 S11 1 U FS 1: 51.471  $\Omega$  4.4922  $\Omega$  291.82 pF 2 450.000 000 MHz

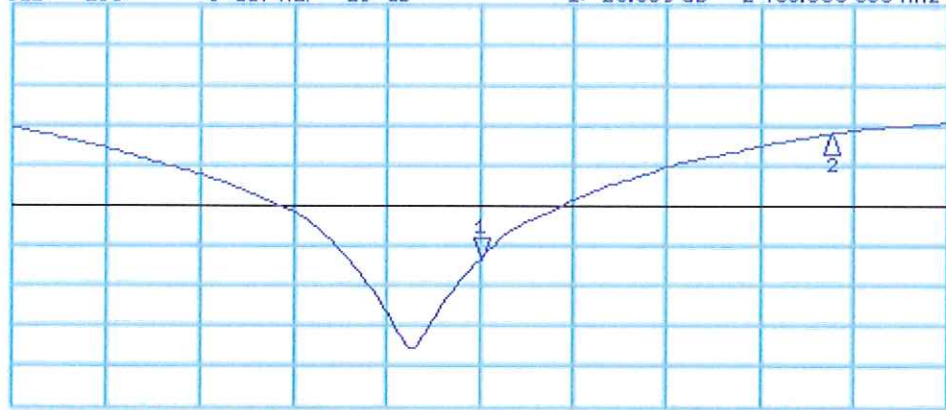
\*  
De1  
Cor  
Avg  
16  
H1d



CH1 Markers  
2: 69.543  $\Omega$   
28.719  $\Omega$   
2.60000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -26.639 dB 2 450.000 000 MHz

Cor  
Avg  
16  
H1d



CH2 Markers  
2: -10.978 dB  
2.60000 GHz

START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

# MOTOROLA MOBILITY, EME Laboratories

## Extension of Dipole Calibration Interval

FCD-1954, Rev.3

Dipole SN: 877

Date of last external calibration: 1/10/2012

External calibration performed by: SPEAG

	Original Calibration Data: 1/10/2012	1st Extension Internal Verification: 1/8/2013	2nd Extension Internal Verification: <date>	Accept / Reject
<b>Return loss (dB):</b> <i>Verify &lt; -20dB &amp; within 20% of original</i>	-26.9	-27.1	-	Accept
<b>Impedance, Real (<math>\Omega</math>):</b> <i>Verify within +/-5 <math>\Omega</math> of original</i>	53.8	54.6	-	Accept
<b>Impedance, Imaginary (<math>\Omega</math>):</b> <i>Verify within +/-5 <math>\Omega</math> of original</i>	2.9	0.3	-	Accept

### Conclusion:

Based on the requirements of KDB 865664 D01 SAR Measurement Requirements for 100MHz to 6GHz, it has been concluded that the dipole identified above has qualified for extension of its calibration interval for one additional year.

This review shall be repeated annually, but not to exceed a maximum 3 years from the most recent manufacturer's calibration.

### First Extension Period:

Approved extension period: **1 Year**

Previous due date: 1/10/2013

**NEW DUE DATE: 1/10/2014**

*2 years from date of last external calibration*

Authorized by: Marge Kaunas

### Second Extension Period:

Approved extension period: **1 Year**

Previous due date:

**NEW DUE DATE:**

*3 years from date of last external calibration*

Authorized by:



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Accreditation No.: **SCS 108**

Client **Motorola MDb**

Certificate No: **D5GHzV2-1098\_Jan12**

## CALIBRATION CERTIFICATE

Object: **D5GHzV2 - SN: 1098**

Calibration procedure(s): **QA CAL-22.v1  
Calibration procedure for dipole validation kits between 3-6 GHz**

Calibration date: **January 17, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe EX3DV4	SN: 3503	30-Dec-11 (No. EX3-3503_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: January 18, 2012

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Accreditation No.: **SCS 108**

**Glossary:**

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

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

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

## Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.8.0
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
<b>Frequency</b>	5200 MHz ± 1 MHz 5800 MHz ± 1 MHz	

## Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	36.0	4.66 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	36.3 ± 6 %	4.60 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

## 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	7.91 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>79.2 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>22.7 mW / g ± 16.5 % (k=2)</b>

## Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	35.3	5.27 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	35.3 ± 6 %	5.22 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.82 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>78.2 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.22 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>22.2 mW / g ± 16.5 % (k=2)</b>

### Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.2 ± 6 %	5.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

### SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.36 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>73.7 mW / g ± 18.1 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.07 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>20.8 mW / g ± 17.6 % (k=2)</b>

### Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.2 ± 6 %	6.28 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

### SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>71.1 mW / g ± 18.1 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	1.97 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>19.7 mW / g ± 17.6 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	51.1 $\Omega$ - 6.8 j $\Omega$
Return Loss	- 23.3 dB

### Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	57.1 $\Omega$ - 0.6 j $\Omega$
Return Loss	- 23.6 dB

### Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	51.0 $\Omega$ - 5.6 j $\Omega$
Return Loss	- 25.0 dB

### Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	58.0 $\Omega$ + 0.6 j $\Omega$
Return Loss	- 22.6 dB

## General Antenna Parameters and Design

Electrical Delay (one direction)	1.206 ns
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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	September 24, 2010

## DASY5 Validation Report for Head TSL

Date: 17.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1098**

Communication System: CW; Frequency: 5200 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.6$  mho/m;  $\epsilon_r = 36.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.22$  mho/m;  $\epsilon_r = 35.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41), ConvF(4.81, 4.81, 4.81); Calibrated: 30.12.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

**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 = 63.621 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 29.5950

**SAR(1 g) = 7.91 mW/g; SAR(10 g) = 2.27 mW/g**

Maximum value of SAR (measured) = 18.221 mW/g

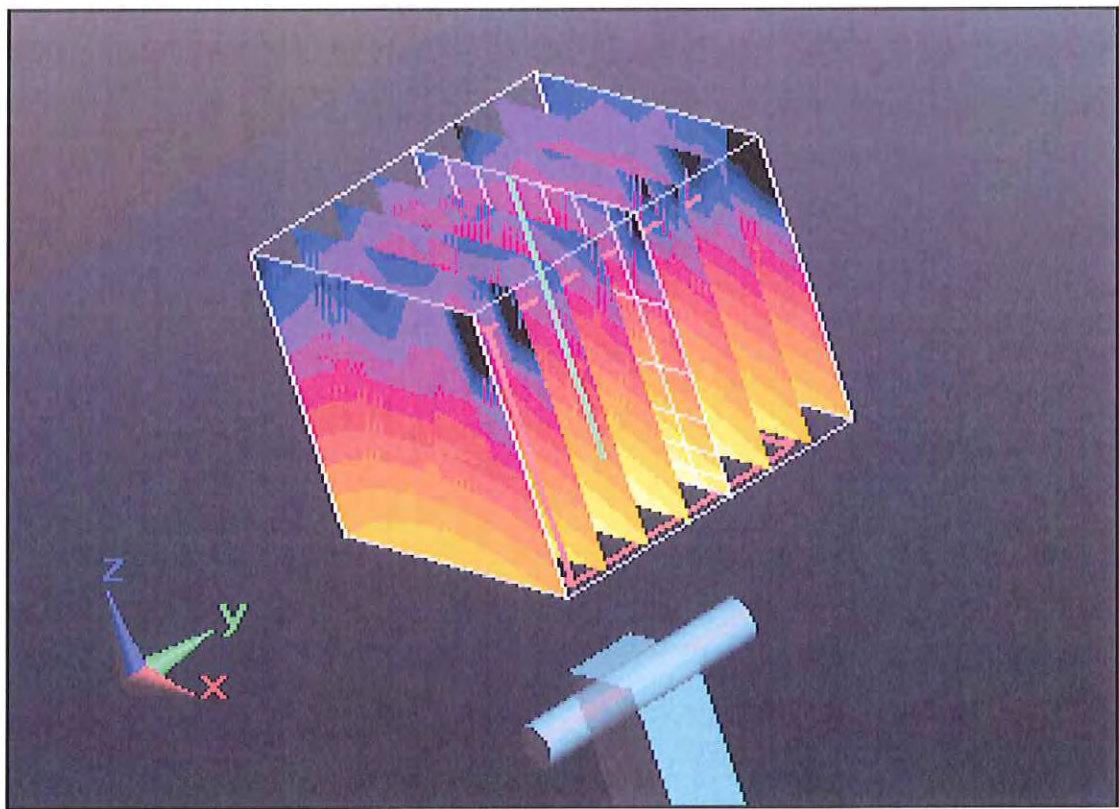
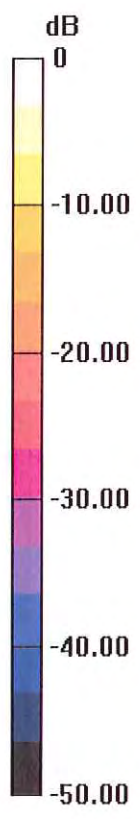
**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 60.177 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 33.0380

**SAR(1 g) = 7.82 mW/g; SAR(10 g) = 2.22 mW/g**

Maximum value of SAR (measured) = 18.918 mW/g



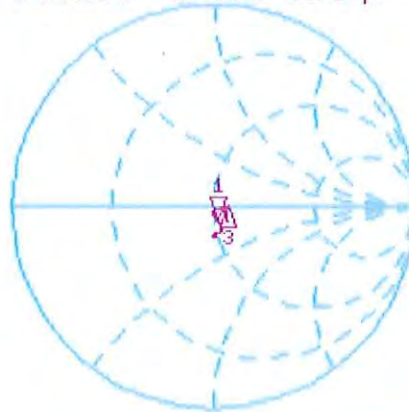
0 dB = 18.920mW/g = 25.54 dB mW/g

# Impedance Measurement Plot for Head TSL

17 Jan 2012 10:33:31

CH1 S11 1 U FS 1: 51.113  $\Omega$  -6.8418  $\Omega$  4.4735 pF 5 200.000 000 MHz

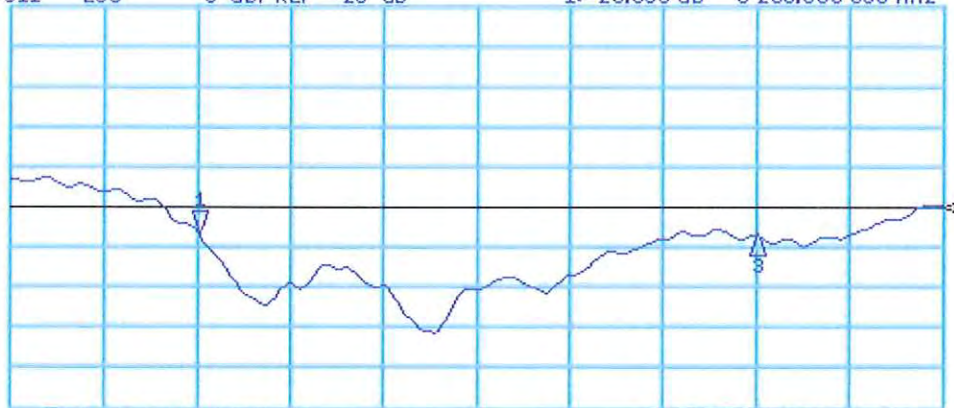
\*  
De1  
Cor  
Avg  
16  
H1 d



CH1 Markers  
3: 57.057  $\Omega$   
-634.77 m $\Omega$   
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1:-23.300 dB 5 200.000 000 MHz

Cor  
Avg  
16  
H1 d



CH2 Markers  
3:-23.584 dB  
5.80000 GHz

START 5 000.000 000 MHz

STOP 6 000.000 000 MHz

## DASY5 Validation Report for Body TSL

Date: 16.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1098**

Communication System: CW; Frequency: 5200 MHz, Frequency: 5800 MHz

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.46$  mho/m;  $\epsilon_r = 49.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.28$  mho/m;  $\epsilon_r = 48.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91), ConvF(4.38, 4.38, 4.38); Calibrated: 30.12.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

**Dipole Calibration for Body 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 = 58.093 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 28.8530

**SAR(1 g) = 7.36 mW/g; SAR(10 g) = 2.07 mW/g**

Maximum value of SAR (measured) = 16.771 mW/g

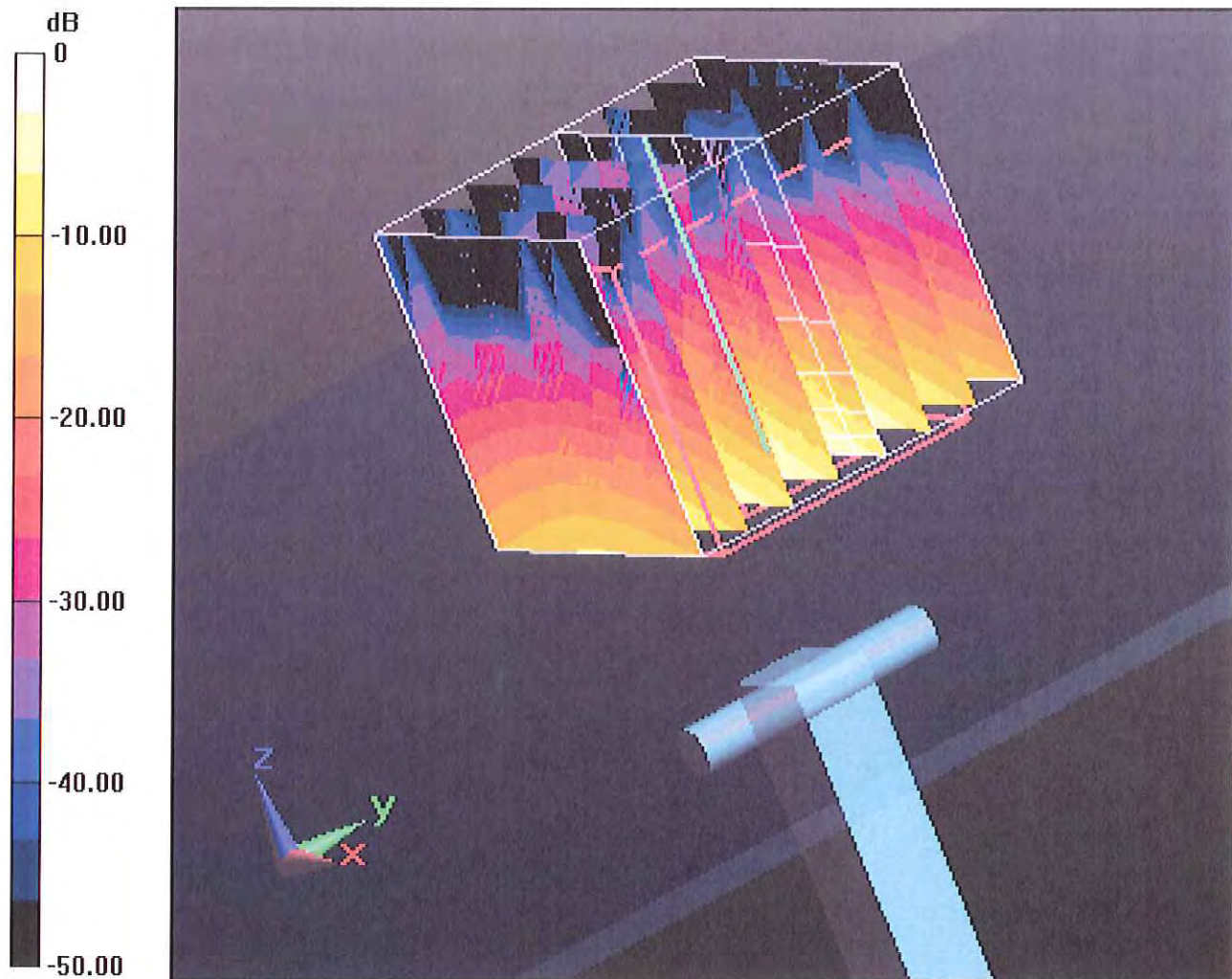
**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 53.483 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 33.0550

**SAR(1 g) = 7.1 mW/g; SAR(10 g) = 1.97 mW/g**

Maximum value of SAR (measured) = 17.172 mW/g



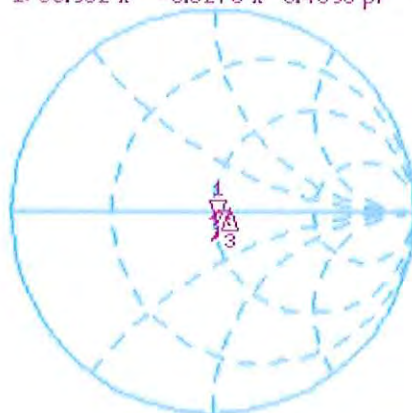
0 dB = 17.170mW/g = 24.70 dB mW/g

# Impedance Measurement Plot for Body TSL

16 Jan 2012 10:43:28

CH1 S11 1 U FS 1: 50.982  $\Omega$  -5.6270  $\Omega$  5.4393 pF 5 200.000 000 MHz

\*  
De l  
Cor



CH1 Markers

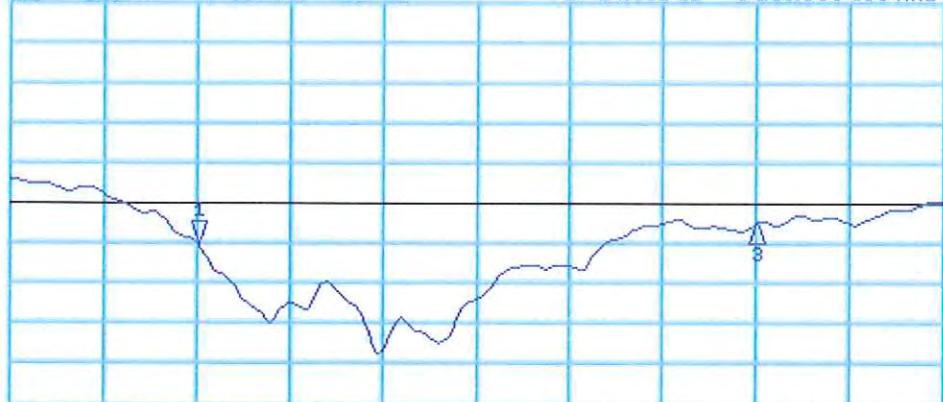
3: 57.996  $\Omega$   
8.5645  $\Omega$   
5.80000 GHz

Avg  
16

H1 d

CH2 S11 LOG 5 dB/REF -20 dB 1:-24.962 dB 5 200.000 000 MHz

Cor



CH2 Markers

3:-22.591 dB  
5.80000 GHz

Avg  
16

H1 d

START 5 000.000 000 MHz

STOP 5 800.000 000 MHz

# MOTOROLA MOBILITY, EME Laboratories

## Extension of Dipole Calibration Interval

FCD-1954, Rev.3

Dipole SN: 1098

Date of last external calibration: 1/17/2012

External calibration performed by: SPEAG

	Original Calibration Data: 1/17/2012	1st Extension Internal Verification: 1/4/2013	2nd Extension Internal Verification: <date>	Accept / Reject
<b>Return loss (dB):</b> <i>Verify &lt; -20dB &amp; within 20% of original</i>	-23.3	-24.2	-	Accept
<b>Impedance, Real (<math>\Omega</math>):</b> <i>Verify within +/-5 <math>\Omega</math> of original</i>	51.1	53.1	-	Accept
<b>Impedance, Imaginary (<math>\Omega</math>):</b> <i>Verify within +/-5 <math>\Omega</math> of original</i>	-6.8	-2.1	-	Accept

### Conclusion:

Based on the requirements of KDB 865664 D01 SAR Measurement Requirements for 100MHz to 6GHz, it has been concluded that the dipole identified above has qualified for extension of its calibration interval for one additional year.

This review shall be repeated annually, but not to exceed a maximum 3 years from the most recent manufacturer's calibration.

### First Extension Period:

Approved extension period: **1 Year**

Previous due date: 1/17/2013

**NEW DUE DATE: 1/17/2014**

*2 years from date of last external calibration*

Authorized by: Marge Kaunas

### Second Extension Period:

Approved extension period: **1 Year**

Previous due date:

**NEW DUE DATE:**

*3 years from date of last external calibration*

Authorized by:

**END OF REPORT**