Test Laboratory: CCIS Date/Time: 07.04.2016 19:13:19

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

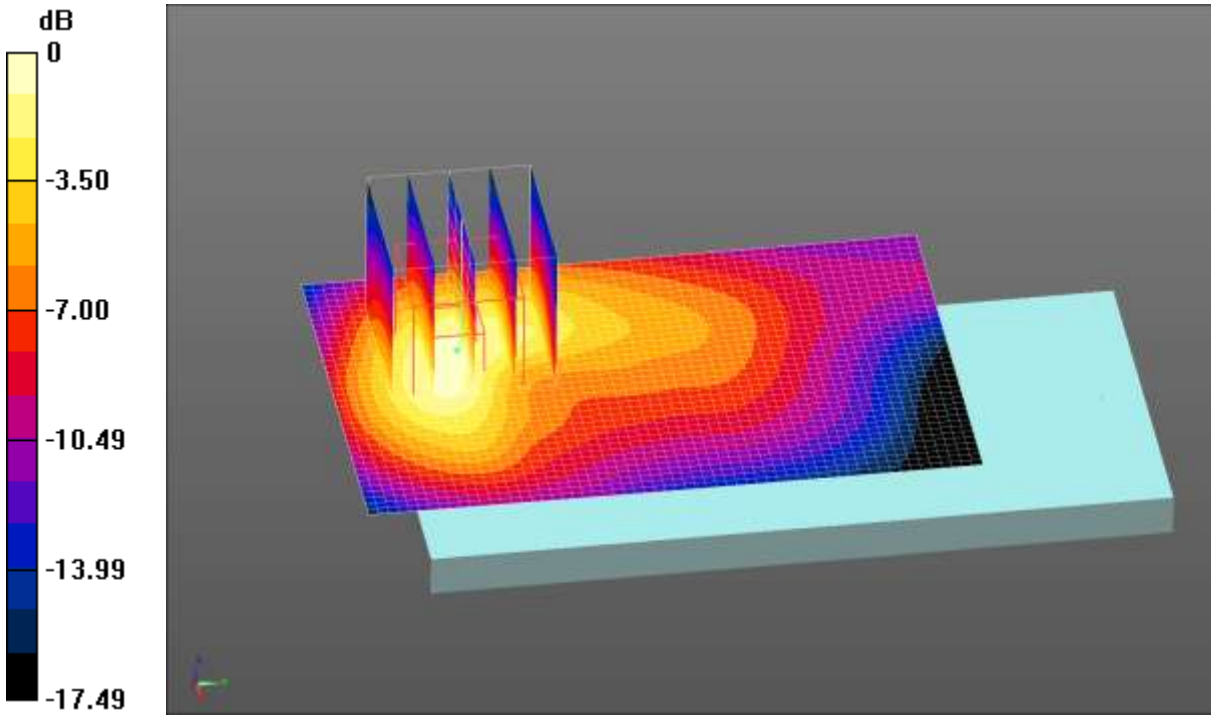
Communication System: UID 0, GSM (0); Frequency: 1850.2 MHz
Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.53 S/m; $\varepsilon_r$ = 52.63; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**GSM 1900 Body Back/Low Channel/Area Scan (41x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.621 W/kg

**GSM 1900 Body Back/Low Channel/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.22 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.899 W/kg
**SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.273 W/kg**
Maximum value of SAR (measured) = 0.739 W/kg




0 dB = 0.739 W/kg = -1.31 dBW/kg

Test Laboratory: CCIS Date/Time: 07.02.2016 11:26:47

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 836.6 MHz
Medium parameters used (extrapolated): f = 836.6 MHz; $\sigma$ = 1.039 S/m; $\varepsilon_r$ = 56.886; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

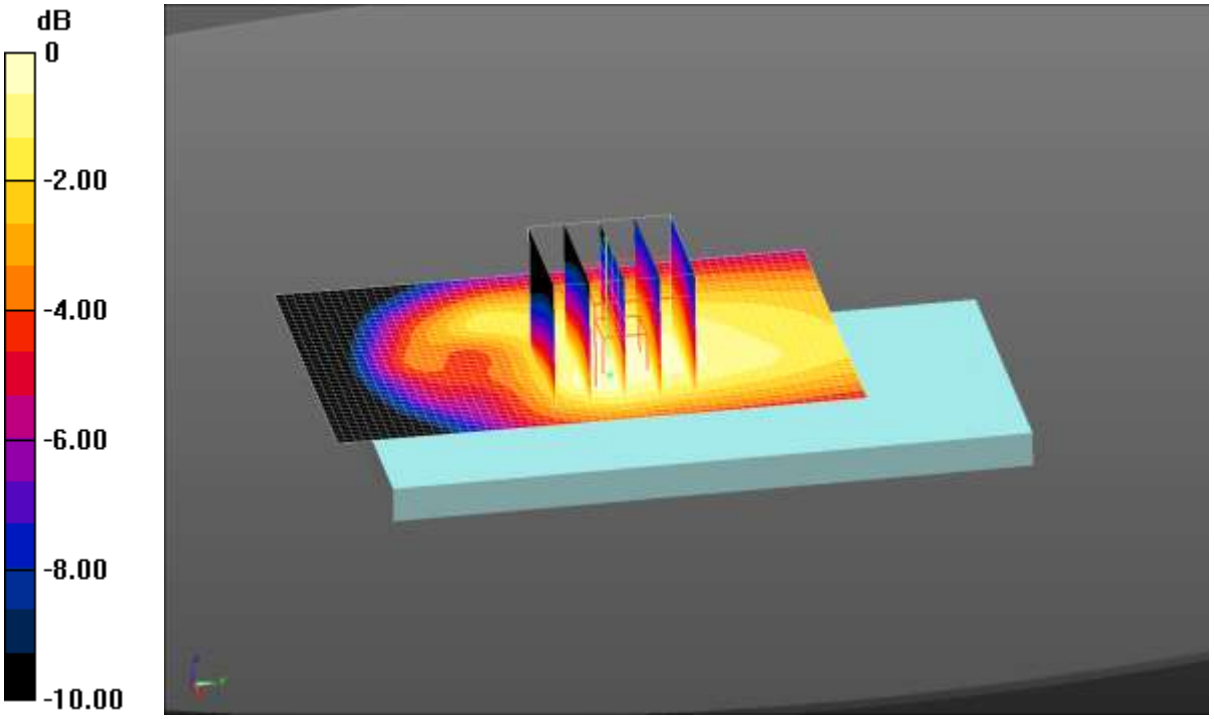
DASY Configuration:

- Probe: EX3DV4 - SN3924; ConvF(9.74, 9.74, 9.74); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## WCDMA 850 Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.62 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.387 W/kg
**SAR(1 g) = 0.255 W/kg; SAR(10 g) = 0.178 W/kg**
Maximum value of SAR (measured) = 0.335 W/kg

**WCDMA 850 Body Back/Middle Channel/Area Scan (41x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.321 W/kg




0 dB = 0.321 W/kg = -4.93 dBW/kg

Test Laboratory: CCIS Date/Time: 07.05.2016 20:48:39

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 1852.4 MHz
Medium parameters used (interpolated): f = 1852.4 MHz; $\sigma$ = 1.527 S/m; $\varepsilon_r$ = 52.588; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

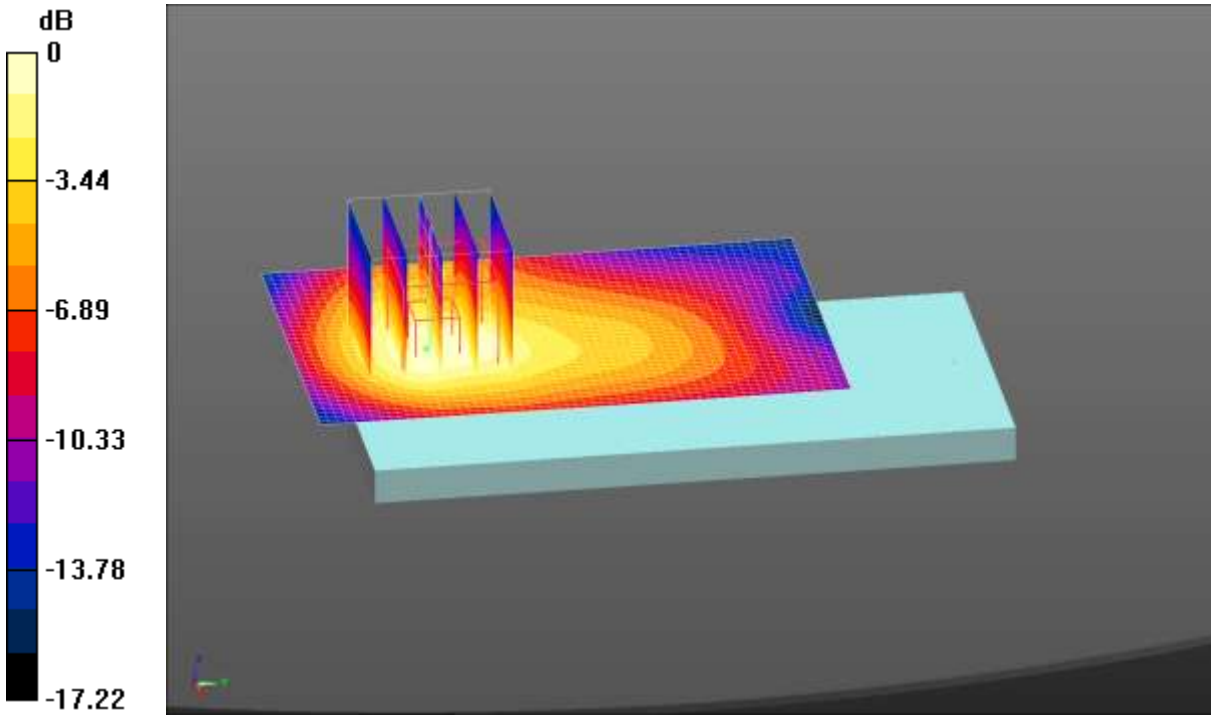
DASY Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## WCDMA 1900 Body Back/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.88 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 1.33 W/kg
**SAR(1 g) = 0.783 W/kg; SAR(10 g) = 0.467 W/kg**
Maximum value of SAR (measured) = 1.12 W/kg

**WCDMA 1900 Body Back/Low Channel/Area Scan (41x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.17 W/kg




0 dB = 1.17 W/kg = 0.68 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 08:29:50

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 1RB QPSK (0); Frequency: 1860 MHz
Medium parameters used (extrapolated): f = 1860 MHz; $\sigma$ = 1.433 S/m; $\varepsilon_r$ = 54.961; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

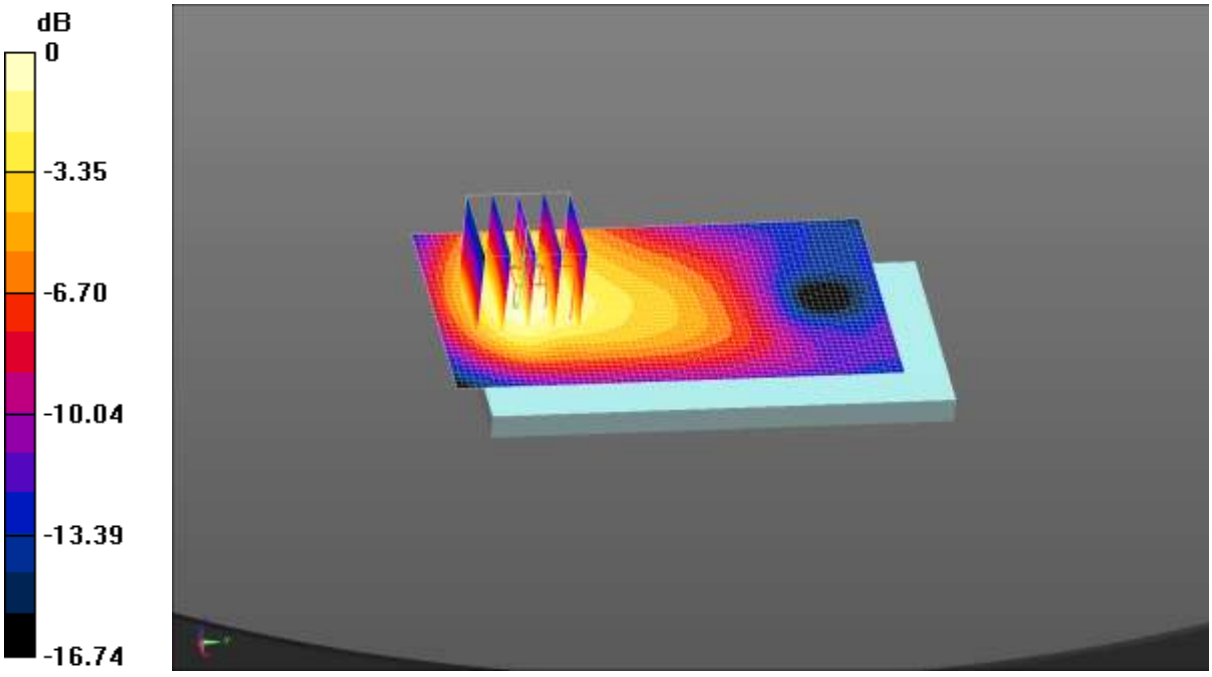
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 2 1RB(20MHz) Body Back/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.75 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.14 W/kg
**SAR(1 g) = 0.663 W/kg; SAR(10 g) = 0.395 W/kg**
Maximum value of SAR (measured) = 0.940 W/kg

## LTE Band 2 1RB(20MHz) Body Back/Low Channel/Area Scan (41x71x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.909 W/kg




0 dB = 0.909 W/kg = -0.41 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 14:24:48

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 1RB QPSK (0); Frequency: 1720 MHz
Medium parameters used: f = 1720 MHz; $\sigma$ = 1.419 S/m; $\varepsilon_r$ = 52.59; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

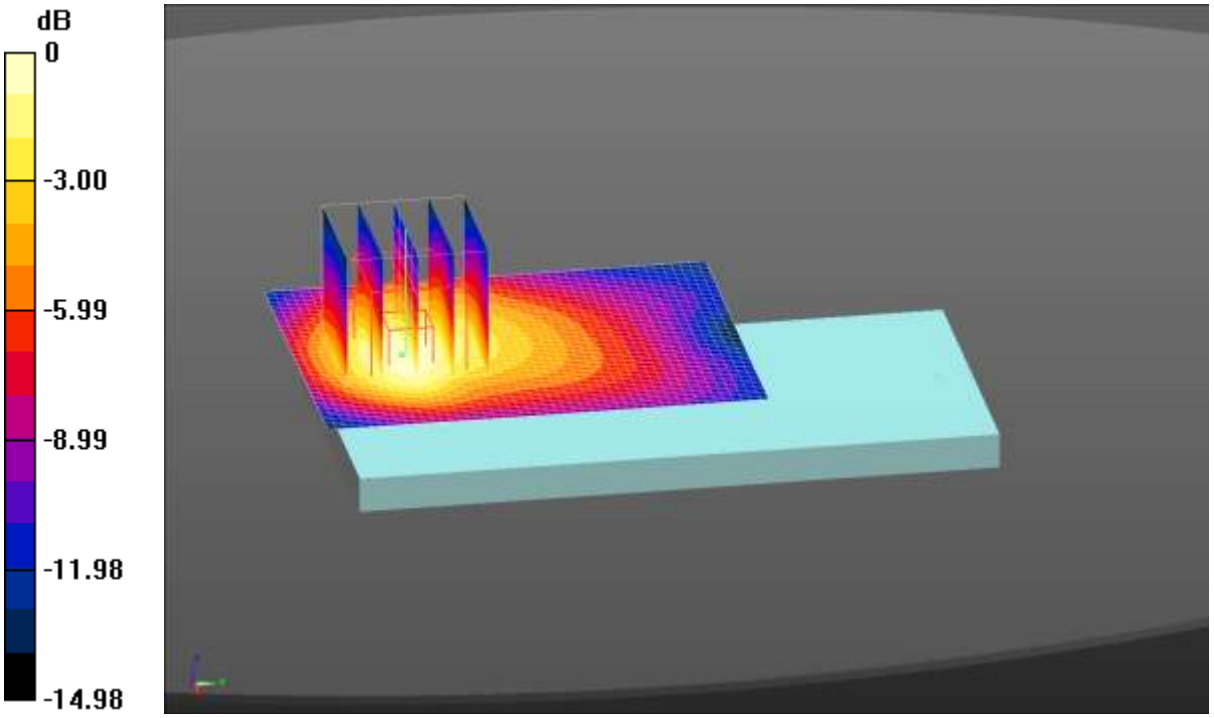
- Probe: EX3DV4 - SN3924; ConvF(7.94, 7.94, 7.94); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 4 1RB(20MHz) Body Back/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.64 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 1.40 W/kg
**SAR(1 g) = 0.799 W/kg; SAR(10 g) = 0.492 W/kg**
Maximum value of SAR (measured) = 1.17 W/kg

## LTE Band 4 1RB(20MHz) Body Back/Low Channel/Area Scan (41x51x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.21 W/kg




0 dB = 1.21 W/kg = 0.83 dBW/kg

Test Laboratory: CCIS Date/Time: 07.07.2016 09:46:13

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 1RB QPSK (0); Frequency: 2510 MHz
Medium parameters used: f = 2510 MHz; $\sigma$ = 2.081 S/m; $\varepsilon_r$ = 53.519; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

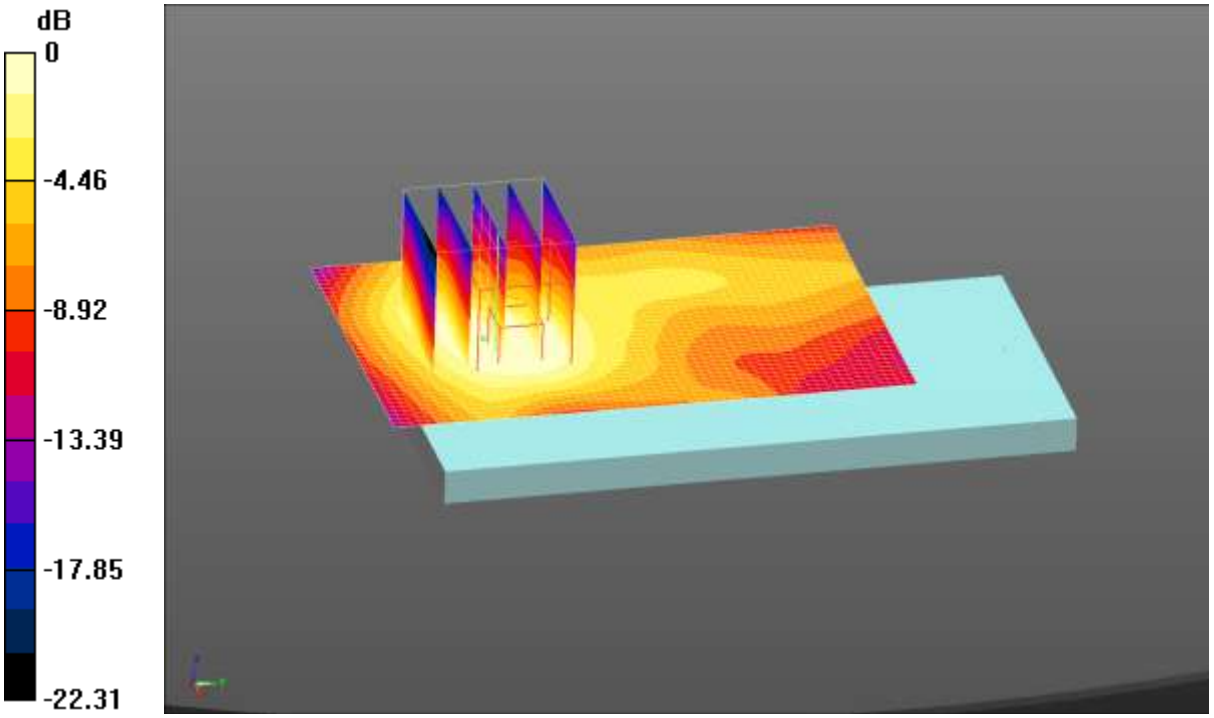
- Probe: EX3DV4 - SN3924; ConvF(7.3, 7.3, 7.3); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 7 1RB(20MHZ) Body Front/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.594 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.976 W/kg
**SAR(1 g) = 0.517 W/kg; SAR(10 g) = 0.275 W/kg**
Maximum value of SAR (measured) = 0.761 W/kg

## LTE Band 7 1RB(20MHZ) Body Front/Low Channel/Area Scan (41x61x1):

Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.684 W/kg




0 dB = 0.684 W/kg = -1.65 dBW/kg

Test Laboratory: CCIS Date/Time: 07.03.2016 10:53:34

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 1RB QPSK (0); Frequency: 710 MHz
Medium parameters used: f = 710 MHz; $\sigma$ = 0.939 S/m; $\varepsilon_r$ = 54.389; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

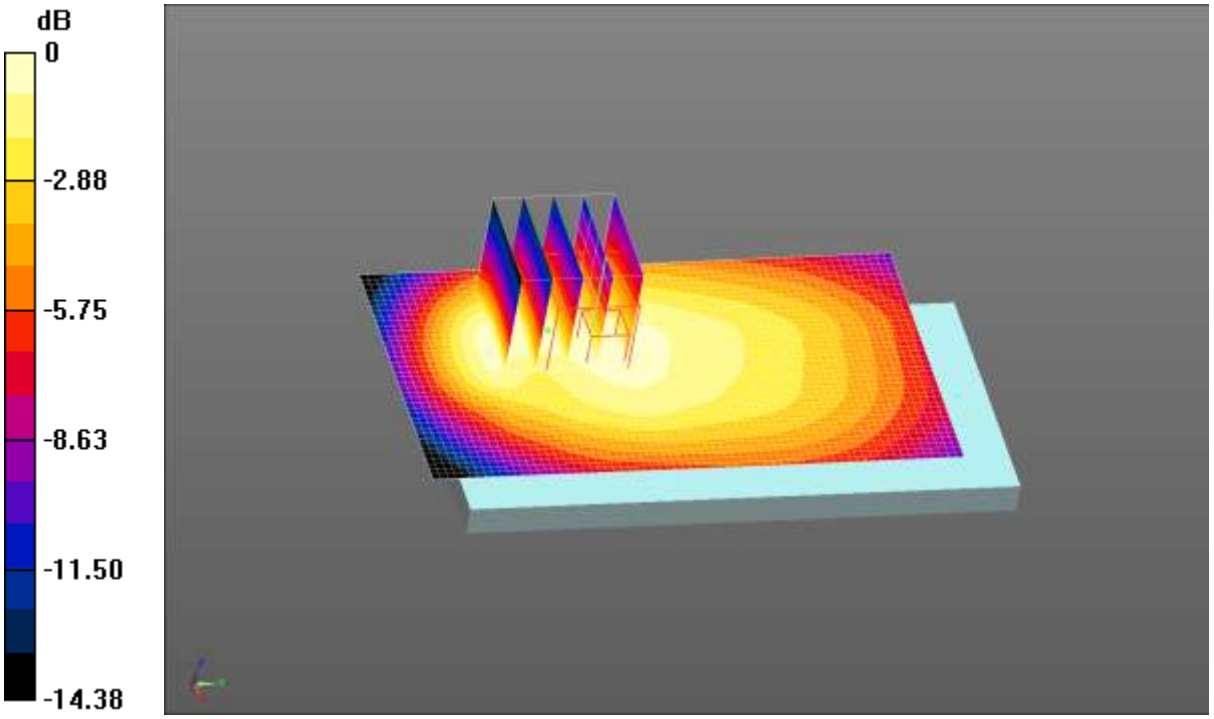
- Probe: EX3DV4 - SN3924; ConvF(9.9, 9.9, 9.9); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 17 1RB(10MHz) Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.74 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 0.177 W/kg
**SAR(1 g) = 0.099 W/kg; SAR(10 g) = 0.065 W/kg**
Maximum value of SAR (measured) = 0.132 W/kg

## LTE Band 17 1RB(10MHz) Body Back/Middle Channel/Area Scan (41x71x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.137 W/kg




0 dB = 0.137 W/kg = -8.63 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 10:57:57

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD(USA) 20MHz 50%RB QPSK (0); Frequency: 1860 MHz
Medium parameters used (extrapolated): f = 1860 MHz; $\sigma$ = 1.433 S/m; $\varepsilon_r$ = 54.961; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

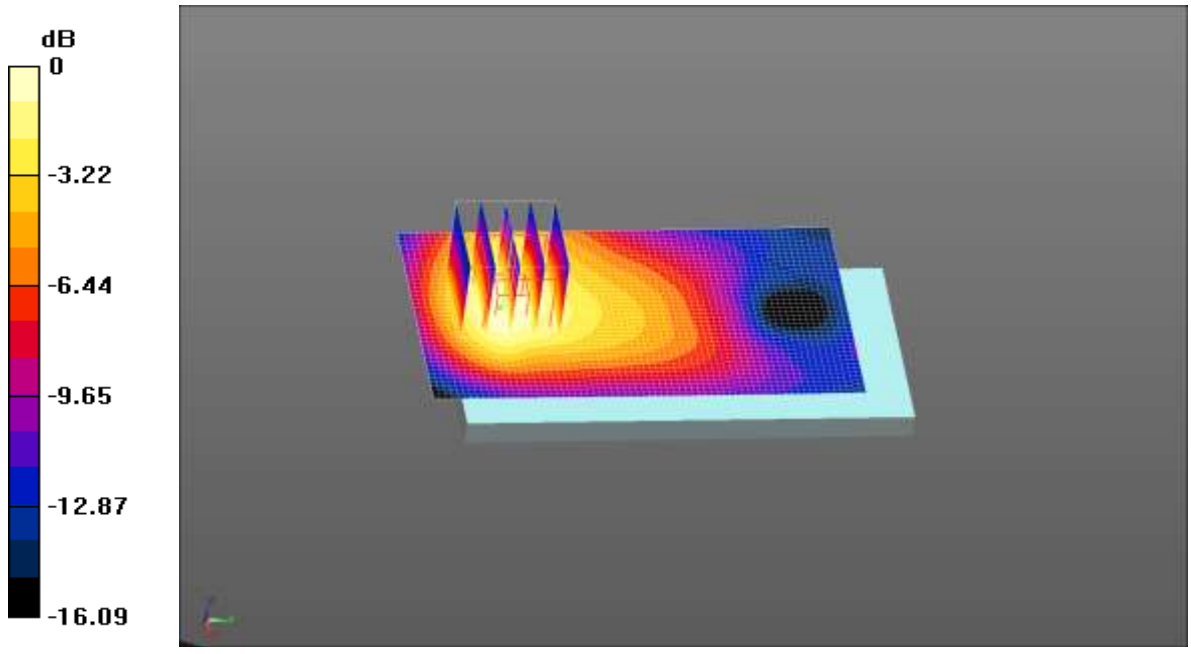
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 2 50%RB(20MHz) Body Back/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.29 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.47 W/kg
**SAR(1 g) = 0.848 W/kg; SAR(10 g) = 0.504 W/kg**
Maximum value of SAR (measured) = 1.23 W/kg

## LTE Band 2 50%RB(10MHz) Body Back/Low Channel/Area Scan (41x71x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.12 W/kg




0 dB = 1.12 W/kg = 0.49 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 11:37:29

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD(USA) 20MHz 50%RB QPSK (0); Frequency: 1745 MHz
Medium parameters used (interpolated): f = 1745 MHz; $\sigma$ = 1.43 S/m; $\varepsilon_r$ = 52.523; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

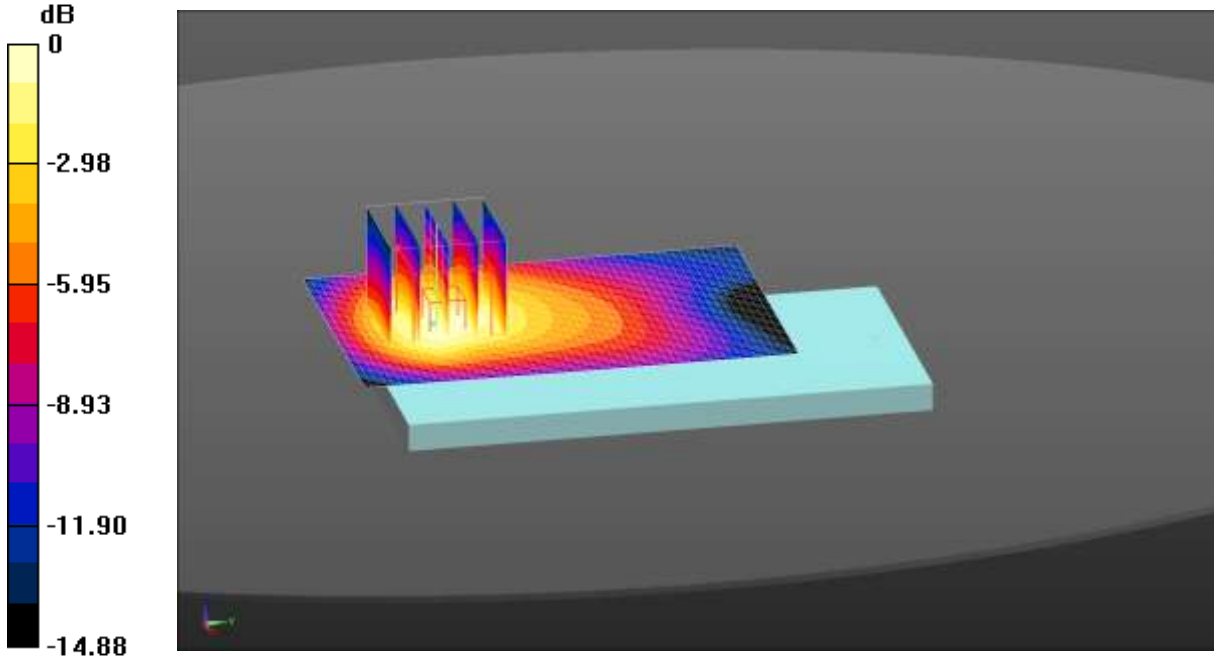
- Probe: EX3DV4 - SN3924; ConvF(7.94, 7.94, 7.94); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 4 50%RB(20MHz) Body Back/High Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.27 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.14 W/kg
**SAR(1 g) = 0.663 W/kg; SAR(10 g) = 0.397 W/kg**
Maximum value of SAR (measured) = 0.956 W/kg

## LTE Band 4 50%RB(20MHz) Body Back/High Channel/Area Scan (41x61x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.872 W/kg




0 dB = 0.872 W/kg = -0.59 dBW/kg

Test Laboratory: CCIS Date/Time: 07.07.2016 10:16:38

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD(USA) 20MHz 50%RB QPSK (0); Frequency: 2510 MHz
Medium parameters used: f = 2510 MHz; $\sigma$ = 2.081 S/m; $\varepsilon_r$ = 53.519; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

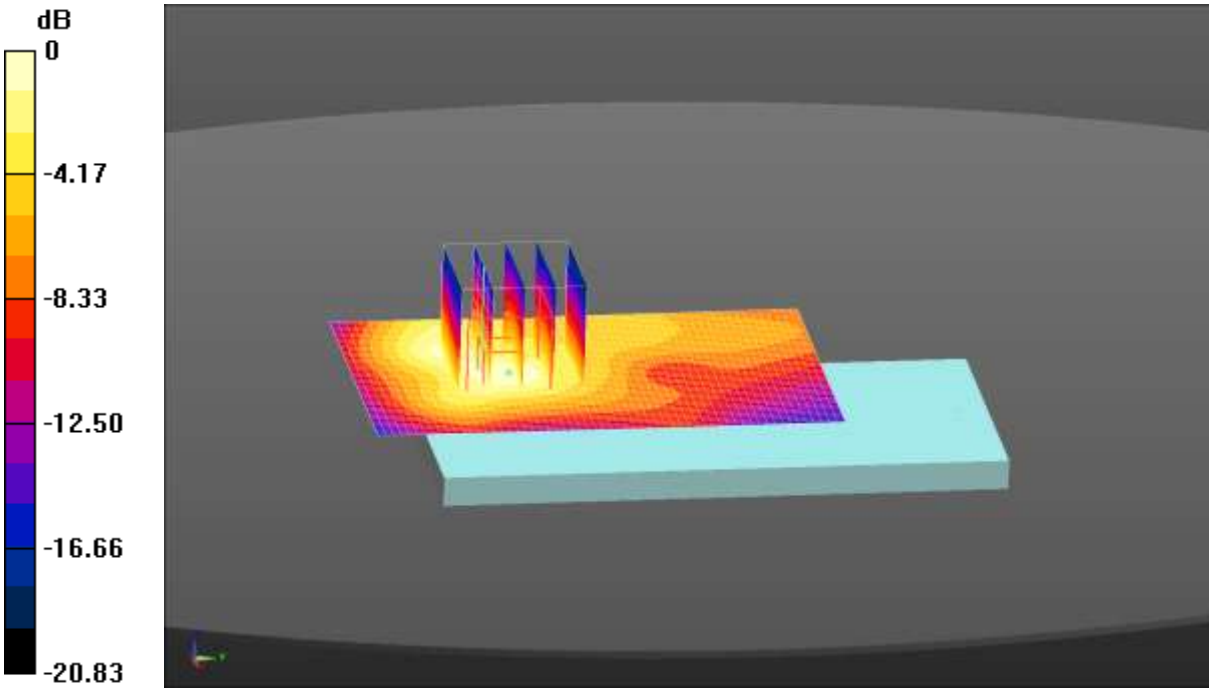
- Probe: EX3DV4 - SN3924; ConvF(7.3, 7.3, 7.3); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band7 50%RB(20MHZ) Body Front/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.786 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.851 W/kg
**SAR(1 g) = 0.448 W/kg; SAR(10 g) = 0.238 W/kg**
Maximum value of SAR (measured) = 0.642 W/kg

## LTE Band7 50%RB(20MHZ) Body Front/Low Channel/Area Scan (41x61x1):

Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.686 W/kg




0 dB = 0.686 W/kg = -1.64 dBW/kg

Test Laboratory: CCIS Date/Time: 07.03.2016 12:23:29

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD (USA) 10MHz 50%RB QPSK (0); Frequency: 710 MHz
Medium parameters used: f = 710 MHz; $\sigma$ = 0.939 S/m; $\varepsilon_r$ = 54.389; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

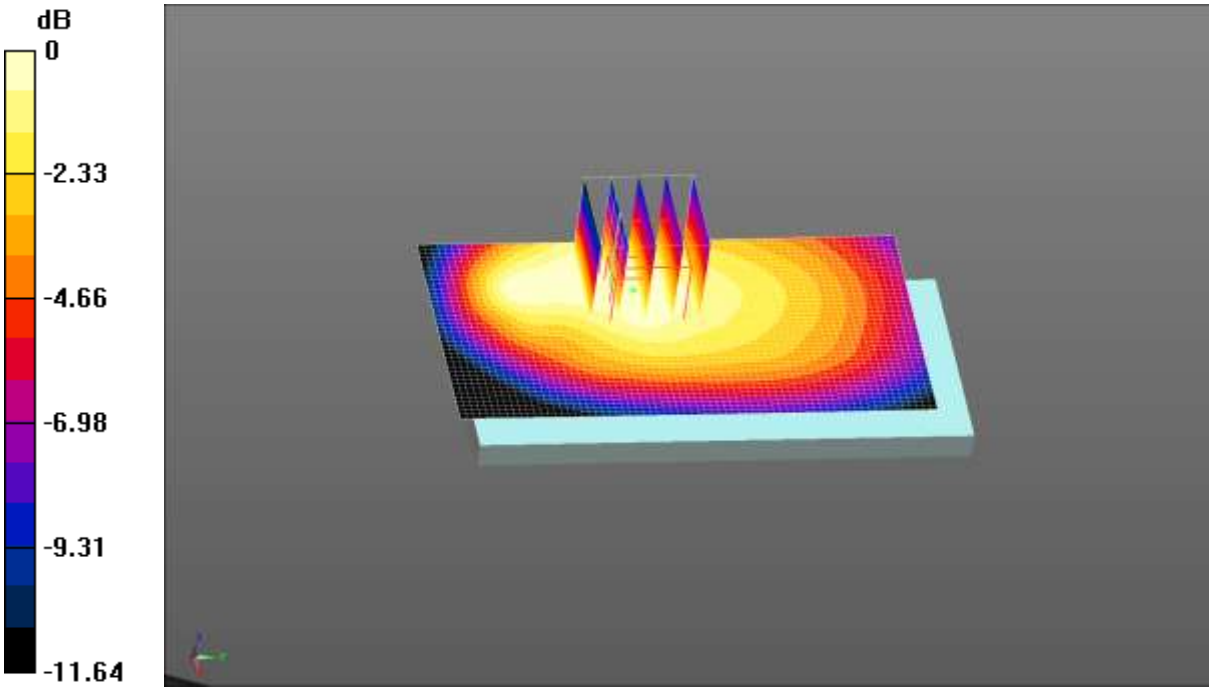
- Probe: EX3DV4 - SN3924; ConvF(9.9, 9.9, 9.9); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 17 50%RB(10MHz) Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.26 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.148 W/kg
**SAR(1 g) = 0.094 W/kg; SAR(10 g) = 0.066 W/kg**
Maximum value of SAR (measured) = 0.125 W/kg

## LTE Band 17 50%RB(10MHz) Body Back/Middle Channel/Area Scan (41x71x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.123 W/kg




0 dB = 0.123 W/kg = -9.10 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 09:39:15

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 100%RB QPSK (0); Frequency: 1860 MHz
Medium parameters used (extrapolated): f = 1860 MHz; $\sigma$ = 1.433 S/m; $\varepsilon_r$ = 54.961; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

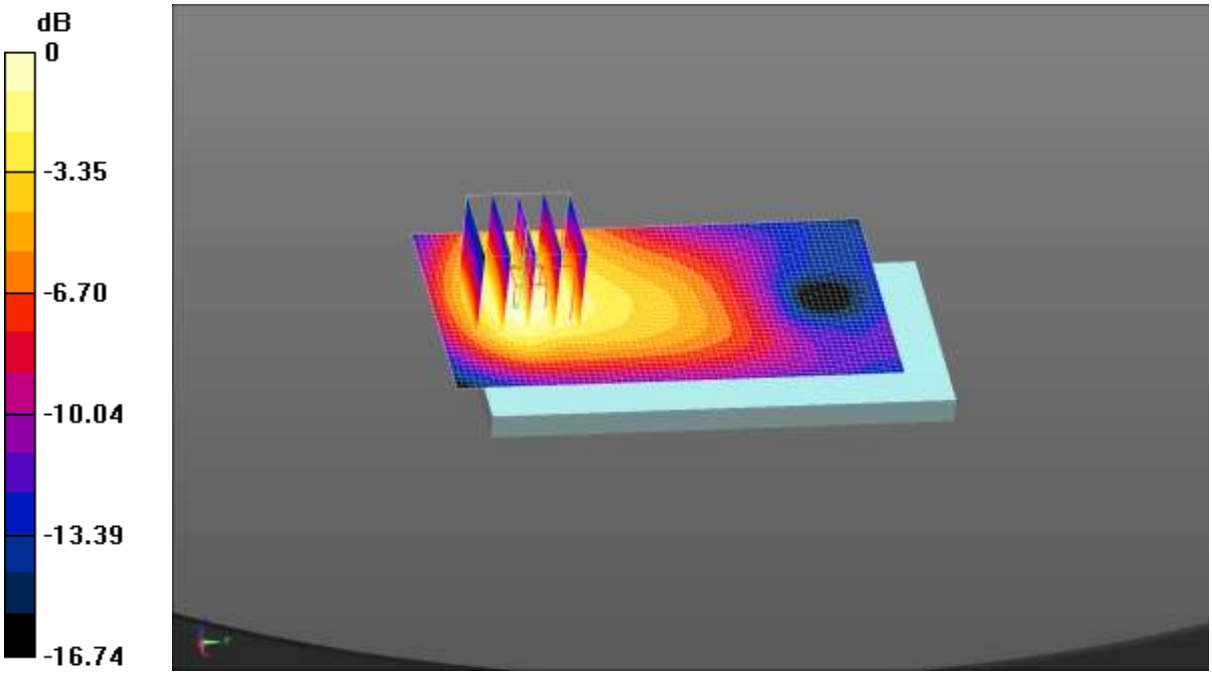
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 2 100%RB(20MHz) Body Back/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.54 V/m; Power Drift = -0.23 dB
Peak SAR (extrapolated) = 1.29 W/kg
**SAR(1 g) = 0.725 W/kg; SAR(10 g) = 0.403 W/kg**
Maximum value of SAR (measured) = 0.986 W/kg

## LTE Band 2 100%RB(20MHz) Body Back/Low Channel/Area Scan (41x71x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.919 W/kg




0 dB = 0.919 W/kg = -0.37 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 12:16:22

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD(USA) 20MHz 100%RB QPSK (0); Frequency: 1745 MHz
Medium parameters used (interpolated): f = 1745 MHz; $\sigma$ = 1.43 S/m; $\varepsilon_r$ = 52.523; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

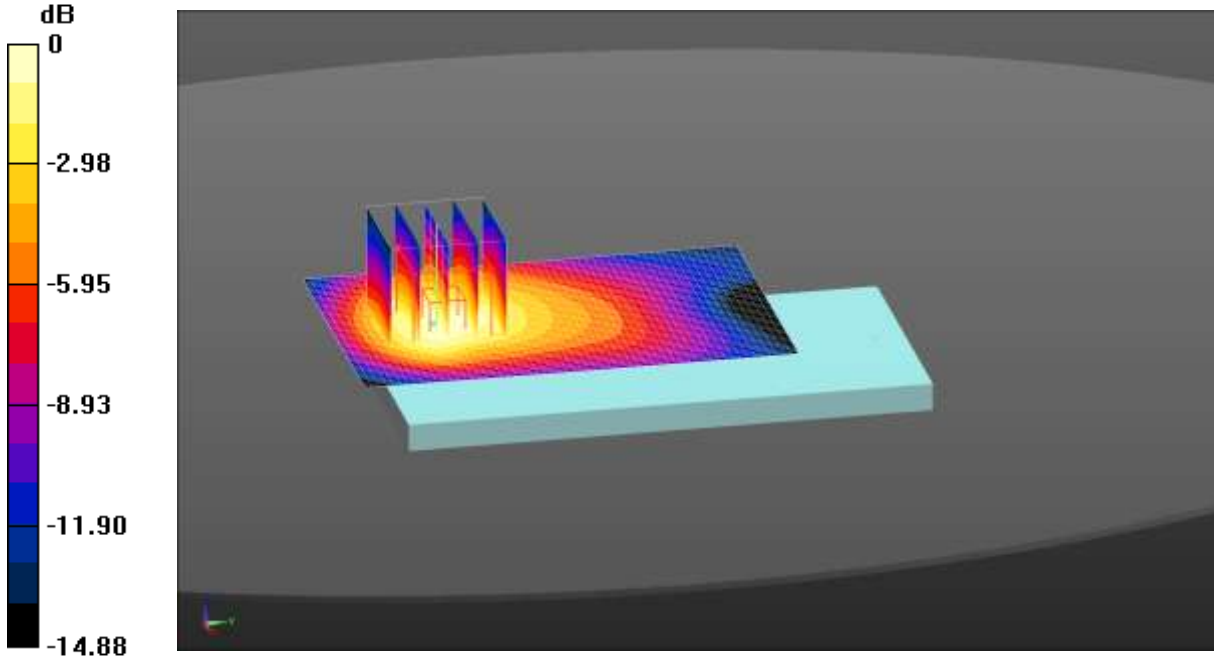
- Probe: EX3DV4 - SN3924; ConvF(7.94, 7.94, 7.94); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 4 100%RB(20MHz) Body Back/High Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.23 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.21 W/kg
**SAR(1 g) = 0.655 W/kg; SAR(10 g) = 0.402 W/kg**
Maximum value of SAR (measured) = 0.991 W/kg

## LTE Band 4 100%RB(20MHz) Body Back/High Channel/Area Scan (41x61x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.906 W/kg




0 dB = 0.906 W/kg = -0.43 dBW/kg

Test Laboratory: CCIS Date/Time: 07.06.2016 23:41:08

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

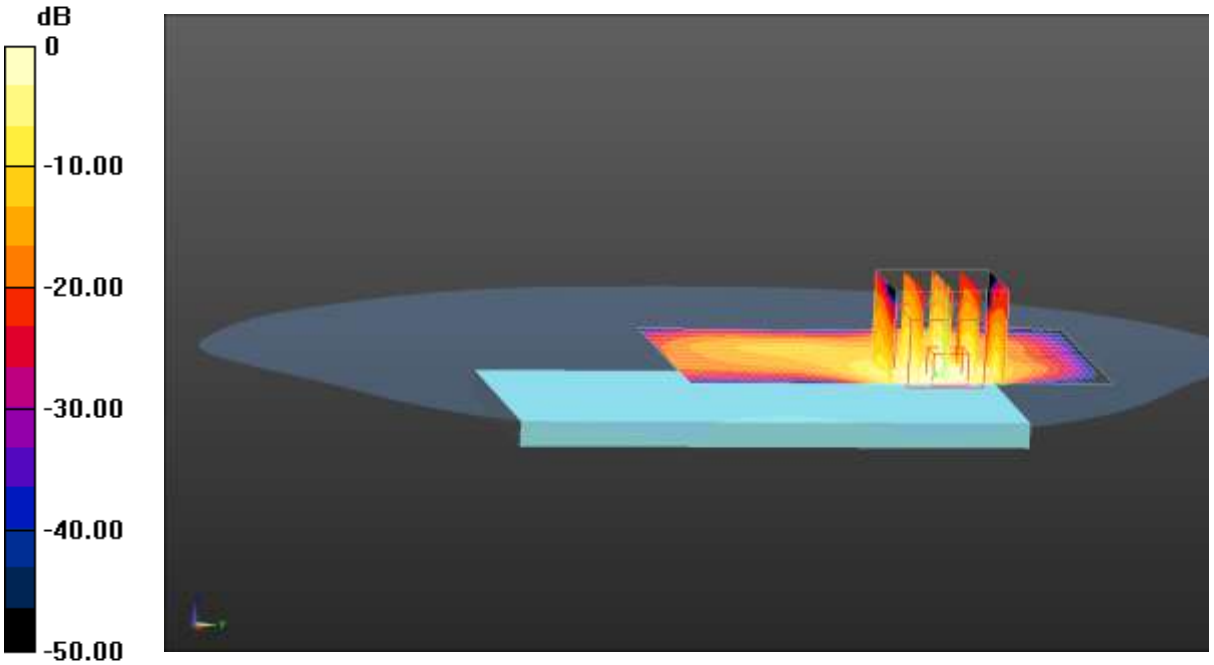
Communication System: UID 0, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) (0);
Frequency: 2437 MHz
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.999 S/m; $\varepsilon_r$ = 53.788; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3924; ConvF(7.3, 7.3, 7.3); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: SAM 5.0; Type: QD000P40CD; Serial: TP:1765
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**WIFI Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.197 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.538 W/kg
**SAR(1 g) = 0.203 W/kg; SAR(10 g) = 0.081 W/kg**
Maximum value of SAR (measured) = 0.354 W/kg

**WIFI Body Back/Middle Channel/Area Scan (41x61x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.250 W/kg




0 dB = 0.250 W/kg = -6.02 dBW/kg

Test Laboratory: CCIS Date/Time: 07.02.2016 14:46:41

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, GPRS(4 Slots) (0); Frequency: 836.6 MHz
Medium parameters used (extrapolated): f = 836.6 MHz; $\sigma$ = 1.039 S/m; $\varepsilon_r$ = 56.886; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

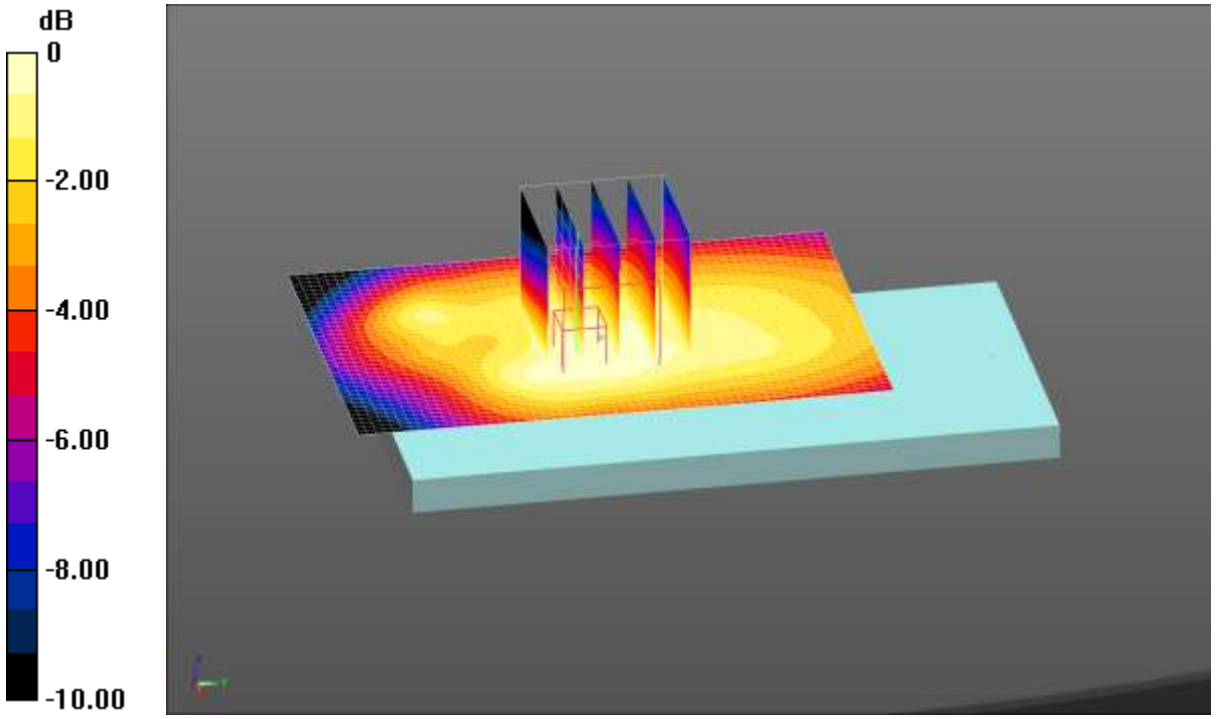
- Probe: EX3DV4 - SN3924; ConvF(9.74, 9.74, 9.74); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## GPRS 850 4Slots Body Back/Middle Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.77 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.669 W/kg
**SAR(1 g) = 0.453 W/kg; SAR(10 g) = 0.318 W/kg**
Maximum value of SAR (measured) = 0.587 W/kg

## GPRS 850 4Slots Body Back/Middle Channel/Area Scan (41x61x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.556 W/kg




0 dB = 0.556 W/kg = -2.55 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 21:59:03

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, GPRS(4 Slots) (0); Frequency: 1850.2 MHz
Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.53 S/m; $\varepsilon_r$ = 52.63; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

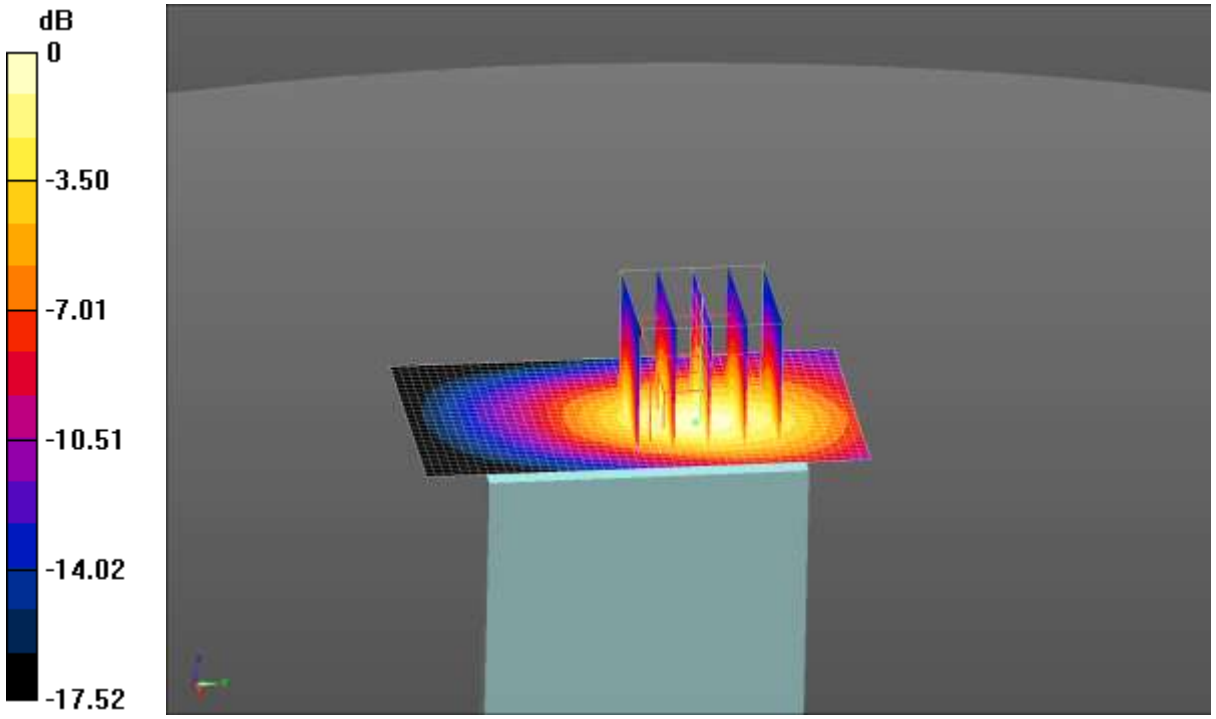
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## GPRS 1900 4Slots Body Bottom/Low Channel/Area Scan (31x51x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.09 W/kg

## GPRS 1900 4Slots Body Bottom/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.14 V/m; Power Drift = -0.20 dB
Peak SAR (extrapolated) = 1.51 W/kg
**SAR(1 g) = 0.860 W/kg; SAR(10 g) = 0.472 W/kg**
Maximum value of SAR (measured) = 1.23 W/kg




0 dB = 1.23 W/kg = 0.90 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 22:12:17

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 1852.4 MHz
Medium parameters used (interpolated): f = 1852.4 MHz; $\sigma$ = 1.527 S/m; $\varepsilon_r$ = 52.588; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

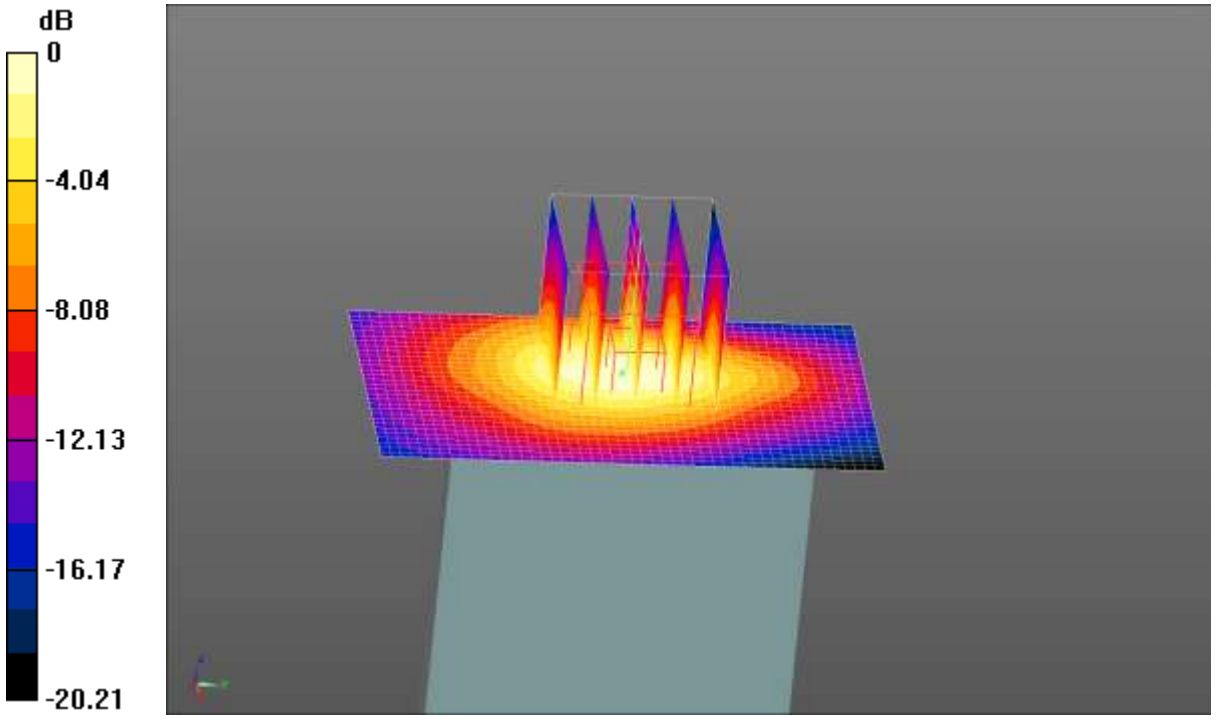
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## WCDMA 1900 Body Bottom/Low Channel/Area Scan (31x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.14 W/kg

## WCDMA 1900 Body Bottom/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.06 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.51 W/kg
**SAR(1 g) = 0.842 W/kg; SAR(10 g) = 0.453 W/kg**
Maximum value of SAR (measured) = 1.16 W/kg




0 dB = 1.16 W/kg = 0.64 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 10:05:13

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 1RB QPSK (0); Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.452 S/m; $\varepsilon_r$ = 54.951; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

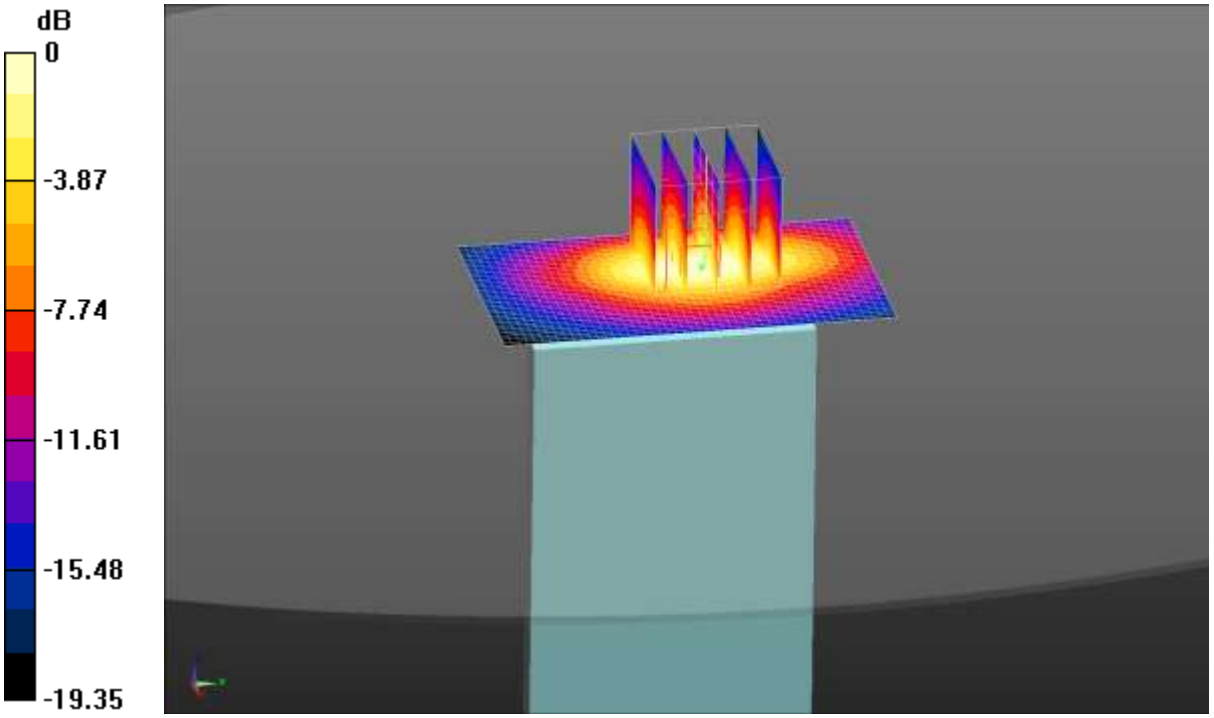
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 2 1RB (20MHz) Body Bottom/High Channel/Area Scan (31x51x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.67 W/kg

## LTE Band 2 1RB (20MHz) Body Bottom/High Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.23 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 2.11 W/kg
**SAR(1 g) = 1.16 W/kg; SAR(10 g) = 0.628 W/kg**
Maximum value of SAR (measured) = 1.72 W/kg




0 dB = 1.72 W/kg = 2.36 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 13:49:55

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 1RB QPSK (0); Frequency: 1745 MHz
Medium parameters used (interpolated): f = 1745 MHz; $\sigma$ = 1.43 S/m; $\varepsilon_r$ = 52.523; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

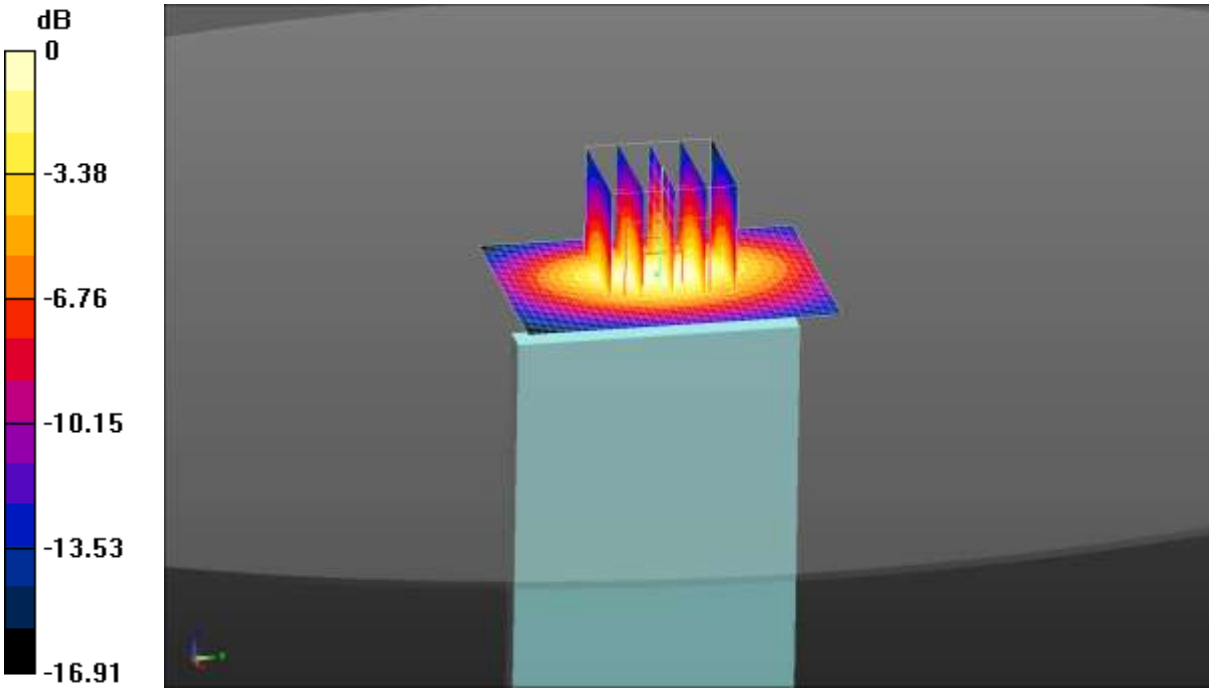
- Probe: EX3DV4 - SN3924; ConvF(7.94, 7.94, 7.94); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 4 1RB(20MHz) Body Bottom/High Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.80 V/m; Power Drift = 0.26 dB
Peak SAR (extrapolated) = 1.94 W/kg
**SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.601 W/kg**
Maximum value of SAR (measured) = 1.58 W/kg

## LTE Band 4 1RB(20MHz) Body Bottom/High Channel/Area Scan (31x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.45 W/kg




0 dB = 1.45 W/kg = 1.61 dBW/kg

Test Laboratory: CCIS Date/Time: 07.07.2016 21:53:03

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-Fdd(USA) 1RB QPSK (0); Frequency: 2510 MHz
Medium parameters used: f = 2510 MHz; $\sigma$ = 2.081 S/m; $\varepsilon_r$ = 53.519; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

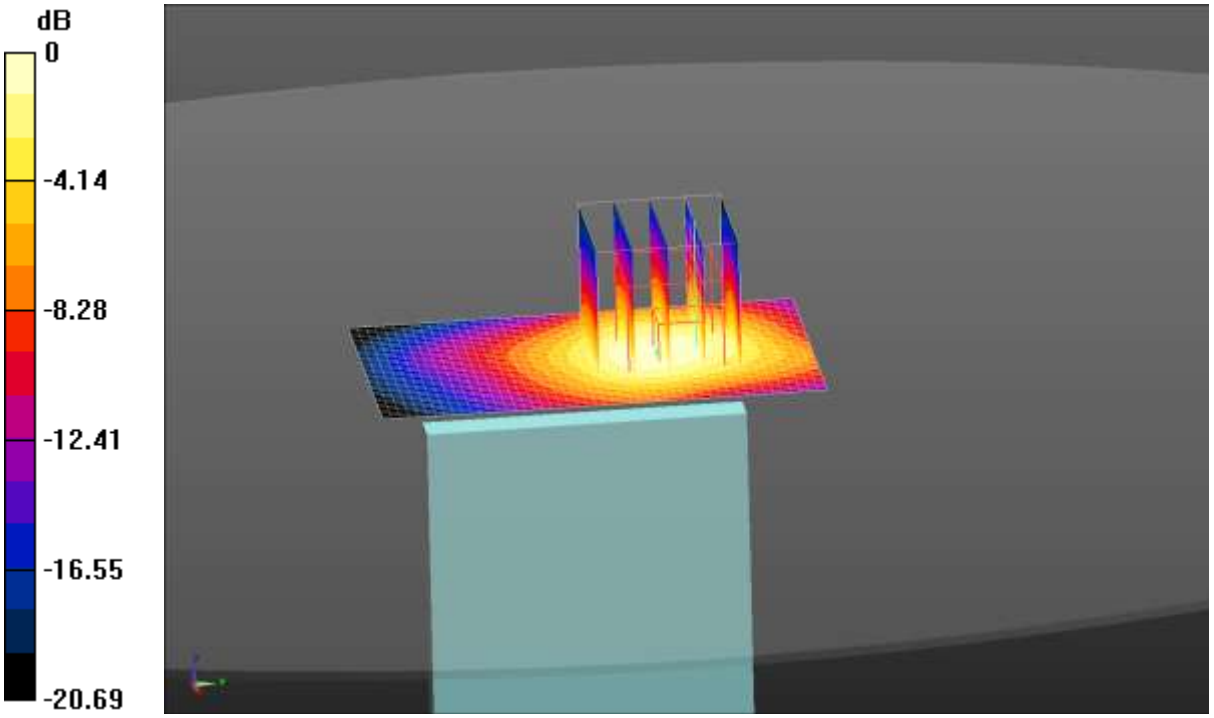
- Probe: EX3DV4 - SN3924; ConvF(7.3, 7.3, 7.3); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band7 1RB(20MHZ) Body Bottom/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.26 V/m; Power Drift = 0.39 dB
Peak SAR (extrapolated) = 1.34 W/kg
**SAR(1 g) = 0.669 W/kg; SAR(10 g) = 0.348 W/kg**
Maximum value of SAR (measured) = 1.03 W/kg

## LTE Band7 1RB(20MHZ) Body Bottom/Low Channel/Area Scan (31x51x1):

Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.894 W/kg




0 dB = 0.894 W/kg = -0.49 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 14:05:44

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD(USA) 20MHz 50%RB QPSK (0); Frequency: 1880 MHz
Medium parameters used (extrapolated): f = 1880 MHz; $\sigma$ = 1.442 S/m; $\varepsilon_r$ = 54.956; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

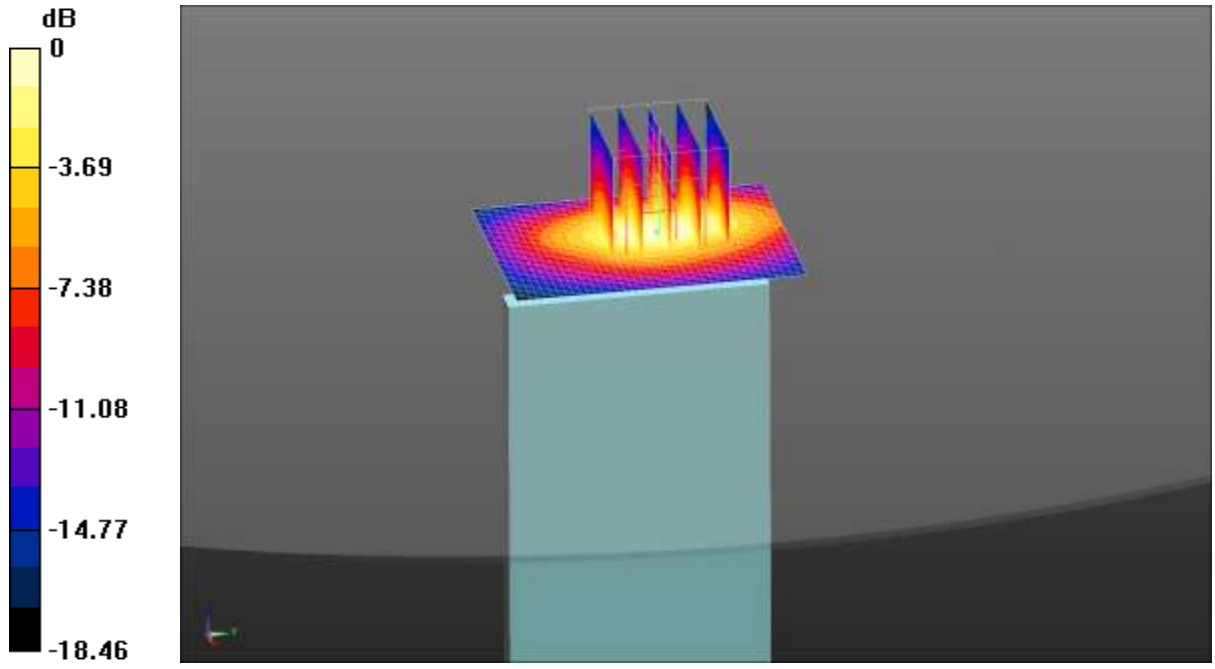
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 2 50%RB(20MHz) Body Bottom/Middle Channel/Area Scan (31x41x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.30 W/kg

## LTE Band 2 50%RB(20MHz) Body Bottom/Middle Channel/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 29.56 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.66 W/kg
**SAR(1 g) = 0.920 W/kg; SAR(10 g) = 0.501 W/kg**
Maximum value of SAR (measured) = 1.36 W/kg




0 dB = 1.36 W/kg = 1.34 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 15:32:06

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD(USA) 20MHz 50%RB QPSK (0); Frequency: 1720 MHz
Medium parameters used: f = 1720 MHz; $\sigma$ = 1.419 S/m; $\varepsilon_r$ = 52.59; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

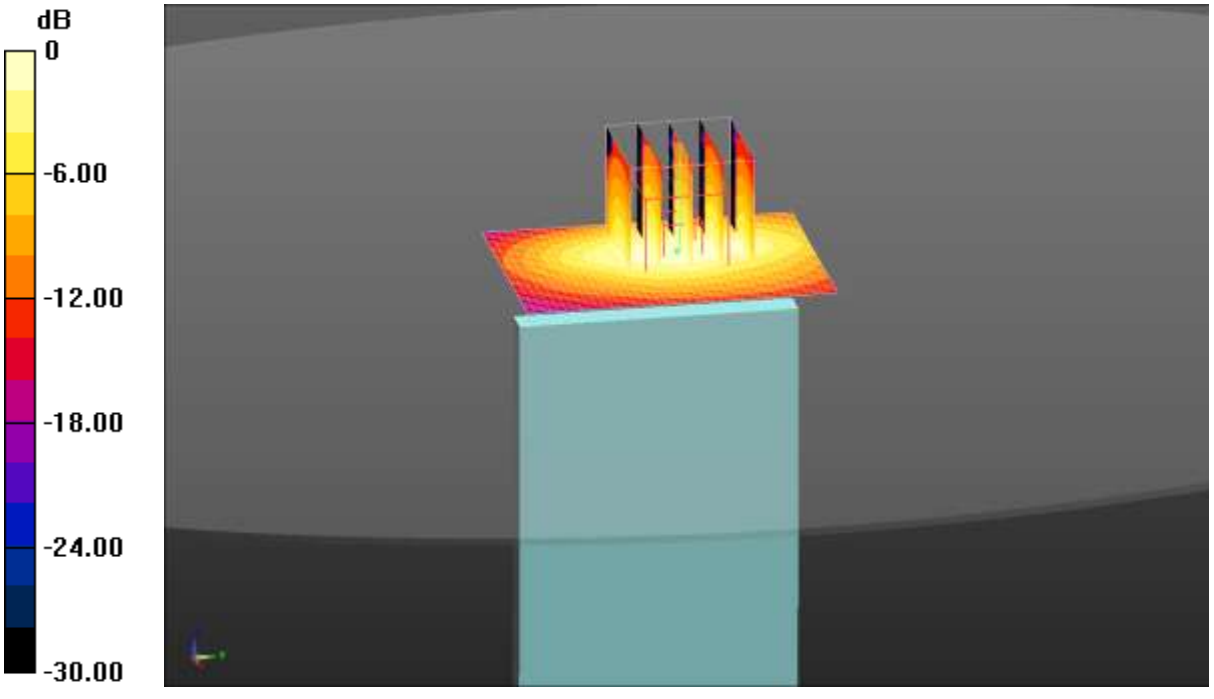
- Probe: EX3DV4 - SN3924; ConvF(7.94, 7.94, 7.94); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 4 50%RB(20MHz) Body Bottom/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.92 V/m; Power Drift = -0.20 dB
Peak SAR (extrapolated) = 1.56 W/kg
**SAR(1 g) = 0.873 W/kg; SAR(10 g) = 0.489 W/kg**
Maximum value of SAR (measured) = 1.15 W/kg

## LTE Band 4 50%RB(20MHz) Body Bottom/Low Channel/Area Scan (31x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.15 W/kg




0 dB = 1.15 W/kg = 0.61 dBW/kg

Test Laboratory: CCIS Date/Time: 07.07.2016 11:13:59

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD(USA) 20MHz 50%RB QPSK (0); Frequency: 2510 MHz
Medium parameters used: f = 2510 MHz; $\sigma$ = 2.081 S/m; $\varepsilon_r$ = 53.519; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

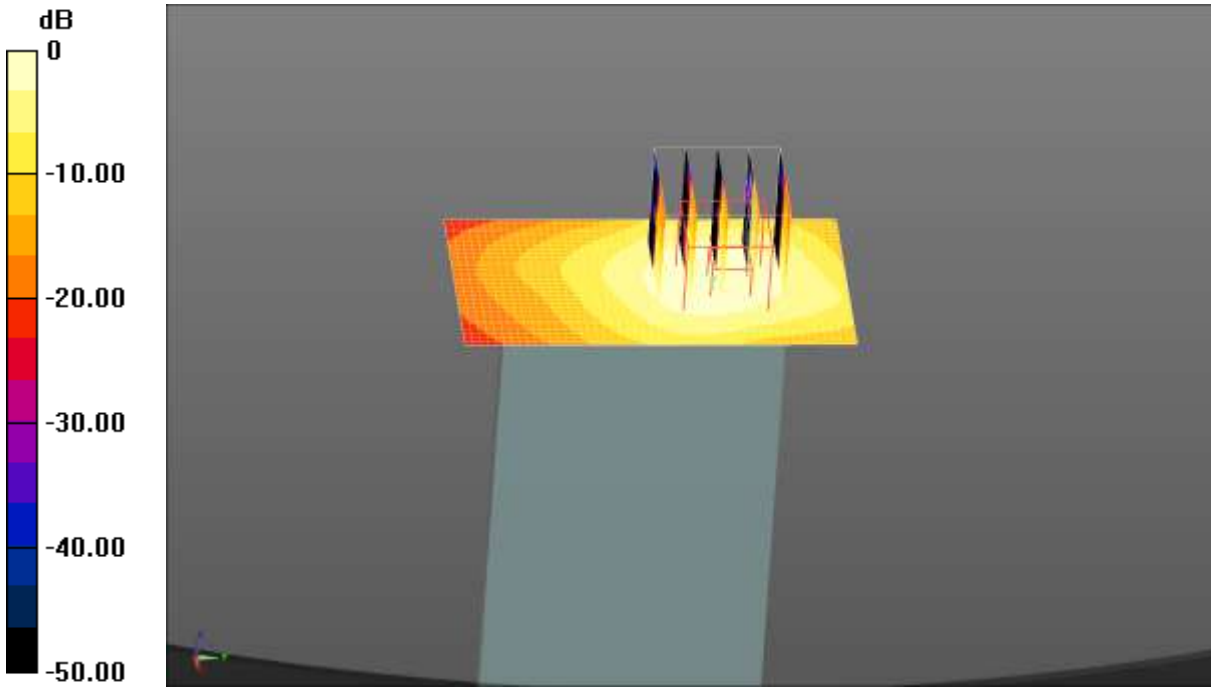
- Probe: EX3DV4 - SN3924; ConvF(7.3, 7.3, 7.3); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band7 50%RB(20MHZ) Body Bottom/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.12 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.98 W/kg
**SAR(1 g) = 0.695 W/kg; SAR(10 g) = 0.268 W/kg**
Maximum value of SAR (measured) = 0.885 W/kg

## LTE Band7 50%RB(20MHZ) Body Bottom/Low Channel/Area Scan (31x51x1):

Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.775 W/kg




0 dB = 0.775 W/kg = -1.11 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 15:53:47

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD (USA) 20MHz 100%RB QPSK (0); Frequency: 1860 MHz
Medium parameters used: f = 1860 MHz; $\sigma$ = 1.551 S/m; $\varepsilon_r$ = 52.047; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

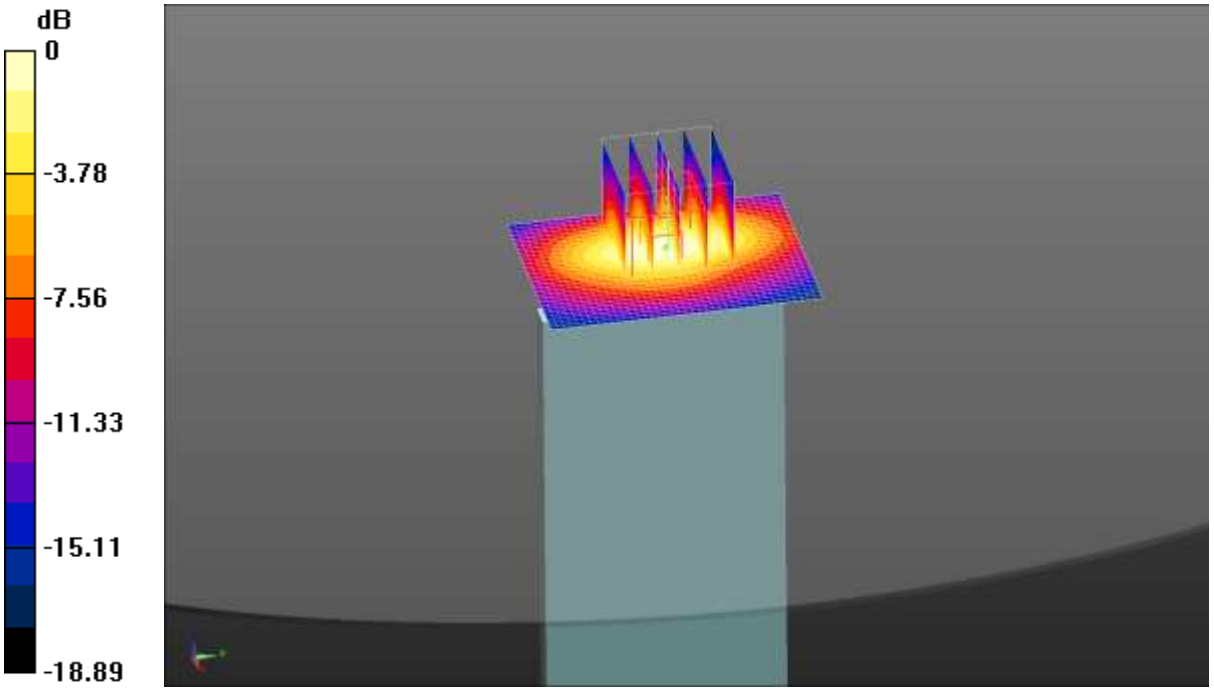
- Probe: EX3DV4 - SN3924; ConvF(7.65, 7.65, 7.65); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 2 100%RB(20MHz) Body Bottom/Low Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.92 V/m; Power Drift = 0.26 dB
Peak SAR (extrapolated) = 1.72 W/kg
**SAR(1 g) = 0.953 W/kg; SAR(10 g) = 0.519 W/kg**
Maximum value of SAR (measured) = 1.37 W/kg

## LTE Band 2 100%RB(20MHz) Body Bottom/Low Channel/Area Scan (31x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.37 W/kg




0 dB = 1.37 W/kg = 1.37 dBW/kg

Test Laboratory: CCIS Date/Time: 07.04.2016 16:31:04

**DUT: MOBILE PHONE; Type: Kinzo A5QL; Serial: 1#**

Communication System: UID 0, LTE-FDD (USA) 20MHz 100%RB QPSK (0); Frequency: 1745 MHz
Medium parameters used (interpolated): f = 1745 MHz; $\sigma$ = 1.43 S/m; $\varepsilon_r$ = 52.523; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

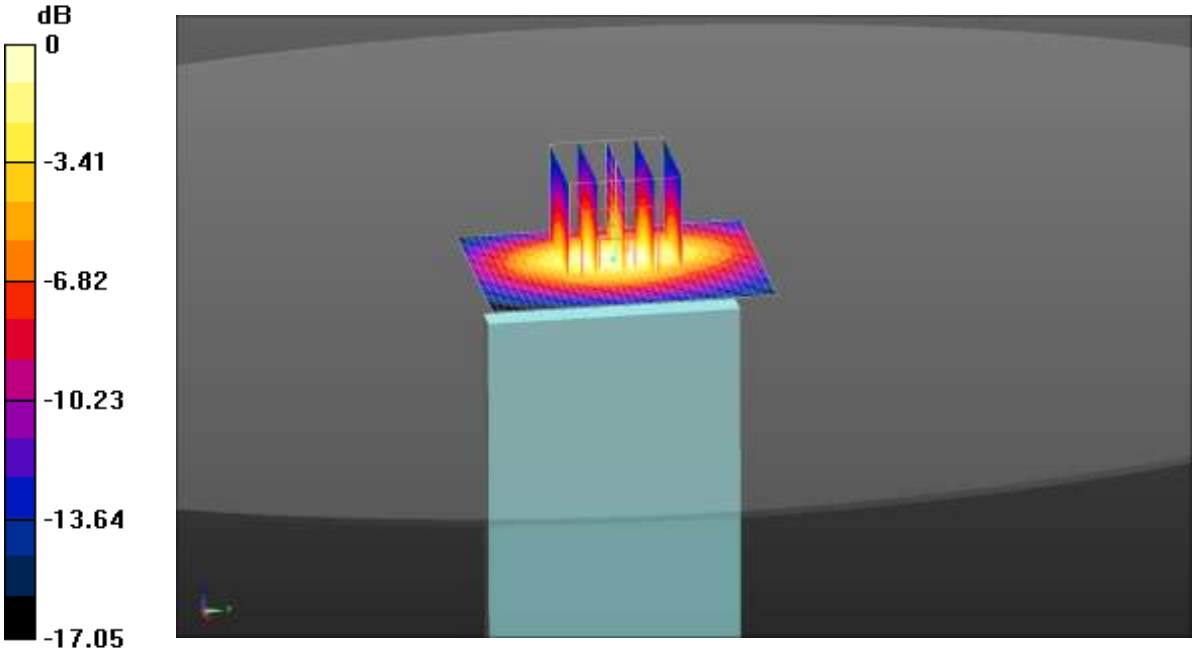
- Probe: EX3DV4 - SN3924; ConvF(7.94, 7.94, 7.94); Calibrated: 07.10.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 31.0
- Electronics: DAE4 Sn1373; Calibrated: 02.11.2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1208
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

## LTE Band 4 100%RB(20MHz) Body Bottom/High Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.65 V/m; Power Drift = 0.26 dB
Peak SAR (extrapolated) = 1.55 W/kg
**SAR(1 g) = 0.868 W/kg; SAR(10 g) = 0.481 W/kg**
Maximum value of SAR (measured) = 1.27 W/kg

## LTE Band 4 100%RB(20MHz) Body Bottom /High Channel/Area Scan (31x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.23 W/kg




0 dB = 1.23 W/kg = 0.90 dBW/kg

# Appendix E: System Calibration Certificate

**Calibration information for E-field probes**

In Collaboration with
speag
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

CALIBRATION No. L0570

Client CCIS Certificate No: Z15-97080

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV4 - SN:3924 |
| Calibration Procedure(s) | FD-Z11-2-004-01<br>Calibration Procedures for Dosimetric E-field Probes |
| Calibration date: | July 10, 2015 |

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRP2 | 101919 | 01-Jul-15 (CTTL, No.J15X04256) | Jun-16 |
| Power sensor NRP-Z91 | 101547 | 01-Jul-15 (CTTL, No.J15X04256) | Jun-16 |
| Power sensor NRP-Z91 | 101548 | 01-Jul-15 (CTTL, No.J15X04256) | Jun-16 |
| Reference10dBAttenuator | 18N50W-10dB | 13-Mar-14(TMC,No.JZ14-1103) | Mar-16 |
| Reference20dBAttenuator | 18N50W-20dB | 13-Mar-14(TMC,No.JZ14-1104) | Mar-16 |
| Reference Probe EX3DV4 | SN 3617 | 28-Aug-14(SPEAG,No.EX3-3617_Aug14) | Aug-15 |
| DAE4 | SN 777 | 17-Sep-14 (SPEAG, DAE4-777_Sep14) | Sep -15 |
| **Secondary Standards** | **ID #** | **Cal Date(Calibrated by, Certificate No.)** | **Scheduled Calibration** |
| SignalGeneratorMG3700A | 6201052605 | 01-Jul-15 (CTTL, No.J15X04255) | Jun-16 |
| Network Analyzer E5071C | MY46110673 | 03-Feb-15 (CTTL, No.J15X00728) | Feb-16 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Yu Zongying | SAR Test Engineer | |
| Reviewed by: | Qi Dianyuan | SAR Project Leader | |
| Approved by: | Lu Bingsong | Deputy Director of the laboratory | |

Issued: July 15, 2015



Certificate No: Z15-97080 Page 1 of 11

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TTL speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
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**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConvF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A,B,C,D | modulation dependent linearization parameters |
| Polarization Φ | Φ rotation around probe axis |
| Polarization θ | θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=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:**

a) 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

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 300MHz to 3GHz)", February 2005

**Methods Applied and Interpretation of Parameters:**

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the $E^2$-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 (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;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *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.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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# Probe EX3DV4

# SN: 3924

Calibrated: July 10, 2015

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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# DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm(μV/(V/m)$^2$)$^A$ | 0.50 | 0.41 | 0.67 | ±10.8% |
| DCP(mV)$^B$ | 102.7 | 99.5 | 100.2 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB√μV | C | D dB | VR mV | Unc$^E$ (k=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 198.9 | ±2.1% |
| | | Y | 0.0 | 0.0 | 1.0 | | 178.3 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 233.2 | |

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

$^A$ The uncertainties of Norm X, Y, Z do not affect the $E^2$-field uncertainty inside TSL (see Page 5 and Page 6).
$^B$ Numerical linearization parameter: uncertainty not required.
$^E$ Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

# DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

## Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz][C] | Relative Permittivity[F] | Conductivity (S/m)[F] | ConvF X | ConvF Y | ConvF Z | Alpha[G] | Depth[G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 9.95 | 9.95 | 9.95 | 0.13 | 1.40 | ±12% |
| 835 | 41.5 | 0.90 | 9.68 | 9.68 | 9.68 | 0.15 | 1.29 | ±12% |
| 900 | 41.5 | 0.97 | 9.42 | 9.42 | 9.42 | 0.22 | 1.09 | ±12% |
| 1750 | 40.1 | 1.37 | 8.37 | 8.37 | 8.37 | 0.21 | 1.10 | ±12% |
| 1900 | 40.0 | 1.40 | 7.95 | 7.95 | 7.95 | 0.22 | 1.12 | ±12% |
| 2450 | 39.2 | 1.80 | 7.17 | 7.17 | 7.17 | 0.35 | 0.98 | ±12% |
| 2600 | 39.0 | 1.96 | 7.04 | 7.04 | 7.04 | 0.34 | 1.07 | ±12% |

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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# DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

## Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz][C] | Relative Permittivity[F] | Conductivity (S/m)[F] | ConvF X | ConvF Y | ConvF Z | Alpha[G] | Depth[G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 55.5 | 0.96 | 9.90 | 9.90 | 9.90 | 0.29 | 0.98 | ±12% |
| 835 | 55.2 | 0.97 | 9.74 | 9.74 | 9.74 | 0.16 | 1.50 | ±12% |
| 900 | 55.0 | 1.05 | 9.51 | 9.51 | 9.51 | 0.30 | 1.03 | ±12% |
| 1750 | 53.4 | 1.49 | 7.94 | 7.94 | 7.94 | 0.21 | 1.13 | ±12% |
| 1900 | 53.3 | 1.52 | 7.65 | 7.65 | 7.65 | 0.13 | 2.58 | ±12% |
| 2450 | 52.7 | 1.95 | 7.30 | 7.30 | 7.30 | 0.28 | 1.31 | ±12% |
| 2600 | 52.5 | 2.16 | 7.20 | 7.20 | 7.20 | 0.38 | 0.98 | ±12% |

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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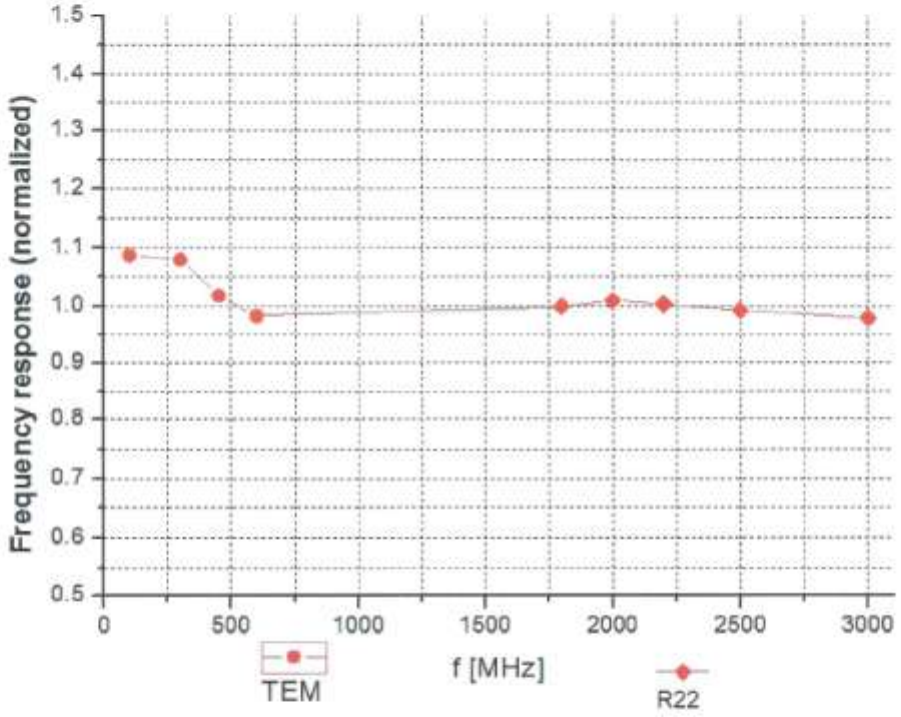
## Frequency Response of E-Field
## (TEM-Cell: ifi110 EXX, Waveguide: R22)




**Uncertainty of Frequency Response of E-field: ±7.5% (k=2)**

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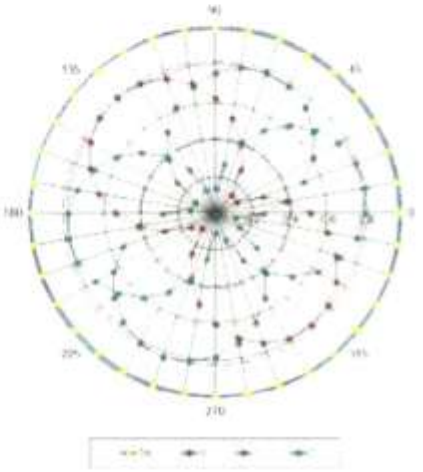
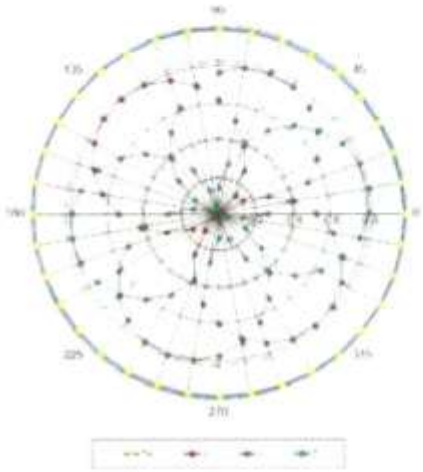
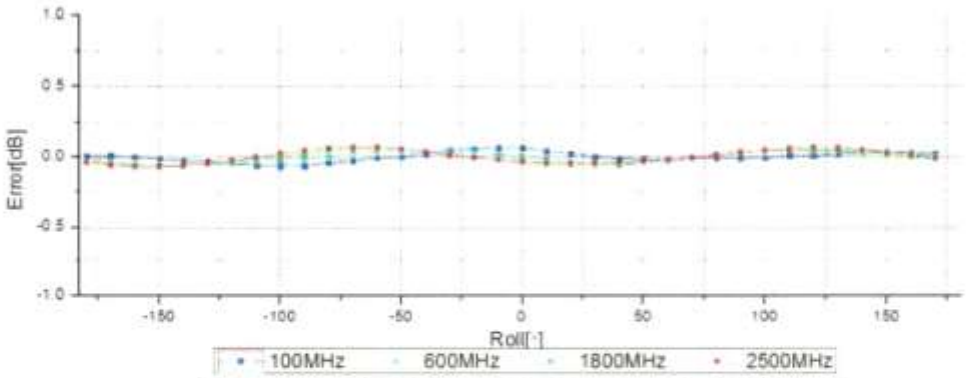
## Receiving Pattern (Φ), θ=0°

**f=600 MHz, TEM** **f=1800 MHz, R22**








**Uncertainty of Axial Isotropy Assessment: ±0.9% (k=2)**

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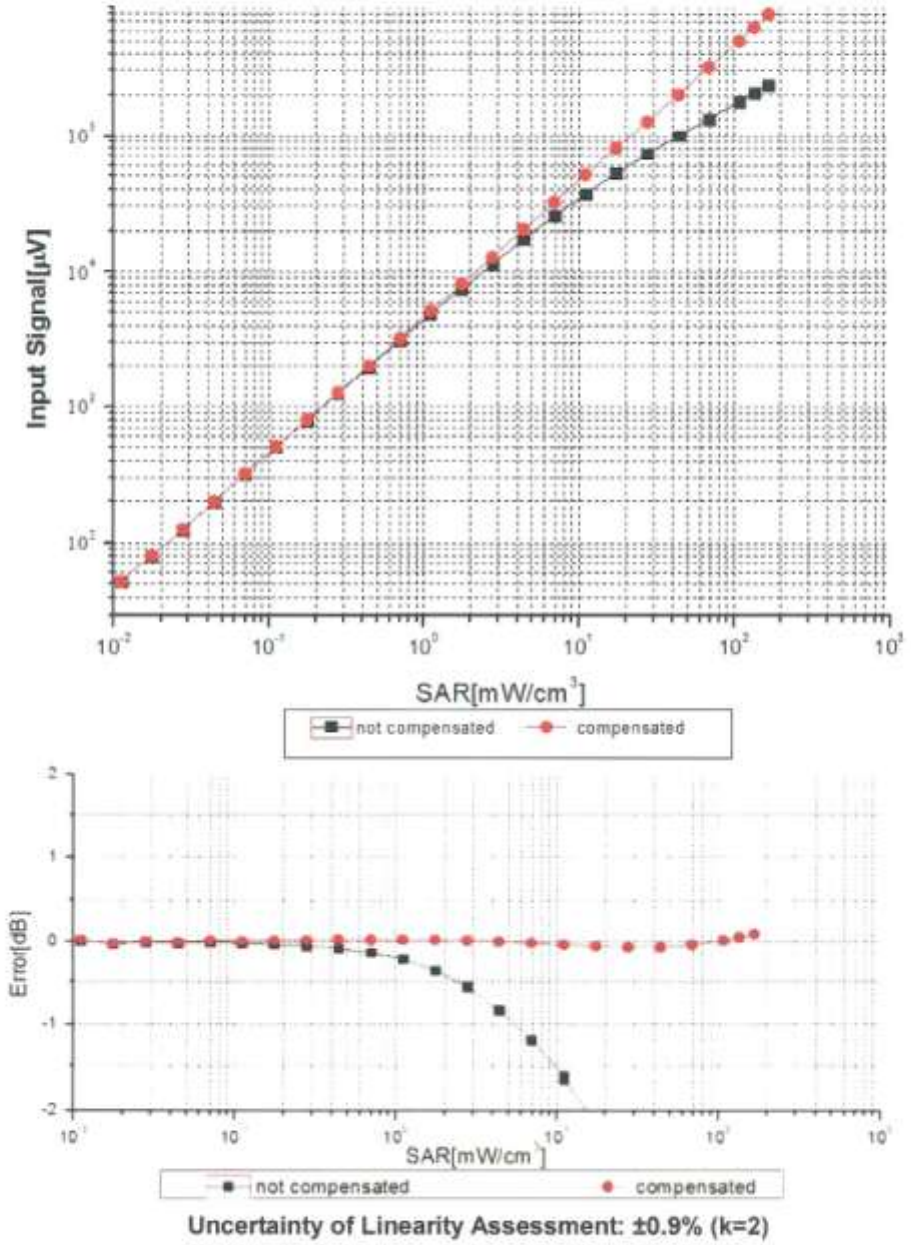
## Dynamic Range f($SAR_{head}$)
## (TEM cell, f = 900 MHz)




Uncertainty of Linearity Assessment: ±0.9% (k=2)

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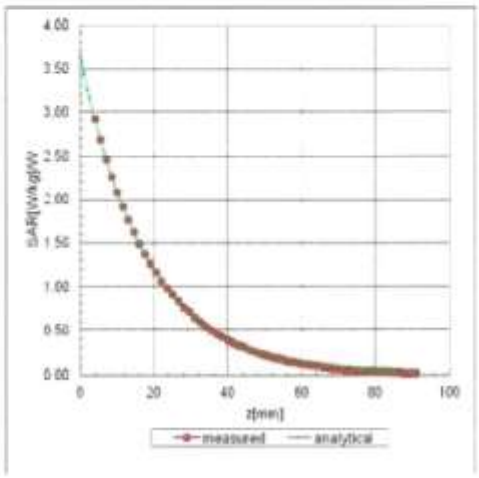
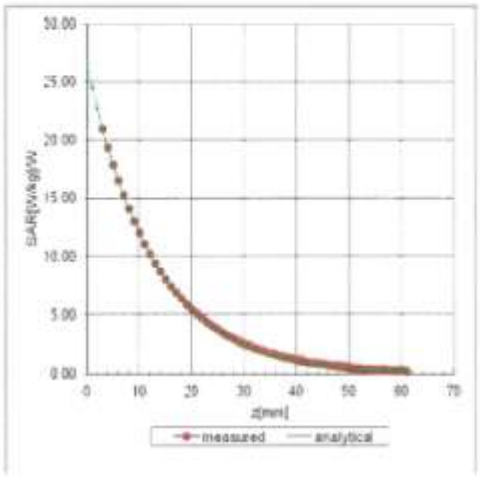
## Conversion Factor Assessment

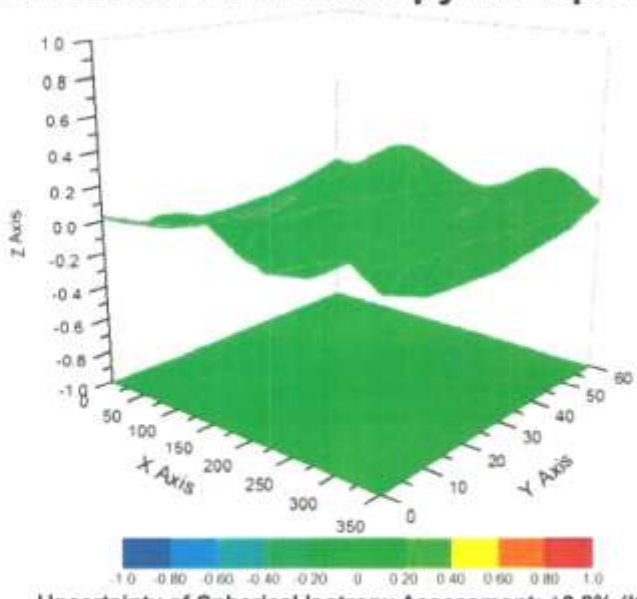
f=900 MHz, WGLS R9(H_convF)




f=1750 MHz, WGLS R22(H_convF)




## Deviation from Isotropy in Liquid




Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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# DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3924

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | 152.8 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disable |
| Probe Overall Length | 337mm |
| Probe Body Diameter | 10mm |
| Tip Length | 9mm |
| Tip Diameter | 2.5mm |
| Probe Tip to Sensor X Calibration Point | 1mm |
| Probe Tip to Sensor Y Calibration Point | 1mm |
| Probe Tip to Sensor Z Calibration Point | 1mm |
| Recommended Measurement Distance from Surface | 1.4mm |

**Calibration information for Dipole**

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

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

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**Accreditation No.: SCS 108**

**Client** CCIS (Auden)

**Certificate No: D750V3-1118_Jul14**

# CALIBRATION CERTIFICATE

Object: D750V3 - SN: 1118

Calibration procedure(s): QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 10, 2014

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 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 30-Apr-14 (No. DAE4-601_Apr14) | Apr-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Michael Weber | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: July 11, 2014

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

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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 1528-2013, "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
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) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**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%.

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 750 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.9 | 0.89 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 41.2 ± 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 | 2.09 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.12 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.36 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.32 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 55.5 | 0.96 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.9 ± 6 % | 1.00 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.19 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **8.44 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.44 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **5.59 W/kg ± 16.5 % (k=2)** |



**Shenzhen Zhongjian Nanfang Testing Co., Ltd.**
No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366

## Appendix (Additional assessments outside the scope of SCS108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 52.3 Ω - 5.7 jΩ |
| Return Loss | - 24.5 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 47.2 Ω - 7.1 jΩ |
| Return Loss | - 22.1 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.030 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 | May 21, 2014 |



**Shenzhen Zhongjian Nanfang Testing Co., Ltd.**
No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366

## DASY5 Validation Report for Head TSL

Date: 10.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1118**

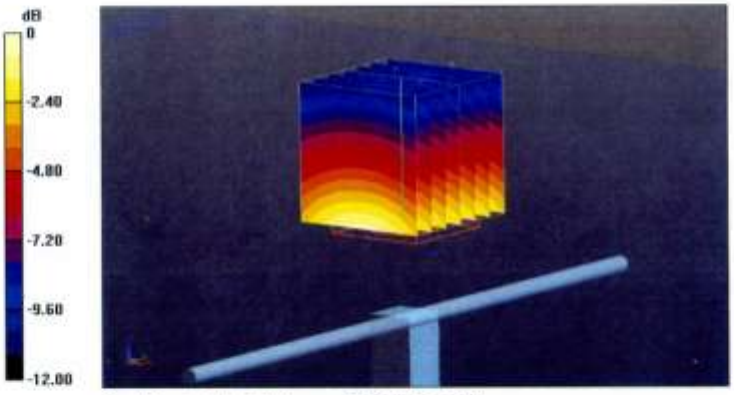
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 0.92 S/m; $\varepsilon_r$ = 41.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

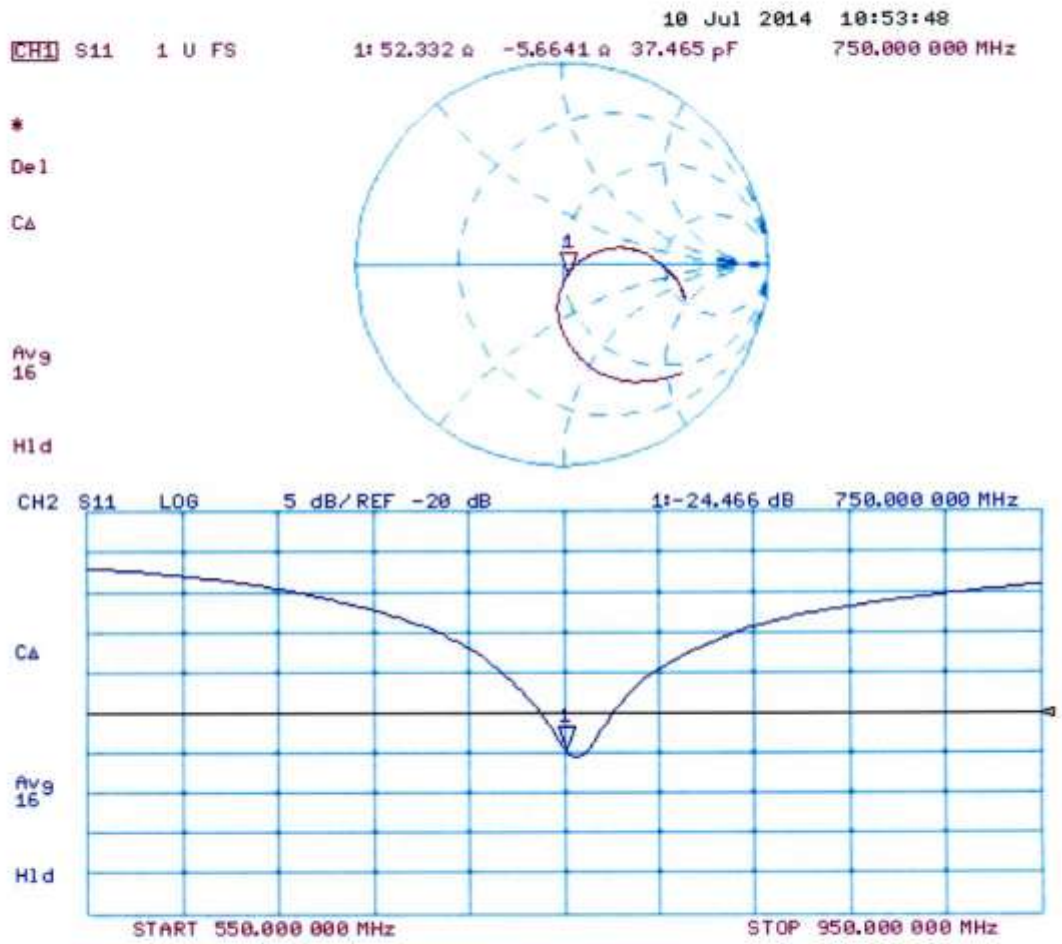
### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.24 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.13 W/kg
**SAR(1 g) = 2.09 W/kg; SAR(10 g) = 1.36 W/kg**
Maximum value of SAR (measured) = 2.44 W/kg




0 dB = 2.44 W/kg = 3.87 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 09.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1118**

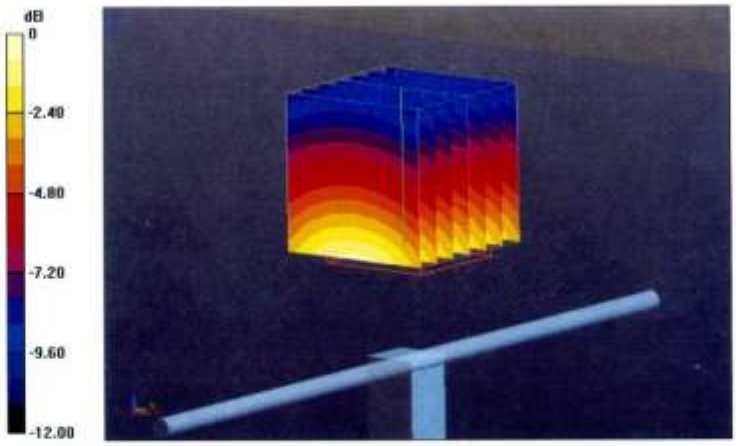
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 1 S/m; $\varepsilon_r$ = 53.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

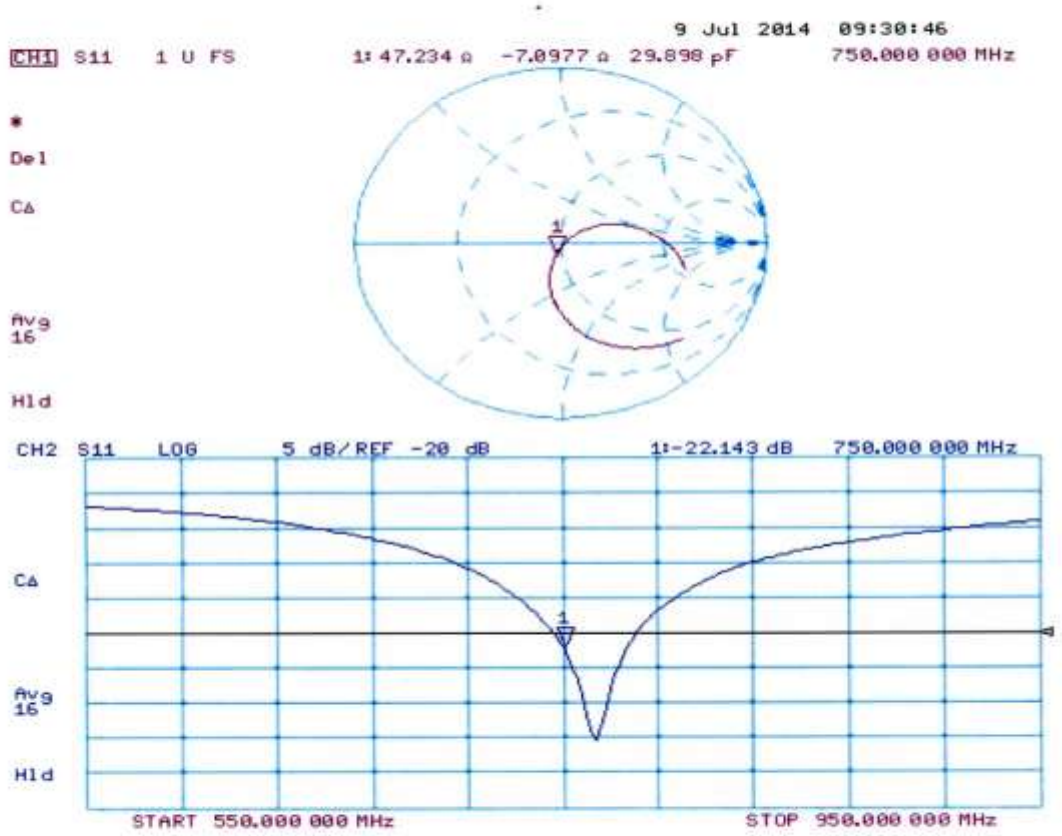
### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.14 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.19 W/kg
**SAR(1 g) = 2.19 W/kg; SAR(10 g) = 1.44 W/kg**
Maximum value of SAR (measured) = 2.54 W/kg




0 dB = 2.54 W/kg = 4.05 dBW/kg

## Impedance Measurement Plot for Body TSL



# Dipole Impedance and Return Loss calibration Report

**Object:** D750V3 - SN: 1118

**Calibration Date:** Aug 26, 2015

**Calibration reference:** IEEE Std 1528:2003, IEC 62209-1:2005, FCC KDB 865664 D01

**Calibrated By:** Janet Wei (Janet Wei, SAR project engineer)

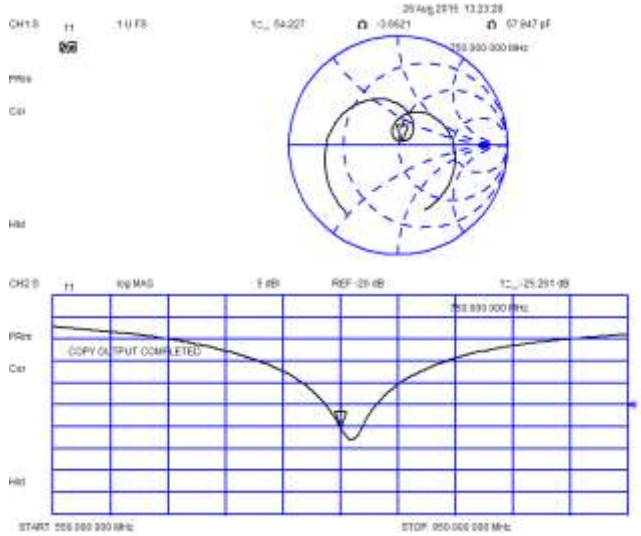
**Reviewed By:** Bruce Zhang (Bruce Zhang, Technical manager)

## Environment of Test Site

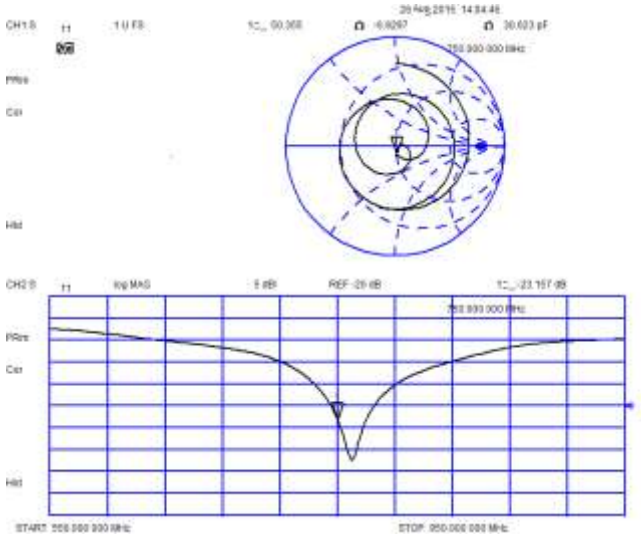
| | |
|---|---|
| Temperature: | 21 ~ 23°C |
| Humidity: | 50~60% RH |
| Atmospheric Pressure: | 1011 mbar |

## Test Data

Measurement Plot for Head TSL



Measurement Plot for Body TSL



## Comparison with Original report

| Items | Calibrated By Speag | Calibrated By CCIS | Deviation | Limit |
|---|---|---|---|---|
| Impendence for Head TSL | 52.3Ω-5.7jΩ | 54.2Ω-3.7 jΩ | 1.9Ω+2.0 jΩ | ±5Ω |
| Return Loss for Head TSL | -24.5dB | -25.3dB | -3.3% | ±20%(No less than 20 dB) |
| Impendence for Body TSL | 47.2Ω-7.1 jΩ | 50.4Ω-6.9 jΩ | 3.2Ω+0.2 jΩ | ±5Ω |
| Return Loss for Body TSL | -22.1dB | -23.2dB | -5.0% | ±20%(No less than 20 dB) |

## Result

Compliance

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: Info@emcite.com Http://www.emcite.com

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Client **Sunway** **Certificate No: J13-2-2185**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D900V2 - SN: 1d086 |
| Calibration Procedure(s) | TMC-OS-E-02-194<br>Calibration procedure for dipole validation kits |
| Calibration date: | August 9, 2013 |

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRVD | 102083 | 11-Sep-12 (TMC, No.JZ12-443) | Sep-13 |
| Power sensor NRV-Z5 | 100595 | 11-Sep-12 (TMC, No. JZ12-443) | Sep -13 |
| Reference Probe EX3DV4 | SN 3846 | 20- Dec-12 (SPEAG, No.EX3-3846_Dec12) | Dec-13 |
| DAE4 | SN 777 | 22-Feb-13 (SPEAG, DAE4-777_Feb13) | Feb -14 |
| Signal Generator E4438C | MY49070393 | 13-Nov-12 (TMC, No.JZ12-394) | Nov-13 |
| Network Analyzer E8362B | MY43021135 | 19-Oct-12 (TMC, No.JZ13-278) | Oct-13 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Zhao Jing | SAR Test Engineer | |
| Reviewed by: | Qi Dianyuan | SAR Project Leader | |
| Approved by: | Xiao Li | Deputy Director of the laboratory | |

Issued: August 11, 2013

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**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORMx,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 300MHz to 3GHz)", February 2005

c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

**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%.

Certificate No: J13-2-2185 Page 2 of 8

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## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY52 | 52.8.7.1137 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Twin Phantom | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 900 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.5 | 0.97 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 42.6 ± 6 % | 0.98 mho/m ± 6 % |
| **Head TSL temperature change during test** | <0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.67 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **10.7 mW /g ± 20.8 % (k=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | Condition | |
| SAR measured | 250 mW input power | 1.72 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.87 mW /g ± 20.4 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 55.0 | 1.05 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 54.2 ± 6 % | 1.02 mho/m ± 6 % |
| **Body TSL temperature change during test** | <0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.63 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **10.7mW /g ± 20.8 % (k=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | Condition | |
| SAR measured | 250 mW input power | 1.71 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.94 mW /g ± 20.4 % (k=2)** |

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
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## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.1Ω-8.85jΩ |
| Return Loss | - 22.3dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 42.1Ω+0.52jΩ |
| Return Loss | - 21.3dB |

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 |

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Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
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**DASY5 Validation Report for Head TSL** Date: 02.08.2013

Test Laboratory: TMC, Beijing, China

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d086**

Communication System: CW; Frequency: 900 MHz

Medium parameters used: f = 900 MHz; $\sigma$ = 0.982 mho/m; $\varepsilon r$ = 42.66; $\rho$ = 1000 kg/m$^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.01,9.01,9.01); Calibrated:20,12,2012
- Sensor-Surface: 2mm (Mechanical Surface Detection); 1.0, 31.0
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: Flat Phantom; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

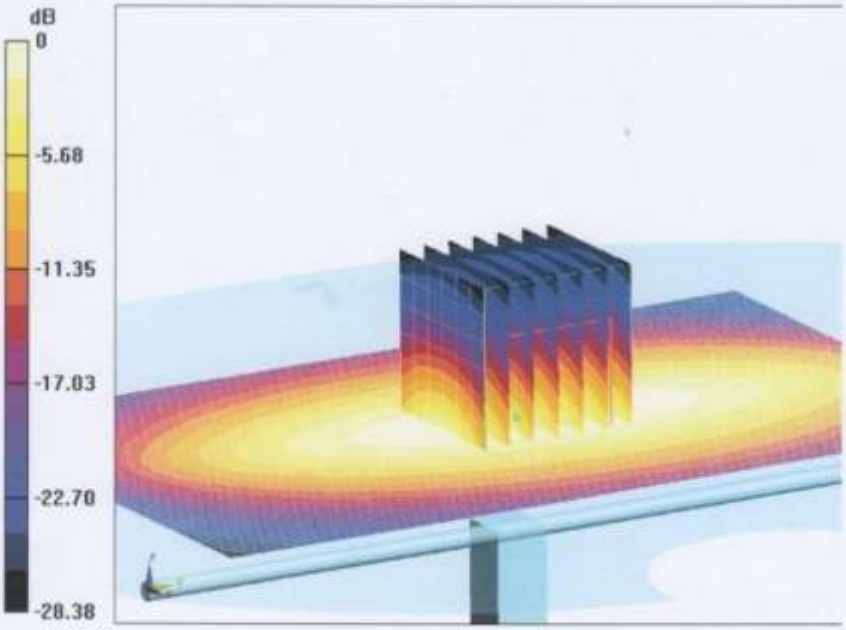
**Dipole Calibration for Head Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.910 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 4.11 W/kg

**SAR(1 g) = 2.67 W/kg; SAR(10 g) = 1.72 W/kg**

Maximum value of SAR (measured) = 3.43 W/kg




0 dB = 3.44 W/kg = 5.36 dBW/kg

Certificate No: J13-2-2185 Page 5 of 8

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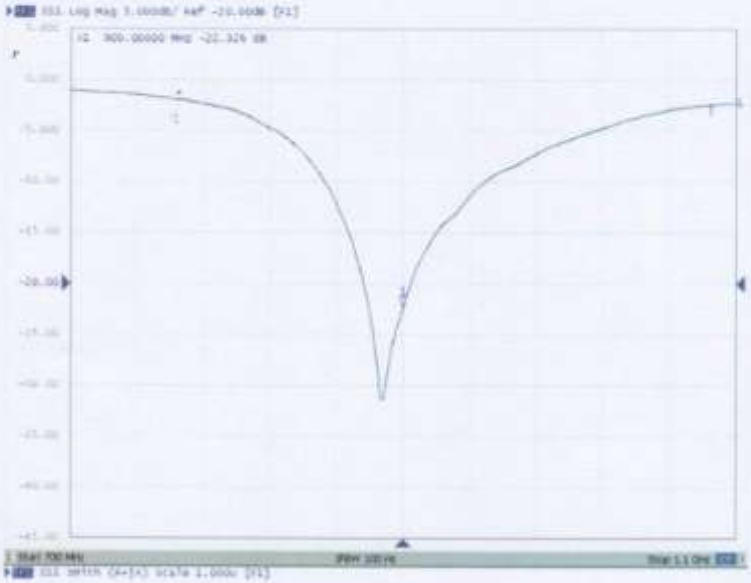
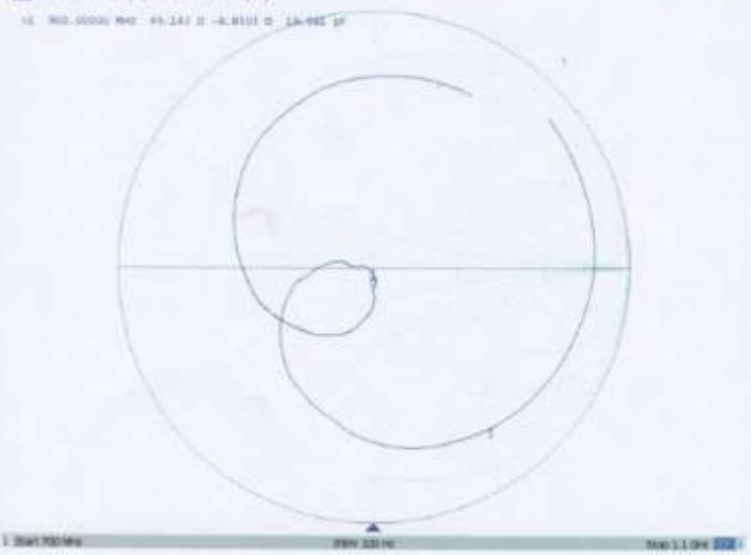
## Impedance Measurement Plot for Head TSL





Certificate No: J13-2-2185 Page 6 of 8

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**DASY5 Validation Report for Body TSL** Date: 02.08.2013

Test Laboratory: TMC, Beijing, China

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d086**

Communication System: CW; Frequency: 900 MHz;

Medium parameters used: f = 900 MHz; $\sigma$ = 1.023 mho/m; $\varepsilon r$ = 54.207; $\rho$ = 1000 $kg/m^3$ .

Phantom section: ELI 4.0

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.01,9.01,9.01) ; Calibrated:20.12.2012
- Sensor-Surface: 2mm (Mechanical Surface Detection); 1.0, 31.0
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: ELI 4.0; Type: QDOVA001DB;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

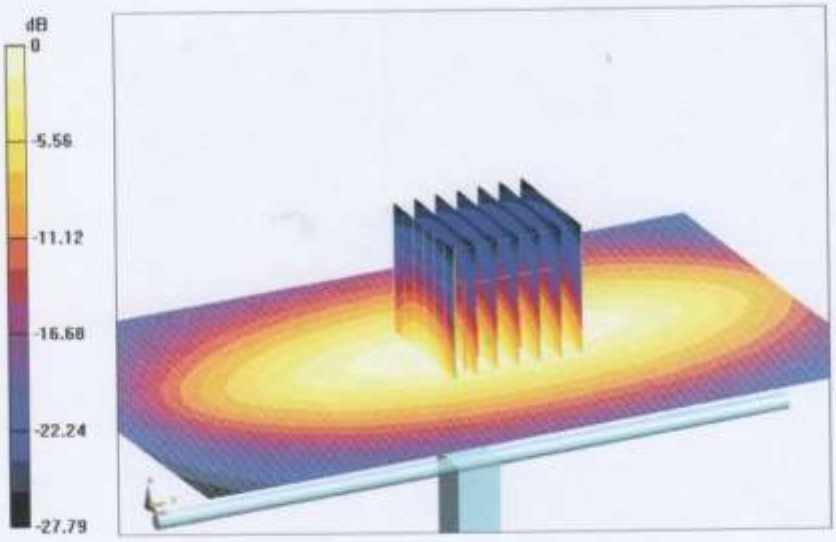
**Dipole Calibration for Body Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.362 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 3.90 W/kg

**SAR(1 g) = 2.63 W/kg; SAR(10 g) = 1.71 W/kg**

Maximum value of SAR (measured) = 3.33 W/kg




0 dB = 3.31 W/kg = 5.19 dBW/kg

Certificate No: J13-2-2185 Page 7 of 8

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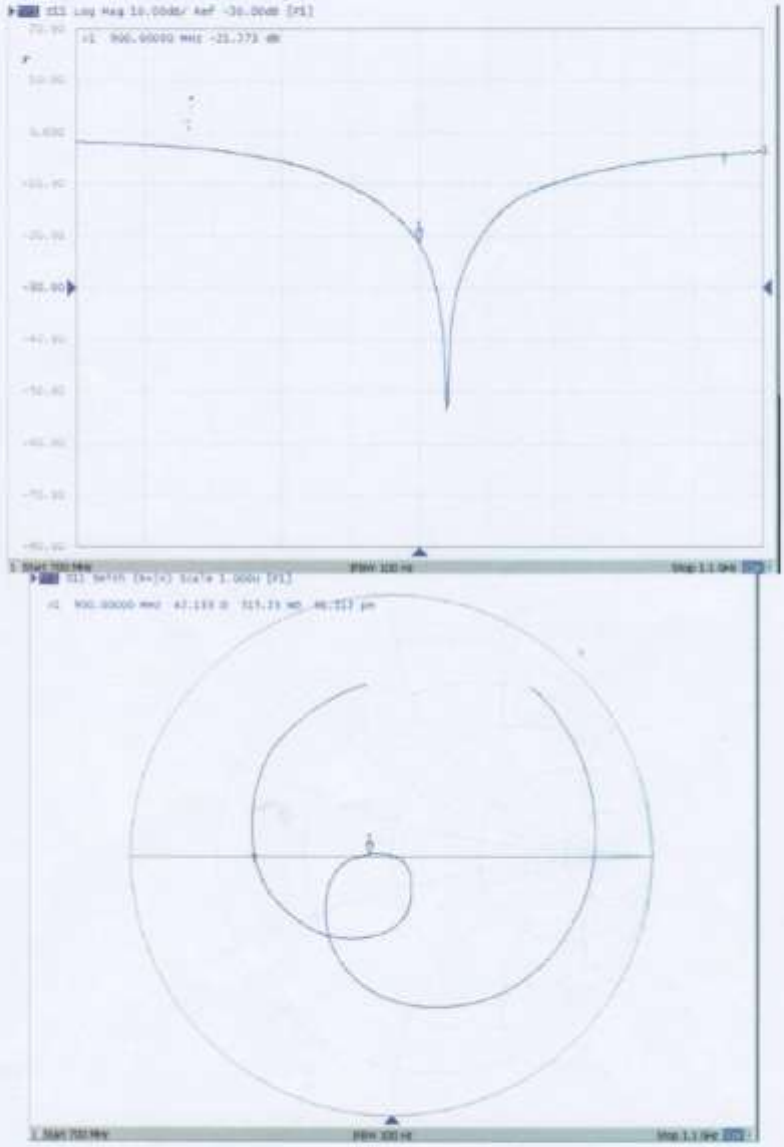
## Impedance Measurement Plot for Body TSL



Certificate No: J13-2-2185 Page 8 of 8

## D900V2, serial no. 1d086 Extended Dipole Calibrations

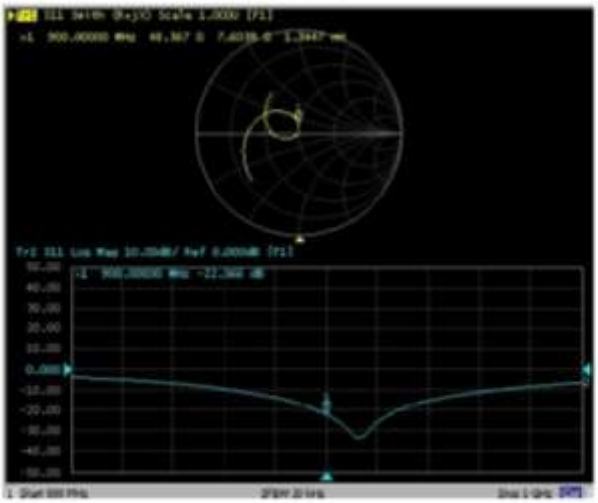
Referring to KDB 865664D01V01r03, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

| D900V2, serial no. 1d086 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 900 Head | | | | 900 Body | | | |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) |
| 2013-8-9 | -22.3 | | 49.2 | | -21.3 | | 42.1 | |
| 2014-8-8 | -22.21 | 0.41 | 49.12 | -0.08 | -21.1 | 0.94 | 42.25 | -0.15 |
| 2015-8-4 | -22.1 | 0.9 | 48.4 | -0.8 | -21.4 | -0.5 | 43.1 | 1.0 |

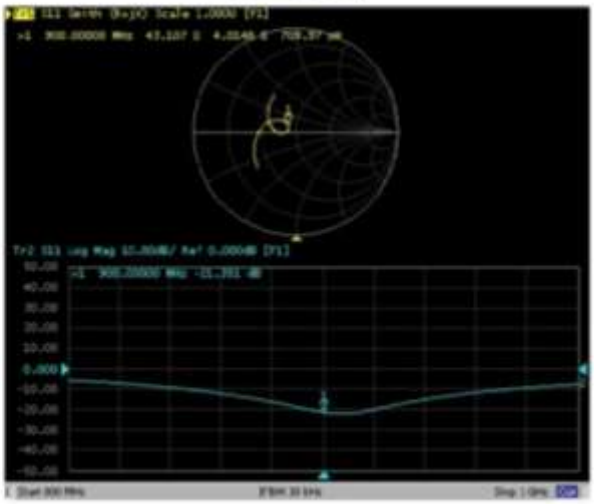
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>- D900V2, serial no. 1d086

900MHz Head



900MHz Body



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Client **Sunway** **Certificate No: J13-2-2184**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1750V2 - SN: 1021 |
| Calibration Procedure(s) | TMC-OS-E-02-194<br>Calibration procedure for dipole validation kits |
| Calibration date: | August 2, 2013 |

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRVD | 102083 | 11-Sep-12 (TMC, No.JZ12-443) | Sep-13 |
| Power sensor NRV-Z5 | 100595 | 11-Sep-12 (TMC, No. JZ12-443) | Sep -13 |
| Reference Probe EX3DV4 | SN 3846 | 20- Dec-12 (SPEAG, No.EX3-3846_Dec12) | Dec-13 |
| DAE4 | SN 777 | 22-Feb-13 (SPEAG, DAE4-777_Feb13) | Feb -14 |
| Signal Generator E4438C | MY49070393 | 13-Nov-12 (TMC, No.JZ12-394) | Nov-13 |
| Network Analyzer E8362B | MY43021135 | 19-Oct-12 (TMC, No.JZ13-278) | Oct-13 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Zhao Jing | SAR Test Engineer | |
| Reviewed by: | Qi Dianyuan | SAR Project Leader | |
| Approved by: | Xiao Li | Deputy Director of the laboratory | |

Issued: August 6, 2013



Certificate No: J13-2-2184 Page 1 of 8

TMC In Collaboration with speag CALIBRATION LABORATORY
Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: Info@emcite.com Http://www.emcite.com

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORMx,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 300MHz to 3GHz)", February 2005
c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

**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** | DASY52 | 52.8.7.1137 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Twin Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1750 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.1 | 1.37 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 40.6 ± 6 % | 1.35 mho/m ± 6 % |
| **Head TSL temperature change during test** | <0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 8.54 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **34.6 mW /g ± 20.8 % (k=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | Condition | |
| SAR measured | 250 mW input power | 4.55 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **18.3 mW /g ± 20.4 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.4 | 1.49 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.4 ± 6 % | 1.52 mho/m ± 6 % |
| **Body TSL temperature change during test** | <0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.52mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **37.5 mW /g ± 20.8 % (k=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | Condition | |
| SAR measured | 250 mW input power | 5.06 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.1 mW /g ± 20.4 % (k=2)** |

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
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## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.3Ω-0.22jΩ |
| Return Loss | - 31.0dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.5Ω-2.36jΩ |
| Return Loss | - 27.5dB |

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 |

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E-mail: Info@emcite.com Http://www.emcite.com

**DASY5 Validation Report for Head TSL** Date: 02.08.2013

Test Laboratory: TMC, Beijing, China

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1021**

Communication System: CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz; $\sigma$ =1.35 mho/m; $\varepsilon r$ = 40.554; $\rho$ = 1000 kg/m$^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(8.39, 8.39,8.39); Calibrated:20,12,2012
- Sensor-Surface: 2mm (Mechanical Surface Detection);1.0, 31.0
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: Flat Phantom; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

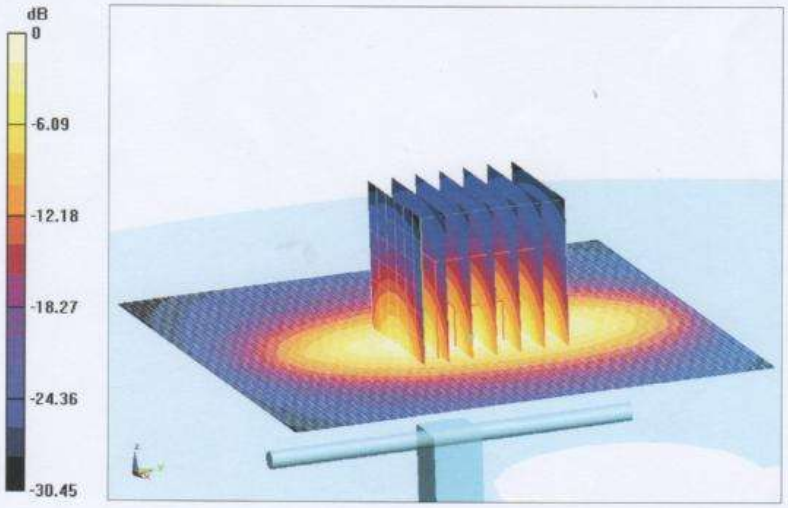
**Dipole Calibration for Head Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.999 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 15.5 W/kg

**SAR(1 g) = 8.54 W/kg; SAR(10 g) = 4.55 W/kg**

Maximum value of SAR (measured) = 12.2 W/kg




0 dB = 12.1 W/kg = 10.81 dBW/kg

Certificate No: J13-2-2184 Page 5 of 8

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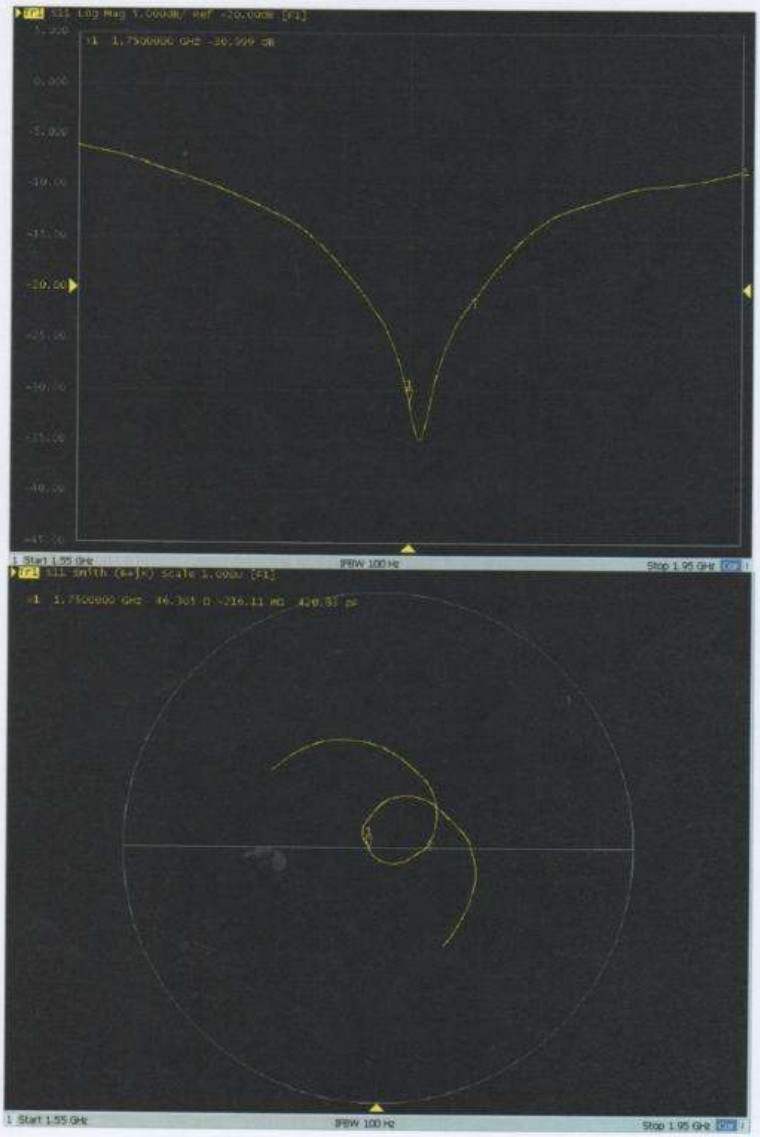
**Impedance Measurement Plot for Head TSL**



Certificate No: J13-2-2184 Page 6 of 8

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Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
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E-mail: Info@emcite.com Http://www.emcite.com

**DASY5 Validation Report for Body TSL** Date: 02.08.2013

Test Laboratory: TMC, Beijing, China

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1021**

Communication System: CW; Frequency: 1750 MHz;

Medium parameters used: f =1750 MHz; $\sigma$ = 1.524 mho/m; $\varepsilon r$ = 53.401; $\rho$ = 1000 $kg/m^3$

Phantom section: Flat Phantom

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.63,7.63,7.63) ; Calibrated:20.12.2012
- Sensor-Surface: 2mm (Mechanical Surface Detection); 1.0, 31.0
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: ELI v4.0 1033;Type: QDOVA001BB;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

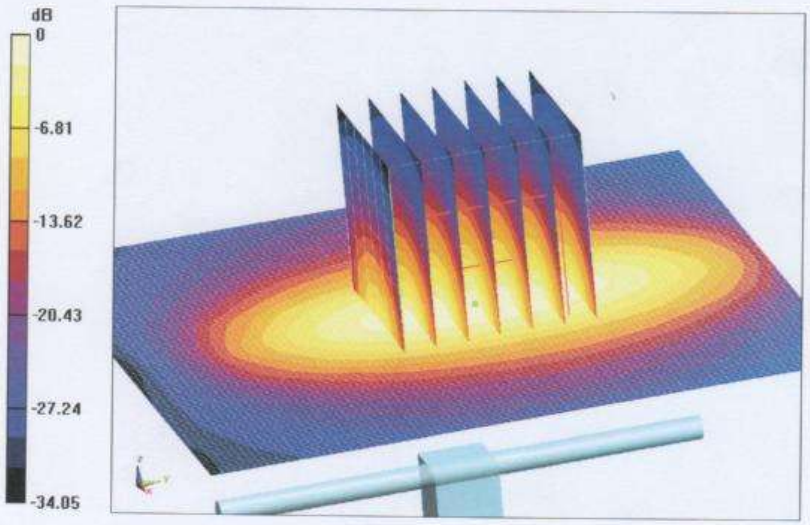
**Dipole Calibration for Body Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.233 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 16.9 W/kg

**SAR(1 g) = 9.52 W/kg; SAR(10 g) = 5.06 W/kg**

Maximum value of SAR (measured) = 13.5 W/kg




0 dB = 13.6 W/kg = 11.33 dBW/kg

Certificate No: J13-2-2184 Page 7 of 8

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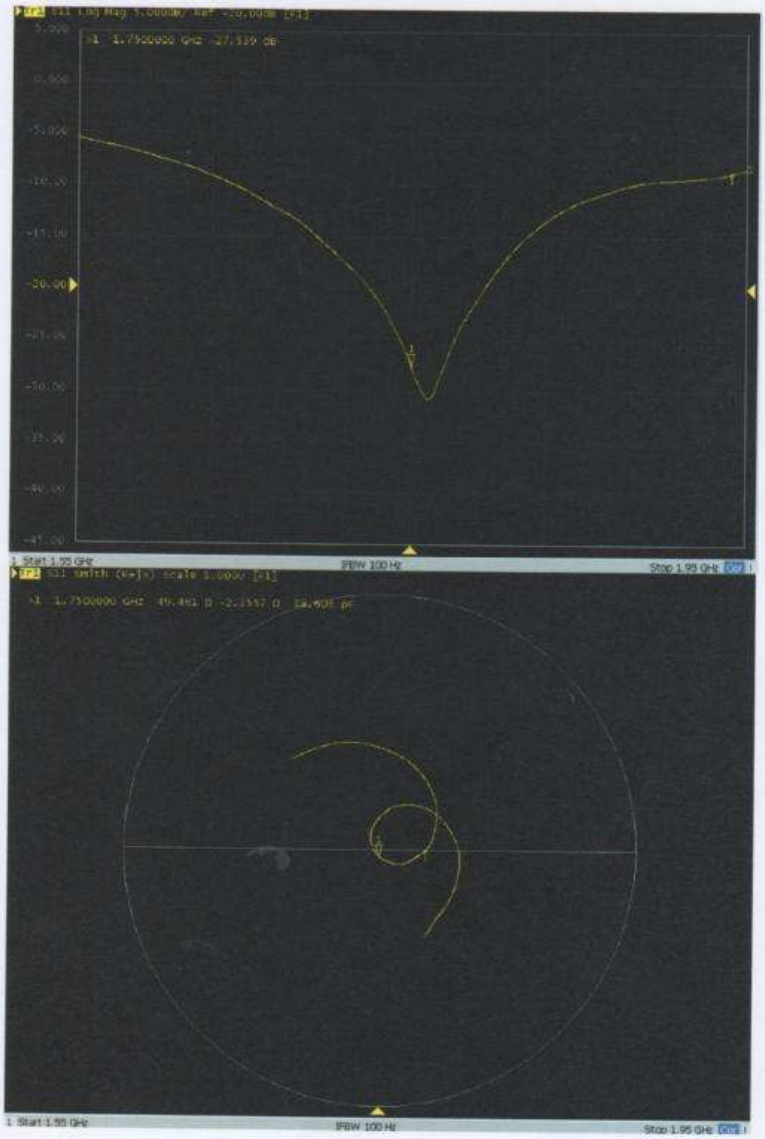
**Impedance Measurement Plot for Body TSL**



Certificate No: J13-2-2184 Page 8 of 8

# Dipole Impedance and Return Loss calibration Report

**Object:** D1750V2 - SN: 1021

**Calibration Date:** Jul 31, 2015

**Calibration reference:** IEEE Std 1528:2013, IEC 62209-1:2006, FCC KDB 865664 D01

**Calibrated By:** Janet Wei (Janet Wei, SAR project engineer)

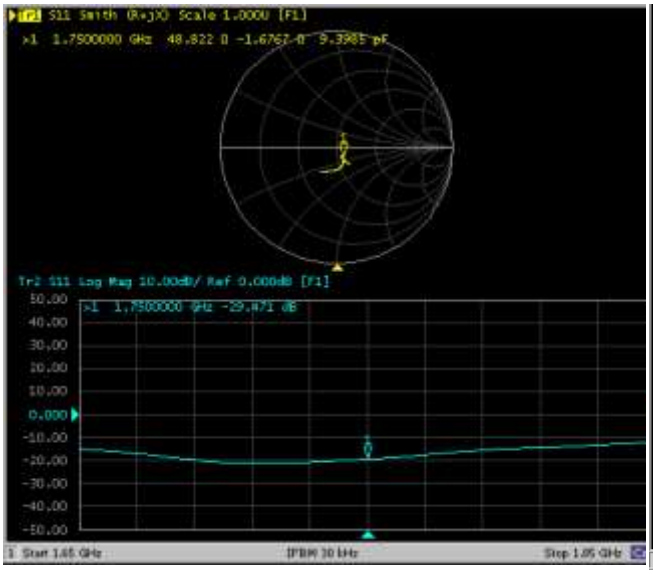
**Reviewed By:** Bruce.Zhang (Bruce Zhang, Technical manager)

## Environment of Test Site

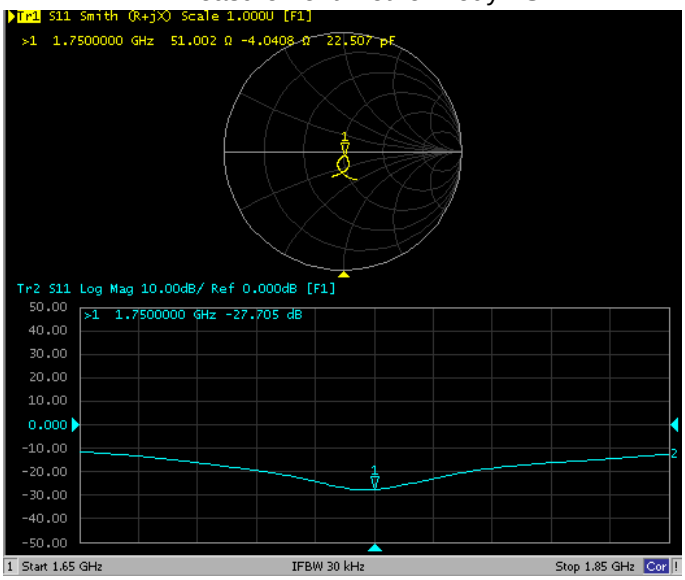
| | |
|---|---|
| Temperature: | 21 ~ 23°C |
| Humidity: | 50~60% RH |
| Atmospheric Pressure: | 1011 mbar |

## Test Data

**Measurement Plot for Head TSL**




Measurement Plot for Body TSL




## Comparison with Original report

| Items | Calibrated By Speag | Calibrated By CCIS | Deviation | Limit |
|---|---|---|---|---|
| Impendence for Head TSL | 46.3Ω-0.22jΩ | 48.8Ω-1.67 jΩ | -2.5Ω+1.451jΩ | ±5Ω |
| Return Loss for Head TSL | -31.0dB | -29.47dB | 4.9% | ±20%(No less than 20 dB) |
| Impendence for Body TSL | 49.5Ω-2.36 jΩ | 51.0Ω-4.04 jΩ | -1.5Ω+1.68 jΩ | ±5Ω |
| Return Loss for Body TSL | -27.5dB | -27.71dB | 0.7% | ±20%(No less than 20 dB) |

## Result

Compliance

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

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

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: **SCS 0108**

Client **SMQ (Auden)**

Certificate No: **D1900V2-5d194_Jan15**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1900V2 - SN: 5d194 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | January 07, 2015 |

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 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-14 (No. ES3-3205_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: January 7, 2015

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

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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

**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 1528-2013, "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
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) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**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%.

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **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 | 40.1 ± 6 % | 1.39 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 10.1 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **40.6 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.32 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **21.3 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.3 | 1.52 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.3 ± 6 % | 1.50 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.95 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **40.1 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.31 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.3 W/kg ± 16.5 % (k=2)** |

## Appendix (Additional assessments outside the scope of SCS108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 53.7 Ω + 4.9 jΩ |
| Return Loss | - 24.5 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 48.9 Ω + 5.1 jΩ |
| Return Loss | - 25.6 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.201 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 | May 06, 2014 |

## DASY5 Validation Report for Head TSL

Date: 07.12.2015

Test Laboratory: SPEAG, Zurich, Switzerland

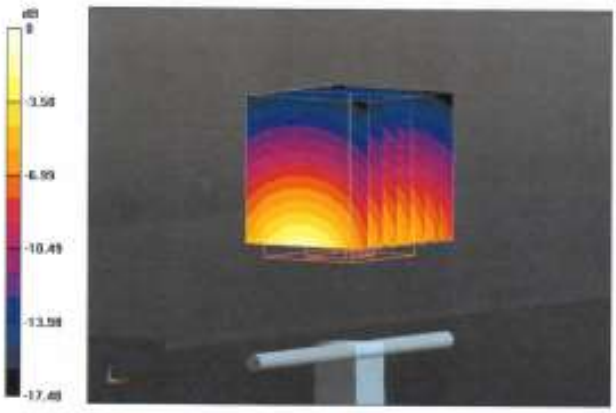
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d194**

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.39 S/m; $\varepsilon_r$ = 40.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

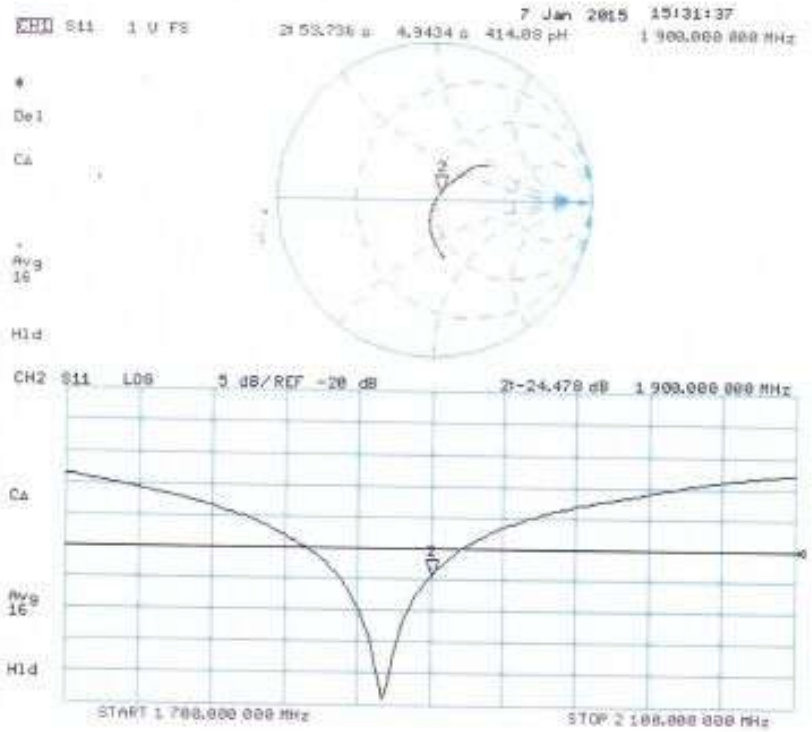
- Probe: ES3DV3 - SN3205; ConvF(5, 5, 5); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**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 = 98.35 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.5 W/kg
**SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.32 W/kg**
Maximum value of SAR (measured) = 12.7 W/kg




0 dB = 12.7 W/kg = 11.04 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 07.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

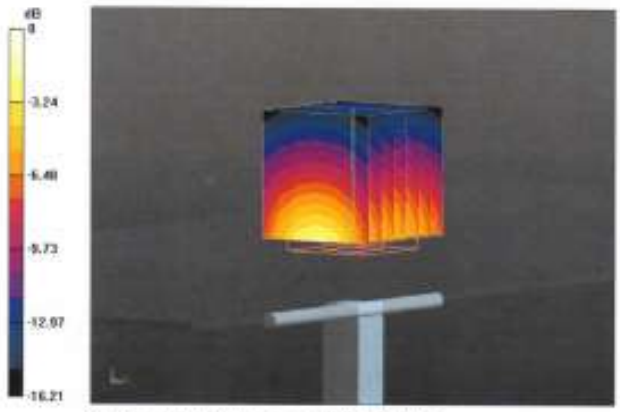
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d194**

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.5 S/m; $\varepsilon_r$ = 53.3; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

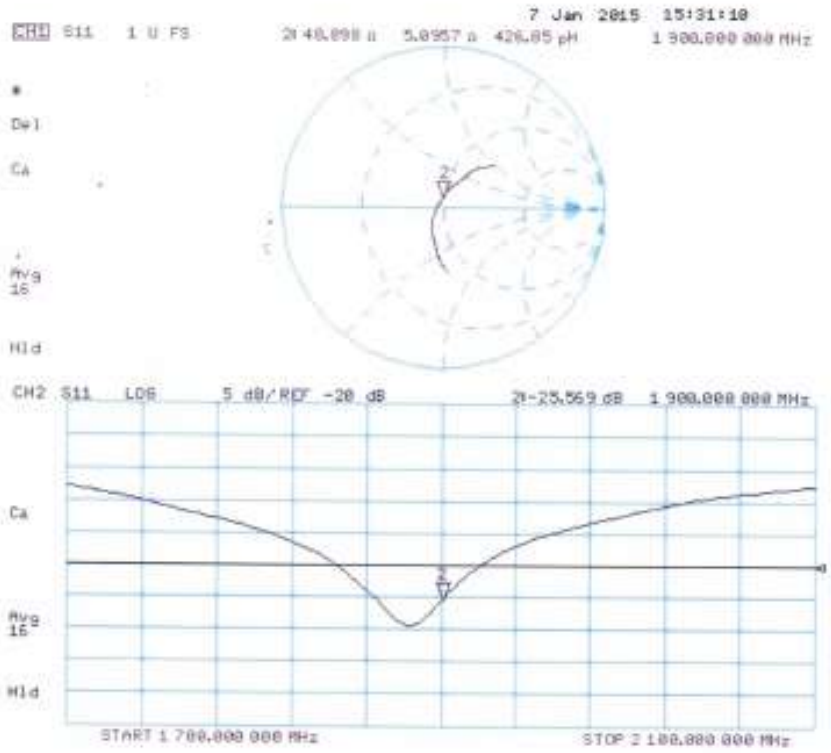
- Probe: ES3DV3 - SN3205; ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**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 = 95.88 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 16.8 W/kg
**SAR(1 g) = 9.95 W/kg; SAR(10 g) = 5.31 W/kg**
Maximum value of SAR (measured) = 12.6 W/kg




0 dB = 12.6 W/kg = 11.00 dBW/kg

## Impedance Measurement Plot for Body TSL



## D1900V2, serial no. 5d194 Extended Dipole Calibrations

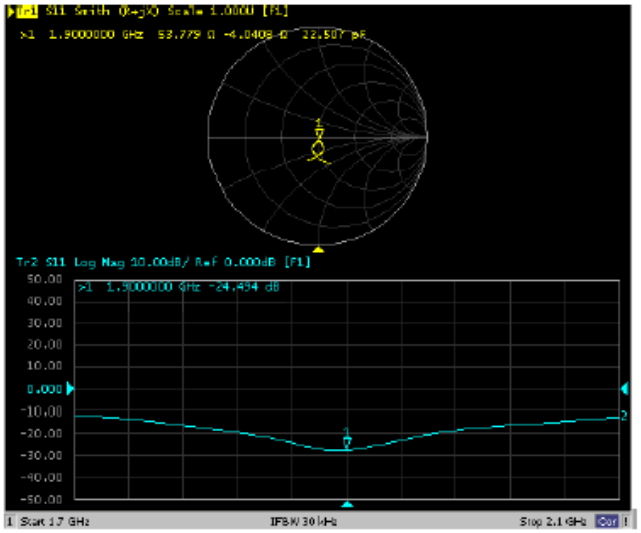
Referring to KDB 865664D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

| D1900V2, serial no. 5d194 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1900 Head | | | | 1900 Body | | | |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) |
| 2015-1-7 | -24.5 | | 53.7 | | -25.6 | | 48.9 | |
| 2016-1-2 | -24.5 | 0 | 53.8 | 0.1 | -26.0 | 1.6 | 48.8 | 0.1 |
| | | | | | | | | |

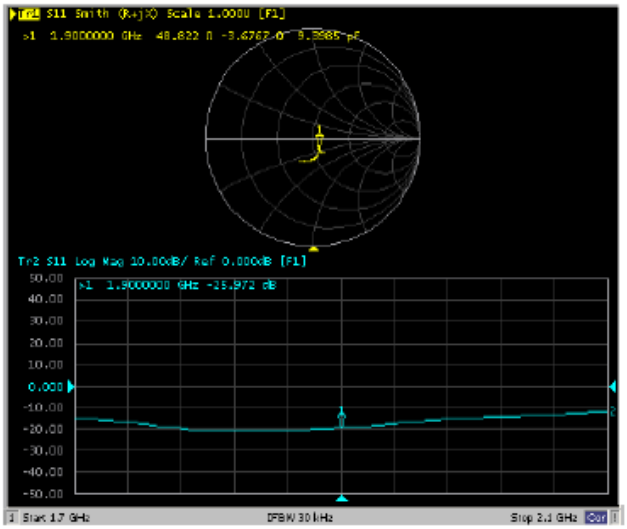
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>- D1900V2, serial no. 5d194

1900MHz Head



1900MHz Body



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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

Client **SMQ (Auden)**

Certificate No: **D2450V2-955_Jan15/2**

# CALIBRATION CERTIFICATE (Replacement of No: D2450V2-955_Jan15)

| | |
|---|---|
| Object | D2450V2 - SN: 955 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | January 08, 2015 |

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 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-14 (No. ES3-3205_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: February 10, 2015

**Calibration Laboratory of**
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**Zeughausstrasse 43, 8004 Zurich, Switzerland**

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**Accreditation No.: SCS 0108**

**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 1528-2013, "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
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) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**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%.

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **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 | |

## 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 ± 0.2) °C | 39.7 ± 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 | 13.2 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **52.4 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.12 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.4 W/kg ± 16.5 % (k=2)** |

## 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 ± 0.2) °C | 51.0 ± 6 % | 2.03 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.8 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **53.7 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.36 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **25.0 W/kg ± 16.5 % (k=2)** |

## Appendix (Additional assessments outside the scope of SCS108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 54.8 Ω + 3.5 jΩ |
| Return Loss | - 24.9 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 51.2 Ω + 4.9 jΩ |
| Return Loss | - 26.0 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.165 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 | August 05, 2014 |

## DASY5 Validation Report for Head TSL

Date: 08.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 955**

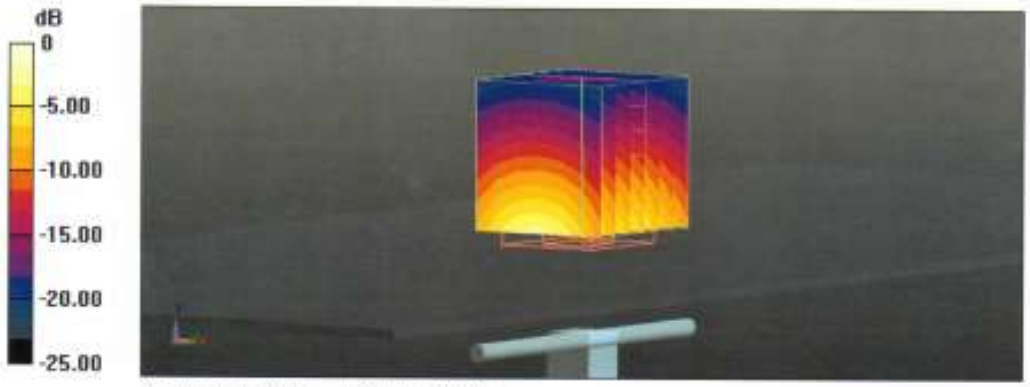
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.84 S/m; $\varepsilon_r$ = 39.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

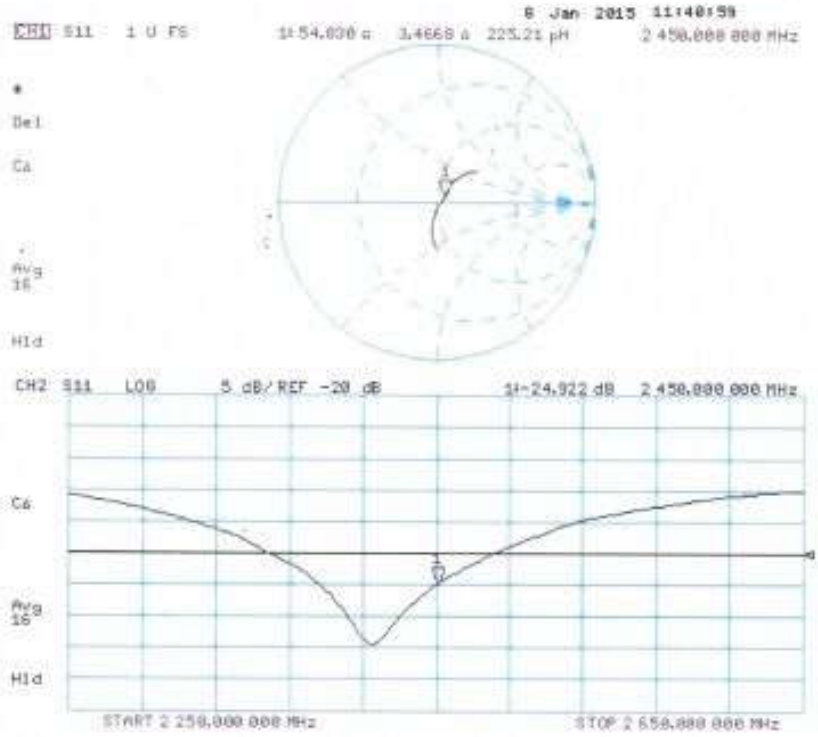
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.2 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 27.5 W/kg
**SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.12 W/kg**
Maximum value of SAR (measured) = 17.5 W/kg




0 dB = 17.5 W/kg = 12.43 dBW/kg

## Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body TSL**

Date: 08.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

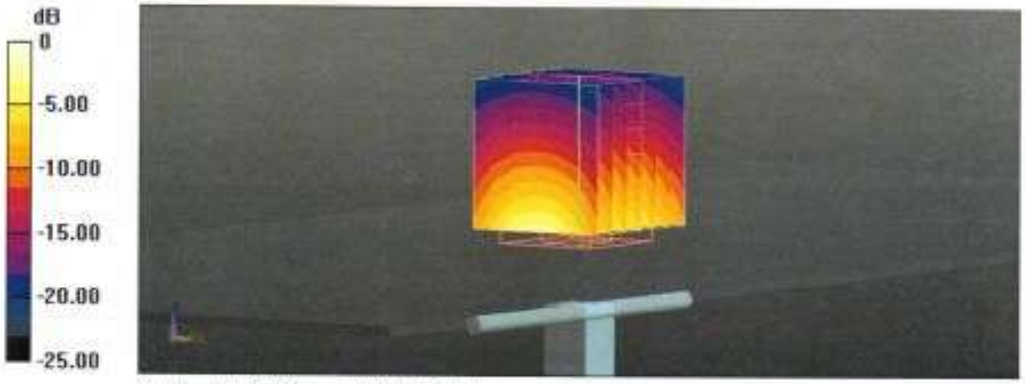
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 955**

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 2.03 S/m; $\varepsilon_r$ = 51; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

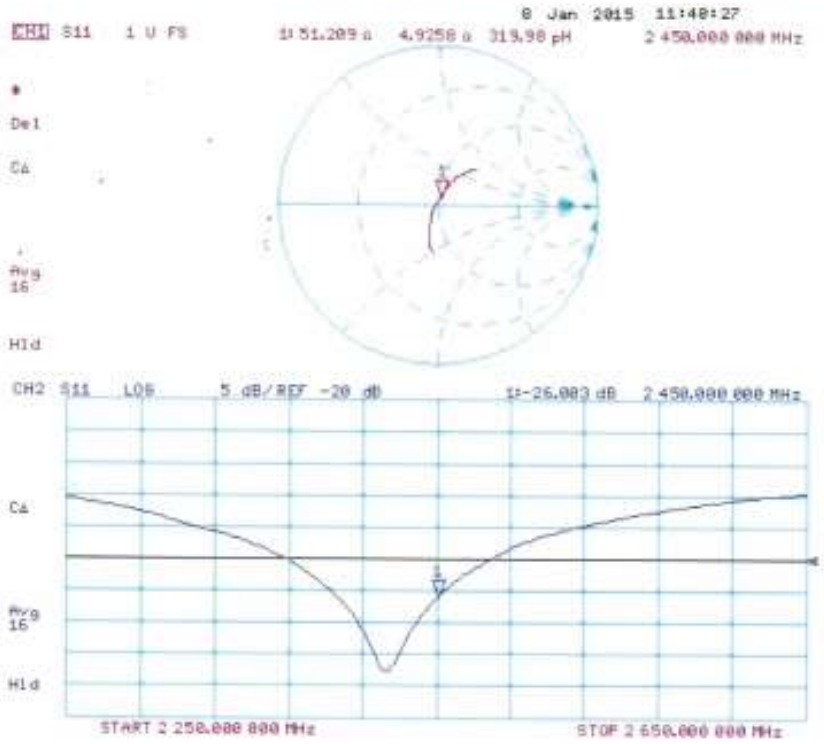
- Probe: ES3DV3 - SN3205; ConvF(4.17, 4.17, 4.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**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 = 97.96 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.8 W/kg
**SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.36 W/kg**
Maximum value of SAR (measured) = 18.3 W/kg




0 dB = 18.3 W/kg = 12.62 dBW/kg

## Impedance Measurement Plot for Body TSL



## D2450V2, serial no. 955 Extended Dipole Calibrations

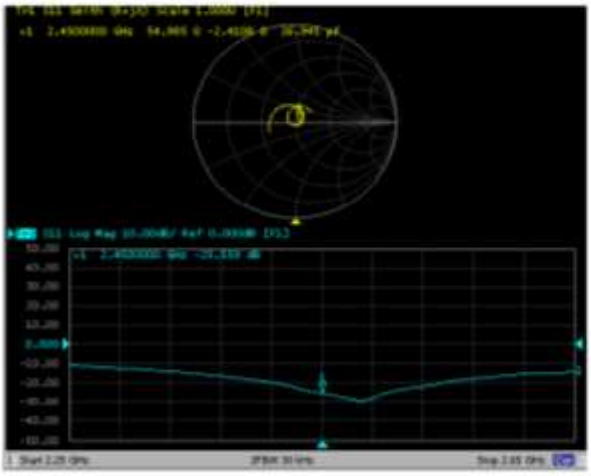
Referring to KDB 865664D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

| D2450V2, serial no. 955 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2450 Head | | | | 2450 Body | | | |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) |
| 2015-1-8 | -24.9 | | 54.8 | | -26.0 | | 51.2 | |
| 2016-1-2 | -25.6 | -2.8 | 55.0 | 0.2 | -27.8 | -6.9 | 52.6 | 1.4 |
| | | | | | | | | |

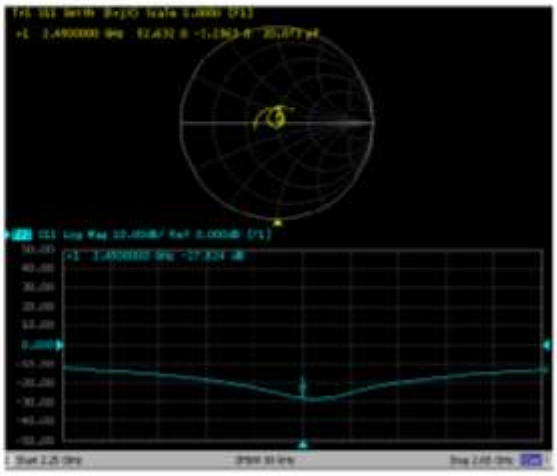
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>- D2450V2, serial no. 955

2450MHz Head



2450MHz Body



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Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client CCIS-CN (Auden)

Certificate No: D2600V2-1114_Sep15

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2600V2 - SN: 1114 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | September 21, 2015 |

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 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 01-Apr-15 (No. 217-02131) | Mar-16 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 01-Apr-15 (No. 217-02134) | Mar-16 |
| Reference Probe EX3DV4 | SN: 7349 | 30-Dec-14 (No. EX3-7349_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 17-Aug-15 (No. DAE4-601_Aug15) | Aug-16 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100972 | 15-Jun-15 (in house check Jun-15) | In house check: Jun-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Michael Weber | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: September 23, 2015

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

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Accreditation No.: SCS 0108

**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 1528-2013, "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
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) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

e) 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%.

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 2600 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 39.0 | 1.96 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 38.6 ± 6 % | 2.04 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 | 14.5 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **56.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.41 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **25.4 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 52.5 | 2.16 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 52.8 ± 6 % | 2.19 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.7 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **54.5 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.12 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **24.4 W/kg ± 16.5 % (k=2)** |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.8 Ω - 7.0 jΩ |
| Return Loss | - 23.1 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 45.7 Ω - 5.0 jΩ |
| Return Loss | - 23.3 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.154 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 | September 10, 2015 |

## DASY5 Validation Report for Head TSL

Date: 21.09.2015

Test Laboratory: SPEAG, Zurich, Switzerland

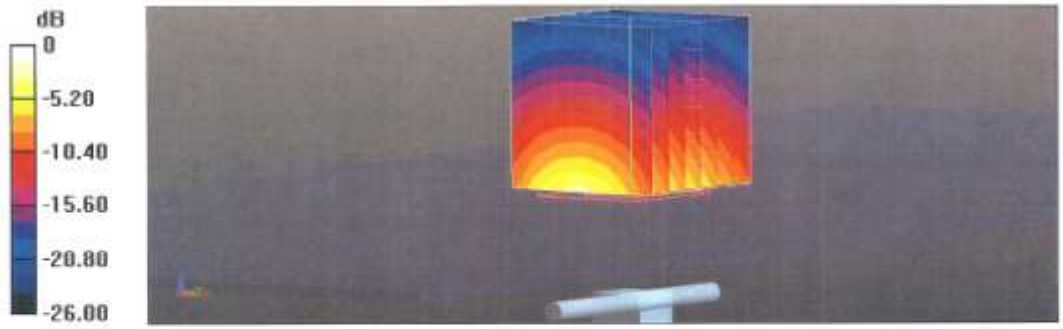
**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1114**

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.04 S/m; $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

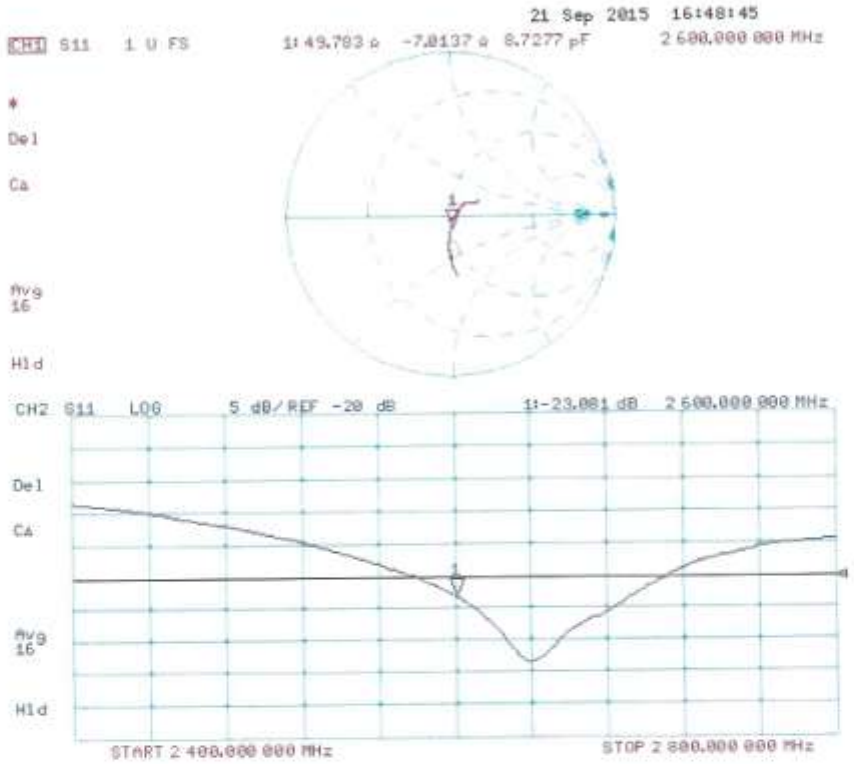
- Probe: EX3DV4 - SN7349; ConvF(7.4, 7.4, 7.4); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**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 = 115.6 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 30.9 W/kg
**SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.41 W/kg**
Maximum value of SAR (measured) = 24.7 W/kg




0 dB = 24.7 W/kg = 13.93 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 17.09.2015

Test Laboratory: The name of your organization

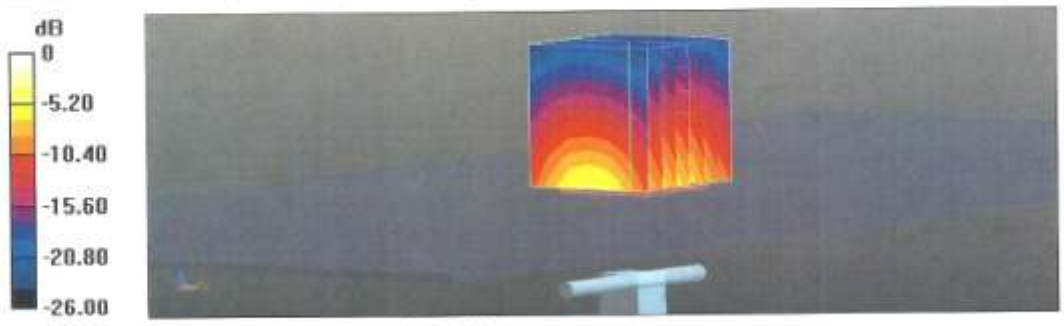
**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1114**

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.19 S/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

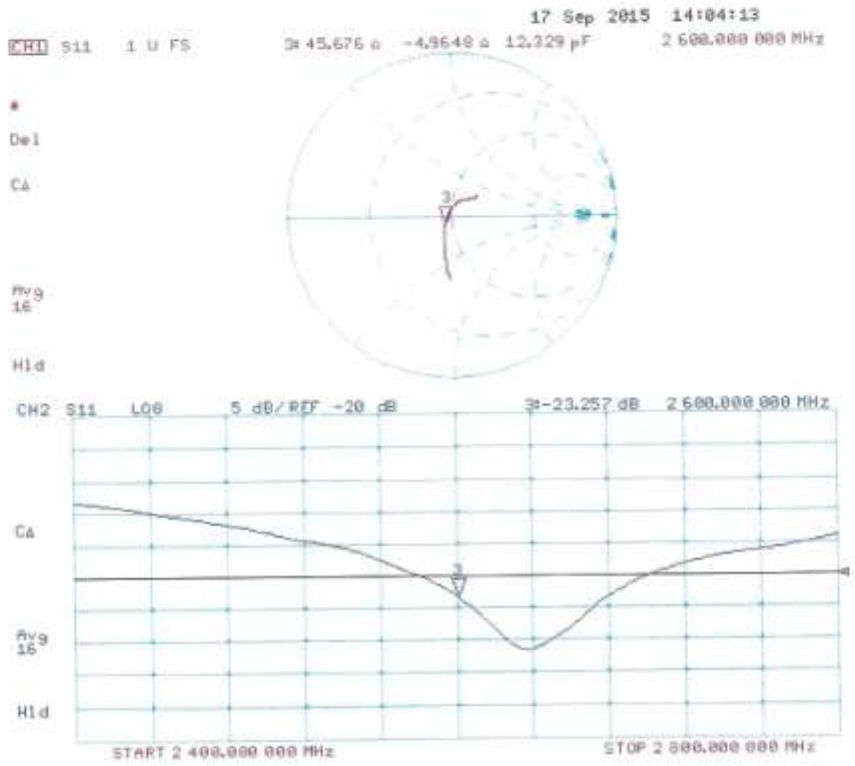
- Probe: EX3DV4 - SN7349; ConvF(7.52, 7.52, 7.52); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**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 = 107.6 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.3 W/kg
**SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.12 W/kg**
Maximum value of SAR (measured) = 23.0 W/kg




0 dB = 23.0 W/kg = 13.62 dBW/kg

**Impedance Measurement Plot for Body TSL**



**Calibration information for DAE**

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

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

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 0108**

**Client** CCIS-SZ (Auden)

**Certificate No: DAE4-1373_Feb16**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | DAE4 - SD 000 D04 BM - SN: 1373 |
| Calibration procedure(s) | QA CAL-06.v29<br>Calibration procedure for the data acquisition electronics (DAE) |
| Calibration date: | February 11, 2016 |

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 |
|---|---|---|---|
| Keithley Multimeter Type 2001 | SN: 0810278 | 09-Sep-15 (No:17153) | Sep-16 |
| **Secondary Standards** | **ID #** | **Check Date (in house)** | **Scheduled Check** |
| Auto DAE Calibration Unit | SE UWS 053 AA 1001 | 05-Jan-16 (in house check) | In house check: Jan-17 |
| Calibrator Box V2.1 | SE UMS 006 AA 1002 | 05-Jan-16 (in house check) | In house check: Jan-17 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | R.Mayoraz | Technician | |
| Approved by: | Fin Bomholt | Deputy Technical Manager | |

Issued: February 11, 2016

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

Certificate No: DAE4-1373_Feb16 Page 1 of 5

**Calibration Laboratory of**
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Engineering AG
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**Accreditation No.: SCS 0108**

**Glossary**

| | |
|---|---|
| DAE | data acquisition electronics |
| Connector angle | information used in DASY system to align probe sensor X to the robot coordinate system. |

**Methods Applied and Interpretation of Parameters**

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

| | | | | |
|---|---|---|---|---|
| High Range: | 1LSB = | 6.1μV , | full range = | -100...+300 mV |
| Low Range: | 1LSB = | 61nV , | full range = | -1.....+3mV |

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X | Y | Z |
|---|---|---|---|
| High Range | 403.853 ± 0.02% (k=2) | 403.821 ± 0.02% (k=2) | 404.118 ± 0.02% (k=2) |
| Low Range | 3.98694 ± 1.50% (k=2) | 4.00837 ± 1.50% (k=2) | 4.01308 ± 1.50% (k=2) |

## Connector Angle

| | |
|---|---|
| **Connector Angle** to be used in DASY system | 220.0 ° ± 1 ° |

## Appendix (Additional assessments outside the scope of SCS0108)

### 1. DC Voltage Linearity

| High Range | | Reading (μV) | Difference (μV) | Error (%) |
|---|---|---|---|---|
| Channel X | + Input | 200025.82 | -4.26 | -0.00 |
| Channel X | + Input | 20002.91 | -0.52 | -0.00 |
| Channel X | - Input | -20003.80 | 1.84 | -0.01 |
| Channel Y | + Input | 200027.44 | -2.49 | -0.00 |
| Channel Y | + Input | 20001.55 | -1.73 | -0.01 |
| Channel Y | - Input | -20007.99 | -2.19 | 0.01 |
| Channel Z | + Input | 200026.66 | -3.10 | -0.00 |
| Channel Z | + Input | 20001.28 | -2.19 | -0.01 |
| Channel Z | - Input | -20007.84 | -2.15 | 0.01 |

| Low Range | | Reading (μV) | Difference (μV) | Error (%) |
|---|---|---|---|---|
| Channel X | + Input | 2000.12 | -0.06 | -0.00 |
| Channel X | + Input | 199.87 | -0.36 | -0.18 |
| Channel X | - Input | -199.81 | -0.01 | 0.00 |
| Channel Y | + Input | 2000.16 | 0.05 | 0.00 |
| Channel Y | + Input | 199.19 | -0.87 | -0.44 |
| Channel Y | - Input | -200.88 | -0.95 | 0.47 |
| Channel Z | + Input | 2000.30 | 0.29 | 0.01 |
| Channel Z | + Input | 198.37 | -1.62 | -0.81 |
| Channel Z | - Input | -202.03 | -2.01 | 1.00 |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Common mode Input Voltage (mV) | High Range Average Reading (μV) | Low Range Average Reading (μV) |
|---|---|---|---|
| Channel X | 200 | 7.85 | 6.06 |
| | - 200 | -5.16 | -7.21 |
| Channel Y | 200 | 10.27 | 9.96 |
| | - 200 | -12.58 | -12.36 |
| Channel Z | 200 | 6.49 | 6.34 |
| | - 200 | -10.05 | -10.37 |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Input Voltage (mV) | Channel X (μV) | Channel Y (μV) | Channel Z (μV) |
|---|---|---|---|---|
| Channel X | 200 | - | 1.02 | -5.36 |
| Channel Y | 200 | 8.07 | - | 2.40 |
| Channel Z | 200 | 9.31 | 6.49 | - |

## 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | High Range (LSB) | Low Range (LSB) |
|---|---|---|
| Channel X | 15938 | 15708 |
| Channel Y | 15863 | 15882 |
| Channel Z | 15888 | 17277 |

## 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

| | Average (μV) | min. Offset (μV) | max. Offset (μV) | Std. Deviation (μV) |
|---|---|---|---|---|
| Channel X | 0.05 | -0.88 | 0.69 | 0.30 |
| Channel Y | -2.16 | -2.85 | -1.42 | 0.30 |
| Channel Z | -2.33 | -3.06 | -1.38 | 0.31 |

## 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

## 7. Input Resistance (Typical values for information)

| | Zeroing (kOhm) | Measuring (MOhm) |
|---|---|---|
| Channel X | 200 | 200 |
| Channel Y | 200 | 200 |
| Channel Z | 200 | 200 |

## 8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|---|---|
| Supply (+ Vcc) | +7.9 |
| Supply (- Vcc) | -7.6 |

## 9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|---|---|---|---|
| Supply (+ Vcc) | +0.01 | +6 | +14 |
| Supply (- Vcc) | -0.01 | -8 | -9 |



**------End of Report------**