

**SAR Test Data Plots**

Test mode: GPRS850 3Tx slot      Test Position: Right Touch Cheek      Test Plot: H1

Date:2018-06-06

Communication System: UID 0, Generic GPRS(TDMA, GMSK, TN 0-1-2) (0); Frequency: 836.6 MHz;Duty Cycle: 1:2.67

Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.933 \text{ S/m}$ ;  $\epsilon_r = 43.899$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(10.73, 10.73, 10.73) @ 836.6 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Right Touch Cheek/Procedure/Area Scan (61x121x1):** Interpolated grid:  $dx=1.500 \text{ mm}$ ,  $dy=1.500 \text{ mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0620 W/kg

**Right Touch Cheek/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

$dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

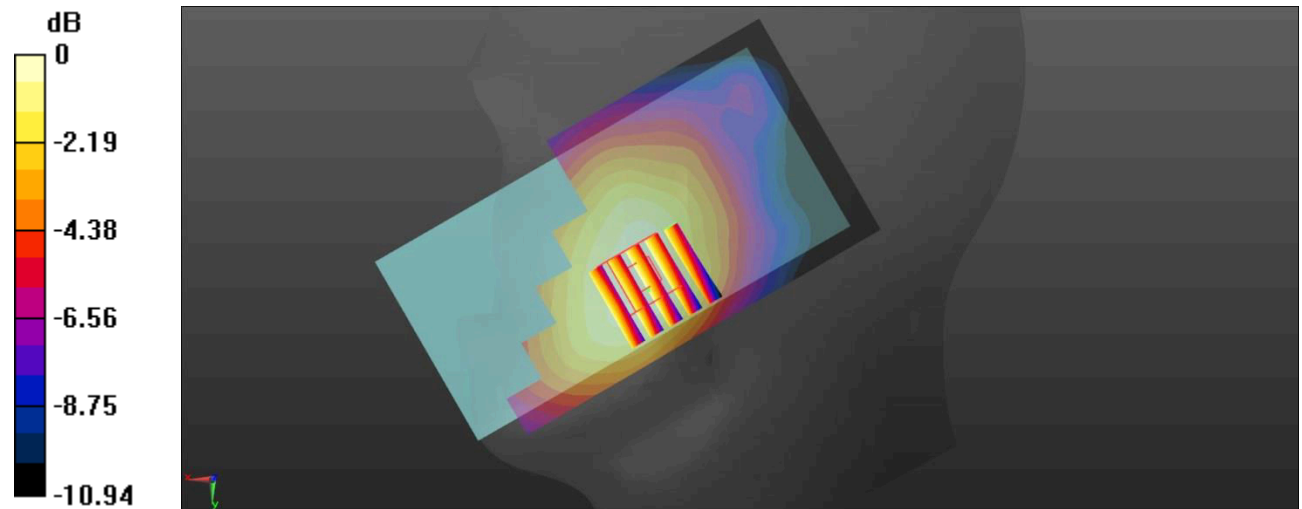
Reference Value = 2.754 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.0670 W/kg

**SAR(1 g) = 0.051 W/kg; SAR(10 g) = 0.038 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0613 W/kg



0 dB = 0.0613 W/kg = -12.13 dBW/kg

Test mode: GPRS1900 4Tx slot    Test Position: Left Touch Cheek    Test Plot: H2

Date:2018-06-08

Communication System: UID 0, Generic GPRS(TDMA, GMSK, TN 0-1-2-3) (0); Frequency: 1880 MHz;Duty Cycle: 1:2.00447

Medium parameters used: f = 1880 MHz;  $\sigma = 1.455$  S/m;  $\epsilon_r = 41.738$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(8.83, 8.83, 8.83) @ 1880 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Left Touch Cheek/Procedure/Area Scan (61x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.0440 W/kg

**Left Touch Cheek/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

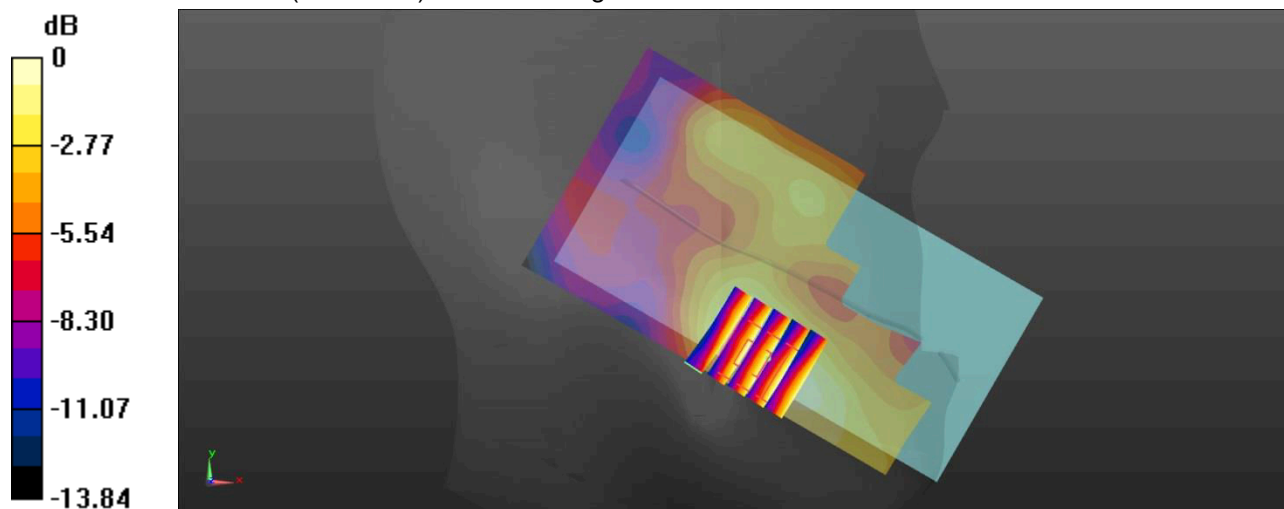
dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.223 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.0500 W/kg

**SAR(1 g) = 0.031 W/kg; SAR(10 g) = 0.020 W/kg**

Maximum value of SAR (measured) = 0.0416 W/kg



0 dB = 0.0416 W/kg = -13.81 dBW/kg

Test mode: WCDMA Band II      Test Position: Left Touch Cheek      Test Plot: H3

Date:2018-06-08

Communication System: UID 0, Generic UMTS (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1

Medium parameters used:  $f = 1907.6$  MHz;  $\sigma = 1.455$  S/m;  $\epsilon_r = 41.738$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

#### DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.83, 8.83, 8.83) @ 1907.6 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Left Touch Cheek/Procedure/Area Scan (61x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.0745 W/kg

**Left Touch Cheek/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

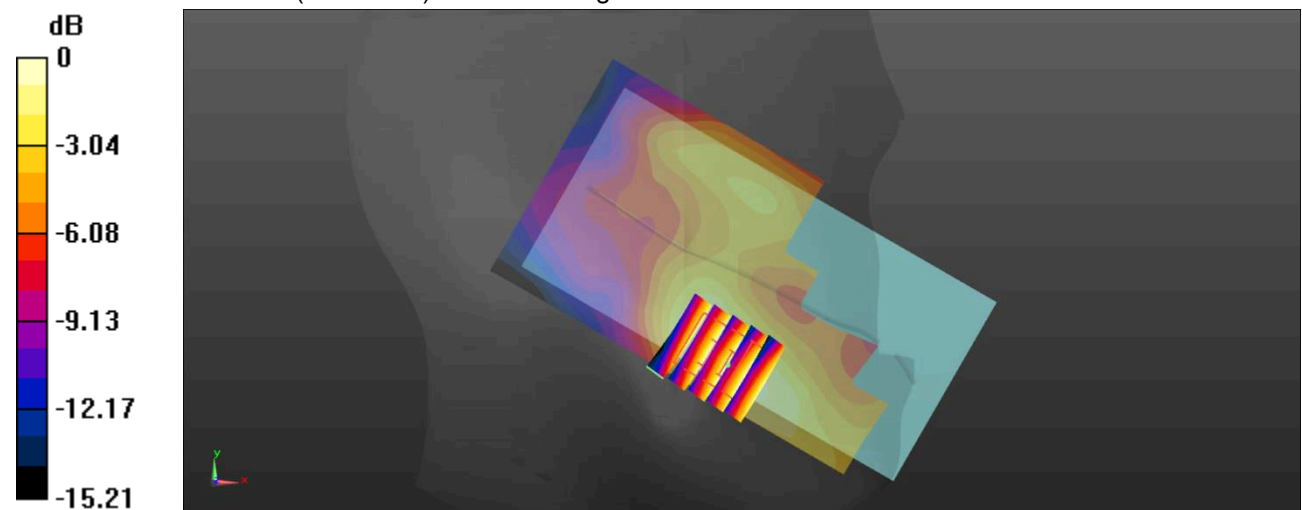
dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.738 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.0880 W/kg

**SAR(1 g) = 0.055 W/kg; SAR(10 g) = 0.034 W/kg**

Maximum value of SAR (measured) = 0.0747 W/kg



0 dB = 0.0747 W/kg = -11.27 dBW/kg

Test mode: WCDMA Band V      Test Position: Right Touch Cheek      Test Plot: H4

Date:2018-06-06

Communication System: UID 0, Generic UMTS (0); Frequency: 836.6 MHz;Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.933$  S/m;  $\epsilon_r = 43.899$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section

#### DASY5 Configuration:

- Probe: EX3DV4 - SN7494; ConvF(10.73, 10.73, 10.73) @ 836.6 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Right Touch Cheek/Procedure/Area Scan (61x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0415 W/kg

**Right Touch Cheek/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

dx=8mm, dy=8mm, dz=5mm

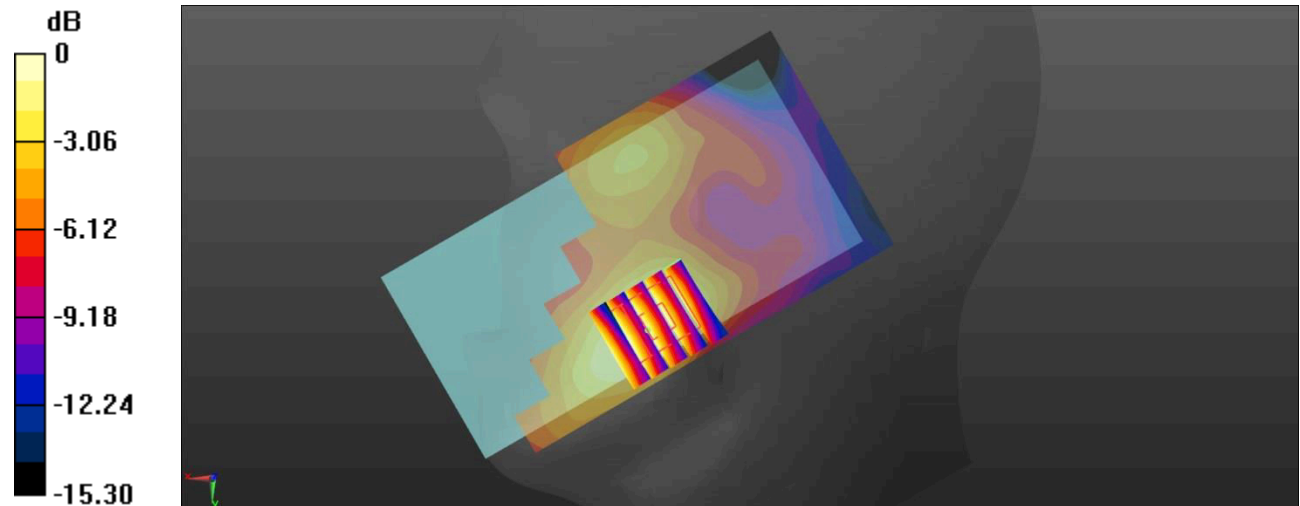
Reference Value = 2.064 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.0450 W/kg

**SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.018 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0397 W/kg



0 dB = 0.0397 W/kg = -14.01 dBW/kg

Test mode: LTE Band 5

Test Position: Right Touch Cheek

Test Plot: H5

H5

Date:2018-06-06

Communication System: UID 0, Generic LTE-FDD (0); Frequency: 836.5 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 836.5$  MHz;  $\sigma = 0.933$  S/m;  $\epsilon_r = 43.899$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(10.73, 10.73, 10.73) @ 836.5 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Right Touch Cheek/Procedure/Area Scan (61x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0343 W/kg

**Right Touch Cheek/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

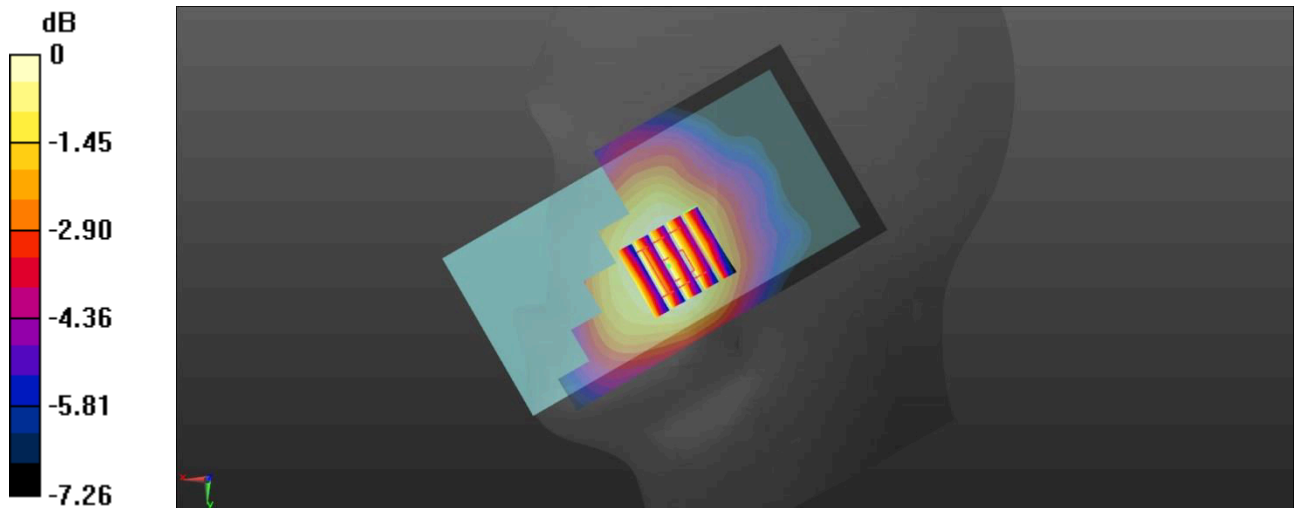
dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.540 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 0.0350 W/kg

**SAR(1 g) = 0.027 W/kg; SAR(10 g) = 0.021 W/kg**[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0321 W/kg



0 dB = 0.0321 W/kg = -14.93 dBW/kg

Test mode: LTE Band 7      Test Position: Left Touch Cheek      Test Plot: H6

Date:2018-06-11

Communication System: UID 0, Generic LTE-FDD (0); Frequency: 2535 MHz;Duty Cycle: 1:1

Medium parameters used:  $f = 2535 \text{ MHz}$ ;  $\sigma = 1.914 \text{ S/m}$ ;  $\epsilon_r = 40.778$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(7.92, 7.92, 7.92) @ 2535 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Left Touch Cheek/Procedure/Area Scan (81x151x1):** Interpolated grid:  $dx=1.200 \text{ mm}$ ,  $dy=1.200 \text{ mm}$

Maximum value of SAR (interpolated) = 0.217 W/kg

**Left Touch Cheek/Procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:

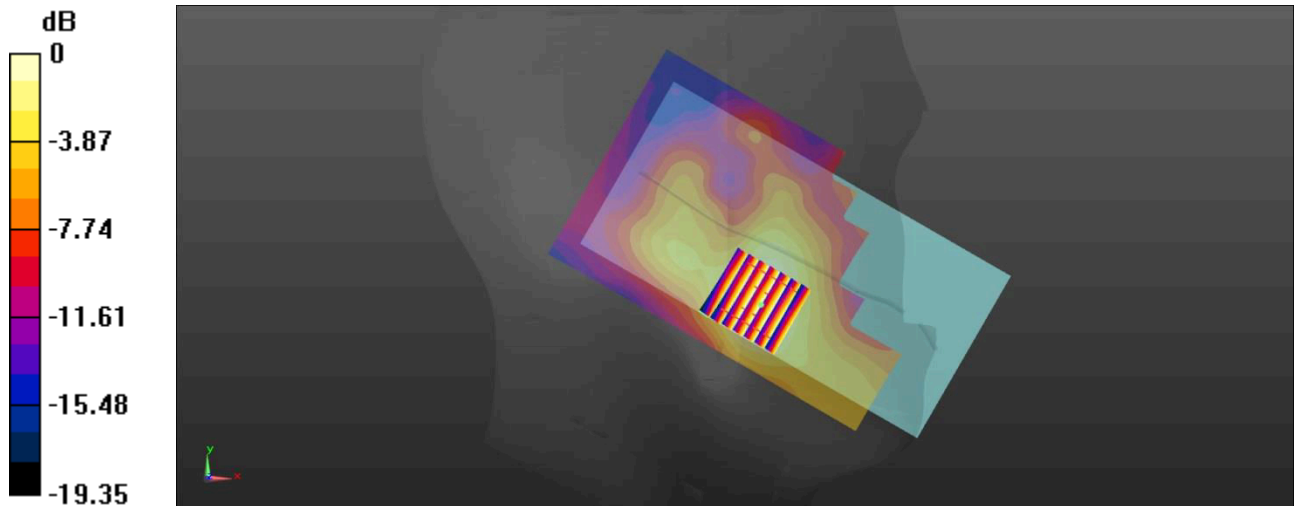
$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 2.861 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.239 W/kg

**SAR(1 g) = 0.139 W/kg; SAR(10 g) = 0.079 W/kg**

Maximum value of SAR (measured) = 0.200 W/kg



0 dB = 0.200 W/kg = -6.99 dBW/kg

Test mode: WLAN 802.11b      Test Position: Left Touch Cheek      Test Plot: H7

Date:2018-06-11

Communication System: UID 0, Generic WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.829 \text{ S/m}$ ;  $\epsilon_r = 41.002$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Left Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(8.27, 8.27, 8.27) @ 2437 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Left Touch Cheek/Procedure/Area Scan (81x151x1):** Interpolated grid:  $dx=1.200 \text{ mm}$ ,  $dy=1.200 \text{ mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.729 W/kg

**Left Touch Cheek/Procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:

$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

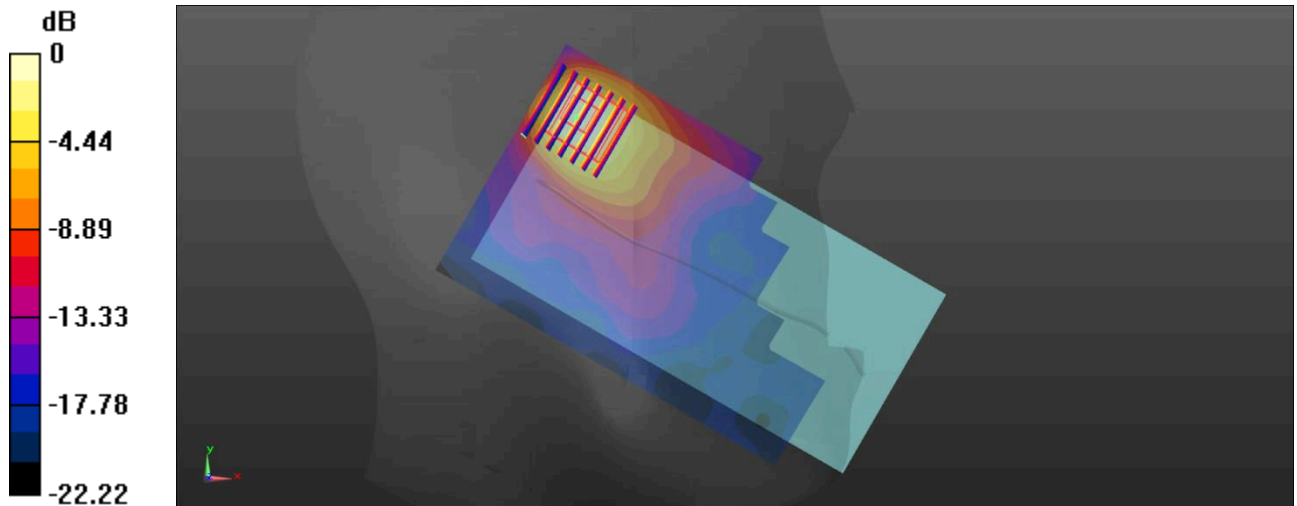
Reference Value = 4.107 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.754 W/kg

**SAR(1 g) = 0.318 W/kg; SAR(10 g) = 0.156 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.543 W/kg



0 dB = 0.543 W/kg = -2.65 dBW/kg

Test mode: BT 8DPSK

Test Position: Left Touch Cheek

Test Plot: H8

Date:2018-06-11

Communication System: UID 0, Generic Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.30617

Medium parameters used (interpolated):  $f = 2441$  MHz;  $\sigma = 1.831$  S/m;  $\epsilon_r = 40.998$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(8.27, 8.27, 8.27) @ 2441 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Left Touch Cheek/Procedure/Area Scan (81x151x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.259 W/kg

**Left Touch Cheek/Procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:

dx=5mm, dy=5mm, dz=5mm

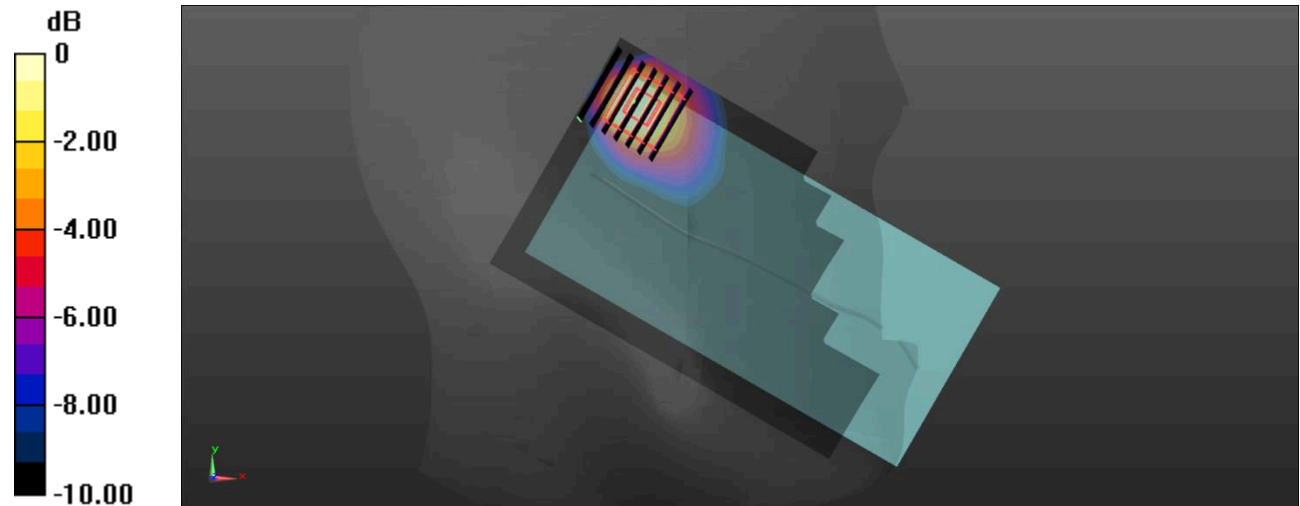
Reference Value = 2.793 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.260 W/kg

**SAR(1 g) = 0.106 W/kg; SAR(10 g) = 0.052 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.181 W/kg



0 dB = 0.181 W/kg = -7.42 dBW/kg



Test mode: GPRS850 3Tx slot      Test Position: Body- worn Rear      Test Plot: B1

Date:2018-06-07

Communication System: UID 0, Generic GPRS(TDMA, GMSK, TN 0-1-2) (0); Frequency: 836.6 MHz;Duty Cycle: 1:2.67

Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.967 \text{ S/m}$ ;  $\epsilon_r = 55.399$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

**DASY 5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(10.5, 10.5, 10.5) @ 836.6 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Rear/Procedure/Area Scan (61x131x1):** Interpolated grid:  $dx=1.500 \text{ mm}$ ,  $dy=1.500 \text{ mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.101 W/kg

**Rear/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

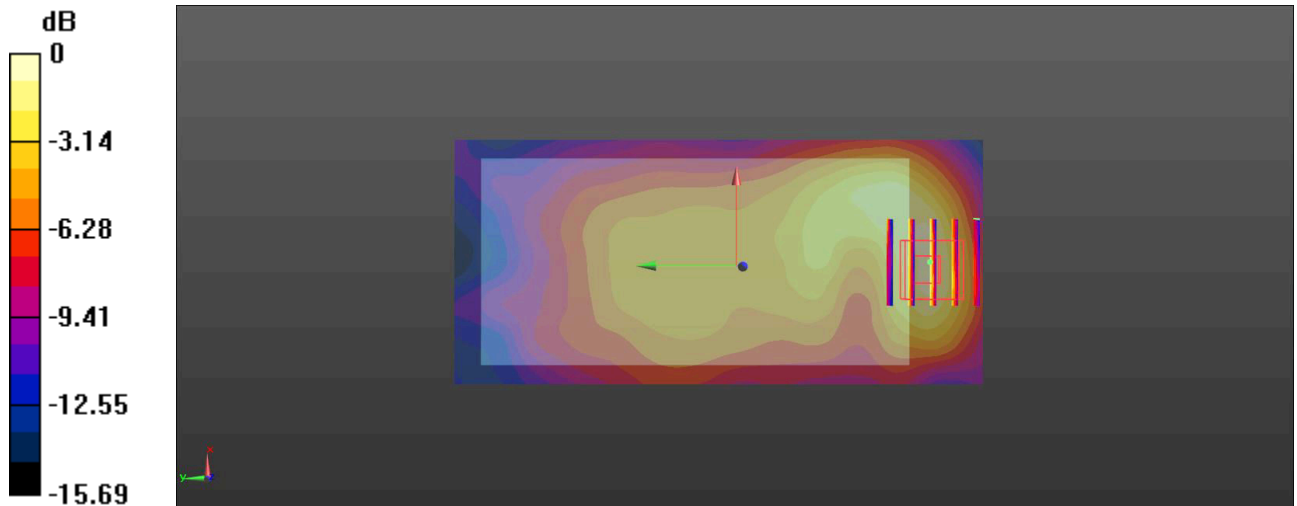
Reference Value = 6.935 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.160 W/kg

**SAR(1 g) = 0.081 W/kg; SAR(10 g) = 0.046 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.115 W/kg



0 dB = 0.115 W/kg = -9.39 dBW/kg

Test mode: GPRS1900 4Tx slot      Test Position: Body- worn Rear      Test Plot: B2

Date:2018-06-08

Communication System: UID 0, Generic GPRS(TDMA, GMSK, TN 0-1-2-3) (0); Frequency: 1880 MHz;Duty Cycle: 1:2.00447

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.539 \text{ S/m}$ ;  $\epsilon_r = 53.741$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(8.42, 8.42, 8.42) @ 1880 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Rear/Procedure/Area Scan (61x131x1):** Interpolated grid:  $dx=1.500 \text{ mm}$ ,  $dy=1.500 \text{ mm}$   
Maximum value of SAR (interpolated) = 0.219 W/kg

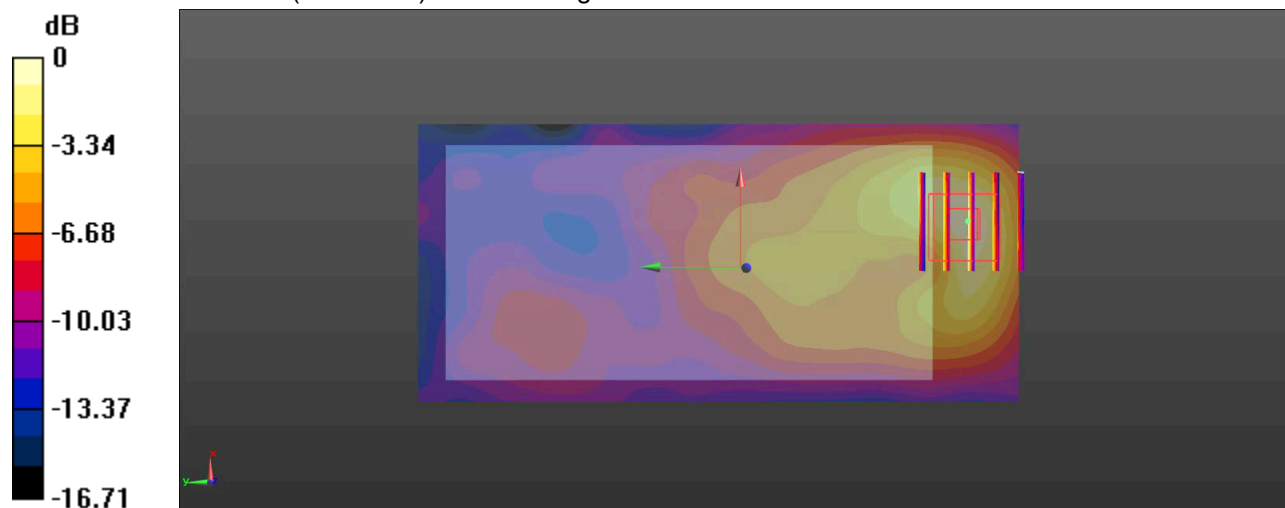
**Rear/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 4.732 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.274 W/kg

**SAR(1 g) = 0.151 W/kg; SAR(10 g) = 0.084 W/kg**

Maximum value of SAR (measured) = 0.225 W/kg



0 dB = 0.225 W/kg = -6.48 dBW/kg

Test mode: WCDMA Band II      Test Position: Body- worn Rear      Test Plot: B3

Date:2018-06-08

Communication System: UID 0, Generic UMTS (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1

Medium parameters used:  $f = 1907.6 \text{ MHz}$ ;  $\sigma = 1.539 \text{ S/m}$ ;  $\epsilon_r = 53.741$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(8.42, 8.42, 8.42) @ 1907.6 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Rear/Procedure/Area Scan (61x131x1):** Interpolated grid:  $dx=1.500 \text{ mm}$ ,  $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 0.354 W/kg

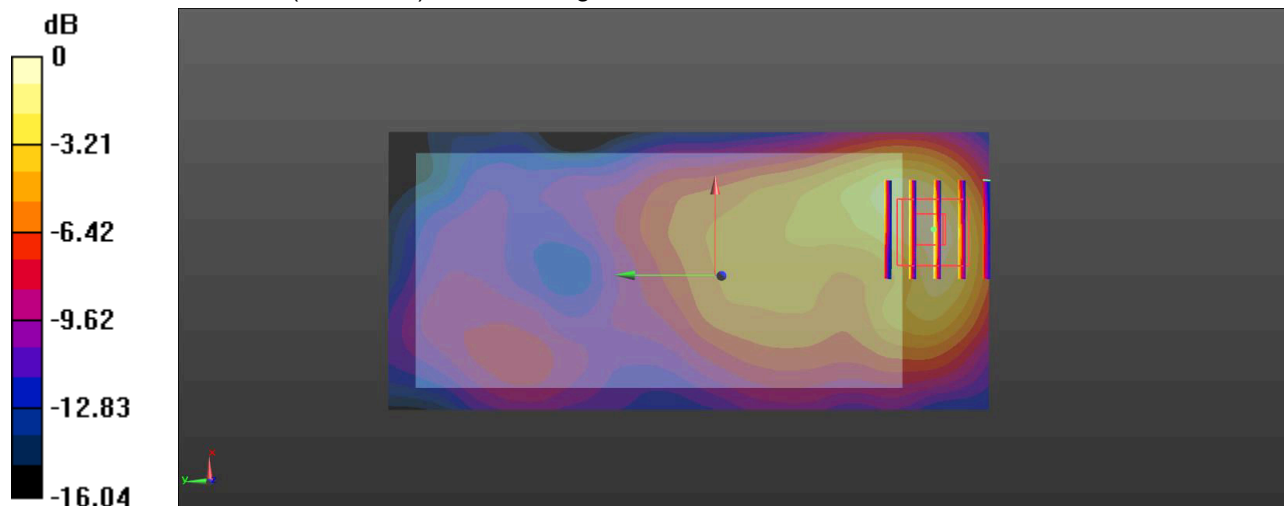
**Rear/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 7.121 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.446 W/kg

**SAR(1 g) = 0.248 W/kg; SAR(10 g) = 0.140 W/kg**

Maximum value of SAR (measured) = 0.363 W/kg



0 dB = 0.363 W/kg = -4.40 dBW/kg

Test mode: WCDMA Band V	Test Position: Body- worn Rear	Test Plot: B4
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Date:2018-06-07

Communication System: UID 0, Generic UMTS (0); Frequency: 836.6 MHz;Duty Cycle: 1:1  
 Medium parameters used (interpolated):  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.967 \text{ S/m}$ ;  $\epsilon_r = 55.399$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(10.5, 10.5, 10.5) @ 836.6 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Rear/Procedure/Area Scan (61x131x1):** Interpolated grid:  $dx=1.500 \text{ mm}$ ,  $dy=1.500 \text{ mm}$

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.211 W/kg

**Rear/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

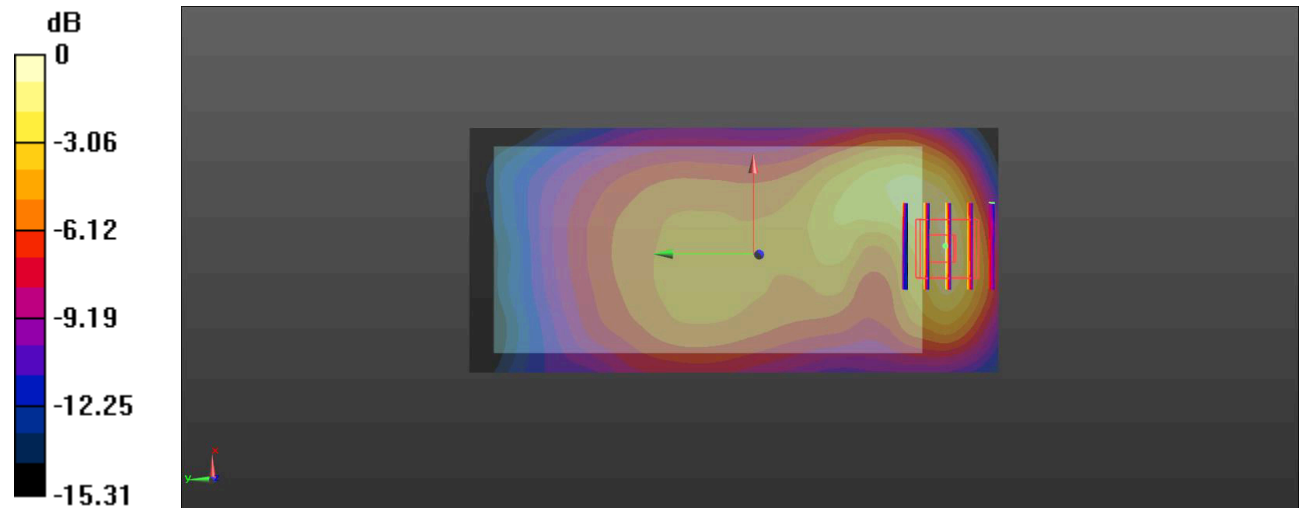
Reference Value = 9.633 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.341 W/kg

**SAR(1 g) = 0.170 W/kg; SAR(10 g) = 0.093 W/kg**

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.254 W/kg



0 dB = 0.254 W/kg = -9.95 dBW/kg

Test mode: LTE Band 5      Test Position: Body- worn Rear      Test Plot: B5

Date:2018-06-07

Communication System: UID 0, Generic LTE-FDD (0); Frequency: 836.5 MHz;Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 836.5 \text{ MHz}$ ;  $\sigma = 0.967 \text{ S/m}$ ;  $\epsilon_r = 55.399$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(10.5, 10.5, 10.5) @ 836.5 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Rear/Procedure/Area Scan (61x131x1):** Interpolated grid:  $dx=1.500 \text{ mm}$ ,  $dy=1.500 \text{ mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.118 W/kg

**Rear/Procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

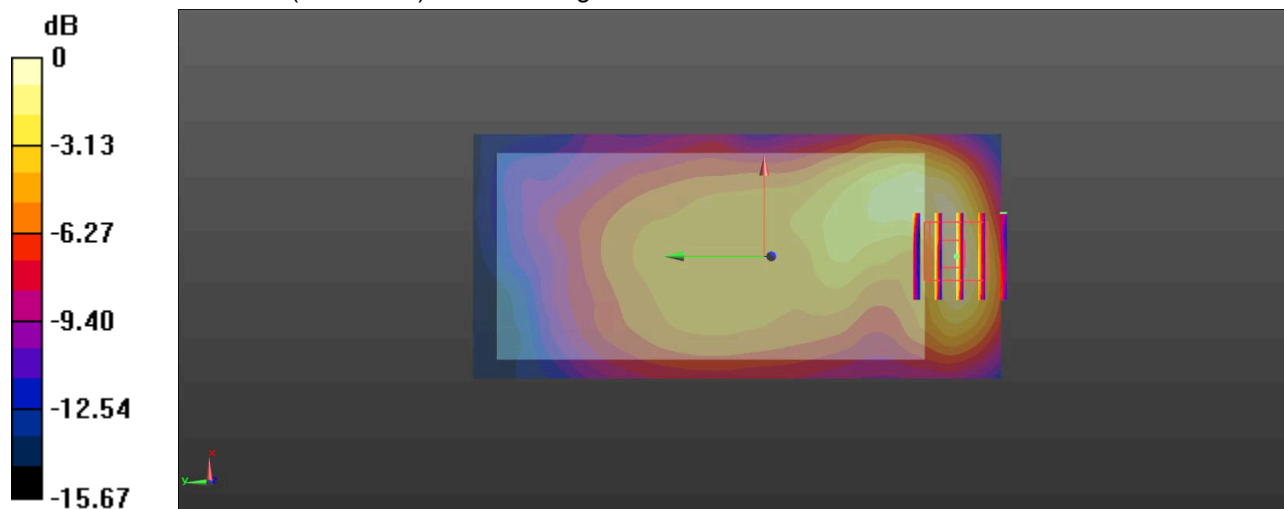
Reference Value = 6.935 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 0.176 W/kg

**SAR(1 g) = 0.087 W/kg; SAR(10 g) = 0.048 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.120 W/kg



0 dB = 0.120 W/kg = -9.21 dBW/kg

Test mode: LTE Band 7

Test Position: Body- worn Rear

Test Plot: B6

Date:2018-06-11

Communication System: UID 0, Generic LTE-FDD (0); Frequency: 2535 MHz;Duty Cycle: 1:1

Medium parameters used:  $f = 2535 \text{ MHz}$ ;  $\sigma = 2.082 \text{ S/m}$ ;  $\epsilon_r = 52.884$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(7.51, 7.51, 7.51) @ 2535 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Rear/Procedure/Area Scan (81x161x1):** Interpolated grid:  $dx=1.200 \text{ mm}$ ,  $dy=1.200 \text{ mm}$

Maximum value of SAR (interpolated) = 1.10 W/kg

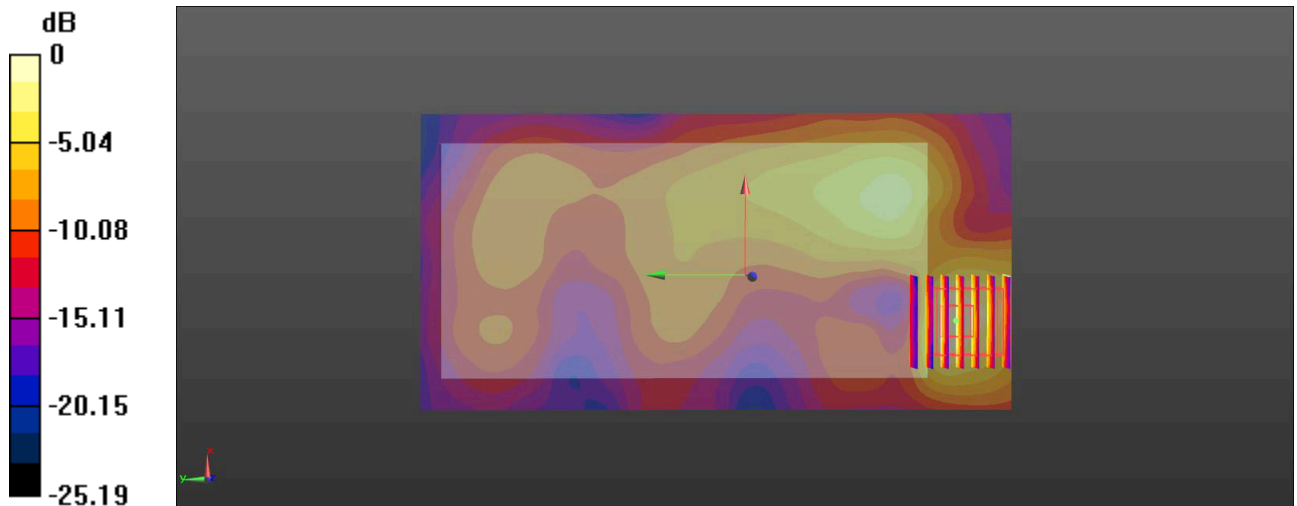
**Rear/Procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 8.475 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 1.30 W/kg

**SAR(1 g) = 0.612 W/kg; SAR(10 g) = 0.292 W/kg**

Maximum value of SAR (measured) = 1.00 W/kg



0 dB = 1.00 W/kg = 0.00 dBW/kg

Test mode: WLAN 802.11b

Test Position: Body- worn Rear

Test Plot: B7

Date:2018-06-11

Communication System: UID 0, Generic WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.991 \text{ S/m}$ ;  $\epsilon_r = 53.023$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7494; ConvF(8.08, 8.08, 8.08) @ 2437 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**Rear/Procedure/Area Scan (81x151x1):** Interpolated grid:  $dx=1.200 \text{ mm}$ ,  $dy=1.200 \text{ mm}$

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.239 W/kg

**Rear/Procedure/Zoom Scan (7x8x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

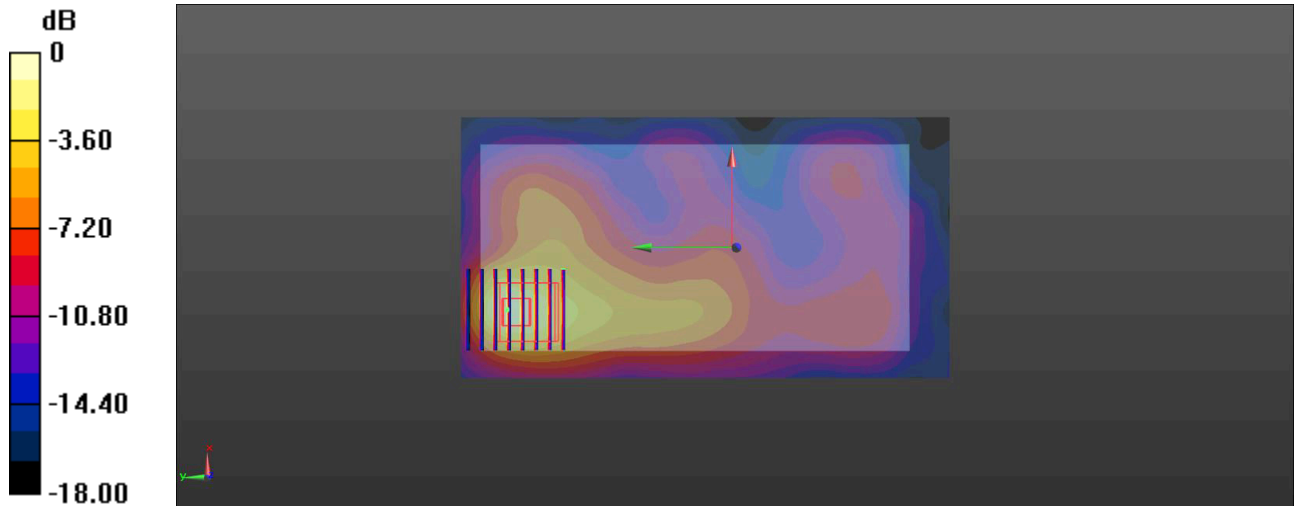
Reference Value = 3.891 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.335 W/kg

**SAR(1 g) = 0.141 W/kg; SAR(10 g) = 0.067 W/kg**

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.246 W/kg



0 dB = 0.246 W/kg = -6.09 dBW/kg

## 15. Simultaneous Transmission analysis

No.	Simultaneous Transmission Configurations	Head	Body-worn	Hotspot	Note
1	GSM(voice) + Bluetooth (data)	Yes	Yes		
2	GSM(voice) + WIFI (data)	Yes	Yes		
3	WCDMA(voice) + Bluetooth (data)	Yes	Yes		
4	WCDMA(voice) + WIFI (data)	Yes	Yes		
5	GPRS (data) + Bluetooth (data)	Yes	Yes	NA	
6	GPRS (data) + WIFI (data)	Yes	Yes	Yes	
7	WCDMA (data) + Bluetooth (data)	Yes	Yes	NA	
8	WCDMA (data) + WIFI (data)	Yes	Yes	Yes	
9	LTE + Bluetooth (data)	Yes	Yes	NA	
10	LTE + WIFI (data)	Yes	Yes	Yes	

### General note:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either GSM or WCDMA LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
3. The reported SAR summation is calculated based on the same configuration and test position
4. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below
  - a)  $[(\text{max. Power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}/x] \text{W/kg}$  for test separation distances  $\leq 50\text{mm}$ ; when  $x=7.5$  for 1-g SAR, and  $x=18.75$  for 10-g SAR.
  - b) When the minimum separation distance is  $<5\text{mm}$ , the distance is used 5mm to determine SAR test exclusion
  - c) 0.4 W/kg for 1-g SAR and 1.0W/kg for 10-g SAR, when the test separation distances is  $>50\text{mm}$ .

Bluetooth Max power	Exposure position	Body-worn
	Test separation	10mm
12.50 dBm	Estimated SAR (W/kg)	0.371



**Maximum reported SAR value for Head**

WWAN PCE + WLAN DTS					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCE	WLAN DTS	
GSM	GSM850	Left Cheek	0.042	0.353	0.395
		Left Tilted	0.032	0.299	0.331
		Right Cheek	0.051	0.268	0.319
		Right Tilted	0.039	0.225	0.264
	PCS1900	Left Cheek	0.032	0.353	0.384
		Left Tilted	0.026	0.299	0.324
		Right Cheek	0.030	0.268	0.298
		Right Tilted	0.024	0.225	0.249
WCDMA	Band II	Left Cheek	0.057	0.353	0.410
		Left Tilted	0.047	0.299	0.346
		Right Cheek	0.054	0.268	0.323
		Right Tilted	0.044	0.225	0.269
	Band V	Left Cheek	0.029	0.353	0.382
		Left Tilted	0.024	0.299	0.323
		Right Cheek	0.031	0.268	0.299
		Right Tilted	0.024	0.225	0.250
LTE	B5 1RB	Left Cheek	0.027	0.353	0.380
		Left Tilted	0.023	0.299	0.322
		Right Cheek	0.028	0.268	0.296
		Right Tilted	0.022	0.225	0.247
	B5 25RB	Left Cheek	0.026	0.353	0.379
		Left Tilted	0.020	0.299	0.319
		Right Cheek	0.027	0.268	0.296
		Right Tilted	0.022	0.225	0.248
	B7 1RB	Left Cheek	0.155	0.353	<b>0.508</b>
		Left Tilted	0.130	0.299	0.429
		Right Cheek	0.150	0.268	0.418
		Right Tilted	0.119	0.225	0.344
	B7 50RB	Left Cheek	0.140	0.353	0.493
		Left Tilted	0.109	0.299	0.407
		Right Cheek	0.139	0.268	0.408
		Right Tilted	0.114	0.225	0.339

WWAN PCE + Bluetooth					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCE	Bluetooth	
GSM	GSM850	Left Cheek	0.042	0.119	0.161
		Left Tilted	0.032	0.101	0.133
		Right Cheek	0.051	0.100	0.150
		Right Tilted	0.039	0.084	0.122
	PCS1900	Left Cheek	0.032	0.119	0.150
		Left Tilted	0.026	0.101	0.126
		Right Cheek	0.030	0.100	0.130
		Right Tilted	0.024	0.084	0.107
WCDMA	Band II	Left Cheek	0.057	0.119	0.176
		Left Tilted	0.047	0.101	0.147
		Right Cheek	0.054	0.100	0.154
		Right Tilted	0.044	0.084	0.127
	Band V	Left Cheek	0.029	0.119	0.148
		Left Tilted	0.024	0.101	0.124
		Right Cheek	0.031	0.100	0.130
		Right Tilted	0.024	0.084	0.108
LTE	B5 1RB	Left Cheek	0.027	0.119	0.146
		Left Tilted	0.023	0.101	0.123
		Right Cheek	0.028	0.100	0.127
		Right Tilted	0.022	0.084	0.106
	B5 25RB	Left Cheek	0.026	0.119	0.145
		Left Tilted	0.020	0.101	0.121
		Right Cheek	0.027	0.100	0.127
		Right Tilted	0.022	0.084	0.106
	B7 1RB	Left Cheek	0.155	0.119	0.274
		Left Tilted	0.130	0.101	0.231
		Right Cheek	0.150	0.100	0.250
		Right Tilted	0.119	0.084	0.203
	B7 50RB	Left Cheek	0.140	0.119	0.259
		Left Tilted	0.109	0.101	0.209
		Right Cheek	0.139	0.100	0.239
		Right Tilted	0.114	0.084	0.197

**Maximum reported SAR value for Body**

WWAN PCE + WLAN DTS					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCE	WLAN DTS	
GSM	GSM850	Front	0.054	0.107	0.160
		Rear	0.081	0.156	0.238
	PCS1900	Front	0.097	0.107	0.204
		Rear	0.153	0.156	0.310
WCDMA	Band II	Front	0.182	0.107	0.289
		Rear	0.174	0.156	0.331
	Band V	Front	0.111	0.107	0.218
		Rear	0.180	0.156	0.337
LTE	B5 1RB	Front	0.060	0.107	0.167
		Rear	0.089	0.156	0.246
	B5 25RB	Front	0.045	0.107	0.152
		Rear	0.082	0.156	0.239
	B7 1RB	Front	0.461	0.107	0.568
		Rear	0.684	0.156	0.840
	B7 50RB	Front	0.360	0.107	0.467
		Rear	0.659	0.156	0.815

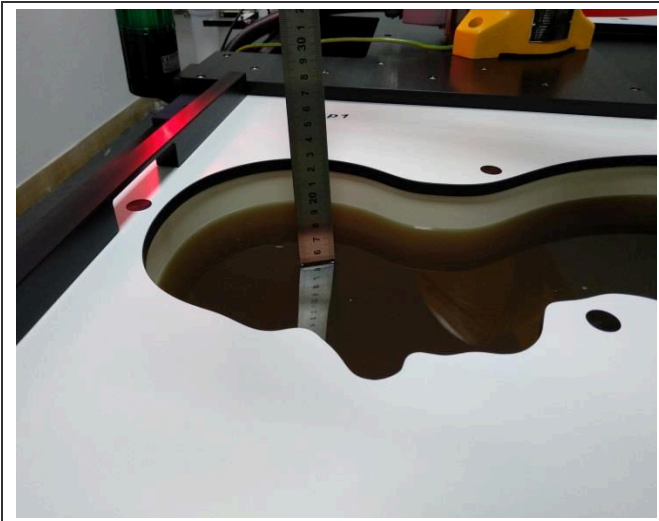
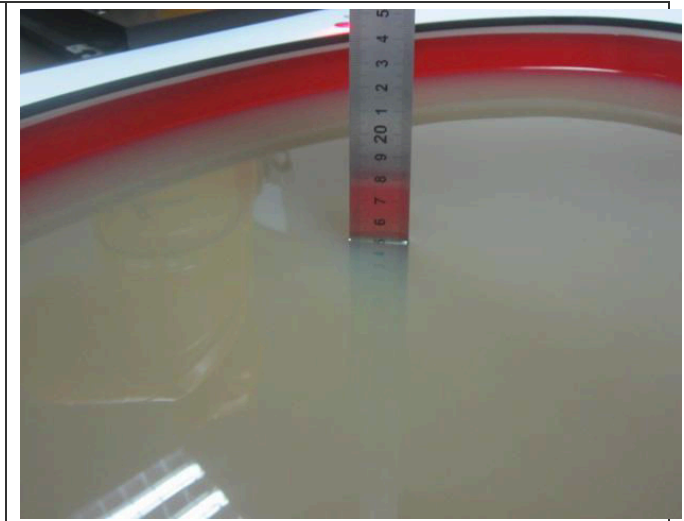

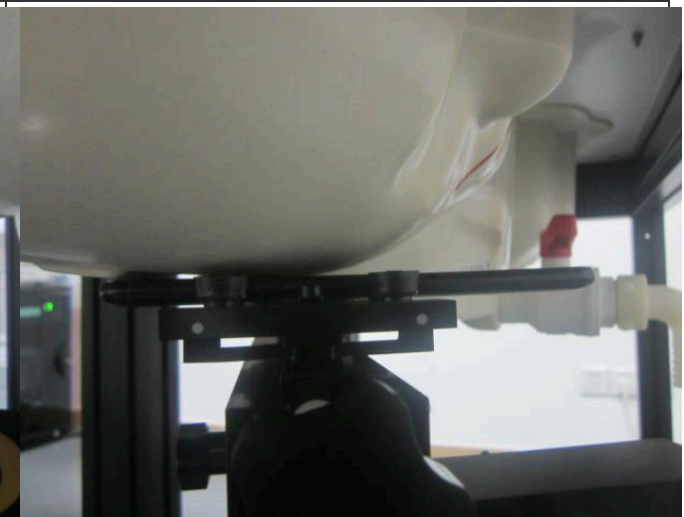
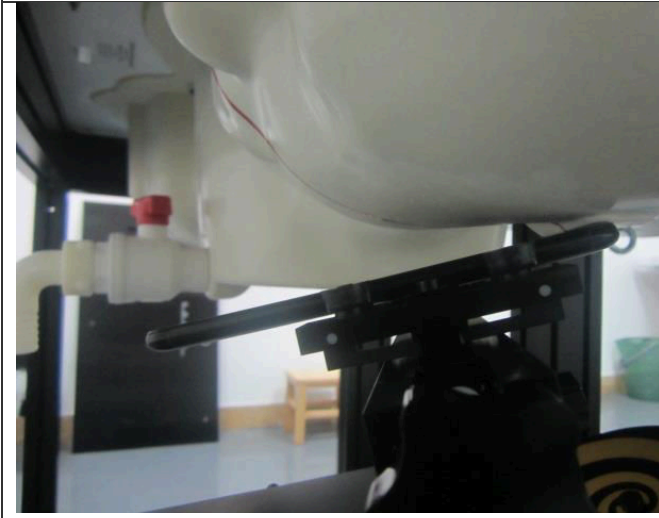

WWAN PCE + Bluetooth					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR
			WWAN PCE	Bluetooth	(W/kg)
GSM	GSM850	Front	0.054	0.371	0.425
		Rear	0.081	0.371	0.452
	PCS1900	Front	0.097	0.371	0.468
		Rear	0.153	0.371	0.525
WCDMA	Band II	Front	0.182	0.371	0.553
		Rear	0.174	0.371	0.545
	Band V	Front	0.111	0.371	0.482
		Rear	0.180	0.371	0.552
LTE	B5 1RB	Front	0.060	0.371	0.431
		Rear	0.089	0.371	0.460
	B5 25RB	Front	0.045	0.371	0.416
		Rear	0.082	0.371	0.454
	B7 1RB	Front	0.461	0.371	0.832
		Rear	0.684	0.371	1.055
	B7 50RB	Front	0.360	0.371	0.731
		Rear	0.659	0.371	1.030

**Maximum reported SAR value for Hotspot mode**

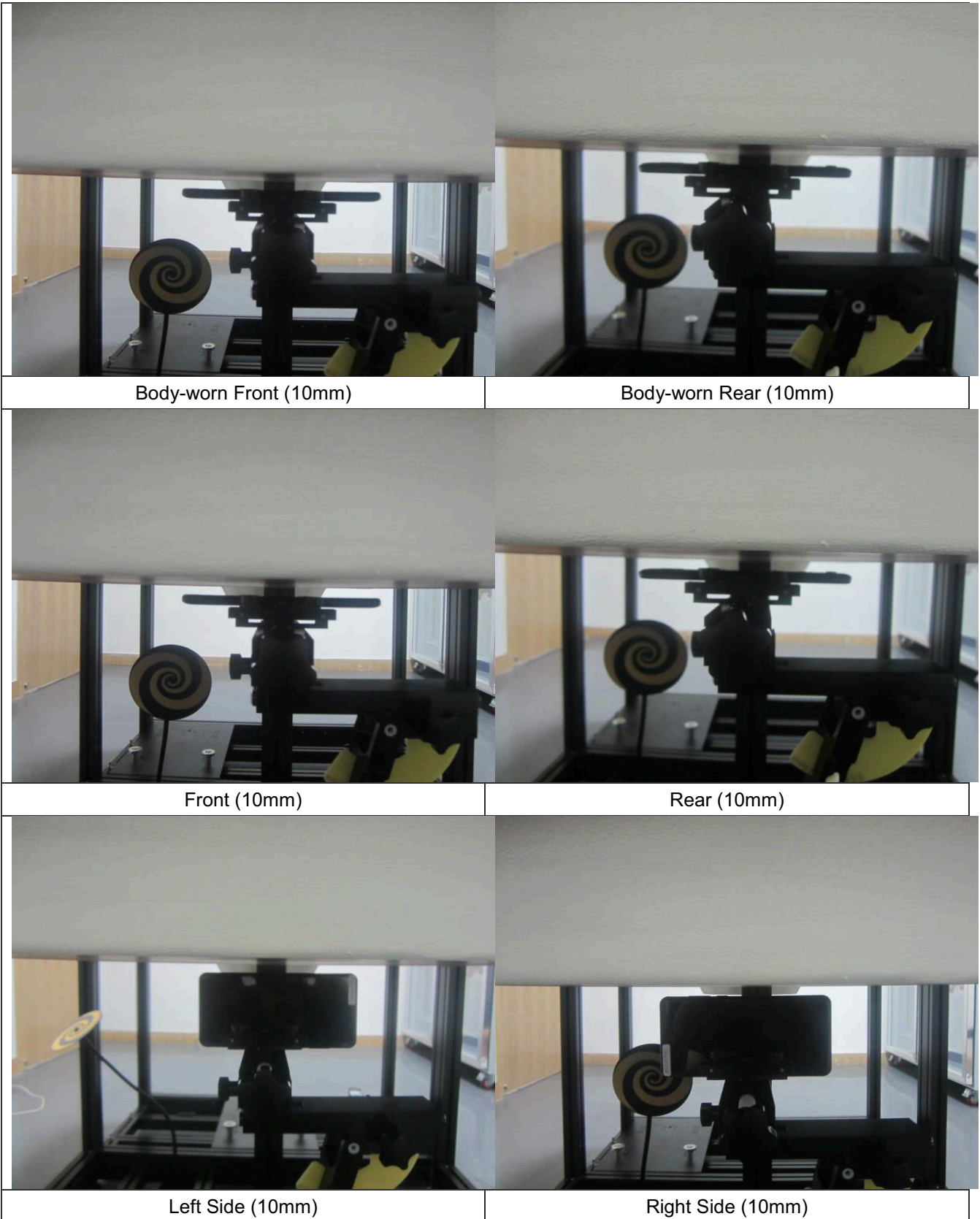
WWAN PCE + WLAN DTS					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR
			WWAN PCE	WLAN DTS	(W/kg)
GSM	GSM850	Front	0.054	0.107	0.160
		Rear	0.081	0.156	0.238
		Left side	0.058	-	0.058
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.055	-	0.055
	PCS1900	Front	0.097	0.107	0.204
		Rear	0.153	0.156	0.310
		Left side	0.093	-	0.093
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.096	-	0.096
WCDMA	Band II	Front	0.182	0.107	0.289
		Rear	0.256	0.156	0.413
		Left side	0.174	-	0.174
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.169	-	0.169
	Band V	Front	0.111	0.107	0.218
		Rear	0.180	0.156	0.337
		Left side	0.110	-	0.110
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.109	-	0.109

LTE	B5 1RB	Front	0.060	0.107	0.167
		Rear	0.089	0.156	0.246
		Left side	0.063	-	0.063
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.054	-	0.054
	B5 25RB	Front	0.045	0.107	0.152
		Rear	0.082	0.156	0.239
		Left side	0.054	-	0.054
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.045	-	0.045
	B7 1RB	Front	0.461	0.107	0.568
		Rear	0.684	0.156	0.840
		Left side	0.483	-	0.483
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.414	-	0.414
	B7 50RB	Front	0.360	0.107	0.467
		Rear	0.659	0.156	0.815
		Left side	0.435	-	0.435
		Right side	-	0.131	0.131
		Top side	-	0.103	0.103
		Bottom side	0.361	-	0.361

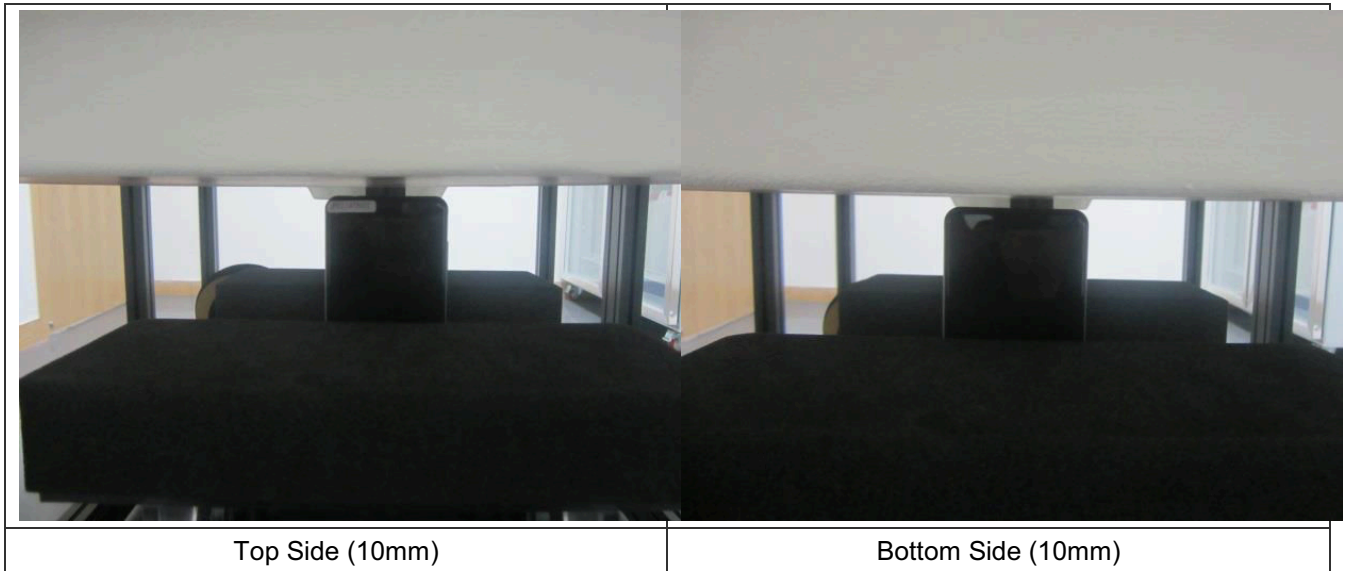
### 16. TestSetup Photos

	
<p>Liquid depth in the Head phantom</p>	<p>Liquid depth in the Body phantom</p>
	
<p>Left Head Touch</p>	<p>Right Head Touch</p>
	
<p>Left Head Tilt (15°)</p>	<p>Right Head Tilt (15°)</p>









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

1.1. DAE4 Calibration Certificate

**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 **CCIC - HTW (Auden)**

Certificate No: **DAE4-1549\_Apr18**

CALIBRATION CERTIFICATE																							
Object	DAE4 - SD 000 D04 BN - SN: 1549																						
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)																						
Calibration date:	April 25, 2018																						
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity &lt; 70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Keithley Multimeter Type 2001</td> <td>SN: 0810278</td> <td>31-Aug-17 (No:21092)</td> <td>Aug-18</td> </tr> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> <tr> <td>Auto DAE Calibration Unit</td> <td>SE UWS 053 AA 1001</td> <td>04-Jan-18 (in house check)</td> <td>In house check: Jan-19</td> </tr> <tr> <td>Calibrator Box V2.1</td> <td>SE UMS 006 AA 1002</td> <td>04-Jan-18 (in house check)</td> <td>In house check: Jan-19</td> </tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Keithley Multimeter Type 2001	SN: 0810278	31-Aug-17 (No:21092)	Aug-18	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	Auto DAE Calibration Unit	SE UWS 053 AA 1001	04-Jan-18 (in house check)	In house check: Jan-19	Calibrator Box V2.1	SE UMS 006 AA 1002	04-Jan-18 (in house check)	In house check: Jan-19
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration																				
Keithley Multimeter Type 2001	SN: 0810278	31-Aug-17 (No:21092)	Aug-18																				
Secondary Standards	ID #	Check Date (in house)	Scheduled Check																				
Auto DAE Calibration Unit	SE UWS 053 AA 1001	04-Jan-18 (in house check)	In house check: Jan-19																				
Calibrator Box V2.1	SE UMS 006 AA 1002	04-Jan-18 (in house check)	In house check: Jan-19																				
Calibrated by:	Name Eric Hainfeld	Function Laboratory Technician	Signature 																				
Approved by:	Sven Kühn	Deputy Manager																					
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			Issued: April 25, 2018																				

**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

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 = 6.1 $\mu$ V, 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	406.286 $\pm$ 0.02% (k=2)	405.992 $\pm$ 0.02% (k=2)	406.121 $\pm$ 0.02% (k=2)
Low Range	3.98481 $\pm$ 1.50% (k=2)	3.99129 $\pm$ 1.50% (k=2)	3.99380 $\pm$ 1.50% (k=2)

**Connector Angle**

Connector Angle to be used in DASY system	19.5 $\pm$ 1 $^{\circ}$
---	-------------------------



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

**1. DC Voltage Linearity**

High Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	200032.88	-6.49	-0.00
Channel X + Input	20007.86	2.59	0.01
Channel X - Input	-19999.45	5.51	-0.03
Channel Y + Input	200041.48	8.18	0.00
Channel Y + Input	20005.02	-0.19	-0.00
Channel Y - Input	-20006.61	-1.53	0.01
Channel Z + Input	200032.37	-0.87	-0.00
Channel Z + Input	20003.95	-1.15	-0.01
Channel Z - Input	-20006.60	-1.44	0.01

Low Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2001.67	0.37	0.02
Channel X + Input	201.82	0.29	0.15
Channel X - Input	-198.25	0.31	-0.16
Channel Y + Input	2001.35	0.05	0.00
Channel Y + Input	200.82	-0.59	-0.29
Channel Y - Input	-199.06	-0.48	0.24
Channel Z + Input	2000.94	-0.41	-0.02
Channel Z + Input	200.84	-0.55	-0.27
Channel Z - Input	-199.79	-1.17	0.59

**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 ( $\mu\text{V}$ )	Low Range Average Reading ( $\mu\text{V}$ )
Channel X	200	-15.83	-18.16
	- 200	21.36	19.06
Channel Y	200	20.98	20.64
	- 200	-22.25	-22.23
Channel Z	200	5.37	5.05
	- 200	-7.46	-7.54

**3. Channel separation**

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

	Input Voltage (mV)	Channel X ( $\mu\text{V}$ )	Channel Y ( $\mu\text{V}$ )	Channel Z ( $\mu\text{V}$ )
Channel X	200	-	-1.66	-2.66
Channel Y	200	5.97	-	-0.75
Channel Z	200	9.87	3.19	-

**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	16424	16943
Channel Y	15770	17113
Channel Z	15616	15207

**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	-0.33	-1.57	0.89	0.48
Channel Y	0.13	-0.93	1.54	0.52
Channel Z	-0.98	-2.13	0.50	0.47

**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

1.2. Probe Calibration Certificate

**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 **CCIC-HTW (Auden)**

Certificate No: **EX3-7494\_Feb18**

**CALIBRATION CERTIFICATE**

Object: **EX3DV4 - SN:7494**

Calibration procedure(s): **QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6  
Calibration procedure for dosimetric E-field probes**

Calibration date: **February 26, 2018**

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 NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02525)	Apr-18
Reference 20 dB Attenuator	SN: S5277 (20x)	07-Apr-17 (No. 217-02528)	Apr-18
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 27, 2018

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



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**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- 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"

**Methods Applied and Interpretation of Parameters:**

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