

## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge3 Side/LTE Band25/QPSK\_RB 1,0/CH26365/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.117 mW/g

### Edge3 Side/LTE Band25/QPSK\_RB 1,0/CH26365/Zoom Scan (5x5x7)/Cube 0: Measurement

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

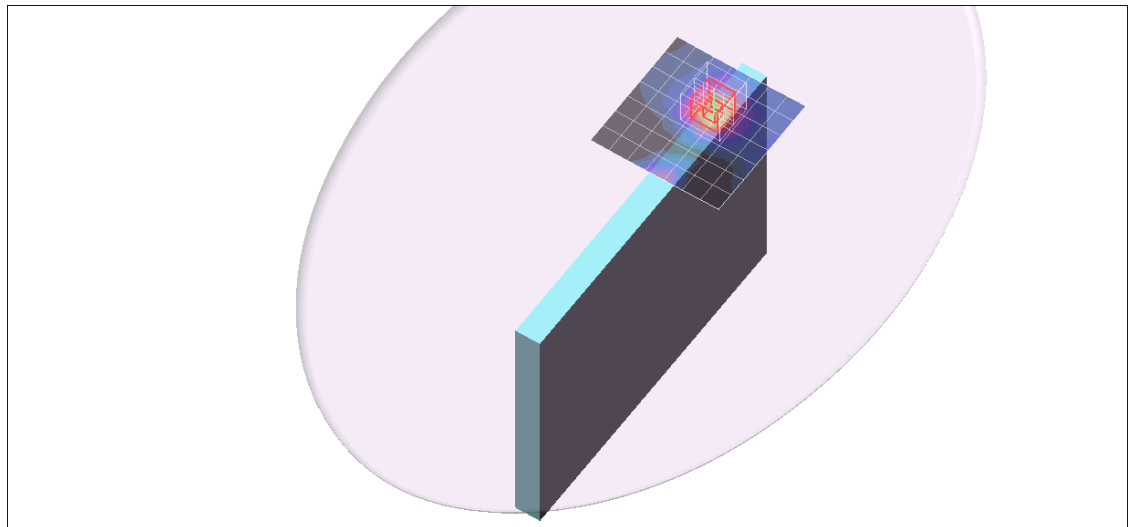
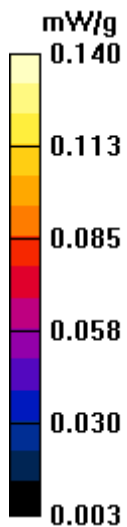
Reference Value = 8.39 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 0.153 W/kg

**SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.056 mW/g**

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

Maximum value of SAR (measured) = 0.126 mW/g



## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge3 Side/LTE Band25/QPSK\_RB 50,0/CH26365/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.114 mW/g

### Edge3 Side/LTE Band25/QPSK\_RB 50,0/CH26365/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

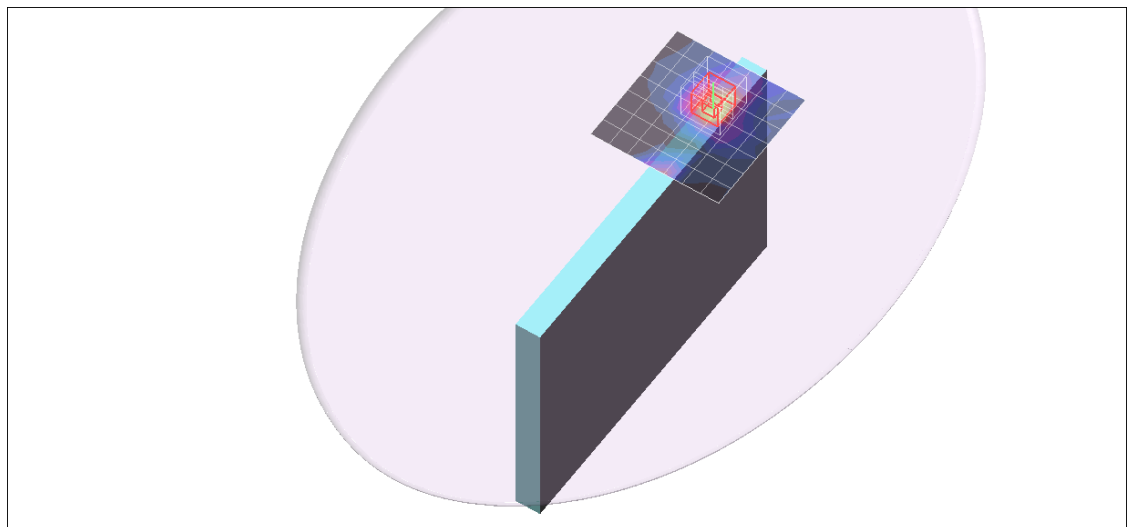
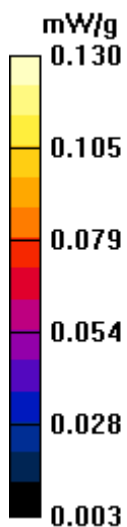
Reference Value = 7.13 V/m; Power Drift = -0.093 dB

Peak SAR (extrapolated) = 0.135 W/kg

**SAR(1 g) = 0.084 mW/g; SAR(10 g) = 0.049 mW/g**

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

Maximum value of SAR (measured) = 0.111 mW/g



## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 1,0/CH26365/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.705 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 1,0/CH26365/Zoom Scan (5x5x7)/Cube 0: Measurement

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

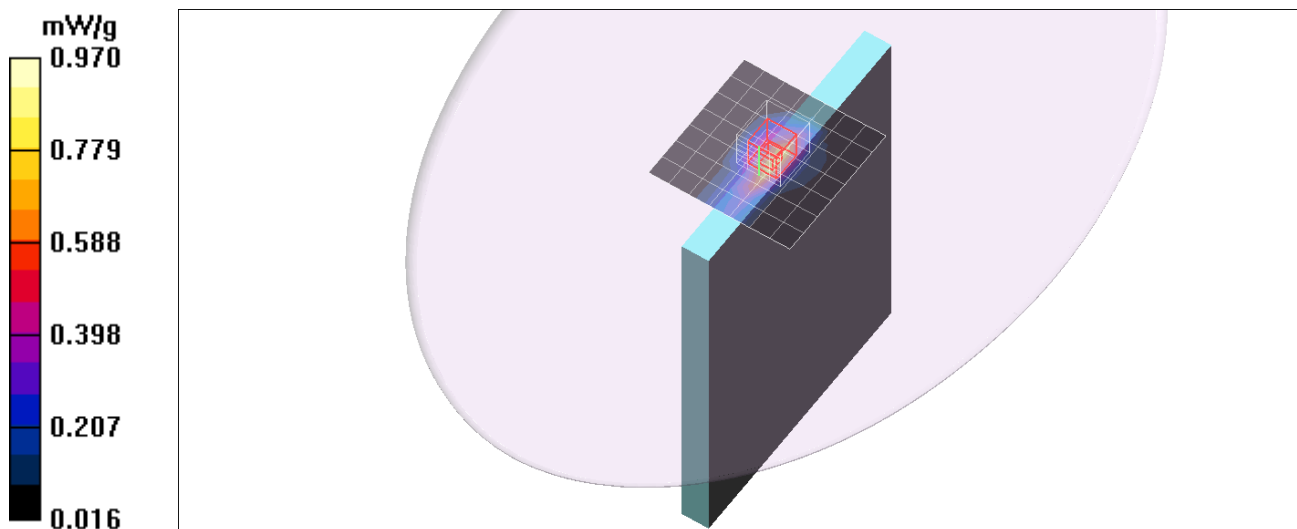
Reference Value = 21.1 V/m; Power Drift = -0.046 dB

Peak SAR (extrapolated) = 1.00 W/kg

**SAR(1 g) = 0.576 mW/g; SAR(10 g) = 0.332 mW/g**

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

Maximum value of SAR (measured) = 0.813 mW/g



## LTE Band25

Frequency: 1860 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1860$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 1,0/CH26140/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.792 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 1,0/CH26140/Zoom Scan (5x5x7)/Cube 0: Measurement

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

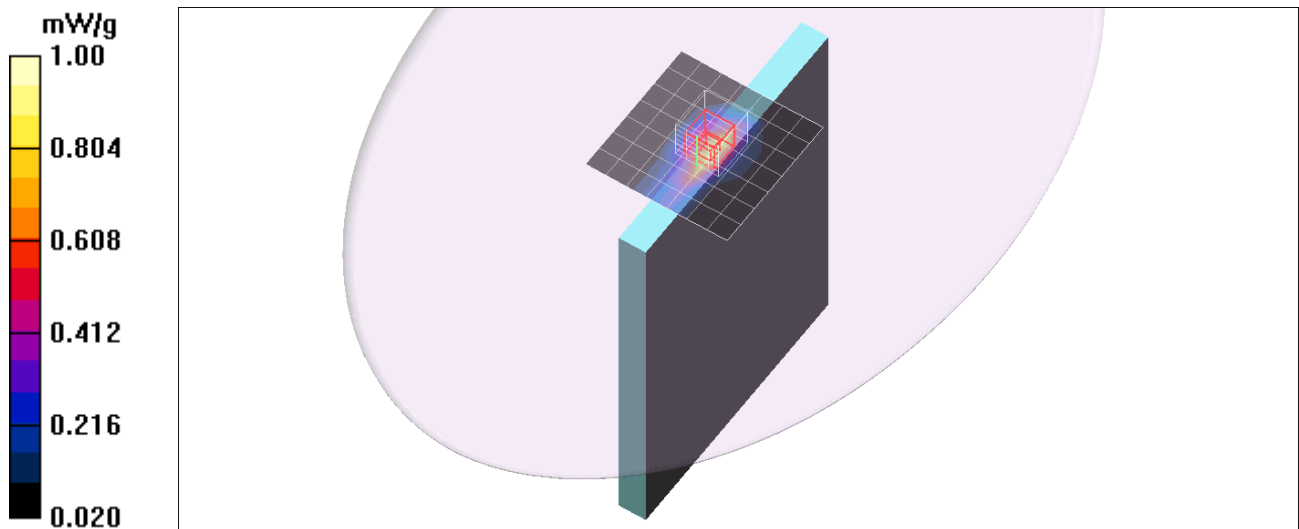
Reference Value = 22.2 V/m; Power Drift = -0.096 dB

Peak SAR (extrapolated) = 1.11 W/kg

**SAR(1 g) = 0.661 mW/g; SAR(10 g) = 0.381 mW/g**

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

Maximum value of SAR (measured) = 0.887 mW/g



## LTE Band25

Frequency: 1905 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1905$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 1,0/CH26590/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.783 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 1,0/CH26590/Zoom Scan (5x5x7)/Cube 0: Measurement

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

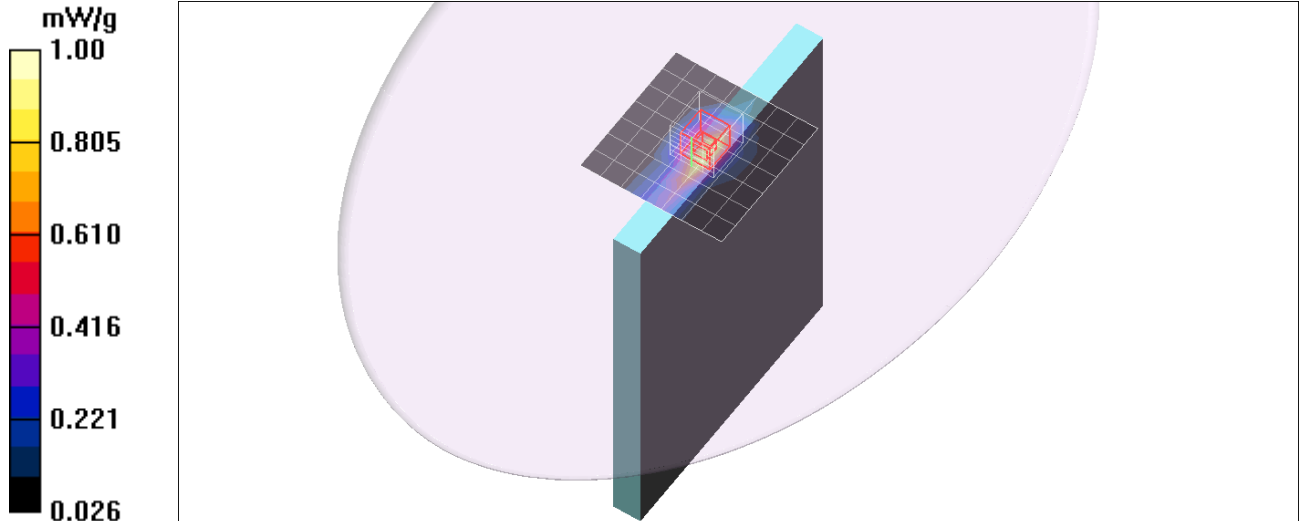
Reference Value = 21.4 V/m; Power Drift = 0.100 dB

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.652 mW/g; SAR(10 g) = 0.381 mW/g**

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

Maximum value of SAR (measured) = 0.904 mW/g



## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 50,0/CH26365/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.617 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 50,0/CH26365/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

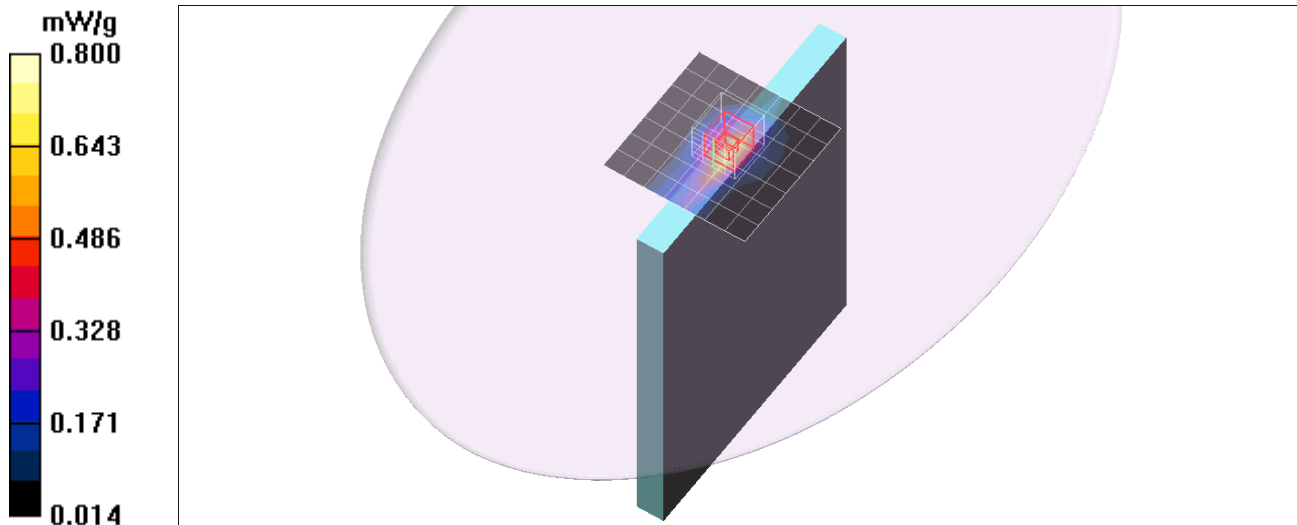
Reference Value = 19.5 V/m; Power Drift = -0.110 dB

Peak SAR (extrapolated) = 0.911 W/kg

**SAR(1 g) = 0.526 mW/g; SAR(10 g) = 0.303 mW/g**

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

Maximum value of SAR (measured) = 0.729 mW/g



## LTE Band25

Frequency: 1860 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1860$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 50,0/CH26140/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.621 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 50,0/CH26140/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

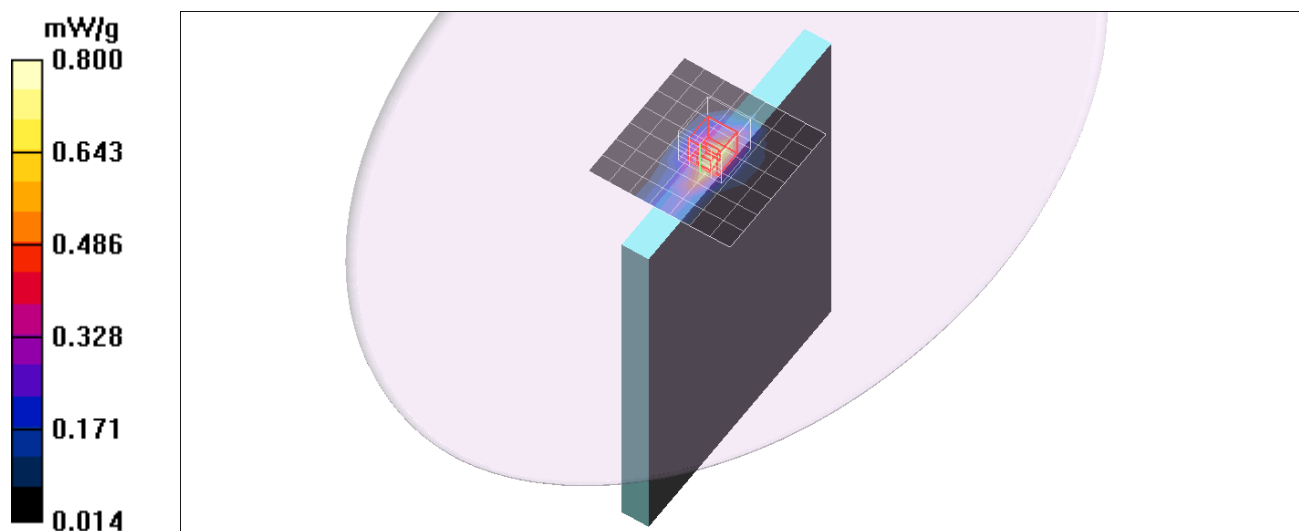
Reference Value = 19.3 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 0.871 W/kg

**SAR(1 g) = 0.507 mW/g; SAR(10 g) = 0.293 mW/g**

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

Maximum value of SAR (measured) = 0.697 mW/g



## LTE Band25

Frequency: 1905 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1905$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 50,0/CH26590/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.593 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 50,0/CH26590/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

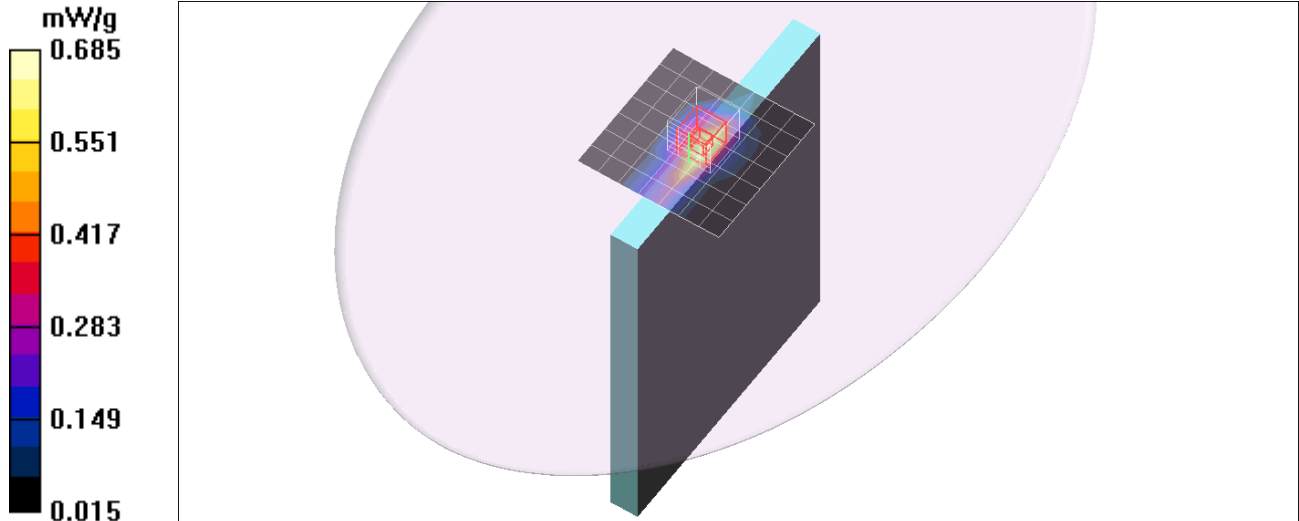
Reference Value = 19.3 V/m; Power Drift = -0.090 dB

Peak SAR (extrapolated) = 0.856 W/kg

**SAR(1 g) = 0.501 mW/g; SAR(10 g) = 0.290 mW/g**

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

Maximum value of SAR (measured) = 0.685 mW/g





## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 100,0/CH26365/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.590 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 100,0/CH26365/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

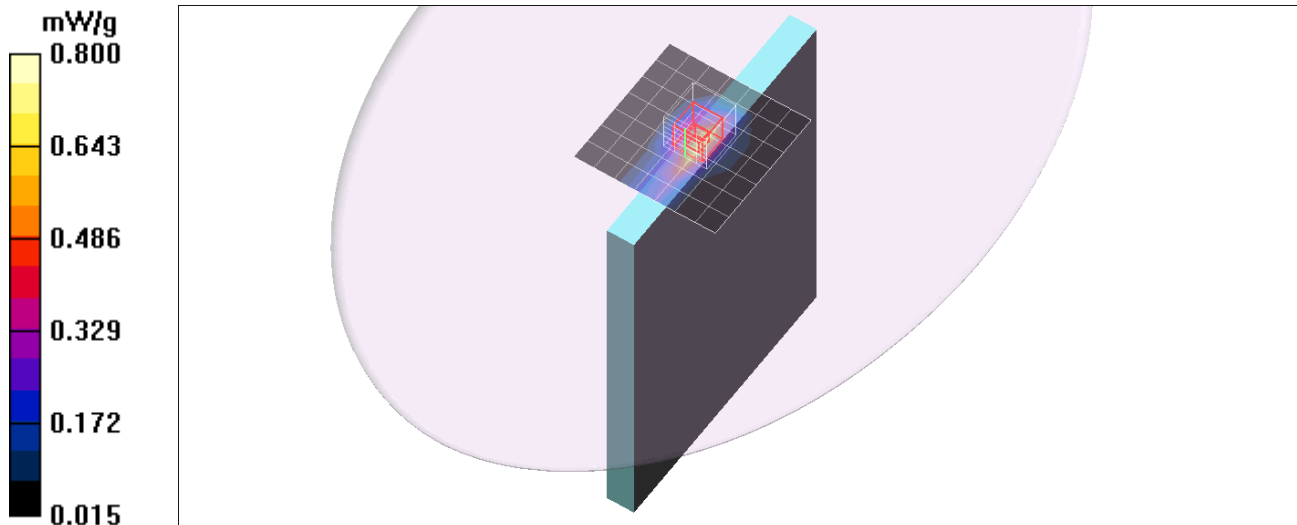
Reference Value = 18.9 V/m; Power Drift = 0.069 dB

Peak SAR (extrapolated) = 0.847 W/kg

**SAR(1 g) = 0.497 mW/g; SAR(10 g) = 0.286 mW/g**

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

Maximum value of SAR (measured) = 0.676 mW/g



## LTE Band25

Frequency: 1860 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1860$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 100,0/CH26140/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.596 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 100,0/CH26140/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

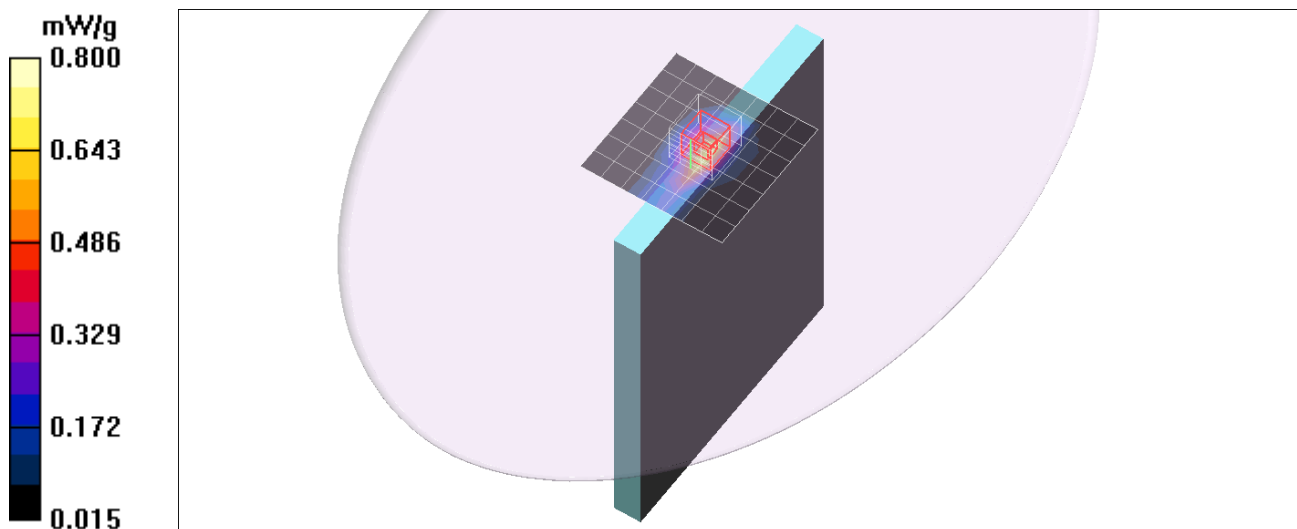
Reference Value = 19.2 V/m; Power Drift = -0.073 dB

Peak SAR (extrapolated) = 0.866 W/kg

**SAR(1 g) = 0.509 mW/g; SAR(10 g) = 0.295 mW/g**

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

Maximum value of SAR (measured) = 0.676 mW/g



## LTE Band25

Frequency: 1905 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1905$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Edge4 Side/LTE Band25/QPSK\_RB 100,0/CH26590/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.649 mW/g

### Edge4 Side/LTE Band25/QPSK\_RB 100,0/CH26590/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

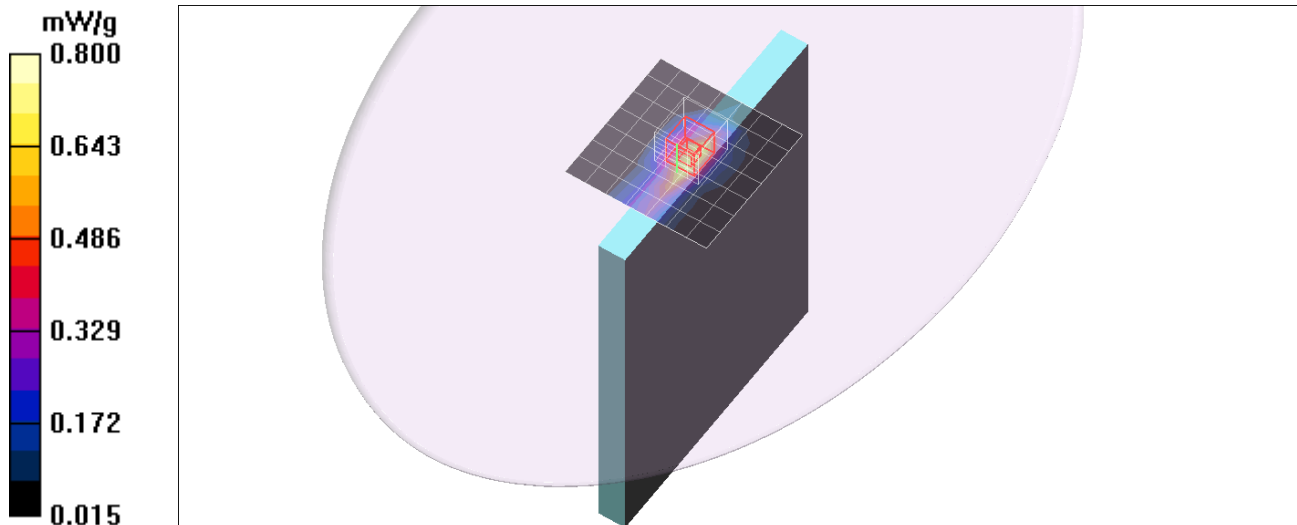
Reference Value = 19.5 V/m; Power Drift = -0.010 dB

Peak SAR (extrapolated) = 0.912 W/kg

**SAR(1 g) = 0.528 mW/g; SAR(10 g) = 0.304 mW/g**

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

Maximum value of SAR (measured) = 0.722 mW/g



## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

**Rear Side/LTE Band25/QPSK\_RB 1,0/CH26365/Area Scan (8x8x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.808 mW/g

**Rear Side/LTE Band25/QPSK\_RB 1,0/CH26365/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

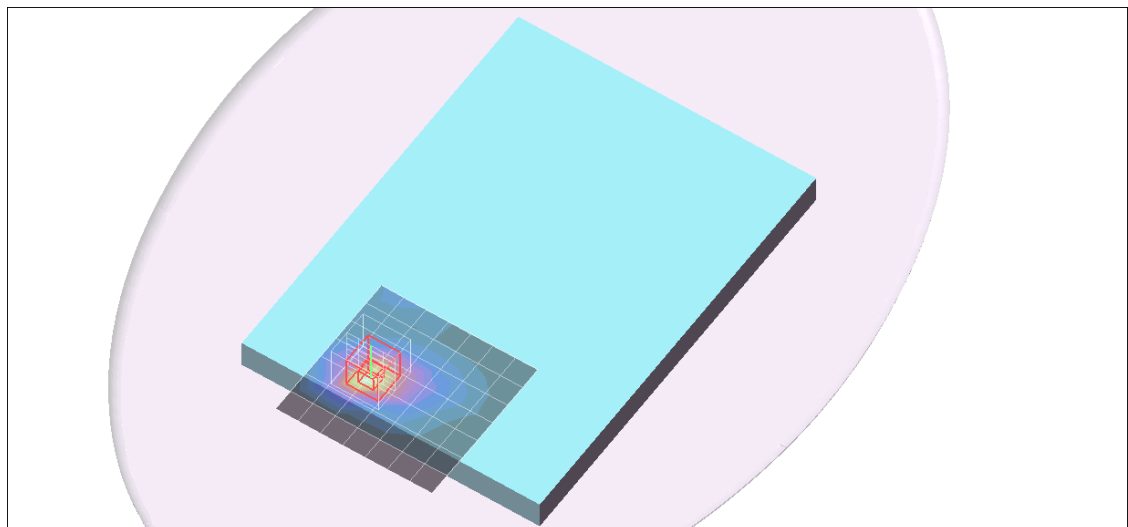
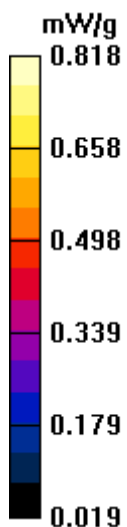
Reference Value = 4.38 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.03 W/kg

**SAR(1 g) = 0.582 mW/g; SAR(10 g) = 0.322 mW/g**

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

Maximum value of SAR (measured) = 0.818 mW/g



## LTE Band25

Frequency: 1860 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1860$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

**Rear Side/LTE Band25/QPSK\_RB 1,0/CH26140/Area Scan (8x8x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.907 mW/g

**Rear Side/LTE Band25/QPSK\_RB 1,0/CH26140/Zoom Scan (5x5x7)/Cube 0:** Measurement

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

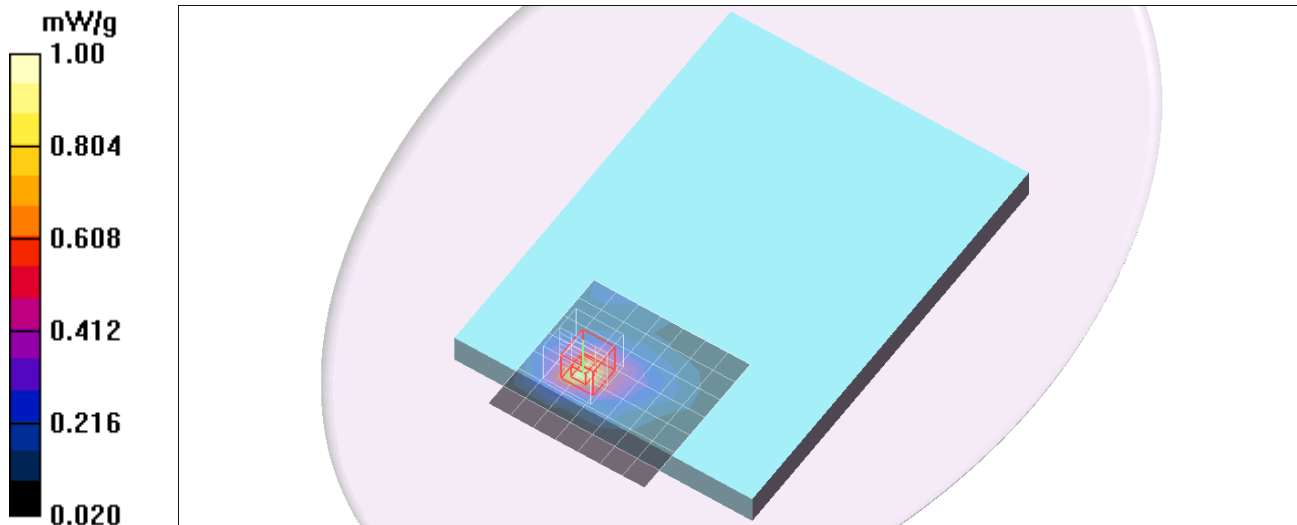
Reference Value = 4.46 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 1.17 W/kg

**SAR(1 g) = 0.672 mW/g; SAR(10 g) = 0.382 mW/g**

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

Maximum value of SAR (measured) = 0.932 mW/g



## LTE Band25

Frequency: 1905 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1905$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

**Rear Side/LTE Band25/QPSK\_RB 1,0/CH26590/Area Scan (8x8x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.933 mW/g

**Rear Side/LTE Band25/QPSK\_RB 1,0/CH26590/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

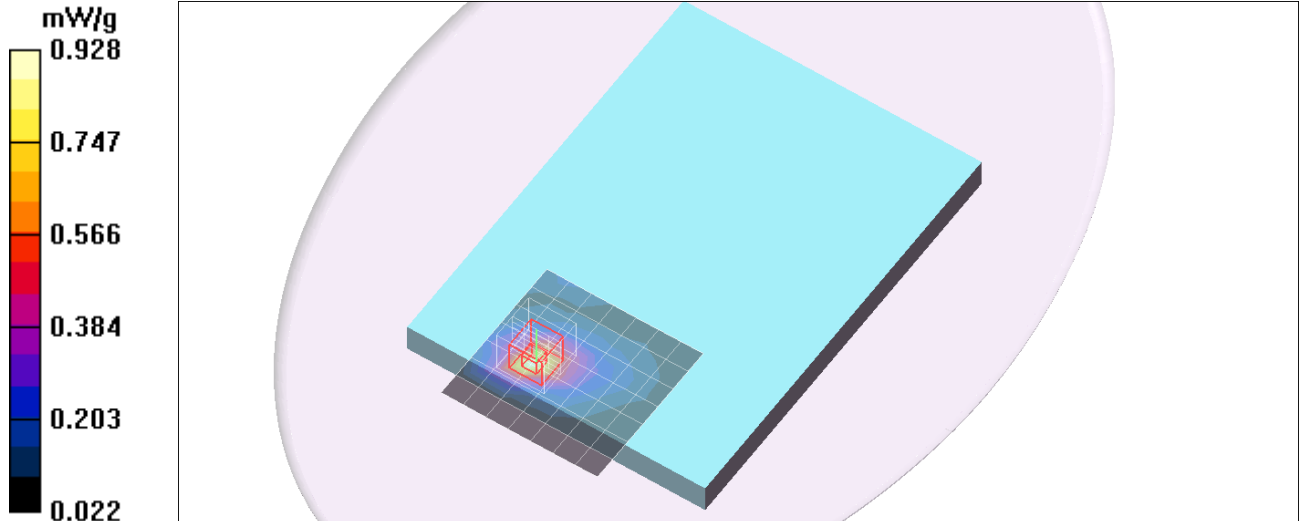
Reference Value = 2.96 V/m; Power Drift = 0.112 dB

Peak SAR (extrapolated) = 1.19 W/kg

**SAR(1 g) = 0.661 mW/g; SAR(10 g) = 0.367 mW/g**

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

Maximum value of SAR (measured) = 0.928 mW/g



## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Rear Side/LTE Band25/QPSK\_RB 50,0/CH26365/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.709 mW/g

### Rear Side/LTE Band25/QPSK\_RB 50,0/CH26365/Zoom Scan (5x5x7)/Cube 0: Measurement grid:

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

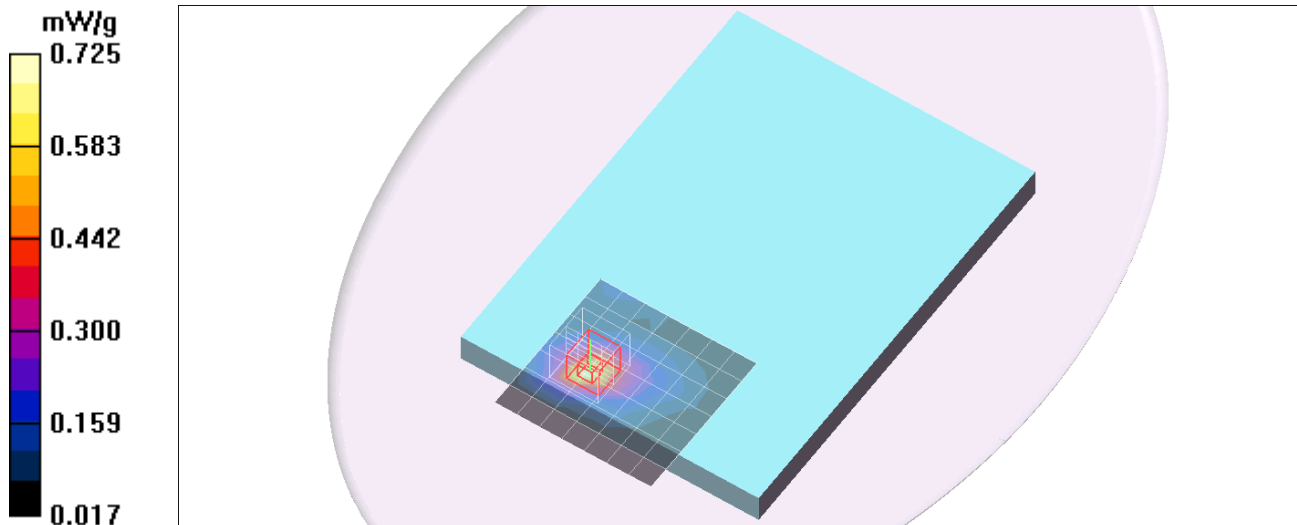
Reference Value = 2.95 V/m; Power Drift = 0.034 dB

Peak SAR (extrapolated) = 0.904 W/kg

**SAR(1 g) = 0.518 mW/g; SAR(10 g) = 0.289 mW/g**

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

Maximum value of SAR (measured) = 0.725 mW/g



## LTE Band25

Frequency: 1860 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1860$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Rear Side/LTE Band25/QPSK\_RB 50,0/CH26140/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.698 mW/g

### Rear Side/LTE Band25/QPSK\_RB 50,0/CH26140/Zoom Scan (5x5x7)/Cube 0: Measurement grid:

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

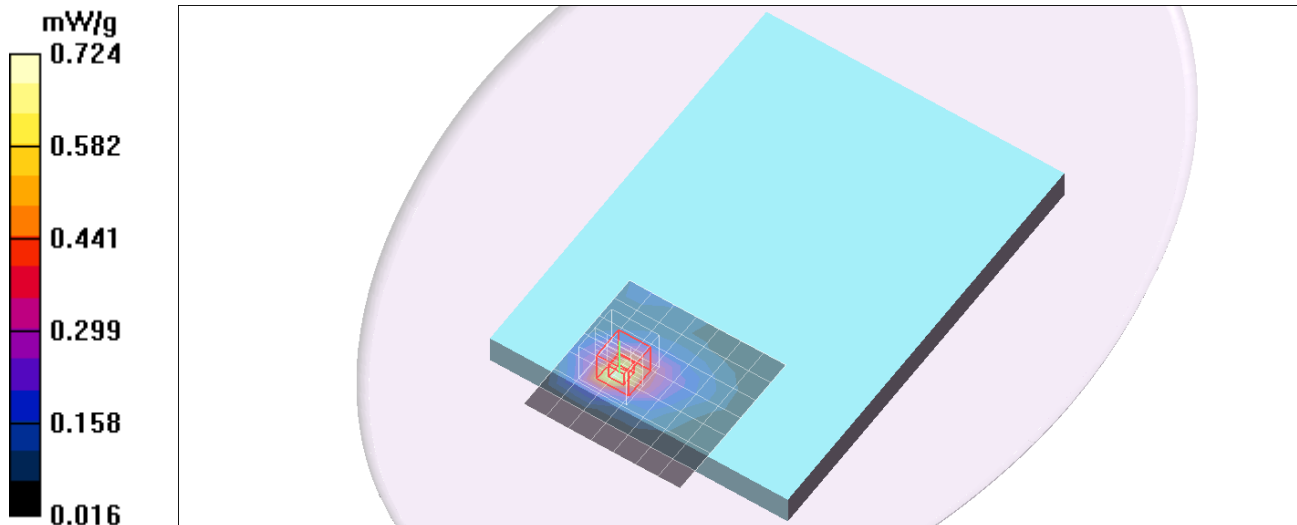
Reference Value = 3.83 V/m; Power Drift = 0.097 dB

Peak SAR (extrapolated) = 0.901 W/kg

**SAR(1 g) = 0.523 mW/g; SAR(10 g) = 0.293 mW/g**

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

Maximum value of SAR (measured) = 0.724 mW/g





## LTE Band25

Frequency: 1905 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1905$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Rear Side/LTE Band25/QPSK\_RB 50,0/CH26590/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.756 mW/g

### Rear Side/LTE Band25/QPSK\_RB 50,0/CH26590/Zoom Scan (5x5x7)/Cube 0: Measurement

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

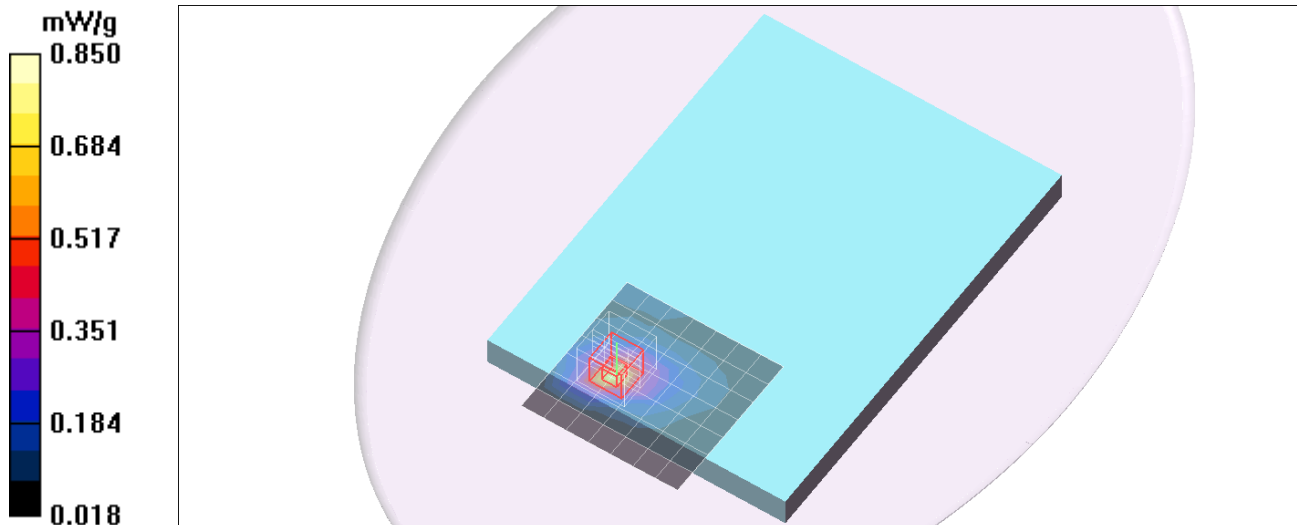
Reference Value = 2.79 V/m; Power Drift = -0.051 dB

Peak SAR (extrapolated) = 0.933 W/kg

**SAR(1 g) = 0.526 mW/g; SAR(10 g) = 0.290 mW/g**

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

Maximum value of SAR (measured) = 0.727 mW/g



## LTE Band25

Frequency: 1882.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used (interpolated):  $f = 1882.5$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Rear Side/LTE Band25/QPSK\_RB 100,0/CH26365/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.705 mW/g

### Rear Side/LTE Band25/QPSK\_RB 100,0/CH26365/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

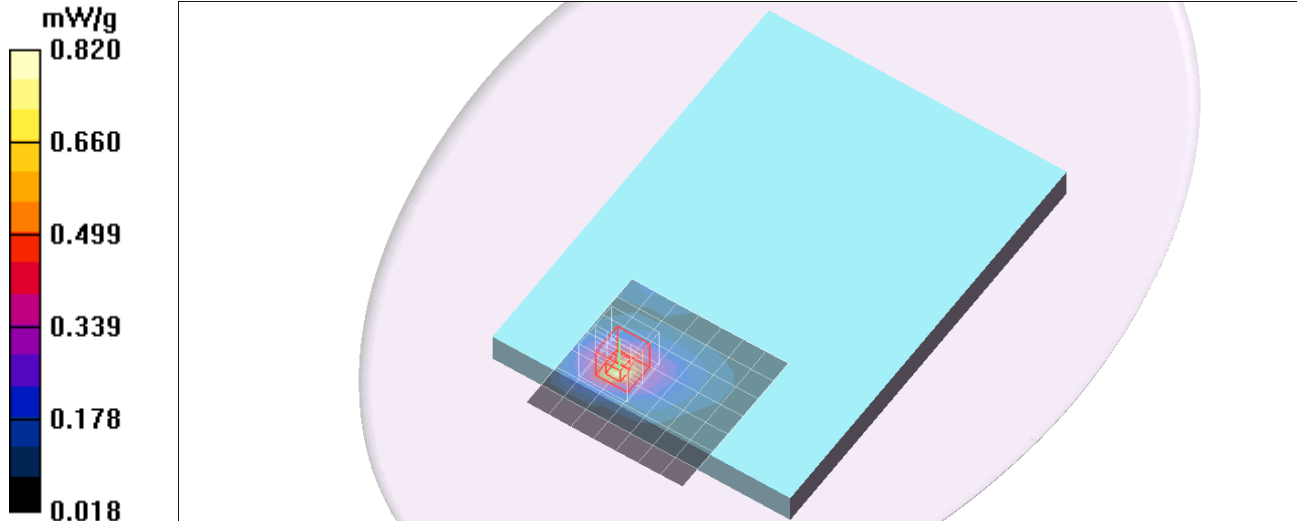
Reference Value = 2.92 V/m; Power Drift = 0.149 dB

Peak SAR (extrapolated) = 0.939 W/kg

**SAR(1 g) = 0.533 mW/g; SAR(10 g) = 0.297 mW/g**

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

Maximum value of SAR (measured) = 0.735 mW/g



## LTE Band25

Frequency: 1860 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
 Medium parameters used (interpolated):  $f = 1860$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

**Rear Side/LTE Band25/QPSK\_RB 100,0/CH26140/Area Scan (8x8x1):** Measurement grid:  
 dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.691 mW/g

**Rear Side/LTE Band25/QPSK\_RB 100,0/CH26140/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid: dx=8mm, dy=8mm, dz=5mm

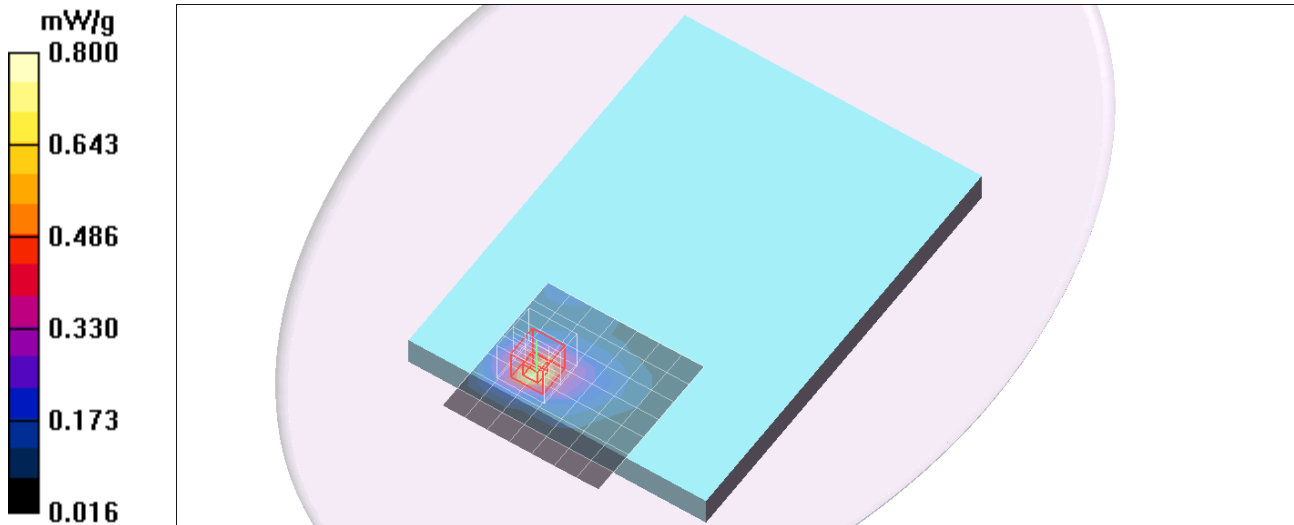
Reference Value = 3.74 V/m; Power Drift = 0.037 dB

Peak SAR (extrapolated) = 0.908 W/kg

**SAR(1 g) = 0.525 mW/g; SAR(10 g) = 0.292 mW/g**

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

Maximum value of SAR (measured) = 0.724 mW/g



## LTE Band25

Frequency: 1905 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 1905$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn558; Calibrated: 7/25/2013
- Probe: EX3DV4 - SN3554; ConvF(6.52, 6.52, 6.52); Calibrated: 9/26/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN: 1052

### Rear Side/LTE Band25/QPSK\_RB 100,0/CH26590/Area Scan (8x8x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.746 mW/g

### Rear Side/LTE Band25/QPSK\_RB 100,0/CH26590/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

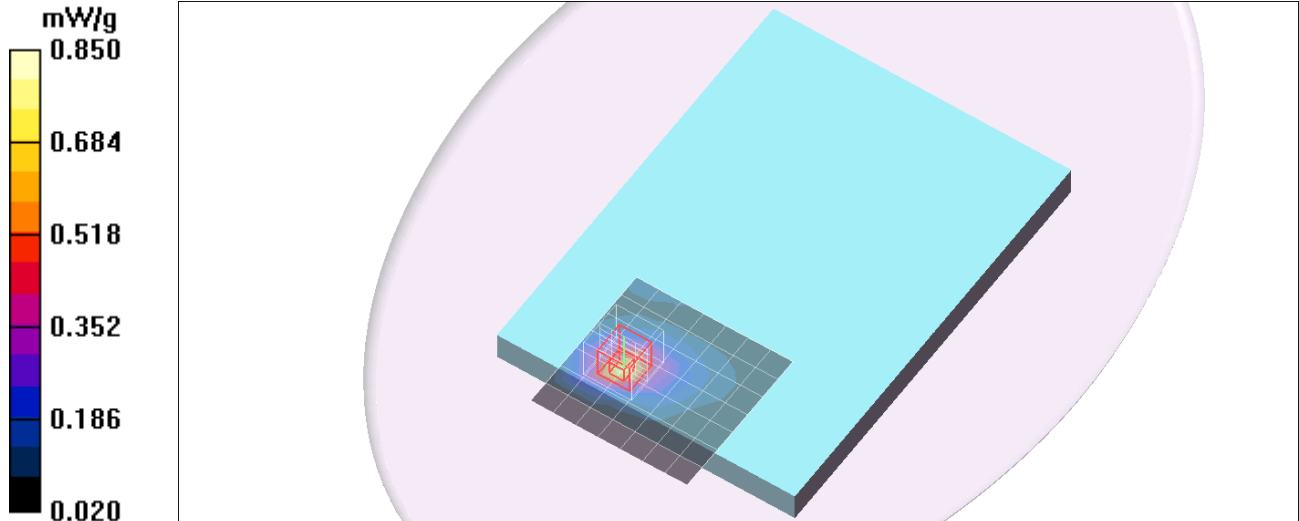
Reference Value = 2.62 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 0.983 W/kg

**SAR(1 g) = 0.558 mW/g; SAR(10 g) = 0.306 mW/g**

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

Maximum value of SAR (measured) = 0.779 mW/g



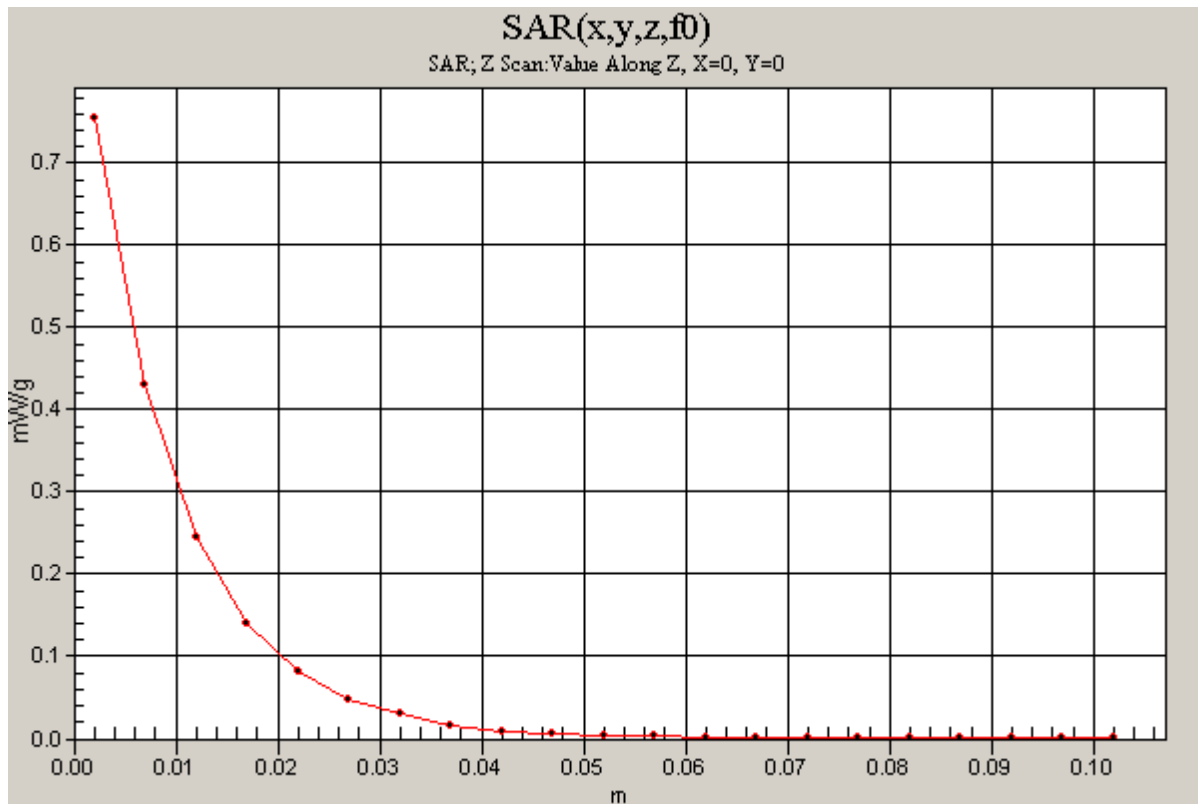
## LTE Band25

Frequency: 1905 MHz; Duty Cycle: 1:1

**Rear Side/LTE Band25/QPSK\_RB 100,0/CH26590/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.755 mW/g





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

Accreditation No.: **SCS 108**

Client **CCS-TW (Auden)**

Certificate No: **EX3-3554\_Sep13**

**CALIBRATION CERTIFICATE**

Object **EX3DV4 - SN:3554**

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

Calibration date: **September 26, 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)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Apr-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 26, 2013

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



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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

### 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

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

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<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<sup>2</sup>-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.

# Probe EX3DV4

## SN:3554

Manufactured: July 13, 2004  
Calibrated: September 26, 2013

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



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3554

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	0.40	0.46	0.38	± 10.1 %
DCP (mV) <sup>B</sup>	98.6	97.6	99.7	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	187.4	±2.5 %
		Y	0.0	0.0	1.0		152.5	
		Z	0.0	0.0	1.0		182.8	

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

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

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3554

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
900	41.5	0.97	7.74	7.74	7.74	0.41	0.94	± 12.0 %
1810	40.0	1.40	6.85	6.85	6.85	0.68	0.67	± 12.0 %
1900	40.0	1.40	6.81	6.81	6.81	0.48	0.79	± 12.0 %
2000	40.0	1.40	6.80	6.80	6.80	0.76	0.62	± 12.0 %
2450	39.2	1.80	6.24	6.24	6.24	0.54	0.72	± 12.0 %
5200	36.0	4.66	4.73	4.73	4.73	0.30	1.80	± 13.1 %
5300	35.9	4.76	4.39	4.39	4.39	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.32	4.32	4.32	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.10	4.10	4.10	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.09	4.09	4.09	0.40	1.80	± 13.1 %

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

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) 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 ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3554

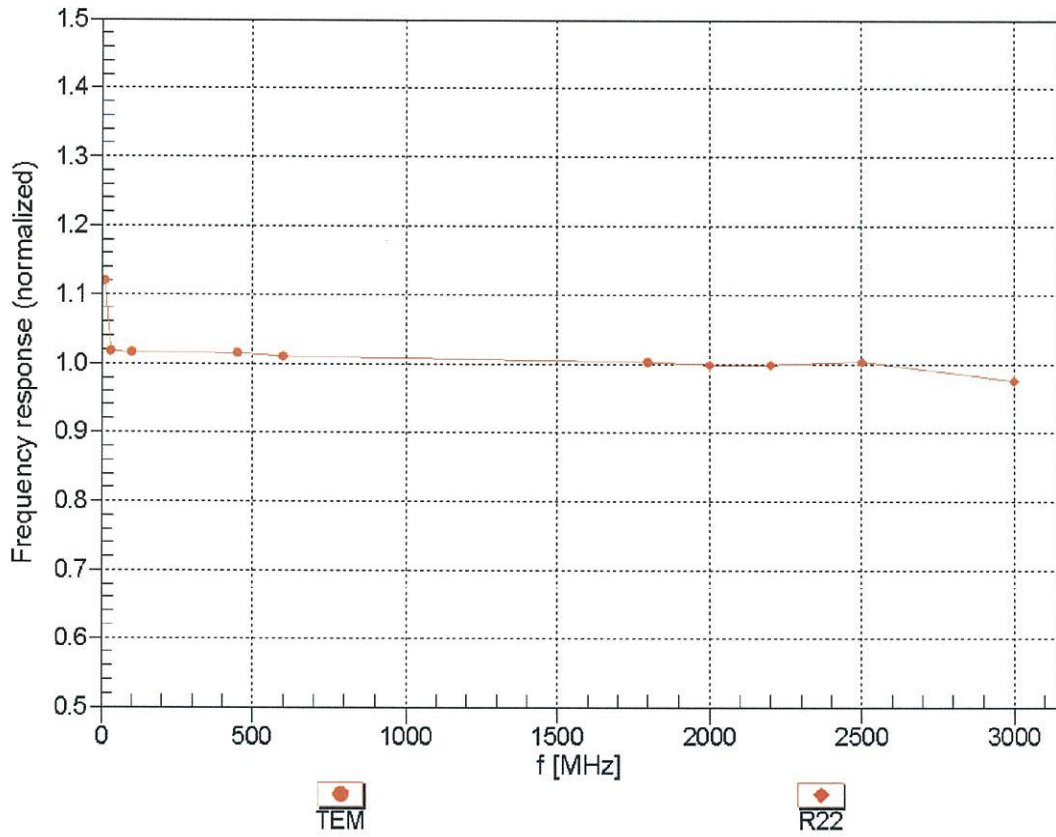
### Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
900	55.0	1.05	7.70	7.70	7.70	0.58	0.78	± 12.0 %
1810	53.3	1.52	6.65	6.65	6.65	0.69	0.70	± 12.0 %
1900	53.3	1.52	6.52	6.52	6.52	0.40	0.89	± 12.0 %
2000	53.3	1.52	6.63	6.63	6.63	0.80	0.64	± 12.0 %
2450	52.7	1.95	6.24	6.24	6.24	0.75	0.66	± 12.0 %
5200	49.0	5.30	4.02	4.02	4.02	0.40	1.90	± 13.1 %
5300	48.9	5.42	3.82	3.82	3.82	0.40	1.90	± 13.1 %
5500	48.6	5.65	3.59	3.59	3.59	0.40	1.90	± 13.1 %
5600	48.5	5.77	3.27	3.27	3.27	0.50	1.90	± 13.1 %
5800	48.2	6.00	3.53	3.53	3.53	0.50	1.90	± 13.1 %

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

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) 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 ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

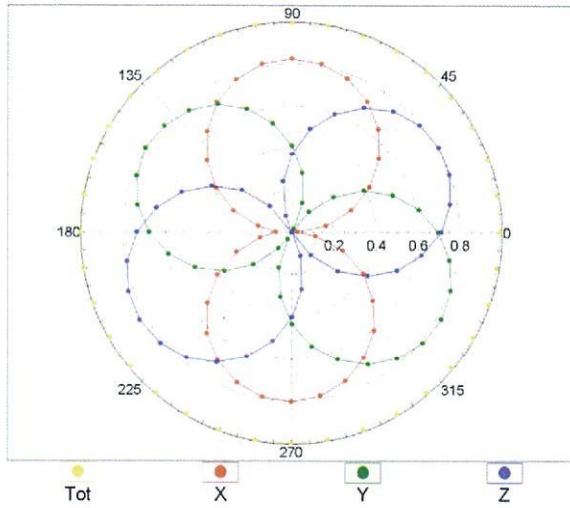
### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



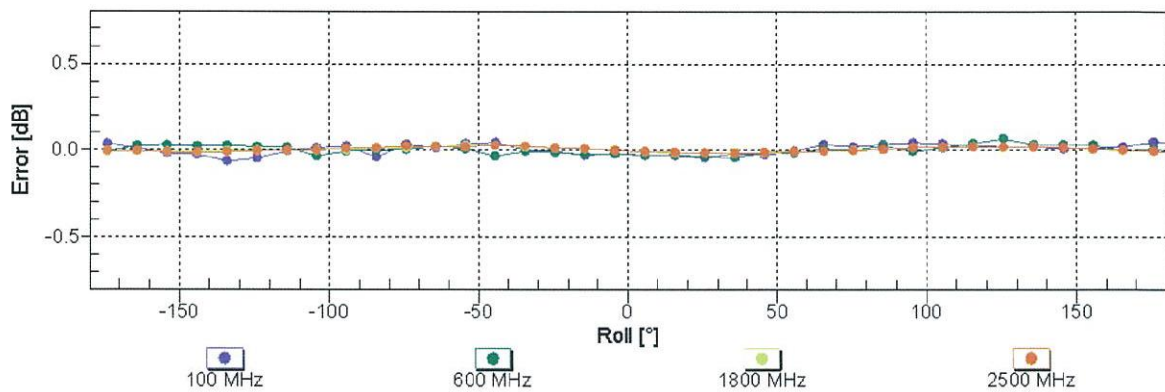
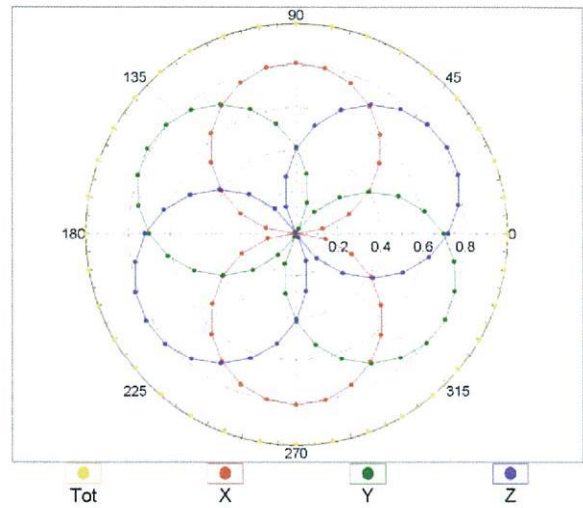
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz, TEM

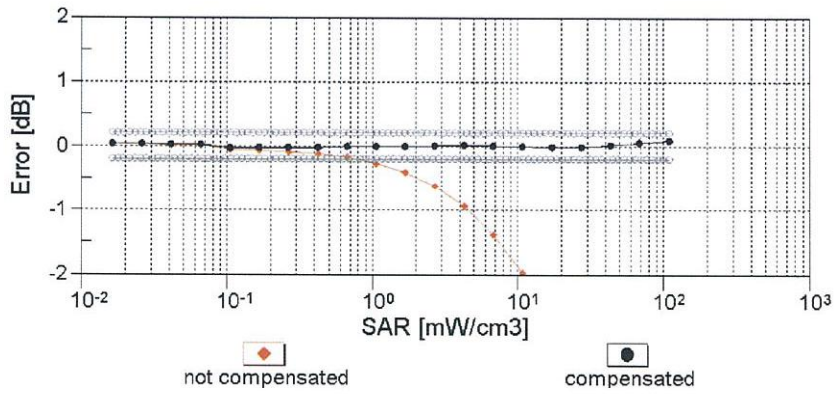
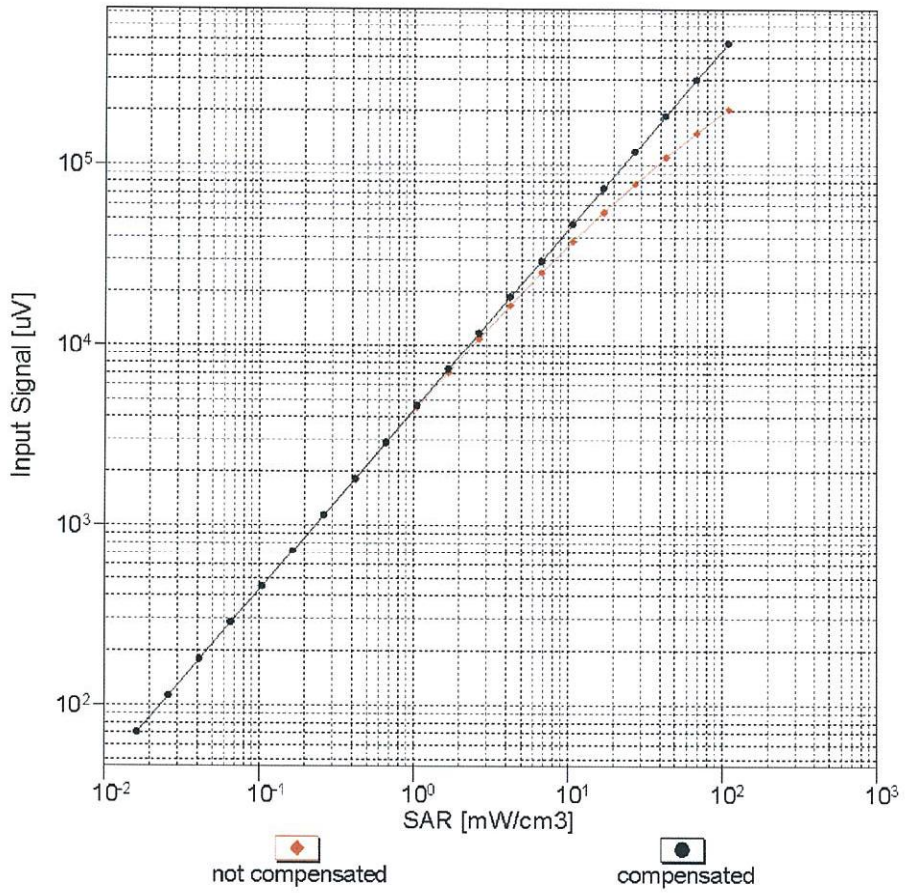


f=1800 MHz, R22



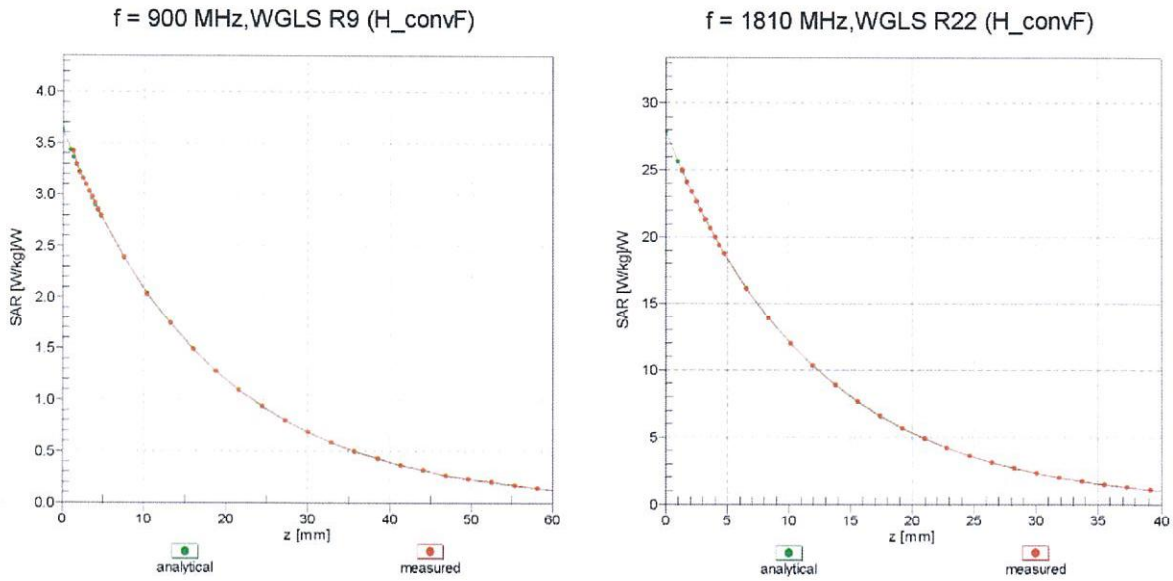
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

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

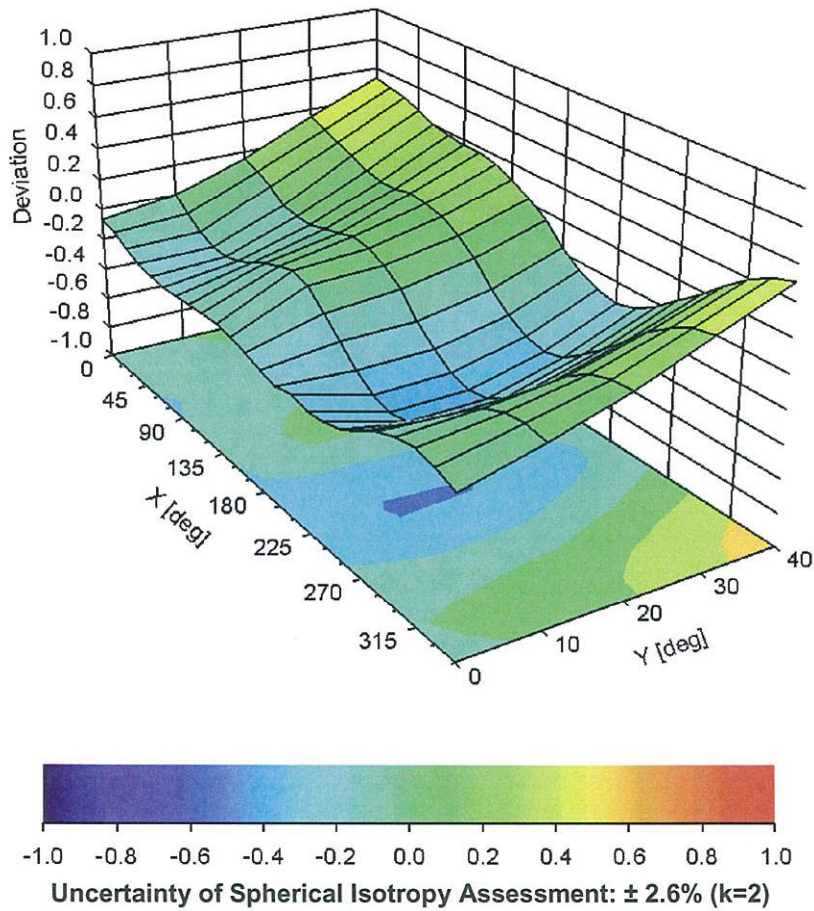


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3554

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-34.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm



## IMPORTANT NOTICE

### USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

**Battery Exchange:** The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

**Shipping of the DAE:** Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

**E-Stop Failures:** Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

**Repair:** Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

**DASY Configuration Files:** Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

**Important Note:**

**Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.**

**Important Note:**

**Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.**

**Important Note:**

**To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.**



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **CCS-TW (Auden)**

Certificate No: **DAE4-558\_Jul13**

## CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 558**

Calibration procedure(s) **QA CAL-06.v26  
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **July 25, 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 ( $22 \pm 3$ )°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	02-Oct-12 (No:12728)	Oct-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-13 (in house check)	In house check: Jan-14
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-13 (in house check)	In house check: Jan-14

Calibrated by:	Name Dominique Steffen	Function Technician	Signature 
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: July 25, 2013

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



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Accreditation No.: **SCS 108**

## 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	404.834 $\pm$ 0.02% (k=2)	404.719 $\pm$ 0.02% (k=2)	404.888 $\pm$ 0.02% (k=2)
Low Range	3.96252 $\pm$ 1.50% (k=2)	3.93898 $\pm$ 1.50% (k=2)	3.98830 $\pm$ 1.50% (k=2)

## Connector Angle

Connector Angle to be used in DASY system	226.5 $^{\circ}$ $\pm$ 1 $^{\circ}$
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## Appendix

### 1. DC Voltage Linearity

High Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	199999.87	2.22	0.00
Channel X + Input	20007.13	6.49	0.03
Channel X - Input	-19995.23	5.84	-0.03
Channel Y + Input	199999.72	2.06	0.00
Channel Y + Input	20004.76	4.02	0.02
Channel Y - Input	-19995.40	5.45	-0.03
Channel Z + Input	199999.60	2.04	0.00
Channel Z + Input	20002.08	1.38	0.01
Channel Z - Input	-20000.87	0.09	-0.00

Low Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2000.97	0.18	0.01
Channel X + Input	201.57	0.30	0.15
Channel X - Input	-198.13	0.50	-0.25
Channel Y + Input	2001.13	0.17	0.01
Channel Y + Input	201.02	-0.49	-0.24
Channel Y - Input	-198.55	-0.05	0.02
Channel Z + Input	2000.94	-0.06	-0.00
Channel Z + Input	200.15	-1.21	-0.60
Channel Z - Input	-199.64	-1.04	0.52

### 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	1.27	-0.63
	- 200	1.15	-0.57
Channel Y	200	8.66	8.49
	- 200	-9.25	-9.75
Channel Z	200	3.62	3.94
	- 200	-5.72	-5.74

### 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	-	5.21	-0.00
Channel Y	200	9.58	-	5.96
Channel Z	200	7.07	7.92	-

#### 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	16226	15249
Channel Y	15710	15696
Channel Z	16055	16722

#### 5. Input Offset Measurement

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

Input 10M $\Omega$

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	0.52	-0.76	1.55	0.43
Channel Y	-0.06	-1.00	1.38	0.46
Channel Z	-0.89	-1.79	0.54	0.46

#### 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