

**11.2. System Check Plots**

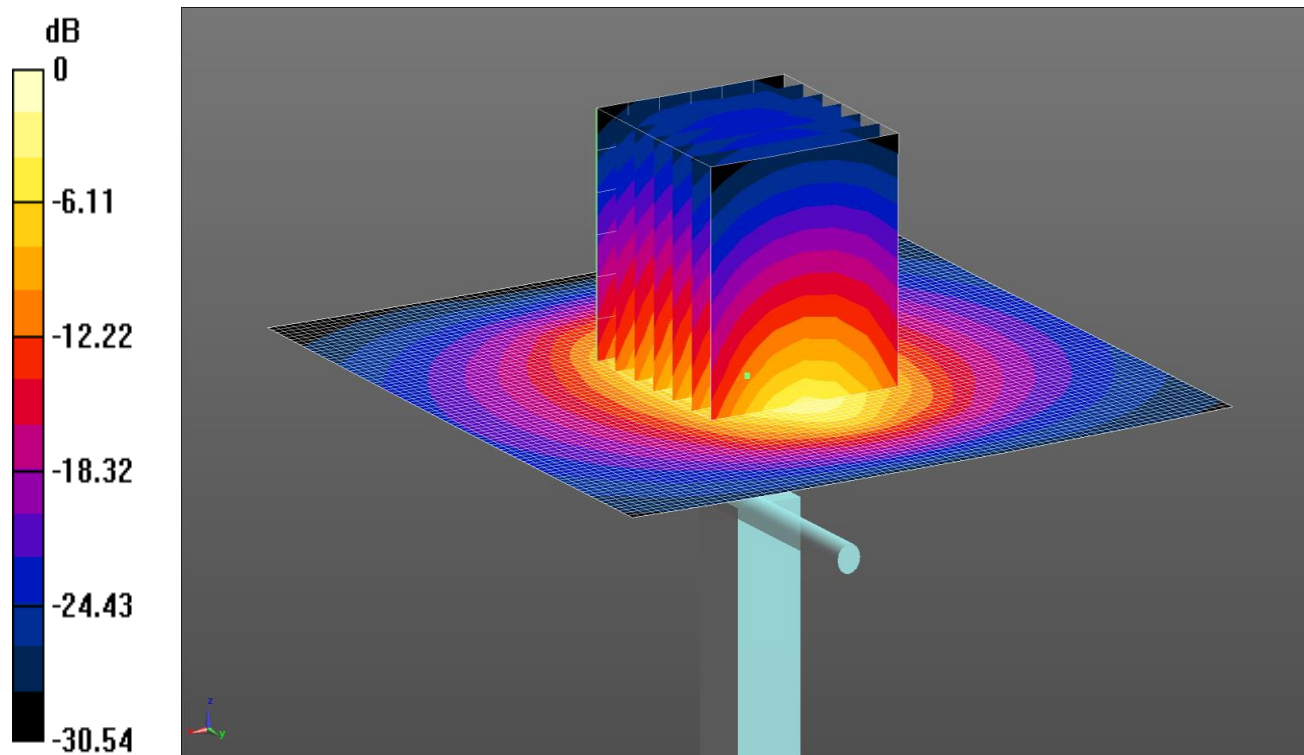
This appendix contains the following system validation distribution scans.

| Scan Reference Number | Title                                           |
|-----------------------|-------------------------------------------------|
| SYS/001               | System Performance Check 2450MHz Body 27 04 16  |
| SYS/002               | System Performance Check 5250 MHz Body 25 04 16 |
| SYS/003               | System Performance Check 5600 MHz Body 25 04 16 |
| SYS/004               | System Performance Check 5750 MHz Body 25 04 16 |

SYS/001: System Performance Check 2450MHz Body 27 04 16

Date: 27/4/2016

DUT: Dipole 2450 MHz; SN725; Type: D2450V2; Serial: D2450V2 - SN:725



0 dB = 20.7 W/kg = 13.15 dBW/kg

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 MHz MSL Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.954$  S/m;  $\epsilon_r = 53.175$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3335; ConvF(4.31, 4.31, 4.31); Calibrated: 23/7/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn432; Calibrated: 25/8/2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/d=10mm, Pin=250mW 2 2/Area Scan (81x81x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 20.7 W/kg

**Configuration/d=10mm, Pin=250mW 2 2/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.17 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 29.5 W/kg

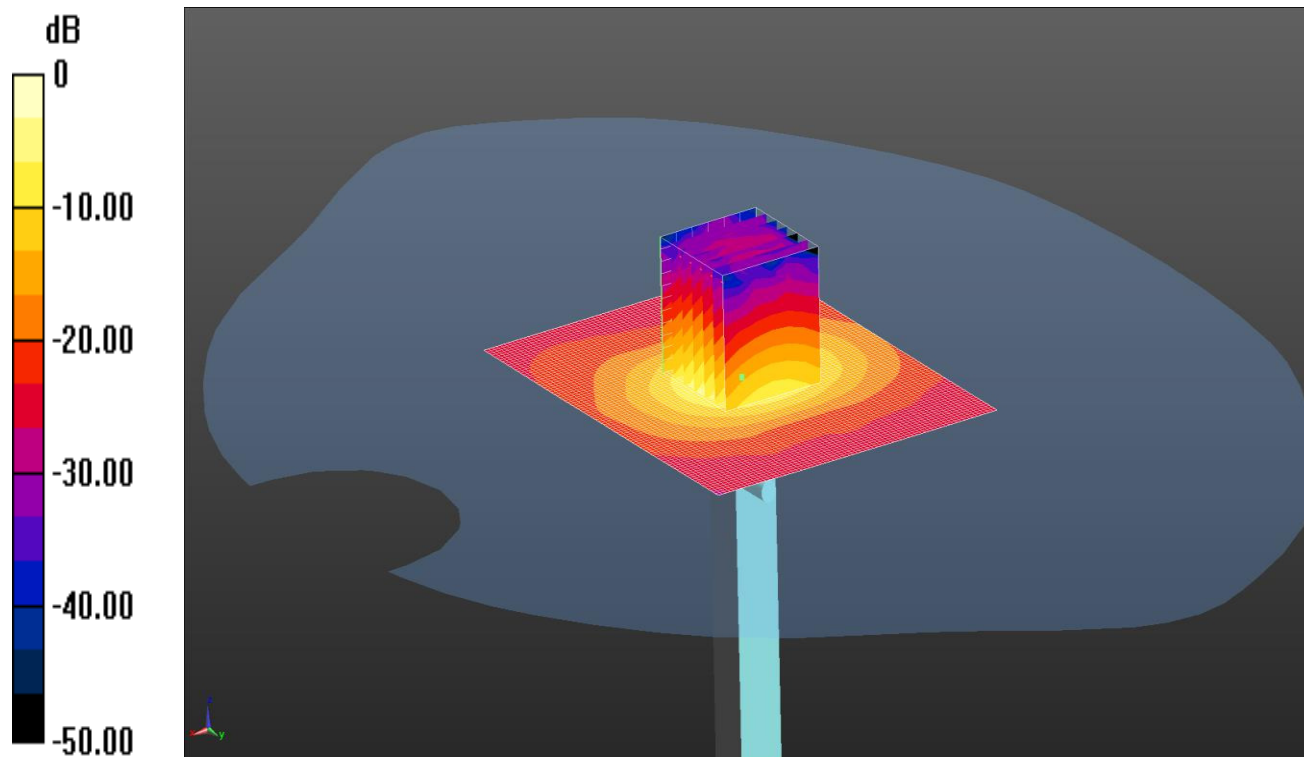
**SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.03 W/kg**

Maximum value of SAR (measured) = 20.8 W/kg

SYS/002: System Performance Check 5250 MHz Body 25 04 16

Date: 25/04/16

DUT: 5GHz Dipole; Type: D5GHzV2; Serial: SN 1016



0 dB = 15.9 W/kg = 12.01 dBW/kg

Communication System: UID 0, CW (0); Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used:  $f = 5250$  MHz;  $\sigma = 5.464$  S/m;  $\epsilon_r = 47.653$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(4.38, 4.38, 4.38); Calibrated: 21/03/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/d=10mm, Pin=100mW 2 2/Area Scan (71x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 16.7 W/kg

**Configuration/d=10mm, Pin=100mW 2 2/Zoom Scan (7x7x12) (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 41.17 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 29.5 W/kg

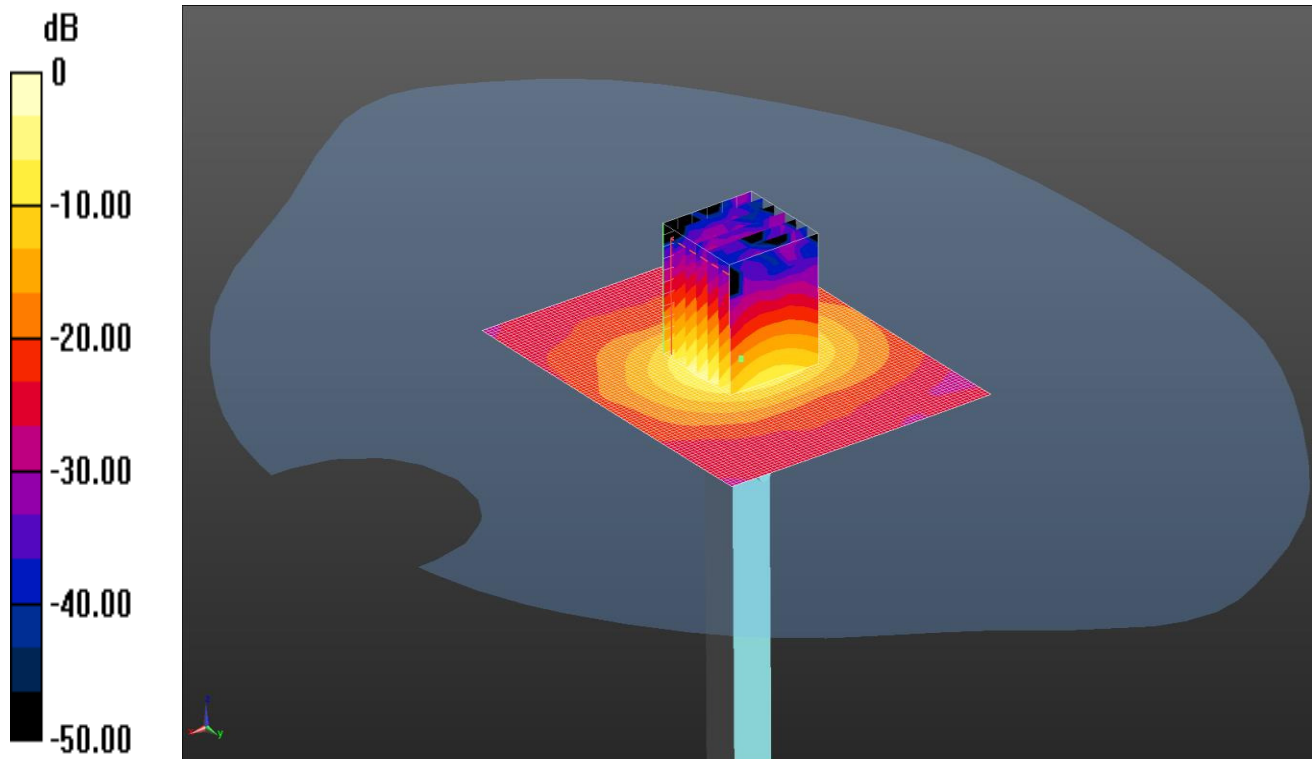
**SAR(1 g) = 7.69 W/kg; SAR(10 g) = 2.17 W/kg**

Maximum value of SAR (measured) = 15.9 W/kg

SYS/003: System Performance Check 5600 MHz Body 25 04 16

Date: 25/04/16

DUT: 5GHz Dipole; Type: D5GHzV2; Serial: SN 1016



0 dB = 16.4 W/kg = 12.15 dBW/kg

Communication System: UID 0, CW (0); Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used:  $f = 5600$  MHz;  $\sigma = 6.013$  S/m;  $\epsilon_r = 46.842$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(3.76, 3.76, 3.76); Calibrated: 21/03/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/d=10mm, Pin=100mW 2/Area Scan (71x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 17.2 W/kg

**Configuration/d=10mm, Pin=100mW 2/Zoom Scan (7x7x12) (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 38.82 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 31.2 W/kg

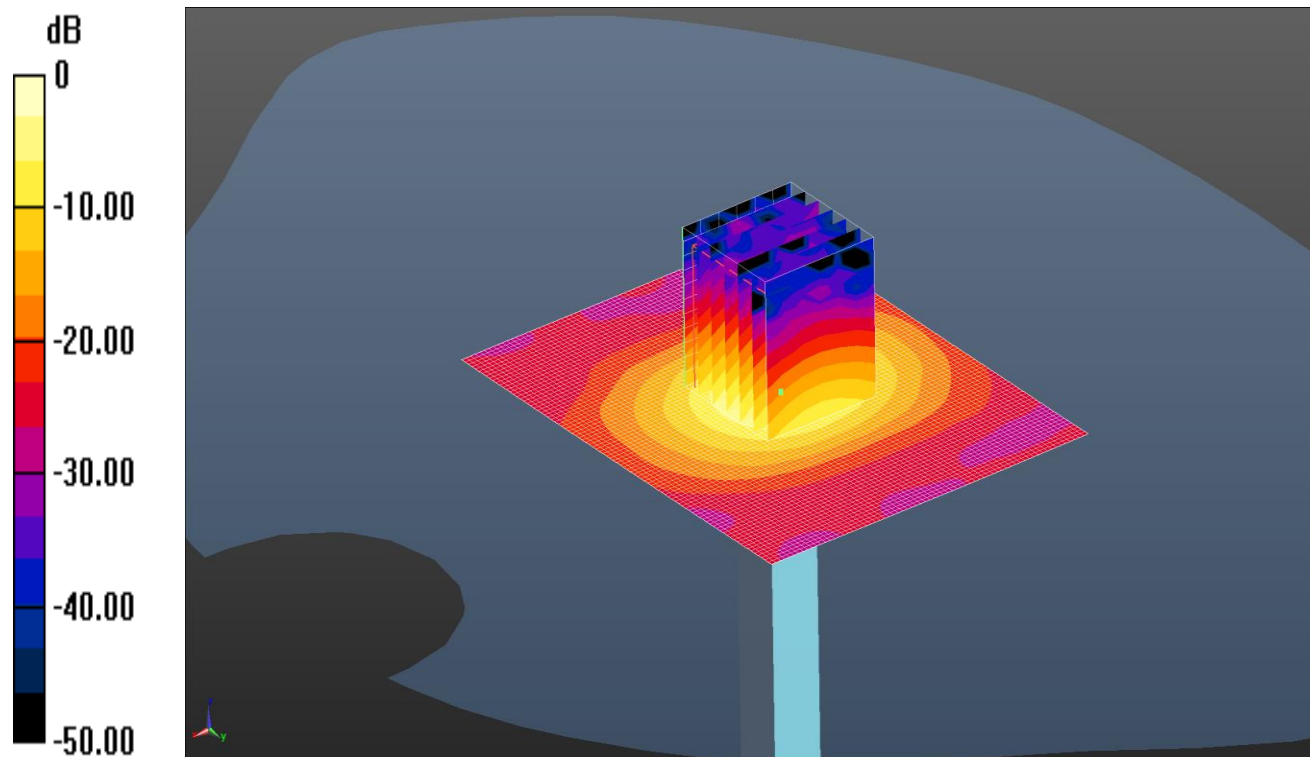
**SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.14 W/kg**

Maximum value of SAR (measured) = 16.4 W/kg

SYS/004: System Performance Check 5750 MHz Body 25 04 16

Date: 25/04/16

DUT: 5GHz Dipole; Type: D5GHzV2; Serial: SN 1016



0 dB = 15.8 W/kg = 11.99 dBW/kg

Communication System: UID 0, CW (0); Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used:  $f = 5750$  MHz;  $\sigma = 6.204$  S/m;  $\epsilon_r = 46.367$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(3.99, 3.99, 3.99); Calibrated: 21/03/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/d=10mm, Pin=100mW 2/Area Scan (71x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 16.8 W/kg

**Configuration/d=10mm, Pin=100mW 2/Zoom Scan (7x7x12) (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 37.68 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 30.7 W/kg

**SAR(1 g) = 7.44 W/kg; SAR(10 g) = 2.09 W/kg**

Maximum value of SAR (measured) = 15.8 W/kg

**11.3. SAR Test Plots**

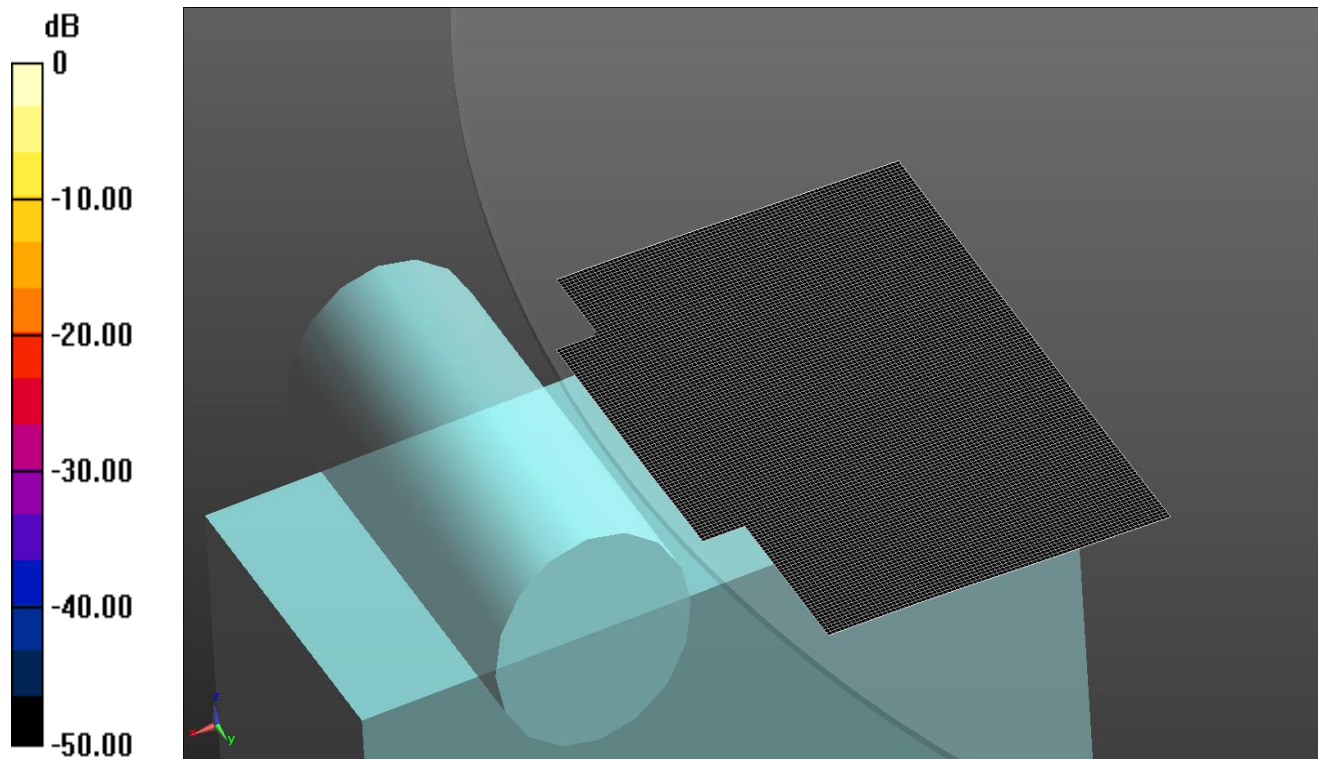
This appendix contains the following SAR distribution scans.

| Scan Reference Number | Title                                 |
|-----------------------|---------------------------------------|
| SAR/001               | Edge 3 Wi-Fi 2450MHz 80211b Ant1 CH1  |
| SAR/002               | Edge 3 Wi-Fi 2450MHz 80211b Ant1 CH6  |
| SAR/003               | Edge 3 Wi-Fi 2450MHz 80211b Ant1 CH11 |
| SAR/004               | Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH56   |
| SAR/005               | Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH100  |
| SAR/006               | Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH149  |
| SAR/007               | Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH52   |
| SAR/008               | Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH64   |

SAR/001: Edge 3 Wi-Fi 2450MHz 80211b Ant1 CH1

Date: 27/04/2016

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



0 dB = 0 W/kg = -999.00 dBW/kg

Communication System: UID 0, WLAN 802.11 (0); Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 MHz MSL Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.914$  S/m;  $\epsilon_r = 53.283$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3335; ConvF(4.31, 4.31, 4.31); Calibrated: 23/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn432; Calibrated: 25/08/2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7164)

**Configuration/Edge 3/Area Scan 2 (141x131x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

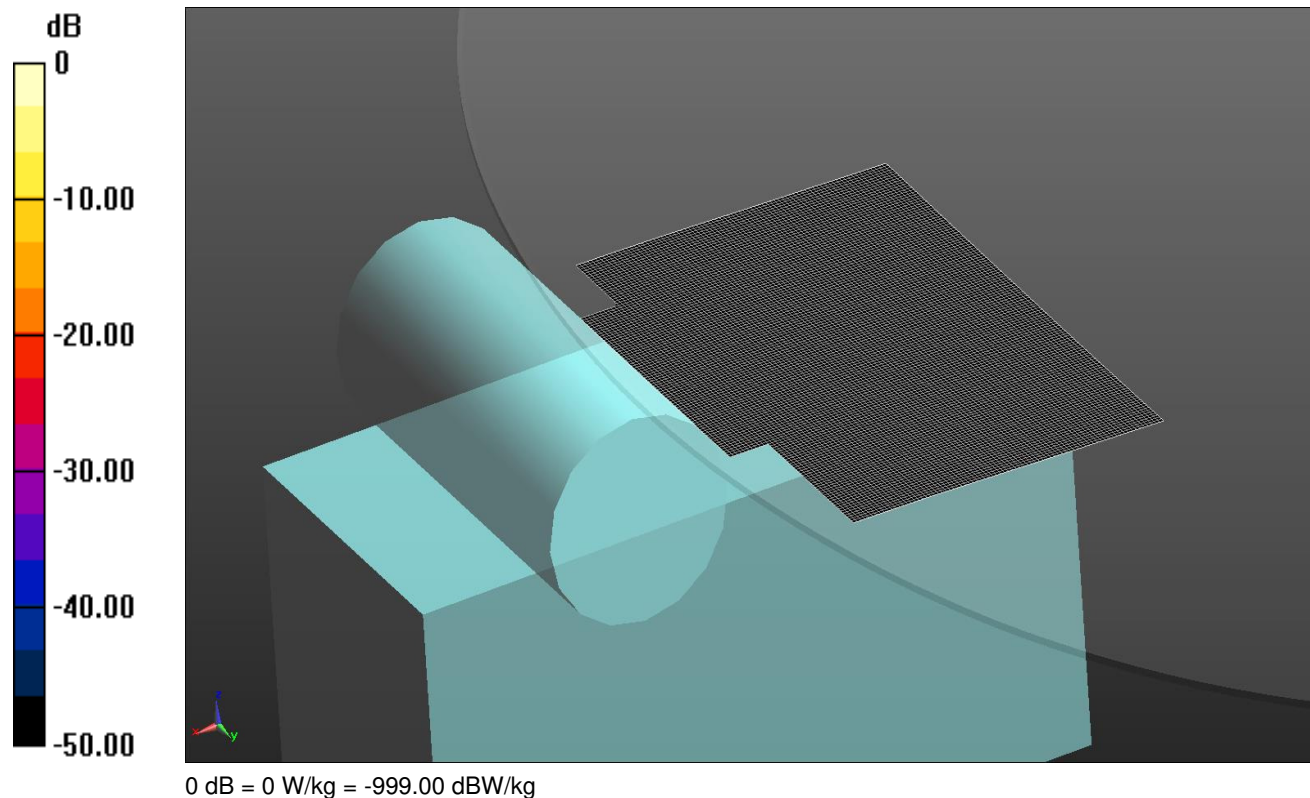
Maximum value of SAR (interpolated) = 0 W/kg



SAR/002: Edge 3 Wi-Fi 2450MHz 80211b Ant1 CH6

Date: 27/04/2016

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



Communication System: UID 0, WLAN 802.11 (0); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 MHz MSL Medium parameters used (interpolated):  $f = 2437$  MHz;  $\sigma = 1.94$  S/m;  $\epsilon_r = 53.212$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3335; ConvF(4.31, 4.31, 4.31); Calibrated: 23/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn432; Calibrated: 25/08/2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7164)

**Configuration/Edge 3/Area Scan 2 (141x131x1):** Interpolated grid:  $dx=1.200$  mm,  $dy=1.200$  mm

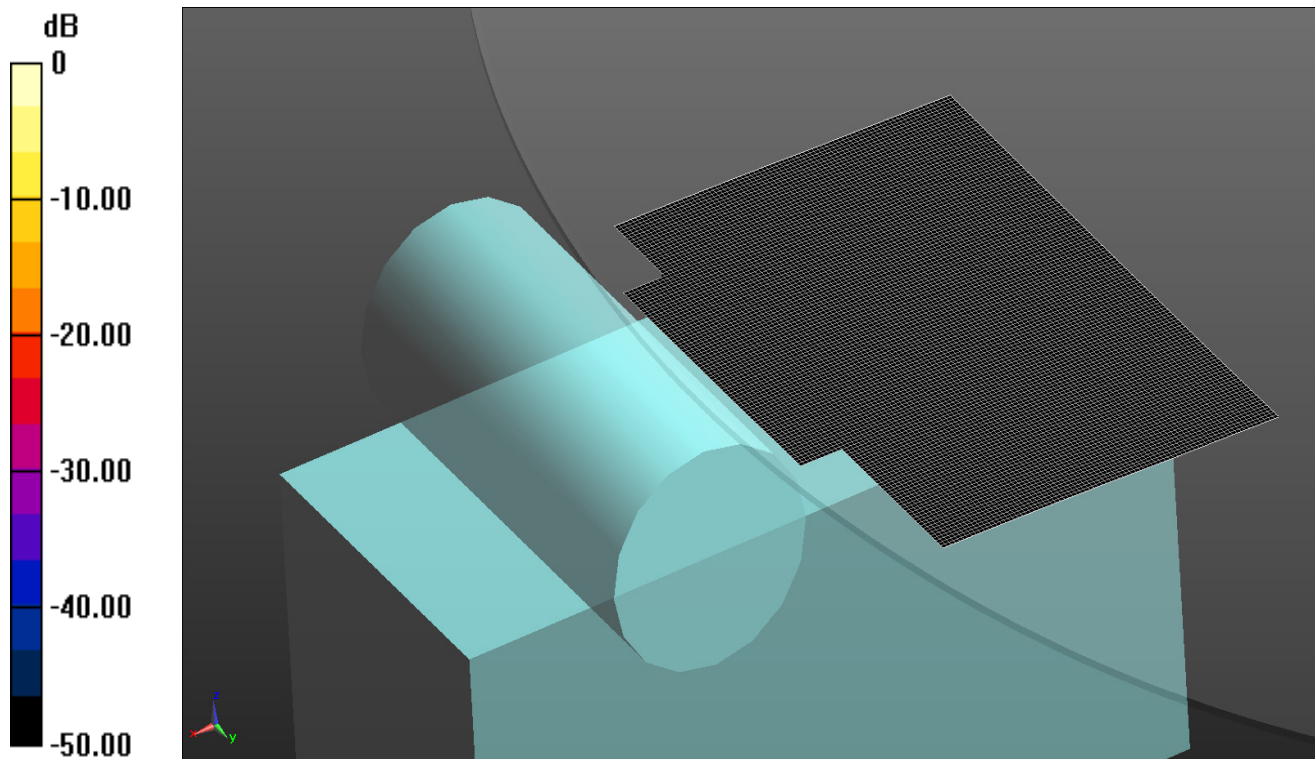
Maximum value of SAR (interpolated) = 0 W/kg



SAR/003: Edge 3 Wi-Fi 2450MHz 80211b Ant1 CH11

Date: 27/04/2016

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



0 dB = 0 W/kg = -999.00 dBW/kg

Communication System: UID 0, WLAN 802.11 (0); Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: 2450 MHz MSL Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 1.973$  S/m;  $\epsilon_r = 53.119$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3335; ConvF(4.31, 4.31, 4.31); Calibrated: 23/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn432; Calibrated: 25/08/2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7164)

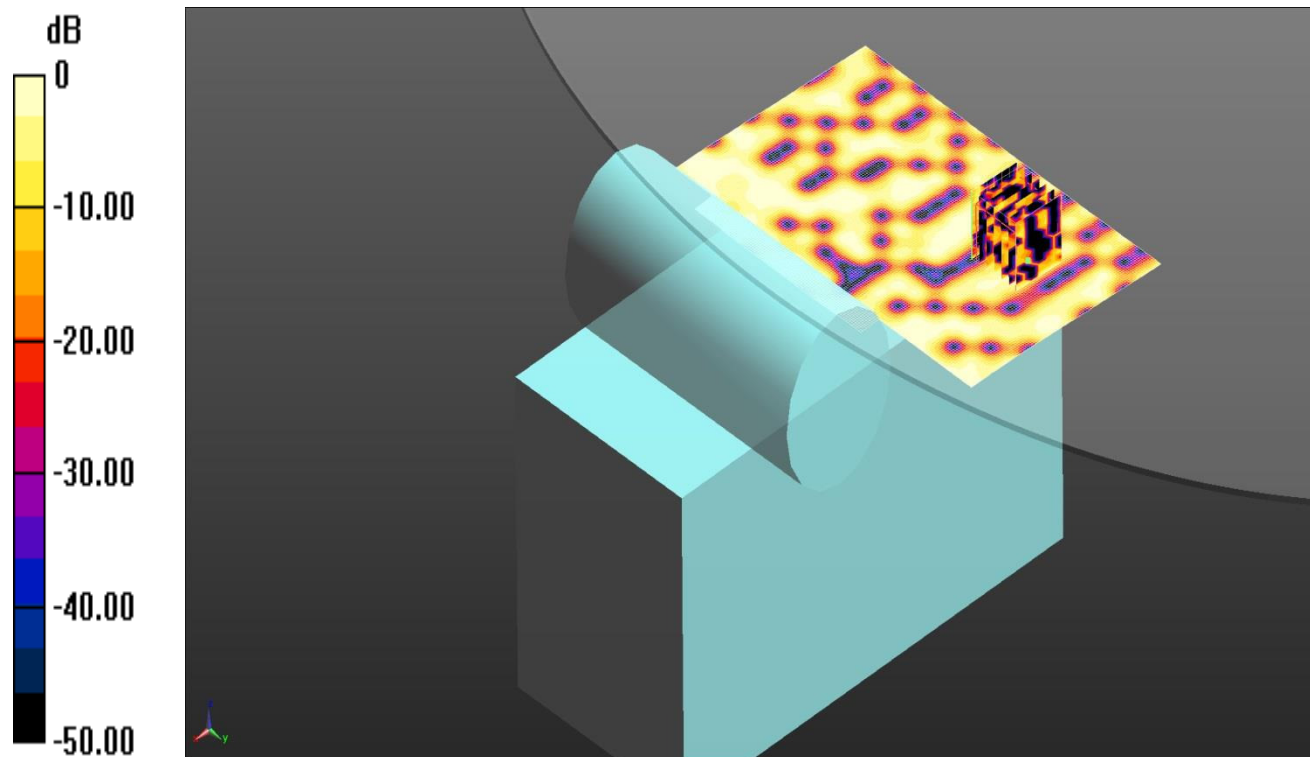
**Configuration/Edge 3/Area Scan 2 (141x131x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0 W/kg

SAR/004: Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH56

Date: 26/04/16

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



0 dB = 0.0508 W/kg = -12.94 dBW/kg

Communication System: UID 0, WLAN 802.11 (0); Frequency: 5280 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used (interpolated):  $f = 5280$  MHz;  $\sigma = 5.485$  S/m;  $\epsilon_r = 47.47$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(4.38, 4.38, 4.38); Calibrated: 21/03/16;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/Edge 3/Area Scan 2 (171x161x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.106 W/kg

**Configuration/Edge 3/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.3760 V/m; Power Drift = 3.23 dB

Peak SAR (extrapolated) = 0.337 W/kg

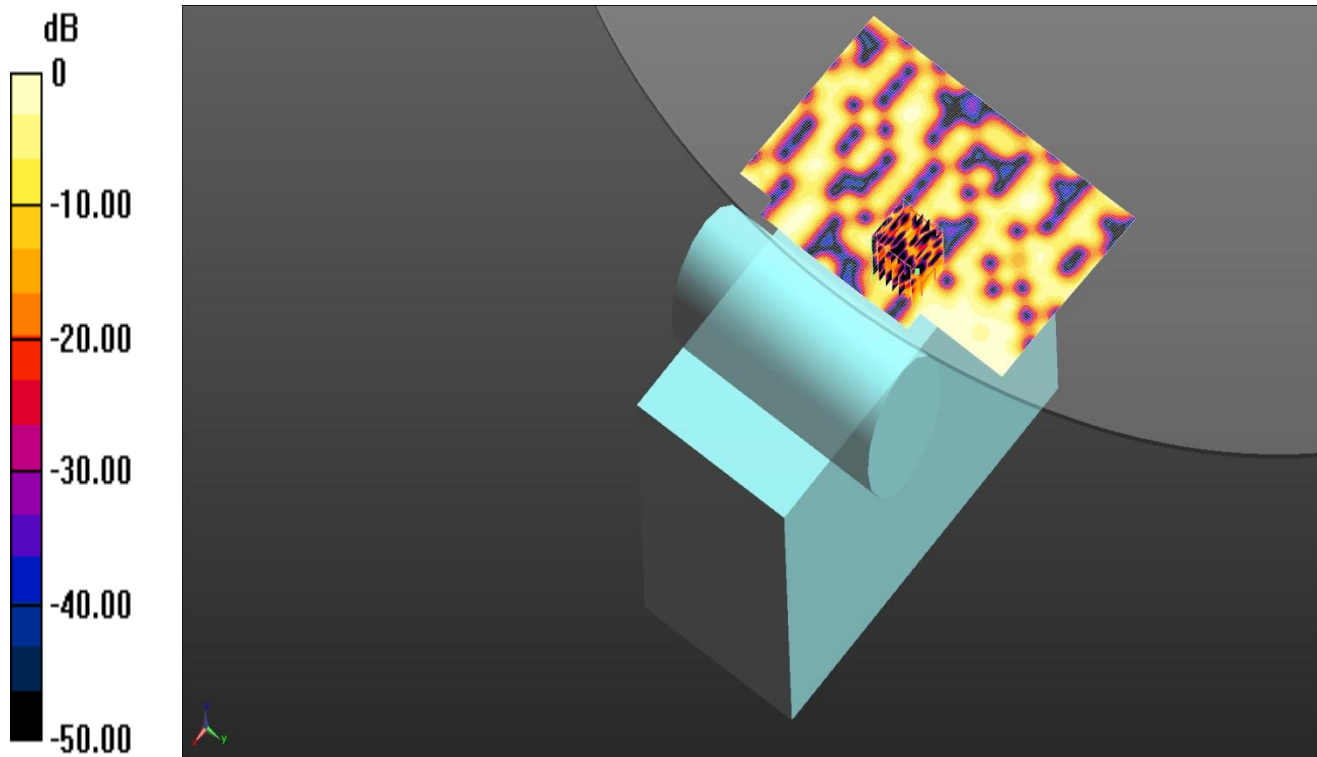
**SAR(1 g) = 0.024 W/kg; SAR(10 g) = 0.00795 W/kg**

Maximum value of SAR (measured) = 0.0508 W/kg

SAR/005: Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH100

Date: 26/04/16

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



0 dB = 0.102 W/kg = -9.91 dBW/kg

Communication System: UID 0, WLAN 802.11 (0); Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used:  $f = 5500$  MHz;  $\sigma = 5.834$  S/m;  $\epsilon_r = 47.158$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(3.76, 3.76, 3.76); Calibrated: 21/03/16;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/Edge 3/Area Scan 2 (171x161x1):** Interpolated grid:  $dx=1.000$  mm,  $dy=1.000$  mm

Maximum value of SAR (interpolated) = 0.128 W/kg

**Configuration/Edge 3/Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4$ mm,  $dy=4$ mm,  $dz=2$ mm

Reference Value = 3.831 V/m; Power Drift = -6.40 dB

Peak SAR (extrapolated) = 0.0890 W/kg

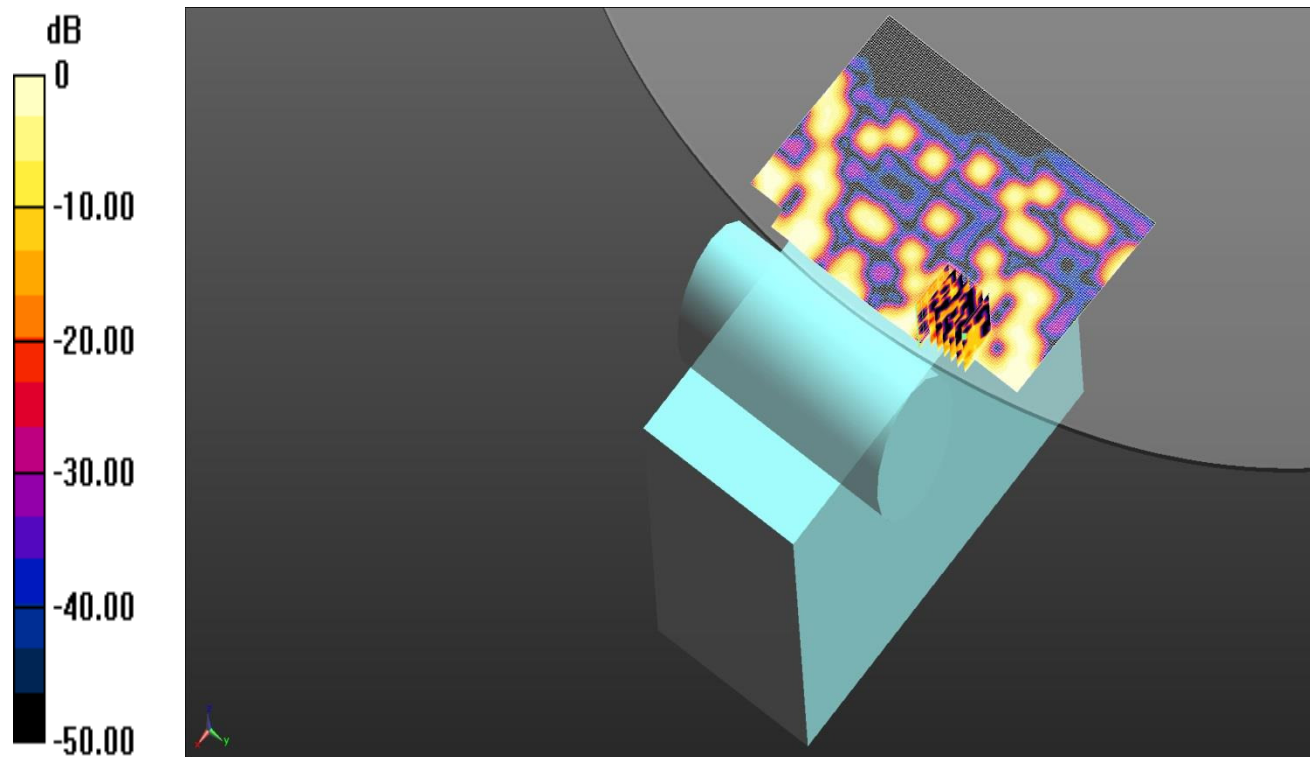
**SAR(1 g) = 0.00427 W/kg; SAR(10 g) = 0.000526 W/kg**

Maximum value of SAR (measured) = 0.102 W/kg

SAR/006: Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH149

Date: 26/04/16

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



0 dB = 0.0573 W/kg = -12.42 dBW/kg

Communication System: UID 0, WLAN 802.11 (0); Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used (interpolated):  $f = 5745$  MHz;  $\sigma = 6.198$  S/m;  $\epsilon_r = 46.397$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(3.99, 3.99, 3.99); Calibrated: 21/03/16;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/Edge 3/Area Scan 2 (171x161x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

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

**Configuration/Edge 3/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.974 V/m; Power Drift = -12.91 dB

Peak SAR (extrapolated) = 0.301 W/kg

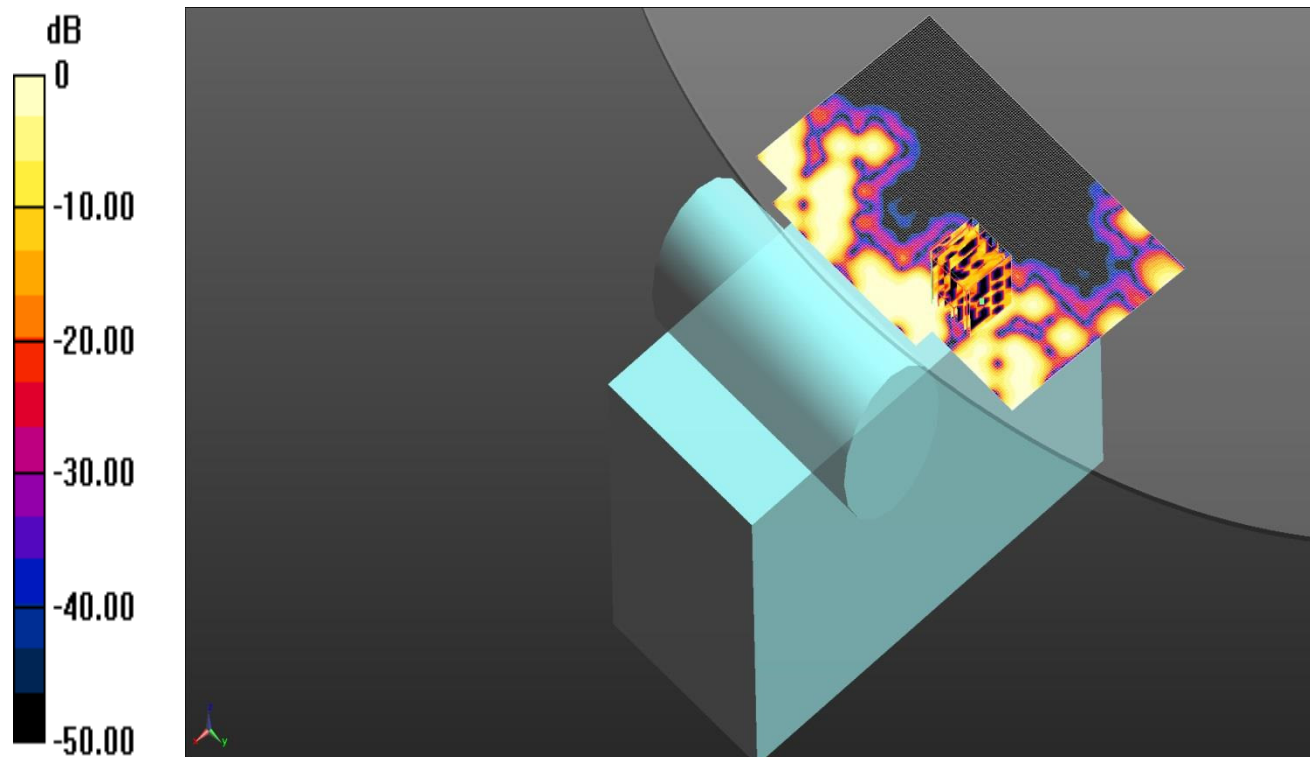
**SAR(1 g) = 0.023 W/kg; SAR(10 g) = n.a.**

Maximum value of SAR (measured) = 0.0573 W/kg

SAR/007: Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH52

Date: 26/04/16

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



0 dB = 0.0410 W/kg = -13.87 dBW/kg

Communication System: UID 0, WLAN 802.11 (0); Frequency: 5260 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used (interpolated):  $f = 5260$  MHz;  $\sigma = 5.471$  S/m;  $\epsilon_r = 47.592$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(4.38, 4.38, 4.38); Calibrated: 21/03/16;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/Edge 3/Area Scan 2 (171x161x1):** Interpolated grid:  $dx=1.000$  mm,  $dy=1.000$  mm

Maximum value of SAR (interpolated) = 0.0631 W/kg

**Configuration/Edge 3/Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4$ mm,  $dy=4$ mm,  $dz=2$ mm

Reference Value = 2.506 V/m; Power Drift = -0.45 dB

Peak SAR (extrapolated) = 0.268 W/kg

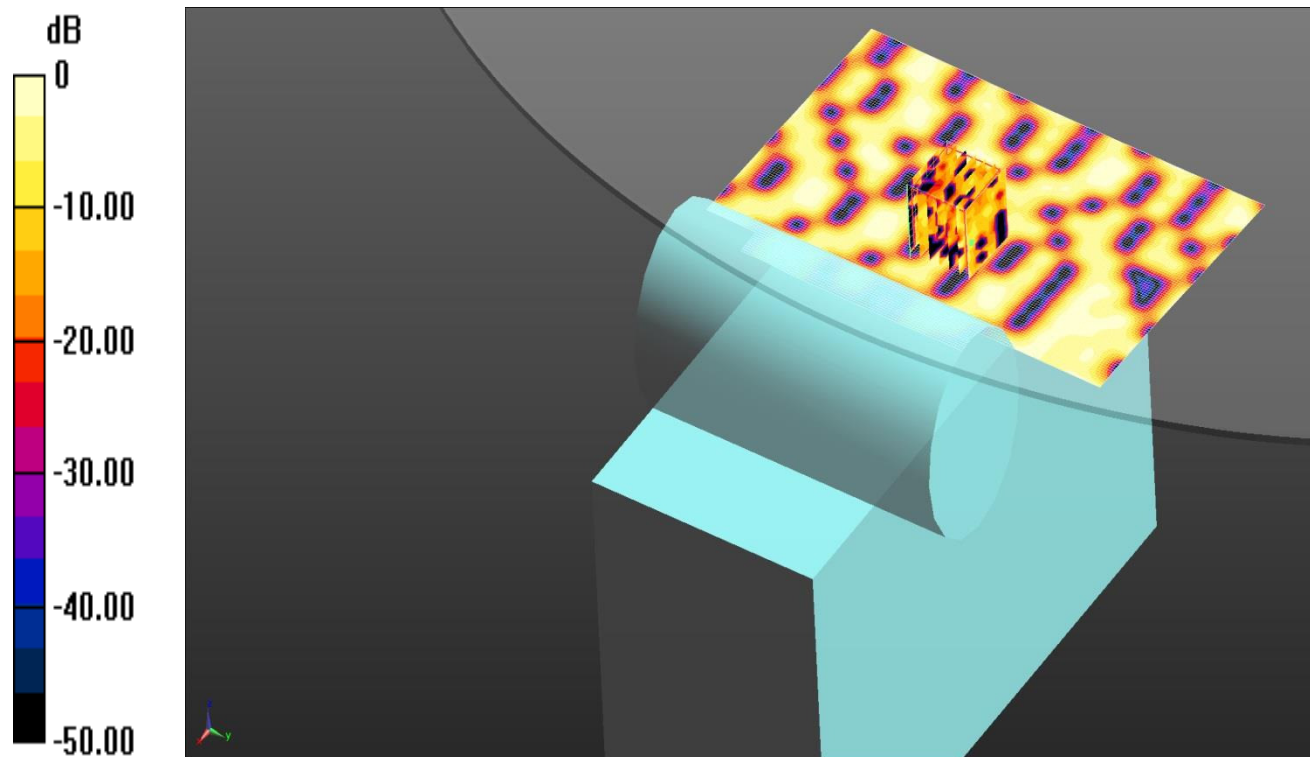
**SAR(1 g) = 0.020 W/kg; SAR(10 g) = 0.00585 W/kg**

Maximum value of SAR (measured) = 0.0410 W/kg

SAR/008: Edge 3 Wi-Fi 5GHz 802.11a Ant1 CH64

Date: 27/04/16

DUT: Hasselblad Victory; Type: Camera; Serial: TQ36000058



0 dB = 0.0648 W/kg = -11.88 dBW/kg

Communication System: UID 0, WLAN 802.11 (0); Frequency: 5320 MHz; Duty Cycle: 1:1

Medium: 5250/5600/5750 MHz MSL Medium parameters used (interpolated):  $f = 5320$  MHz;  $\sigma = 5.55$  S/m;  $\epsilon_r = 47.369$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(4.38, 4.38, 4.38); Calibrated: 21/03/16;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn431; Calibrated: 17/11/15
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA; Serial: TP:xxxx
- ; SEMCAD X Version 14.6.10 (7331)

**Configuration/Edge 3 2/Area Scan 2 (171x161x1):** Interpolated grid:  $dx=1.000$  mm,  $dy=1.000$  mm

Maximum value of SAR (interpolated) = 0.137 W/kg

**Configuration/Edge 3 2/Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4$ mm,  $dy=4$ mm,  $dz=2$ mm

Reference Value = 0.9700 V/m; Power Drift = -8.63 dB

Peak SAR (extrapolated) = 0.0210 W/kg

**SAR(1 g) = 0.000531 W/kg; SAR(10 g) = 5.33e-005 W/kg**

Maximum value of SAR (measured) = 0.0648 W/kg

#### **11.4. Calibration Certificate for E-field probe**

This sub-section contains Cal Certificates for E-field probes, and is not included in the total number of pages for this report.



A2436

**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  
 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 **UL RFI UK**

Certificate No: **ES3-3335\_Jul15**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3335**

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: **July 23, 2015**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| 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-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

|                                                                                                                 | Name            | Function              | Signature |
|-----------------------------------------------------------------------------------------------------------------|-----------------|-----------------------|-----------|
| Calibrated by:                                                                                                  | Claudio Leubler | Laboratory Technician |           |
| Approved by:                                                                                                    | Katja Pokovic   | Technical Manager     |           |
| Issued: July 23, 2015                                                                                           |                 |                       |           |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                 |                       |           |



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| 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),<br>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:

- 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
- 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
- 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
- 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<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.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).



# Probe ES3DV3

## SN:3335

Manufactured: January 24, 2012  
Calibrated: July 23, 2015

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

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3335

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.07     | 1.08     | 1.13     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 103.1    | 107.3    | 106.3    |               |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C   | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----|---------------------------|---|---------|------------------------------|-----|---------|----------|---------------------------|
| 0   | CW                        | X | 0.0     | 0.0                          | 1.0 | 0.00    | 191.9    | $\pm 3.8 \%$              |
|     |                           | Y | 0.0     | 0.0                          | 1.0 |         | 191.2    |                           |
|     |                           | Z | 0.0     | 0.0                          | 1.0 |         | 198.9    |                           |

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

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -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: ES3DV3 - SN:3335

### 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 <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 6.57    | 6.57    | 6.57    | 0.23               | 2.33                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 6.30    | 6.30    | 6.30    | 0.72               | 1.20                    | ± 12.0 %  |
| 900                  | 41.5                               | 0.97                            | 6.19    | 6.19    | 6.19    | 0.21               | 2.67                    | ± 12.0 %  |
| 1450                 | 40.5                               | 1.20                            | 5.30    | 5.30    | 5.30    | 0.22               | 2.40                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 5.24    | 5.24    | 5.24    | 0.57               | 1.39                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 5.07    | 5.07    | 5.07    | 0.79               | 1.18                    | ± 12.0 %  |
| 2100                 | 39.8                               | 1.49                            | 5.08    | 5.08    | 5.08    | 0.78               | 1.21                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 4.78    | 4.78    | 4.78    | 0.78               | 1.23                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 4.42    | 4.42    | 4.42    | 0.75               | 1.26                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 4.33    | 4.33    | 4.33    | 0.76               | 1.29                    | ± 12.0 %  |
| 3500                 | 37.9                               | 2.91                            | 4.25    | 4.25    | 4.25    | 0.95               | 1.16                    | ± 13.1 %  |

<sup>C</sup> Frequency validity above 300 MHz 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. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<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.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3335

### 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 <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 6.13    | 6.13    | 6.13    | 0.80               | 1.13                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 6.04    | 6.04    | 6.04    | 0.50               | 1.51                    | ± 12.0 %  |
| 900                  | 55.0                               | 1.05                            | 5.97    | 5.97    | 5.97    | 0.80               | 1.17                    | ± 12.0 %  |
| 1450                 | 54.0                               | 1.30                            | 5.10    | 5.10    | 5.10    | 0.33               | 2.01                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 4.89    | 4.89    | 4.89    | 0.54               | 1.53                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 4.71    | 4.71    | 4.71    | 0.46               | 1.72                    | ± 12.0 %  |
| 2100                 | 53.2                               | 1.62                            | 4.83    | 4.83    | 4.83    | 0.77               | 1.29                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 4.46    | 4.46    | 4.46    | 0.76               | 1.31                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 4.31    | 4.31    | 4.31    | 0.80               | 1.08                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 4.16    | 4.16    | 4.16    | 0.80               | 0.80                    | ± 12.0 %  |
| 3500                 | 51.3                               | 3.31                            | 3.83    | 3.83    | 3.83    | 0.90               | 1.34                    | ± 13.1 %  |

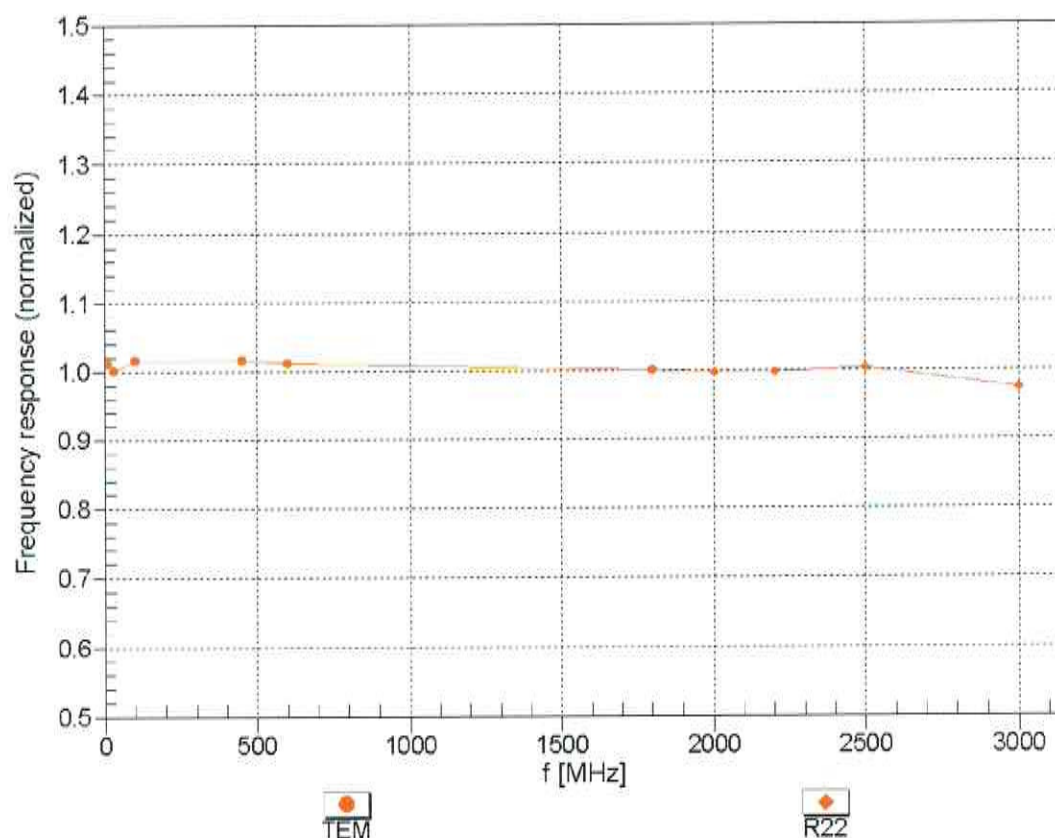
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<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.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

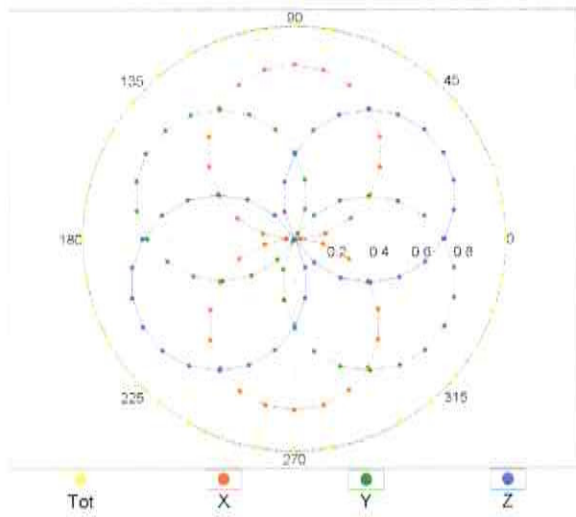


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

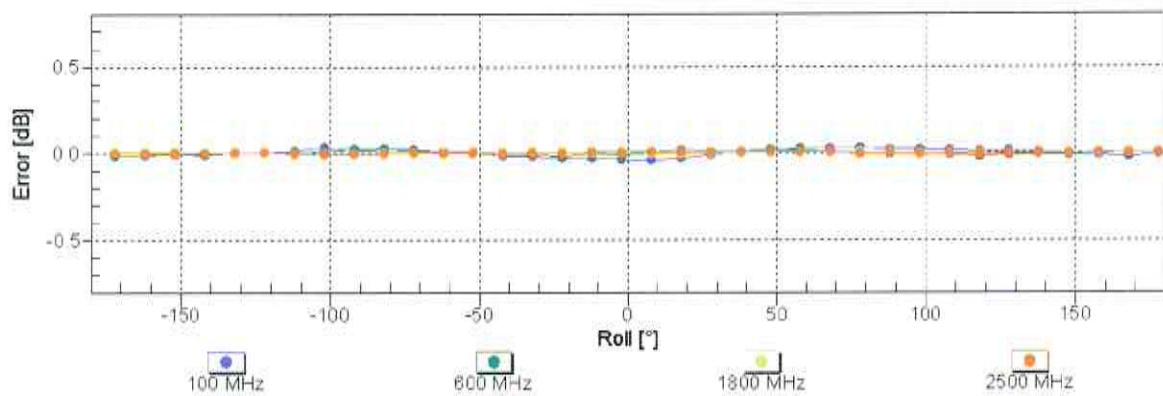
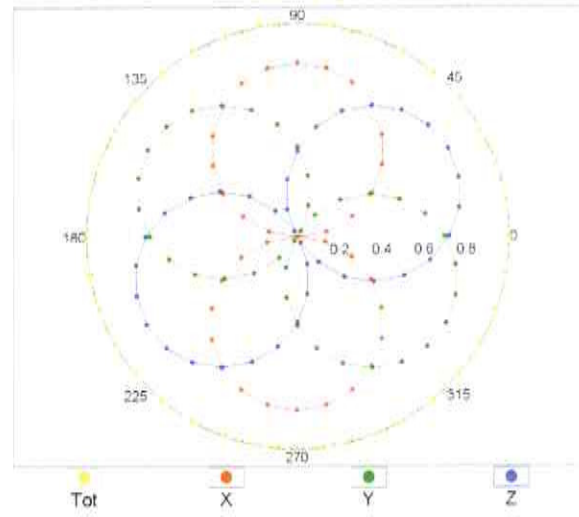


## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz, TEM

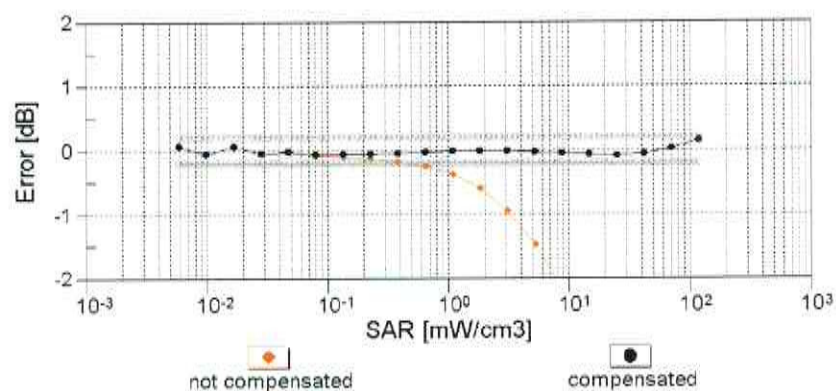
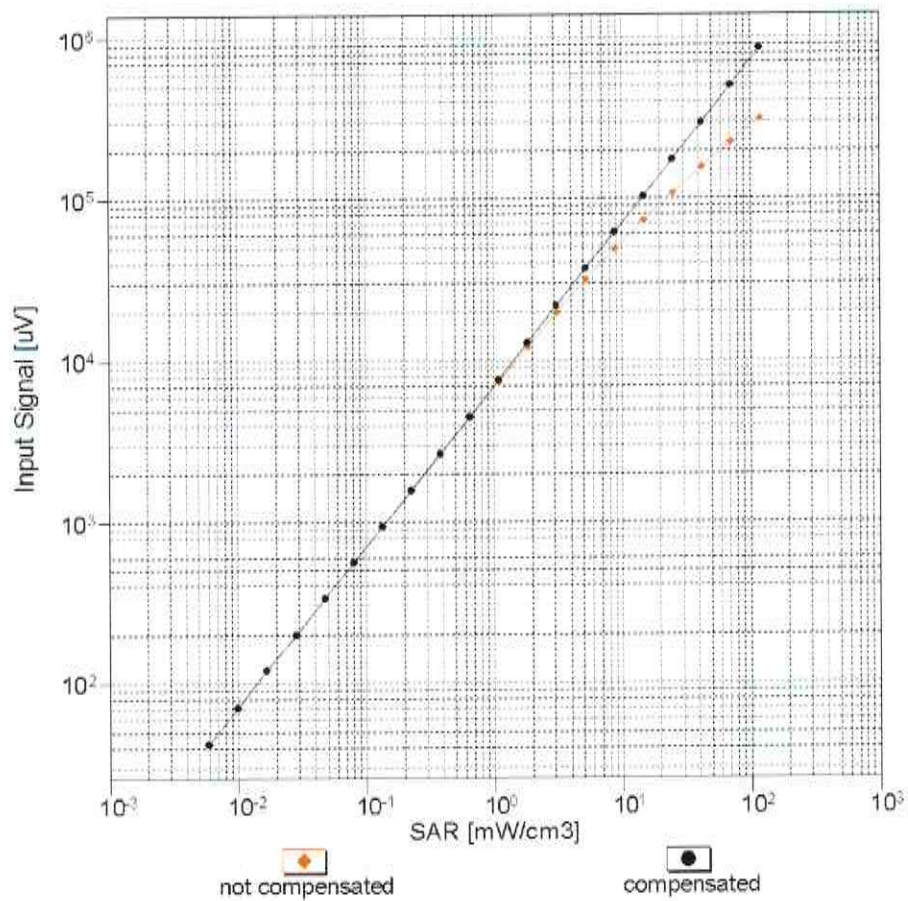


f=1800 MHz, R22



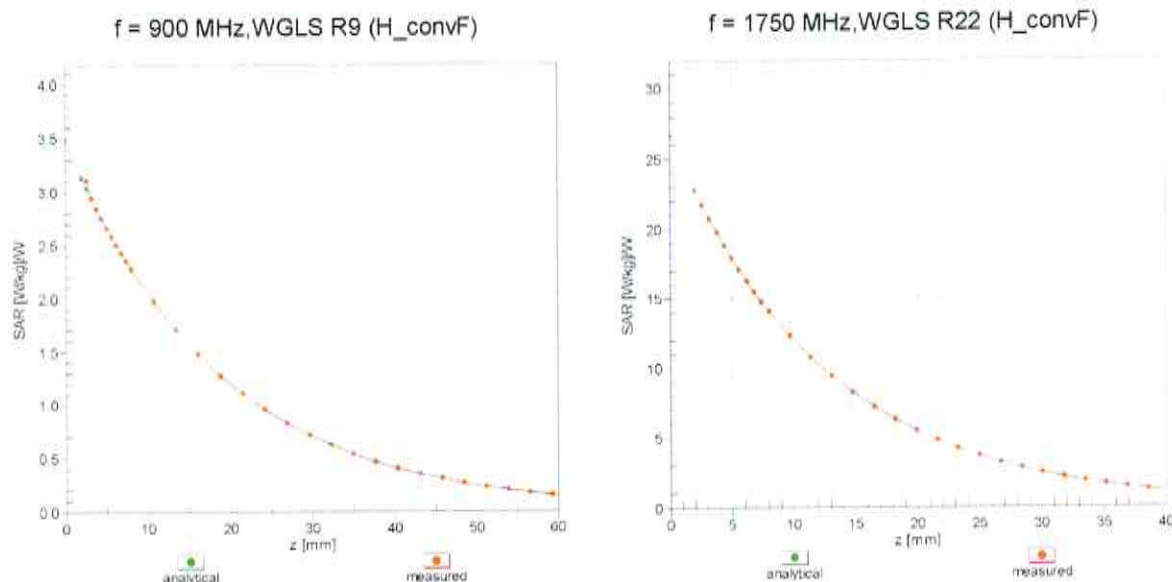
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

## Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f_{\text{eval}} = 1900 \text{ MHz}$ )



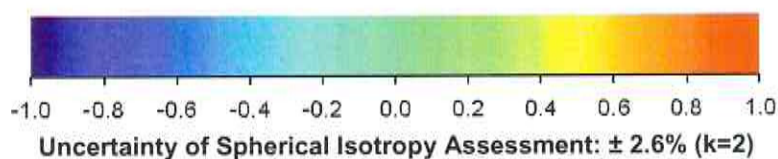
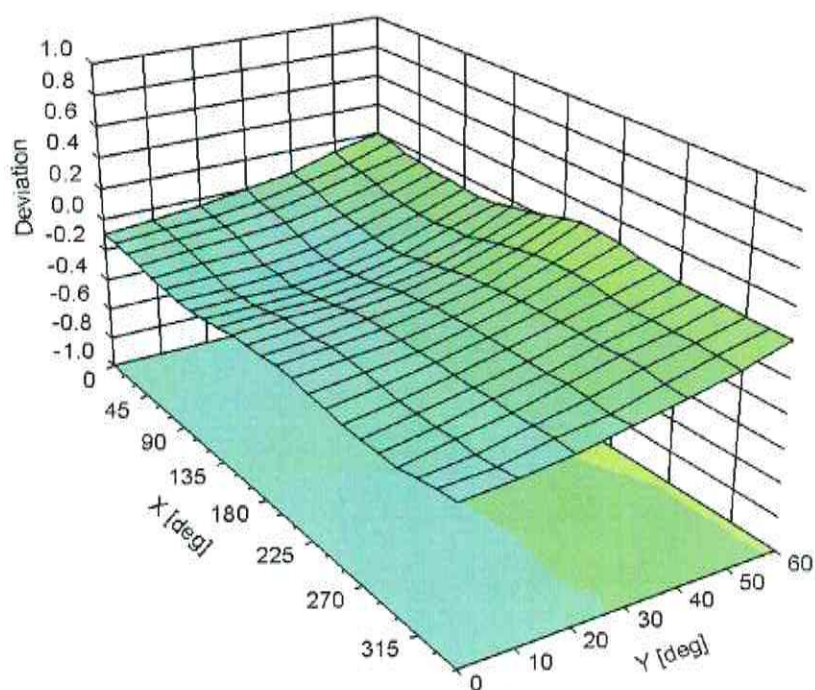
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ),  $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3335

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 57.9       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



A2544

Checked by  
Benedikt  
30/3/16

**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  
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

Client **UL RFI UK**

Certificate No: **EX3-3994\_Mar16**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3994**

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: **March 21, 2016**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 31-Dec-15 (No. ES3-3013_Dec15)    | Dec-16                 |
| DAE4                       | SN: 660         | 23-Dec-15 (No. DAE4-660_Dec15)    | Dec-16                 |
| 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-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

|                                                                                                                 | Name          | Function              | Signature |
|-----------------------------------------------------------------------------------------------------------------|---------------|-----------------------|-----------|
| Calibrated by:                                                                                                  | Leif Klysner  | Laboratory Technician |           |
| Approved by:                                                                                                    | Katja Pokovic | Technical Manager     |           |
| Issued: March 22, 2016                                                                                          |               |                       |           |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |               |                       |           |





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

## Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| 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),<br>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:

- 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
- 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
- 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
- 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).

# Probe EX3DV4

## SN:3994

Manufactured: January 21, 2014  
Calibrated: March 21, 2016

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

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3994

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.50     | 0.50     | 0.43     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                                     | 101.2    | 101.2    | 96.5     |           |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C   | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----|---------------------------|---|---------|------------------------------|-----|---------|----------|---------------------------|
| 0   | CW                        | X | 0.0     | 0.0                          | 1.0 | 0.00    | 195.7    | ±3.0 %                    |
|     |                           | Y | 0.0     | 0.0                          | 1.0 |         | 183.5    |                           |
|     |                           | Z | 0.0     | 0.0                          | 1.0 |         | 177.0    |                           |

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 Norm X,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:3994

### 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 <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 10.32   | 10.32   | 10.32   | 0.65               | 0.80                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 9.79    | 9.79    | 9.79    | 0.57               | 0.86                    | ± 12.0 %  |
| 900                  | 41.5                               | 0.97                            | 9.42    | 9.42    | 9.42    | 0.47               | 0.95                    | ± 12.0 %  |
| 1450                 | 40.5                               | 1.20                            | 8.72    | 8.72    | 8.72    | 0.43               | 0.80                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 8.42    | 8.42    | 8.42    | 0.34               | 0.80                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 8.14    | 8.14    | 8.14    | 0.31               | 0.87                    | ± 12.0 %  |
| 2100                 | 39.8                               | 1.49                            | 8.26    | 8.26    | 8.26    | 0.36               | 0.80                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 7.71    | 7.71    | 7.71    | 0.29               | 0.80                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 7.36    | 7.36    | 7.36    | 0.32               | 0.80                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 7.07    | 7.07    | 7.07    | 0.37               | 0.80                    | ± 12.0 %  |
| 5250                 | 35.9                               | 4.71                            | 5.20    | 5.20    | 5.20    | 0.35               | 1.80                    | ± 13.1 %  |
| 5600                 | 35.5                               | 5.07                            | 4.50    | 4.50    | 4.50    | 0.50               | 1.80                    | ± 13.1 %  |
| 5750                 | 35.4                               | 5.22                            | 4.51    | 4.51    | 4.51    | 0.50               | 1.80                    | ± 13.1 %  |

<sup>C</sup> Frequency validity above 300 MHz 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. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<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.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3994

### 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 <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 9.93    | 9.93    | 9.93    | 0.54               | 0.80                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 9.73    | 9.73    | 9.73    | 0.44               | 0.89                    | ± 12.0 %  |
| 900                  | 55.0                               | 1.05                            | 9.74    | 9.74    | 9.74    | 0.41               | 0.90                    | ± 12.0 %  |
| 1450                 | 54.0                               | 1.30                            | 8.47    | 8.47    | 8.47    | 0.32               | 0.80                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 8.12    | 8.12    | 8.12    | 0.46               | 0.80                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 7.81    | 7.81    | 7.81    | 0.37               | 0.85                    | ± 12.0 %  |
| 2100                 | 53.2                               | 1.62                            | 8.10    | 8.10    | 8.10    | 0.28               | 1.02                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 7.45    | 7.45    | 7.45    | 0.32               | 0.95                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 7.28    | 7.28    | 7.28    | 0.36               | 0.85                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 6.99    | 6.99    | 6.99    | 0.29               | 0.95                    | ± 12.0 %  |
| 5250                 | 48.9                               | 5.36                            | 4.38    | 4.38    | 4.38    | 0.55               | 1.90                    | ± 13.1 %  |
| 5600                 | 48.5                               | 5.77                            | 3.76    | 3.76    | 3.76    | 0.60               | 1.90                    | ± 13.1 %  |
| 5750                 | 48.3                               | 5.94                            | 3.99    | 3.99    | 3.99    | 0.60               | 1.90                    | ± 13.1 %  |

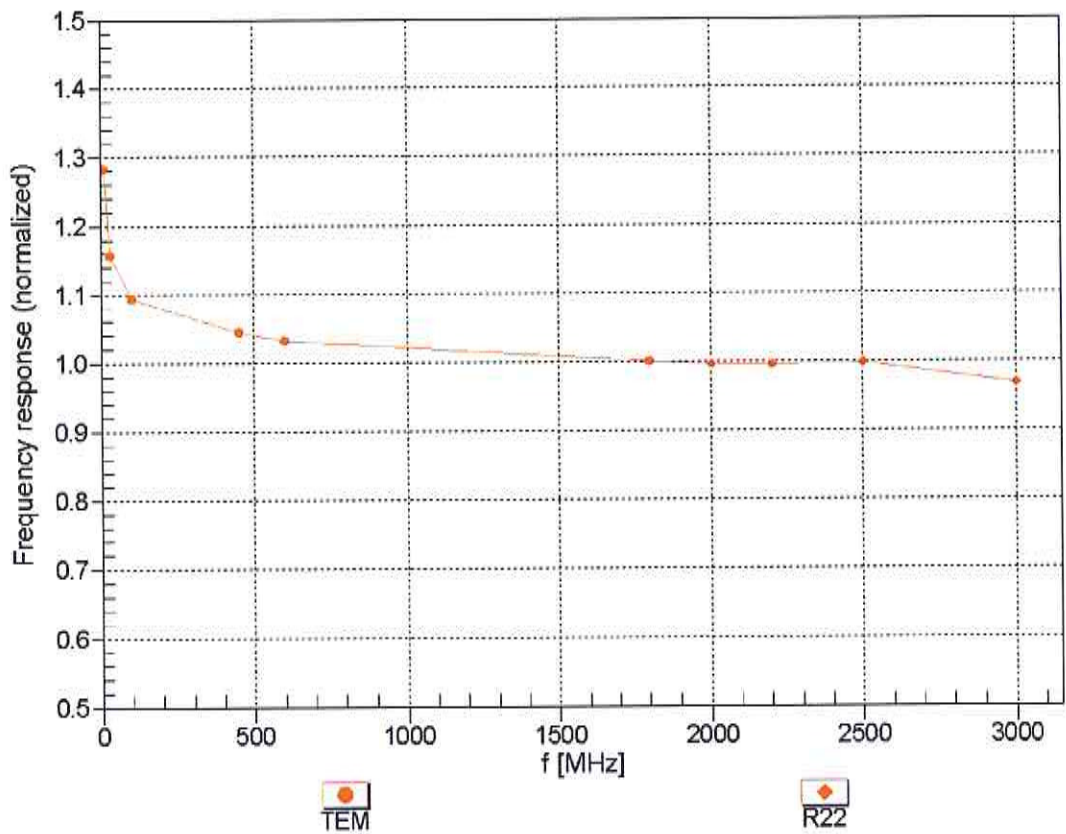
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<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.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



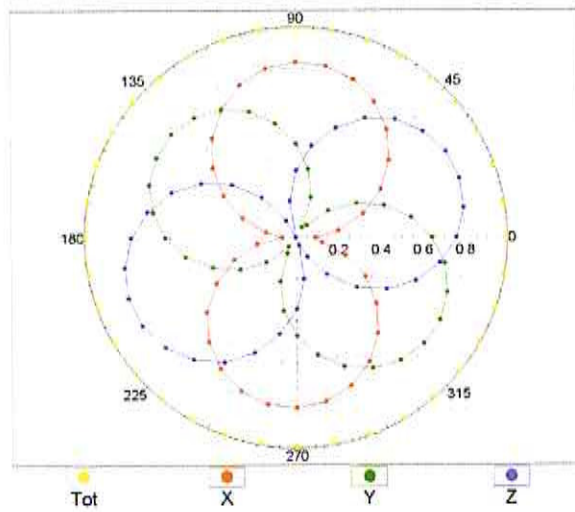
**Frequency Response of E-Field**  
(TEM-Cell:ifi110 EXX, Waveguide: R22)



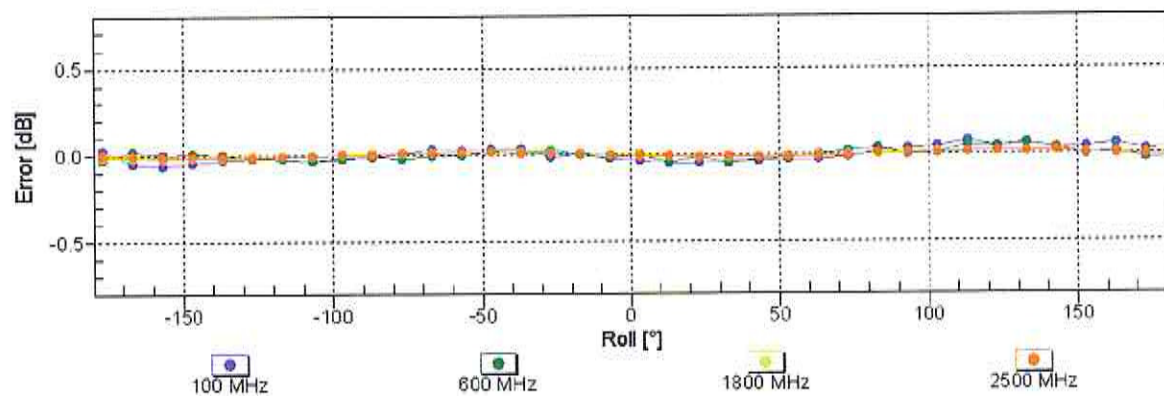
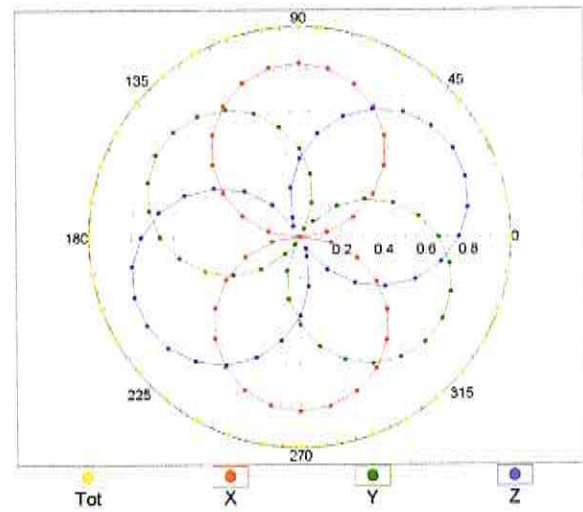
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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

f=600 MHz,TEM

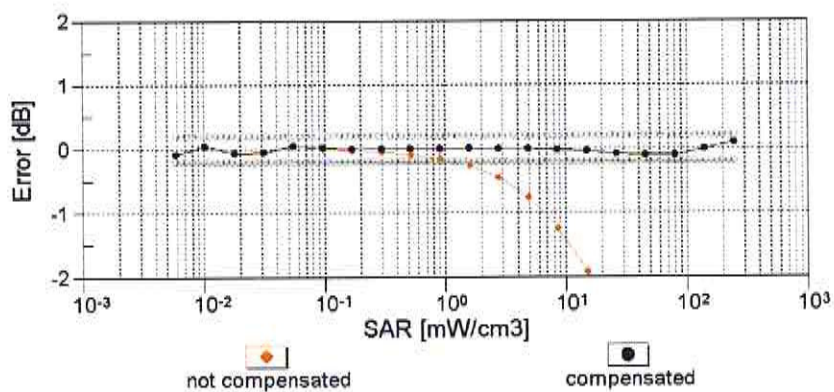
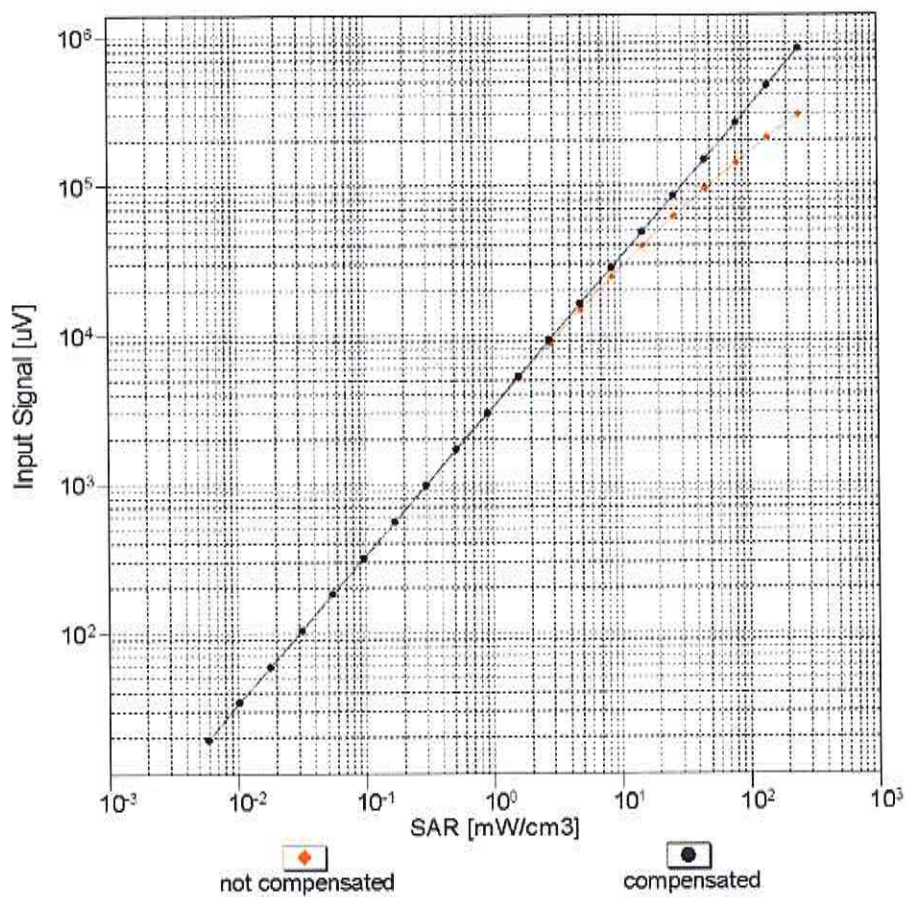


f=1800 MHz,R22



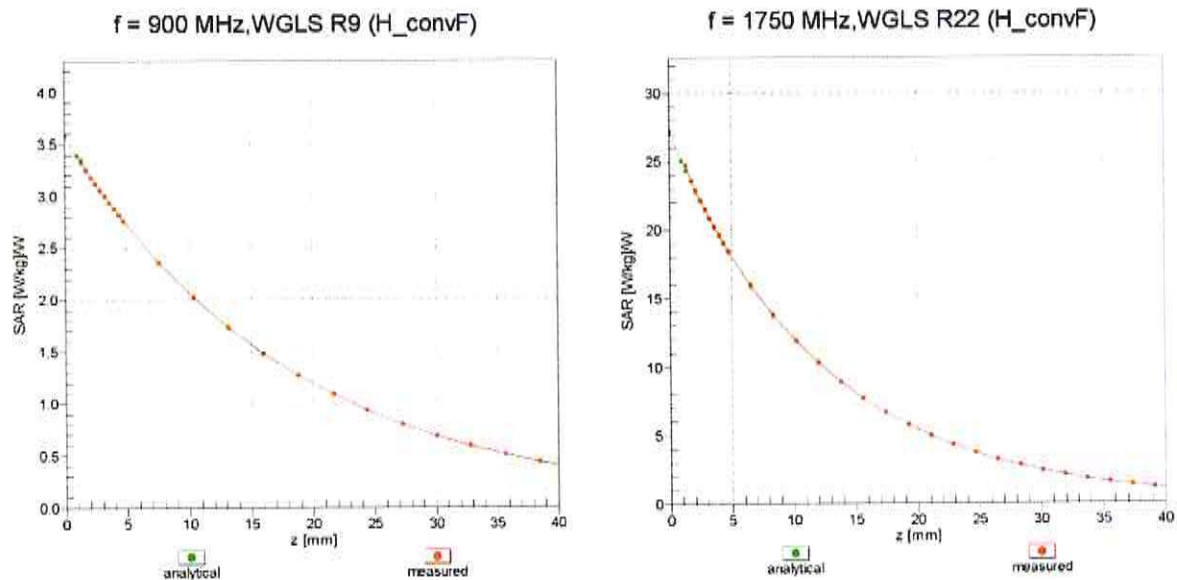
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

# **Dynamic Range $f(\text{SAR}_{\text{head}})$** (TEM cell , $f_{\text{eval}} = 1900 \text{ MHz}$ )



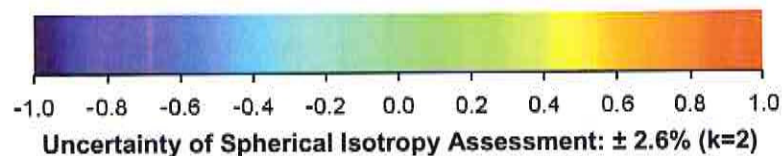
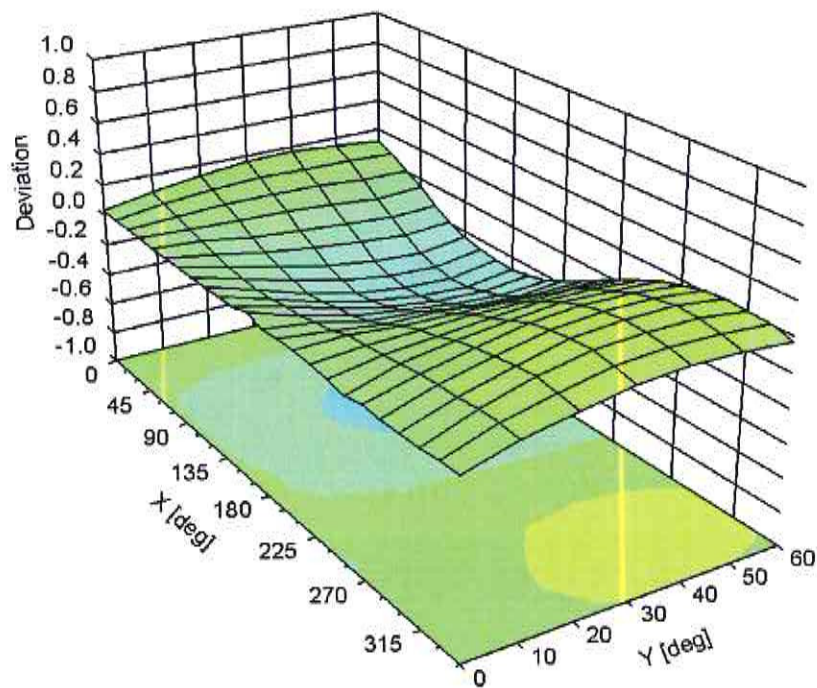
**Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )**

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ),  $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3994

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | -27        |
| 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 | 1.4 mm     |