

### 10.3 Measured SAR Results

**Table 1: Wi-Fi (5G, U-NII-2A)**

| Test Position                                                                                                                                                                                                                                              | Cover Type | Channel/ Frequency (MHz) | Mode 802.11n HT40 | Duty Cycle | Area Scan Max.SAR (W/Kg) | Tune-up limit (dBm) | Conducted Power (dBm) | Drift (dB) | Measured SAR <sub>1g</sub> (W/kg) | Scaling Factor | Reported SAR <sub>1g</sub> (W/kg) | Plot No. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------|-------------------|------------|--------------------------|---------------------|-----------------------|------------|-----------------------------------|----------------|-----------------------------------|----------|
| <b>Head SAR</b>                                                                                                                                                                                                                                            |            |                          |                   |            |                          |                     |                       |            |                                   |                |                                   |          |
| Left Cheek                                                                                                                                                                                                                                                 | standard   | 54/5270                  | OFDM              | 1:1        | 0.559                    | 15.50               | 14.82                 | 0.100      | 0.511                             | 1.17           | 0.598                             | 4        |
| Left Tilt                                                                                                                                                                                                                                                  | standard   | 54/5270                  | OFDM              | 1:1        | 0.490                    | 15.50               | 14.82                 | 0.027      | 0.426                             | 1.17           | 0.498                             | /        |
| Right Cheek                                                                                                                                                                                                                                                | standard   | 54/5270                  | OFDM              | 1:1        | 0.475                    | 15.50               | 14.82                 | 0.028      | 0.329                             | 1.17           | 0.385                             | /        |
| Right Tilt                                                                                                                                                                                                                                                 | standard   | 54/5270                  | OFDM              | 1:1        | 0.412                    | 15.50               | 14.82                 | 0.049      | 0.300                             | 1.17           | 0.351                             | /        |
| <b>Body SAR (Distance 10mm)</b>                                                                                                                                                                                                                            |            |                          |                   |            |                          |                     |                       |            |                                   |                |                                   |          |
| Back Side                                                                                                                                                                                                                                                  | standard   | 54/5270                  | OFDM              | 1:1        | 0.177                    | 15.50               | 14.82                 | -0.090     | 0.158                             | 1.17           | 0.185                             | 5        |
| Front Side                                                                                                                                                                                                                                                 | standard   | 54/5270                  | OFDM              | 1:1        | 0.124                    | 15.50               | 14.82                 | -0.026     | 0.120                             | 1.17           | 0.140                             | /        |
| Left Edge                                                                                                                                                                                                                                                  | N/A        | N/A                      | N/A               | N/A        | N/A                      | N/A                 | N/A                   | N/A        | N/A                               | N/A            | N/A                               | N/A      |
| Right Edge                                                                                                                                                                                                                                                 | standard   | 54/5270                  | OFDM              | 1:1        | 0.111                    | 15.50               | 14.82                 | 0.078      | 0.129                             | 1.17           | 0.151                             | /        |
| Top Edge                                                                                                                                                                                                                                                   | standard   | 54/5270                  | OFDM              | 1:1        | 0.045                    | 15.50               | 14.82                 | -0.009     | 0.059                             | 1.17           | 0.069                             | /        |
| Bottom Edge                                                                                                                                                                                                                                                | N/A        | N/A                      | N/A               | N/A        | N/A                      | N/A                 | N/A                   | N/A        | N/A                               | N/A            | N/A                               | N/A      |
| Note: 1. The value with blue color is the maximum SAR Value of each test band.<br>2. When the adjusted SAR is $\leq 1.2$ W/kg, SAR is not required for the other band/ configuration; Otherwise, each band/ configuration is tested independently for SAR. |            |                          |                   |            |                          |                     |                       |            |                                   |                |                                   |          |

#### Wi-Fi (5G, U-NII-1)

Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is  $\leq 1.2$  W/kg, SAR is not required for U-NII-1 band.



Table 2: Wi-Fi (5G, U-NII-3)

| Test Position                                                                                                                                                                                                                                              | Cover Type | Channel/ Frequency (MHz) | Mode 802.11n HT40 | Duty Cycle | Area Scan Max.SAR (W/Kg) | Tune-up limit (dBm) | Conducted Power (dBm) | Drift (dB) | Measured SAR <sub>1g</sub> (W/kg) | Scaling Factor | Reported SAR <sub>1g</sub> (W/kg) | Plot No. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------|-------------------|------------|--------------------------|---------------------|-----------------------|------------|-----------------------------------|----------------|-----------------------------------|----------|
| Head SAR                                                                                                                                                                                                                                                   |            |                          |                   |            |                          |                     |                       |            |                                   |                |                                   |          |
| Left Cheek                                                                                                                                                                                                                                                 | standard   | 159/5795                 | OFDM              | 1:1        | 0.0404                   | 10.50               | 9.52                  | 0.000      | 0.076                             | 1.25           | 0.095                             | 6        |
| Left Tilt                                                                                                                                                                                                                                                  | standard   | 159/5795                 | OFDM              | 1:1        | 0.0324                   | 10.50               | 9.52                  | 0.023      | 0.052                             | 1.25           | 0.066                             | /        |
| Right Cheek                                                                                                                                                                                                                                                | standard   | 159/5795                 | OFDM              | 1:1        | 0.0106                   | 10.50               | 9.52                  | -0.063     | 0.026                             | 1.25           | 0.033                             | /        |
| Right Tilt                                                                                                                                                                                                                                                 | standard   | 159/5795                 | OFDM              | 1:1        | 0.0105                   | 10.50               | 9.52                  | 0.096      | 0.021                             | 1.25           | 0.026                             | /        |
| Note: 1. The value with blue color is the maximum SAR Value of each test band.<br>2. When the adjusted SAR is $\leq 1.2$ W/kg, SAR is not required for the other band/ configuration; Otherwise, each band/ configuration is tested independently for SAR. |            |                          |                   |            |                          |                     |                       |            |                                   |                |                                   |          |



## 11 Measurement Uncertainty

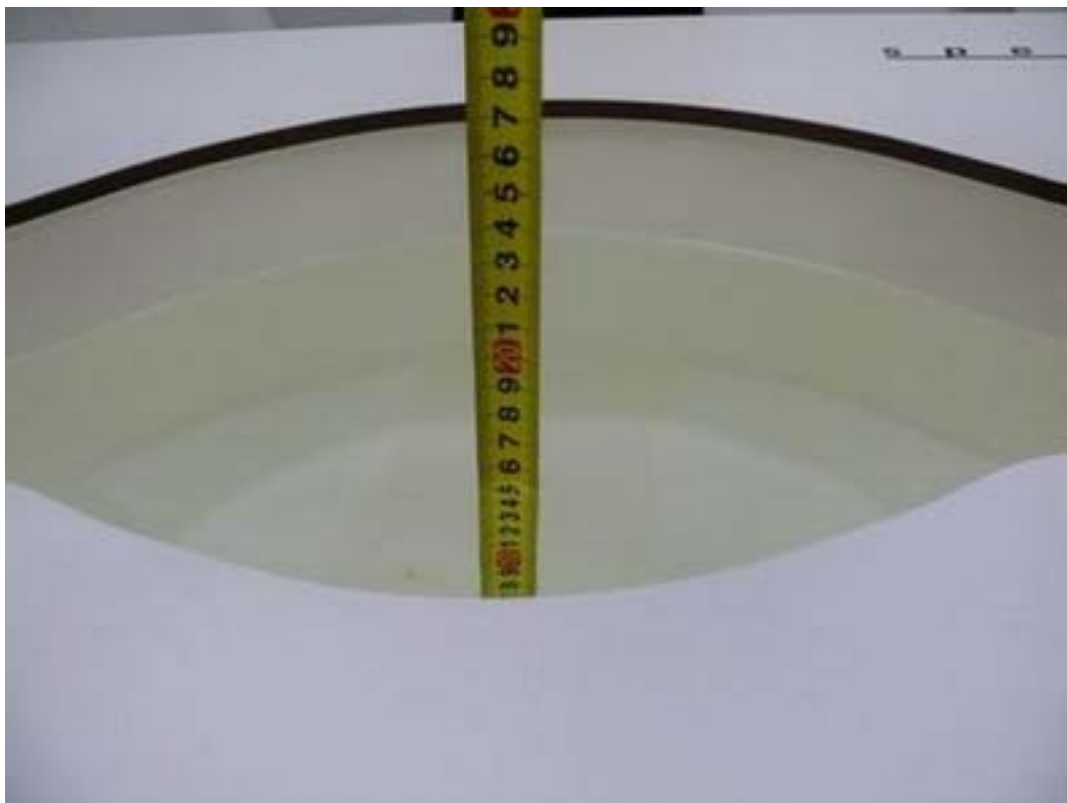
Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is  $< 1.5$  W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.

## ANNEX A: Test Layout





Picture 3: Liquid depth in the head Phantom (5250 MHz, 15.4cm depth)



Picture 4: Liquid depth in the flat Phantom (5250 MHz, 15.3cm depth)



Picture 5: Liquid depth in the head Phantom (5750 MHz, 15.1cm depth)

## ANNEX B: System Check Results

### Plot 1 System Performance Check at 5250 MHz Head TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1151

Date: 8/9/2017

Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5250 \text{ MHz}$ ;  $\sigma = 4.80 \text{ mho/m}$ ;  $\epsilon_r = 35.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $22.3^\circ\text{C}$  Liquid Temperature:  $21.5^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.66, 5.66, 5.66); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=100mW/Area Scan (61x101x1):** Measurement grid:  $dx=1.000\text{mm}$ ,  $dy=1.000\text{mm}$

Maximum value of SAR (interpolated) =  $9.14 \text{ mW/g}$

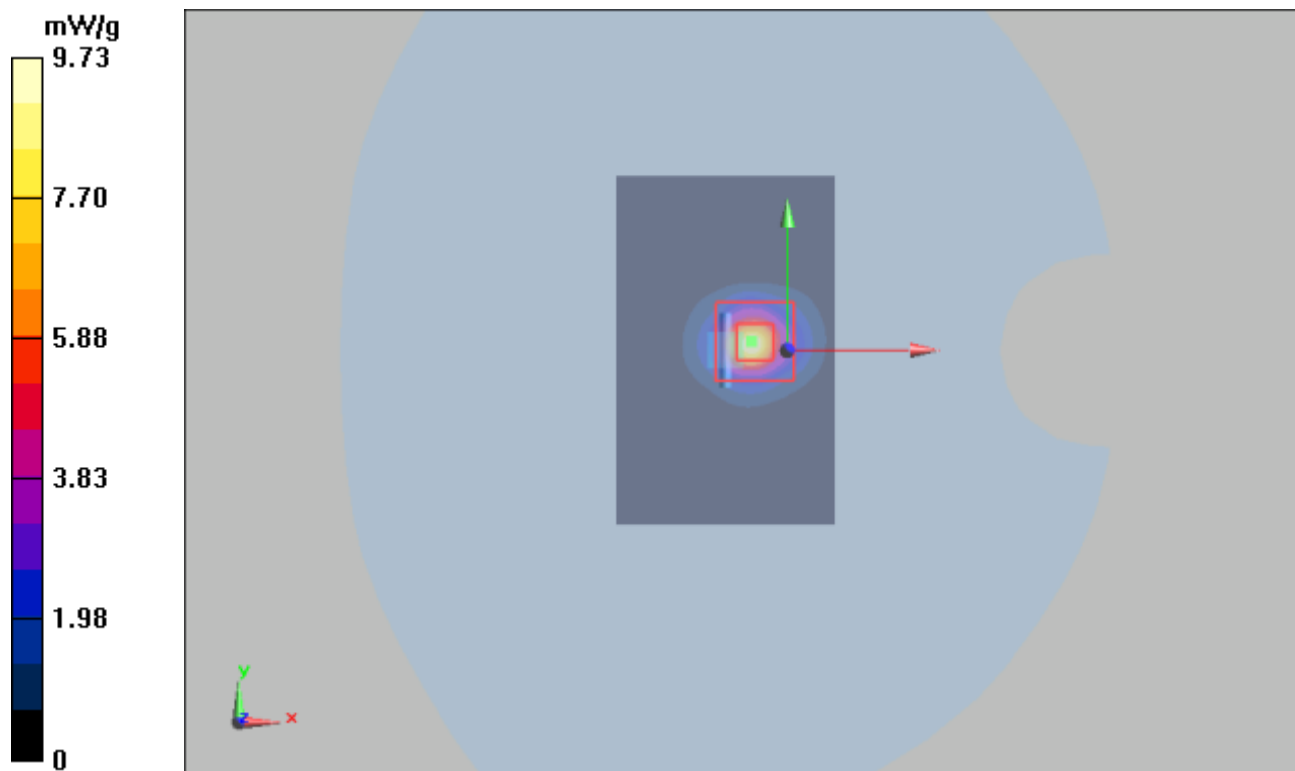
**d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=2\text{mm}$

Reference Value =  $33.6 \text{ V/m}$ ; Power Drift =  $-0.095 \text{ dB}$

Peak SAR (extrapolated) =  $52.2 \text{ W/kg}$

**SAR(1 g) =  $7.87 \text{ mW/g}$ ; SAR(10 g) =  $2.25 \text{ mW/g}$**

Maximum value of SAR (measured) =  $9.73 \text{ mW/g}$



## Plot 2 System Performance Check at 5250 MHz Body TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1151

Date: 8/9/2017

Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 5.32$  mho/m;  $\epsilon_r = 48.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.03, 5.03, 5.03); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=250mW/Area Scan (61x101x1):** Measurement grid: dx=1.000mm, dy=1.000mm

Maximum value of SAR (interpolated) = 7.69 mW/g

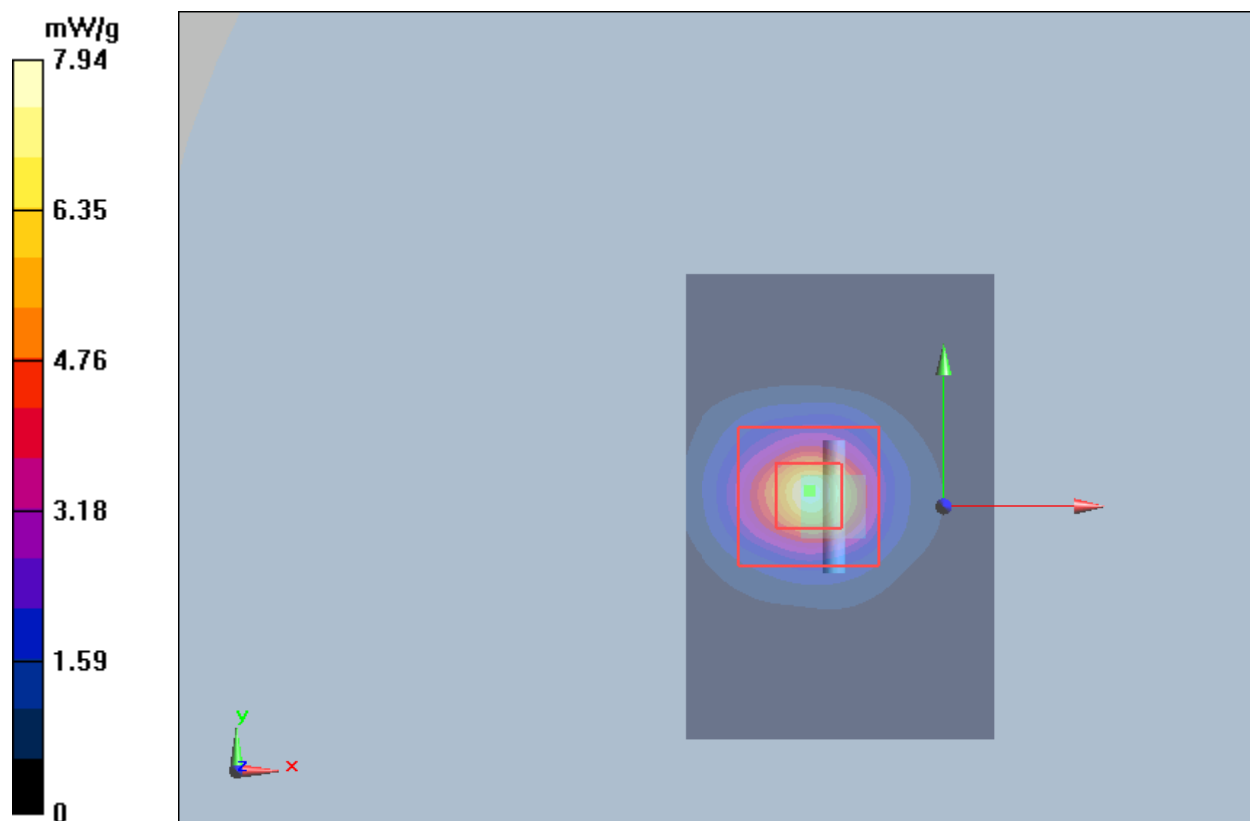
**d=10mm, Pin=250mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 36.3 V/m; Power Drift = 0.0277 dB

Peak SAR (extrapolated) = 47.7 W/kg

**SAR(1 g) = 7.46 mW/g; SAR(10 g) = 2.26 mW/g**

Maximum value of SAR (measured) = 7.94 mW/g



### Plot 3 System Performance Check at 5750 MHz Head TSL

**DUT: Dipole 5750 MHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1151**

Date: 8/25/2017

Communication System: CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5750$  MHz;  $\sigma = 5.21$  mho/m;  $\epsilon_r = 34.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.00, 5.00, 5.00); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**d=10mm, Pin=100mW/Area Scan (61x101x1):** Measurement grid: dx=1.000mm, dy=1.000mm

Maximum value of SAR (interpolated) = 8.31 mW/g

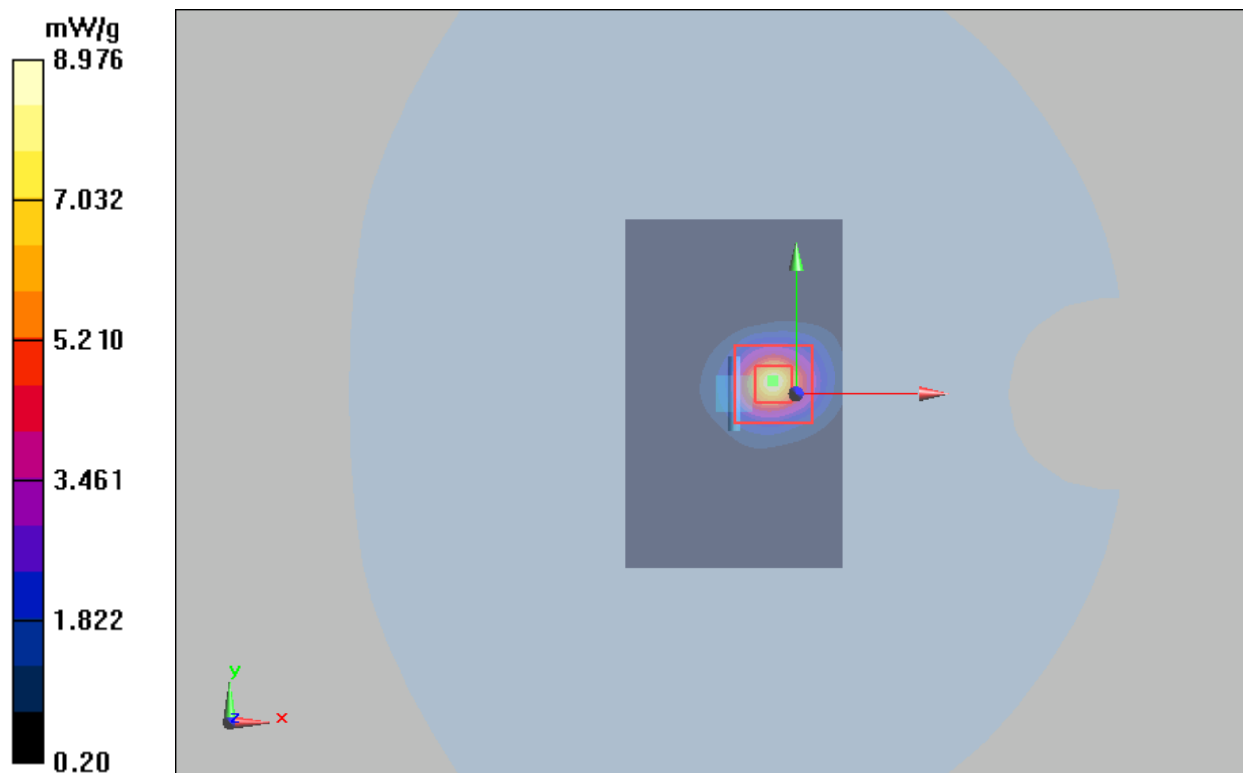
**d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 23.1 V/m; Power Drift = 0.044 dB

Peak SAR (extrapolated) = 23.4 W/kg

**SAR(1 g) = 7.66 mW/g; SAR(10 g) = 2.27 mW/g**

Maximum value of SAR (measured) = 8.976 mW/g



## ANNEX C: Highest Graph Results

### Plot 4 802.11n HT40 U-NII-2A Left Cheek CH54

Date: 8/9/2017

Communication System: UID 0, 802.11n(40M) (0); Frequency: 5270 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 5270$  MHz;  $\sigma = 4.778$  S/m;  $\epsilon_r = 35.906$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.66, 5.66, 5.66); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Left Cheek CH54/Area Scan (111x181x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.849 W/kg

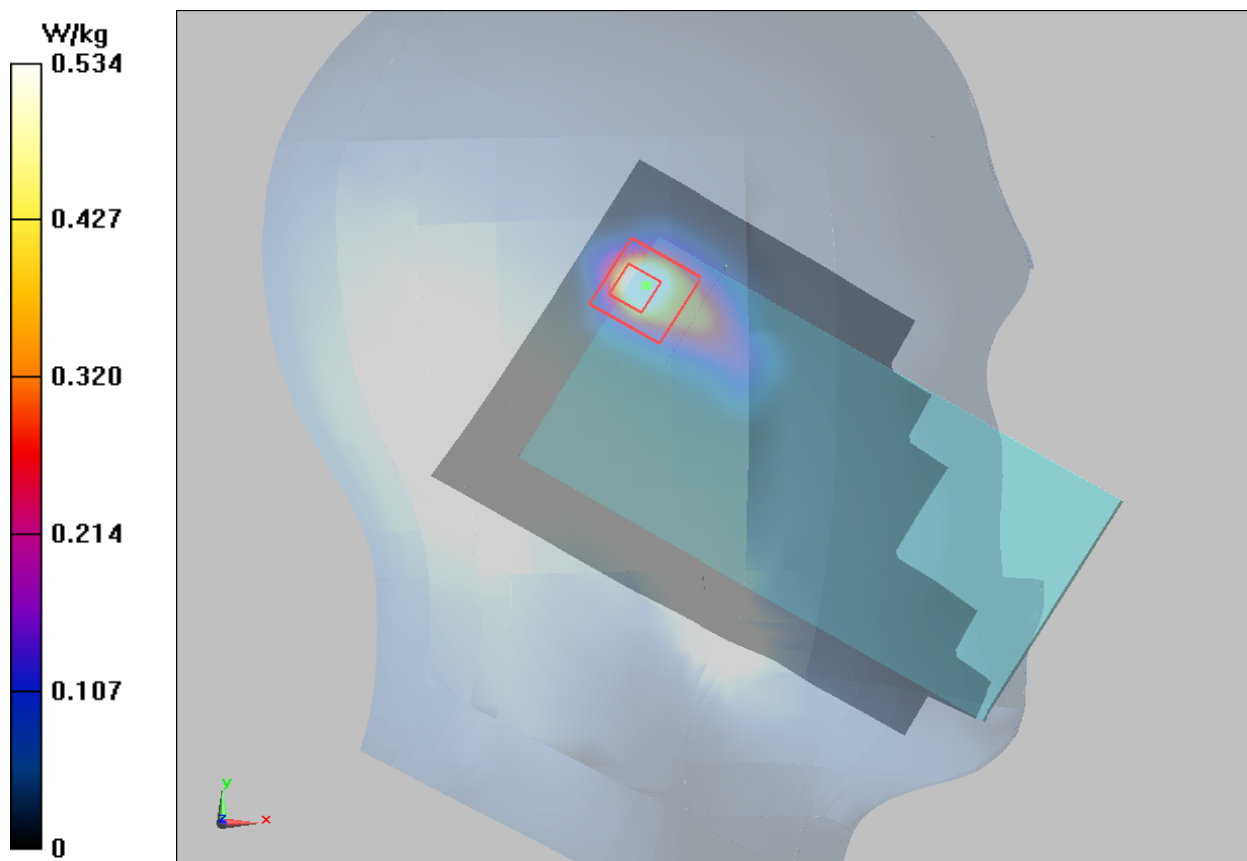
**Left Cheek CH54/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.356 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 1.50 W/kg

**SAR(1 g) = 0.511 W/kg; SAR(10 g) = 0.180 W/kg**

Maximum value of SAR (measured) = 0.534 W/kg



# Plot 5 802.11n HT40 U-NII-2A Back Side CH54 (Distance 10mm)

Date: 8/9/2017

Communication System: UID 0, 802.11n(40M) (0); Frequency: 5270 MHz;Duty Cycle: 1:1

Medium parameters used:  $f = 5270 \text{ MHz}$ ;  $\sigma = 5.45 \text{ S/m}$ ;  $\epsilon_r = 46.654$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.03, 5.03, 5.03); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Back Side CH54/Area Scan (111x181x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.269 W/kg

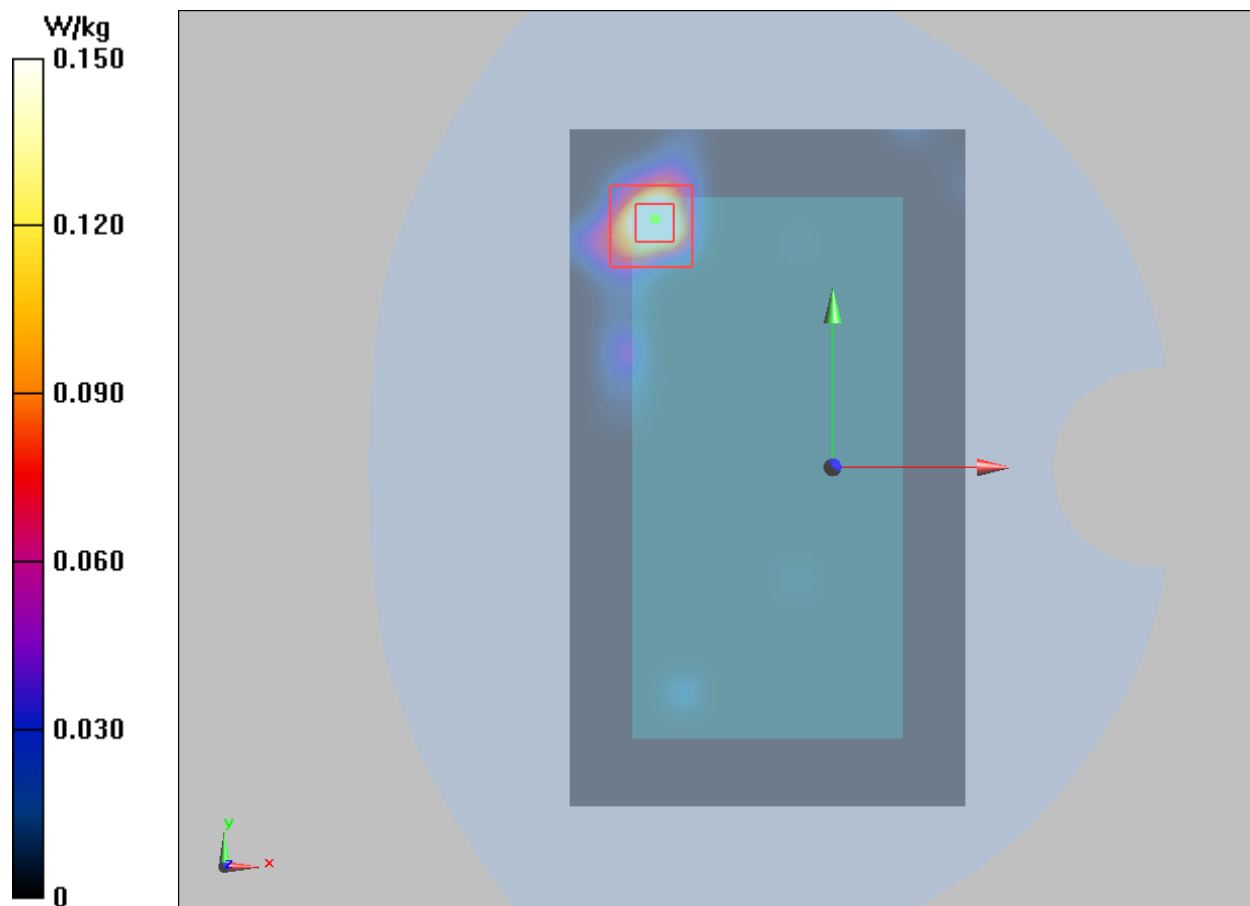
**Back Side CH54/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 3.139 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.754 W/kg

**SAR(1 g) = 0.158 W/kg; SAR(10 g) = 0.052 W/kg**

Maximum value of SAR (measured) = 0.150 W/kg



## Plot 6 802.11n HT40 U-NII-3 Left Cheek CH159

Date: 8/25/2017

Communication System: UID 0, 802.11n(40M) (0); Frequency: 5795 MHz;Duty Cycle: 1:1

Medium parameters used:  $f = 5795$  MHz;  $\sigma = 5.462$  S/m;  $\epsilon_r = 34.604$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C Liquid Temperature: 21.5°C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.00, 5.00, 5.00); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Left Cheek CH159/Area Scan (111x181x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0594 W/kg

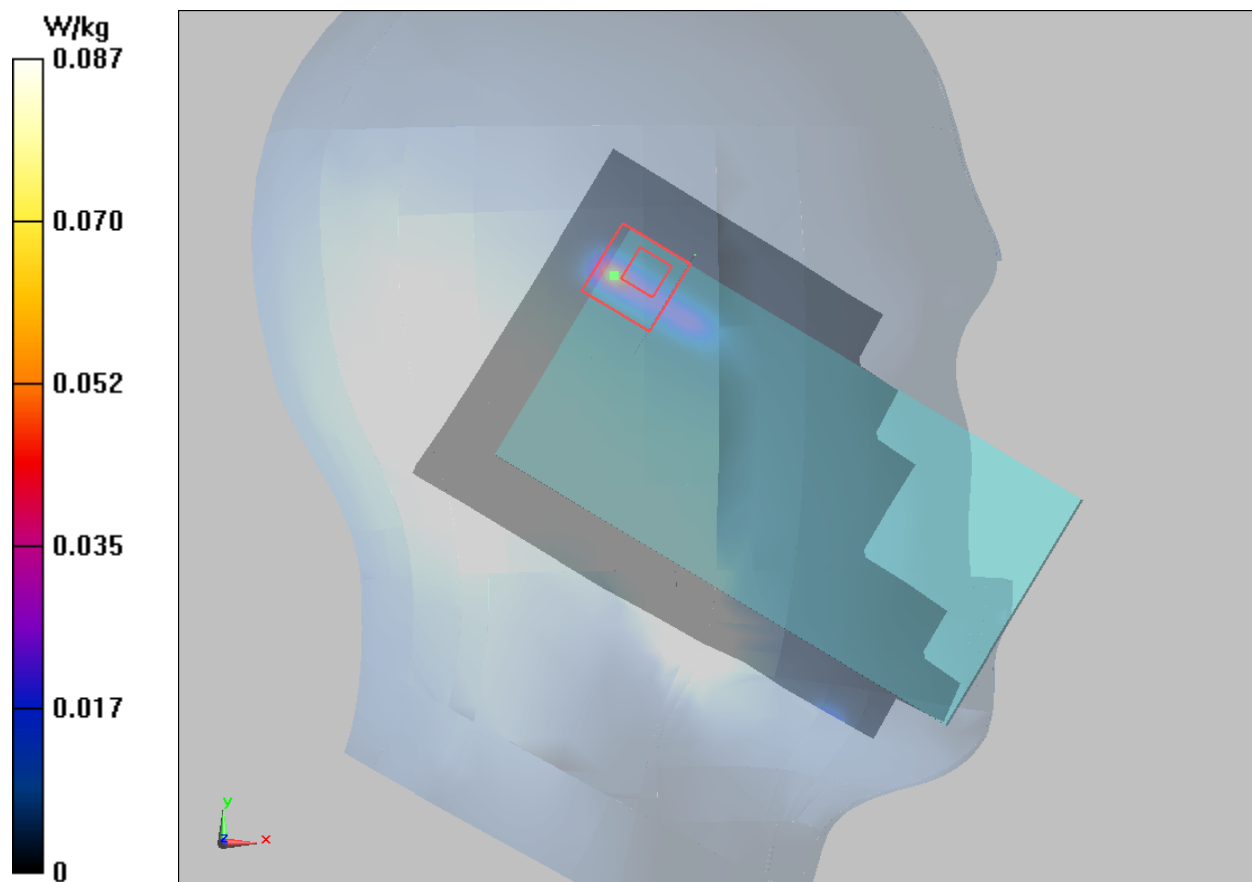
**Left Cheek CH159/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.360 W/kg

**SAR(1 g) = 0.076 W/kg; SAR(10 g) = 0.020 W/kg.**

Maximum value of SAR (measured) = 0.087W/kg





## ANNEX D: Probe Calibration Certificate



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



中国认可  
 国际互认  
 校准  
 CALIBRATION  
 CNAS L0570

Client TA(Shanghai)

Certificate No: Z17-97012

## CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3677

Calibration Procedure(s) FD-Z11-004-01  
 Calibration Procedures for Dosimetric E-field Probes

Calibration date: January 23, 2017

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&amp;TE critical for calibration)

| Primary Standards       | ID #        | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|-------------|------------------------------------------|-----------------------|
| Power Meter NRP2        | 101919      | 27-Jun-16 (CTTL, No.J16X04777)           | Jun-17                |
| Power sensor NRP-Z91    | 101547      | 27-Jun-16 (CTTL, No.J16X04777)           | Jun-17                |
| Power sensor NRP-Z91    | 101548      | 27-Jun-16 (CTTL, No.J16X04777)           | Jun-17                |
| Reference10dBAttenuator | 18N50W-10dB | 13-Mar-16(CTTL,No.J16X01547)             | Mar-18                |
| Reference20dBAttenuator | 18N50W-20dB | 13-Mar-16(CTTL, No.J16X01548)            | Mar-18                |
| Reference Probe EX3DV4  | SN 7433     | 26-Sep-16(SPEAG,No.EX3-7433_Sep16)       | Sep-17                |
| DAE4                    | SN 549      | 13-Dec-16(SPEAG, No.DAE4-549_Dec16)      | Dec -17               |
| Secondary Standards     | ID #        | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| SignalGeneratorMG3700A  | 6201052605  | 27-Jun-16 (CTTL, No.J16X04776)           | Jun-17                |
| Network Analyzer E5071C | MY46110673  | 26-Jan-16 (CTTL, No.J16X00894)           | Jan -17               |

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

Issued: January 24, 2017

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

Certificate No: Z17-97012

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E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

## 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 $\Phi$   | $\Phi$ rotation around probe axis                                                                                                           |
| Polarization $\theta$ | $\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i<br>$\theta=0$ 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 300MHz to 3GHz)", 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  $\theta=0$  ( $f \leq 900\text{MHz}$  in TEM-cell;  $f > 1800\text{MHz}$ : waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect 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 (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>; V<sub>Rx,y,z</sub>; A,B,C** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800\text{MHz}$ ) and inside waveguide using analytical field distributions based on power measurements for  $f > 800\text{MHz}$ . The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to 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  $\pm 50\text{MHz}$  to  $\pm 100\text{MHz}$ .
- 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).



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# Probe EX3DV4

## SN: 3677

Calibrated: January 23, 2017

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)



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## DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

### Basic Calibration Parameters

|                                      | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|--------------------------------------|----------|----------|----------|-----------|
| Norm( $\mu V/(V/m)^2$ ) <sup>A</sup> | 0.39     | 0.44     | 0.38     | ±10.8%    |
| DCP(mV) <sup>B</sup>                 | 97.3     | 102.2    | 101.1    |           |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A dB | B dB $\sqrt{\mu V}$ | C   | D dB | VR mV | Unc <sup>E</sup> (k=2) |
|-----|---------------------------|---|------|---------------------|-----|------|-------|------------------------|
| 0   | CW                        | X | 0.0  | 0.0                 | 1.0 | 0.00 | 180.5 | ±2.0%                  |
|     |                           | Y | 0.0  | 0.0                 | 1.0 |      | 195.3 |                        |
|     |                           | Z | 0.0  | 0.0                 | 1.0 |      | 177.9 |                        |

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<sup>2</sup>-field uncertainty inside TSL (see Page 5 and Page 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.



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China  
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E-mail: cttl@chinattl.com [Http://www.chinattl.cn](http://www.chinattl.cn)

## DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

### 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) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 9.58    | 9.58    | 9.58    | 0.30               | 0.75                    | ±12%        |
| 835                  | 41.5                               | 0.90                            | 9.31    | 9.31    | 9.31    | 0.11               | 1.55                    | ±12%        |
| 1750                 | 40.1                               | 1.37                            | 8.60    | 8.60    | 8.60    | 0.24               | 1.07                    | ±12%        |
| 1900                 | 40.0                               | 1.40                            | 8.39    | 8.39    | 8.39    | 0.23               | 1.10                    | ±12%        |
| 2300                 | 39.5                               | 1.67                            | 8.13    | 8.13    | 8.13    | 0.53               | 0.74                    | ±12%        |
| 2450                 | 39.2                               | 1.80                            | 7.90    | 7.90    | 7.90    | 0.61               | 0.71                    | ±12%        |
| 2600                 | 39.0                               | 1.96                            | 7.64    | 7.64    | 7.64    | 0.68               | 0.68                    | ±12%        |
| 5250                 | 35.9                               | 4.71                            | 5.66    | 5.66    | 5.66    | 0.40               | 1.20                    | ±13%        |
| 5600                 | 35.5                               | 5.07                            | 4.99    | 4.99    | 4.99    | 0.40               | 1.40                    | ±13%        |
| 5750                 | 35.4                               | 5.22                            | 5.00    | 5.00    | 5.00    | 0.40               | 1.40                    | ±13%        |

<sup>C</sup> Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. 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 frequency 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



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## DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

### 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) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 55.5                               | 0.96                            | 9.99    | 9.99    | 9.99    | 0.30               | 0.95                    | ±12%        |
| 835                  | 55.2                               | 0.97                            | 9.74    | 9.74    | 9.74    | 0.14               | 1.66                    | ±12%        |
| 1750                 | 53.4                               | 1.49                            | 8.39    | 8.39    | 8.39    | 0.21               | 1.16                    | ±12%        |
| 1900                 | 53.3                               | 1.52                            | 7.98    | 7.98    | 7.98    | 0.22               | 1.24                    | ±12%        |
| 2300                 | 52.9                               | 1.81                            | 7.97    | 7.97    | 7.97    | 0.55               | 0.80                    | ±12%        |
| 2450                 | 52.7                               | 1.95                            | 7.85    | 7.85    | 7.85    | 0.50               | 0.86                    | ±12%        |
| 2600                 | 52.5                               | 2.16                            | 7.63    | 7.63    | 7.63    | 0.44               | 0.91                    | ±12%        |
| 5250                 | 48.9                               | 5.36                            | 5.03    | 5.03    | 5.03    | 0.50               | 1.60                    | ±13%        |
| 5600                 | 48.5                               | 5.77                            | 4.34    | 4.34    | 4.34    | 0.54               | 1.66                    | ±13%        |
| 5750                 | 48.3                               | 5.94                            | 4.52    | 4.52    | 4.52    | 0.57               | 1.95                    | ±13%        |

<sup>C</sup> Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. 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 frequency 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.

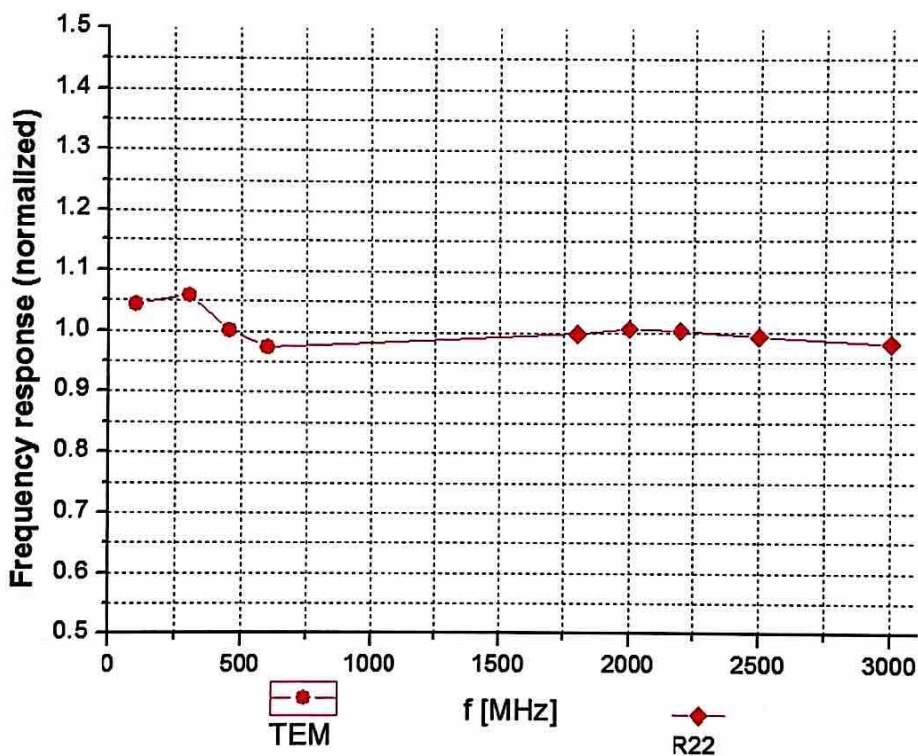
<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip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



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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209  
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## Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field:  $\pm 7.5\%$  ( $k=2$ )

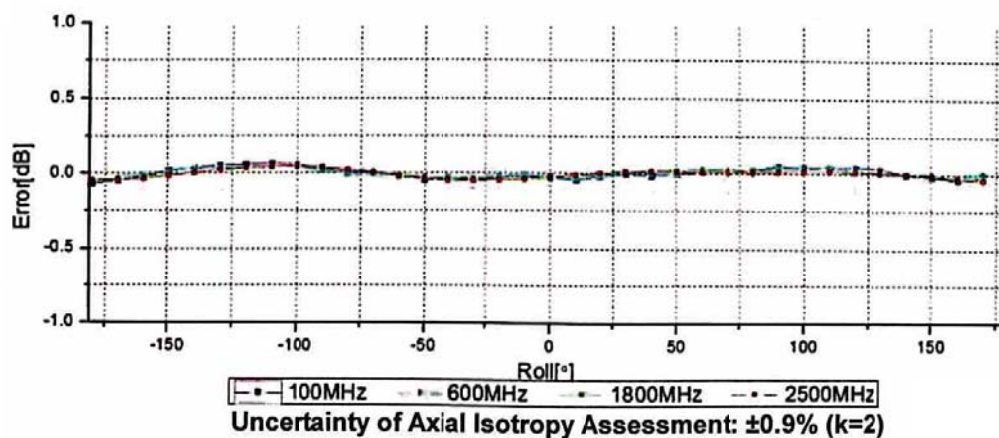
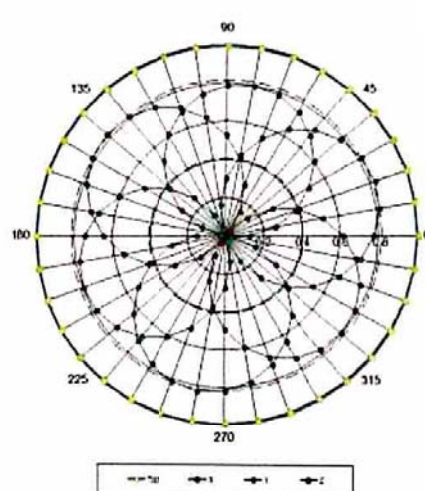
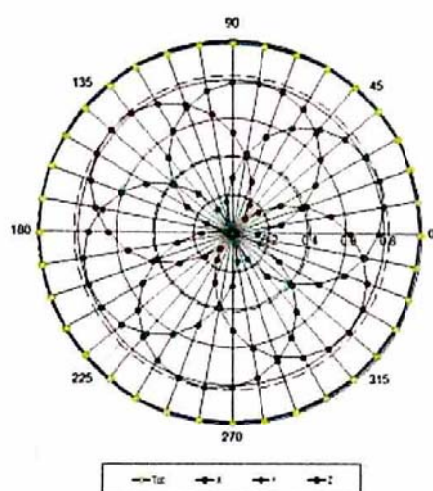


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## Receiving Pattern ( $\Phi$ ), $\theta=0^\circ$

**f=600 MHz, TEM**

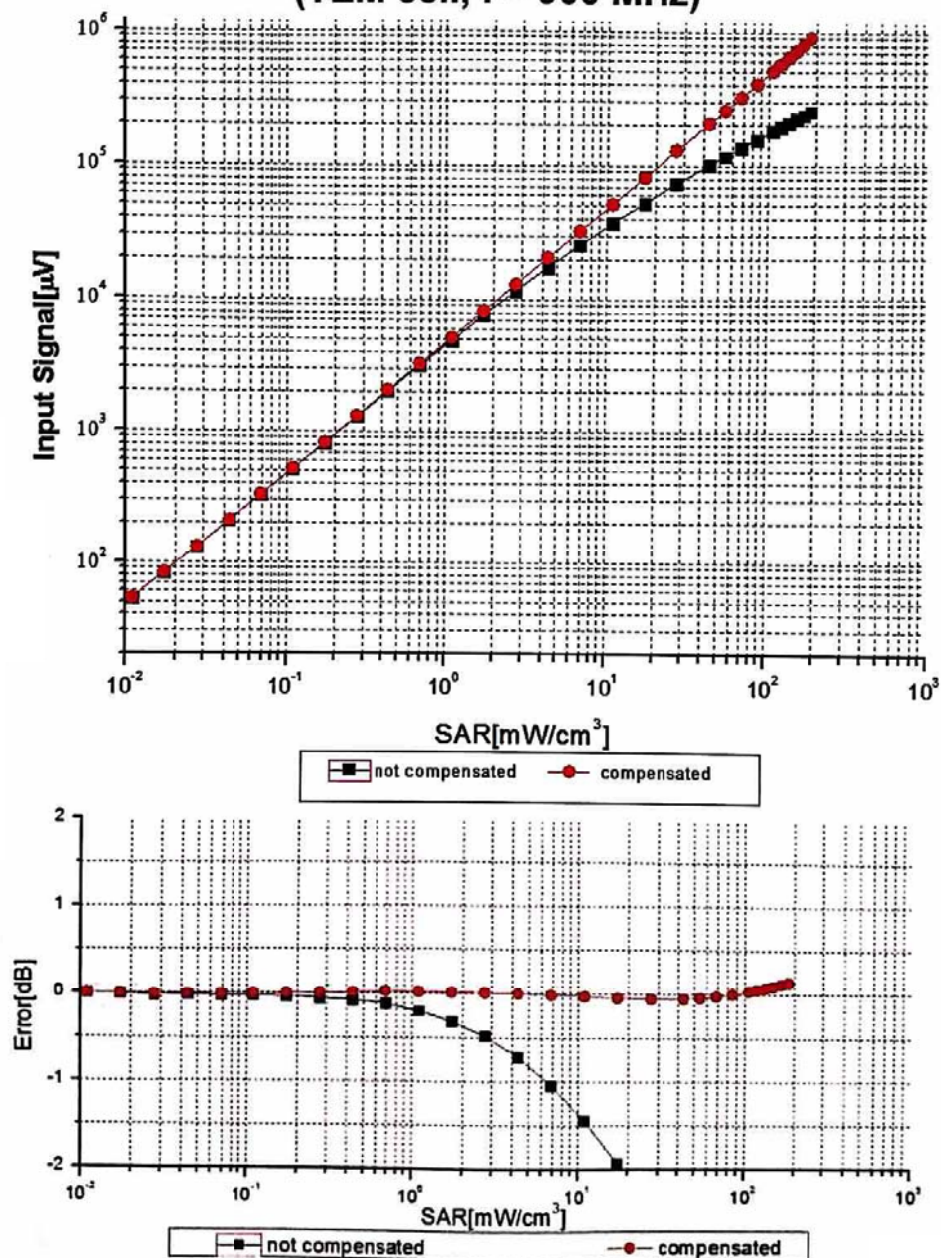
**f=1800 MHz, R22**





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### Dynamic Range f(SAR<sub>head</sub>) (TEM cell, f = 900 MHz)



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

Certificate No: Z17-97012

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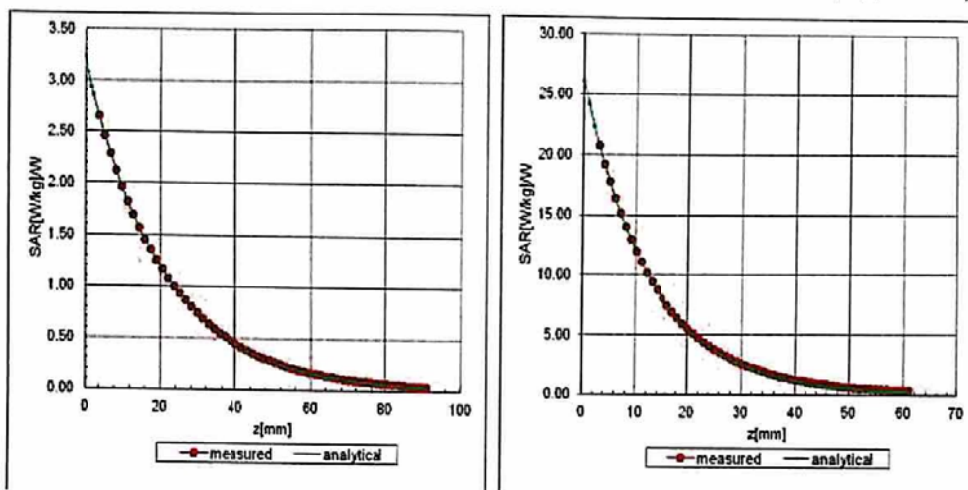


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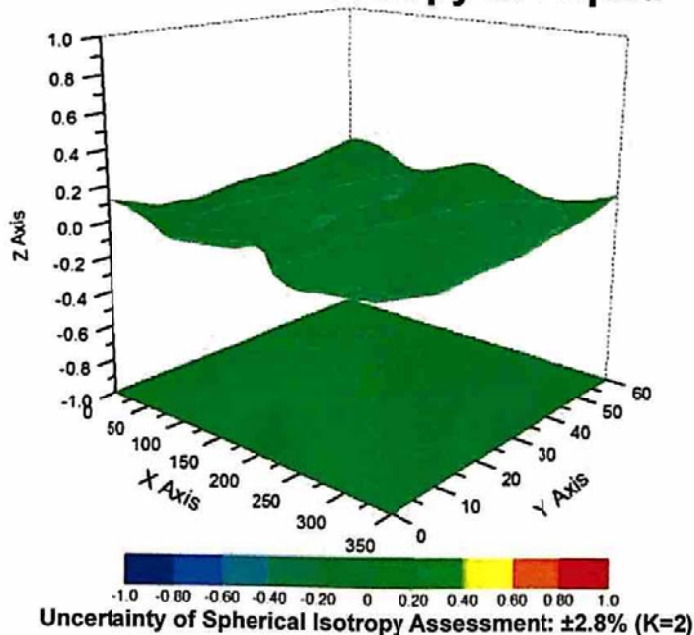
## Conversion Factor Assessment

f=835 MHz, WGLS R9(H\_convF)

f=1750 MHz, WGLS R22(H\_convF)



## Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.8\%$  (K=2)