

#2

Date: 3/27/2016

GSM850_GPRS(2 Tx slots)_Back_1cm_Ch128

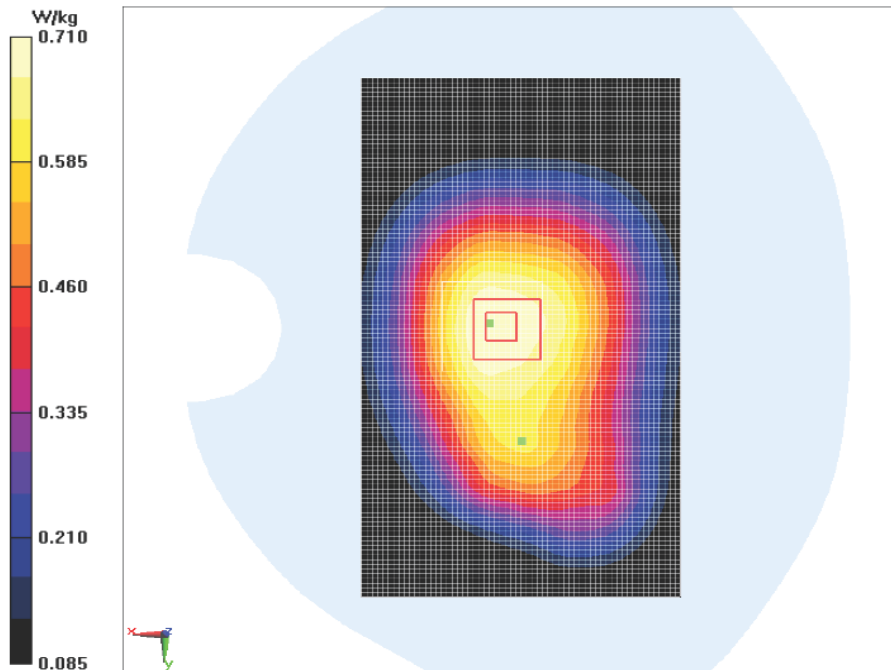
Communication System: GPRS850; Frequency: 824.2 MHz; Duty Cycle: 1:4
Medium parameters used: $f = 824.2$ MHz; $\sigma = 0.99$ mho/m; $\epsilon_r = 56.4$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(9.18, 9.18, 9.18); Calibrated: 8/26/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 7/16/2015
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY5, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Back/Area Scan (61x111x1): Interpolated grid: $dx=1.0$ mm, $dy=1.0$ mm
Maximum value of SAR (interpolated) = 0.729 mW/g

Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm
Reference Value = 27.354 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.902 W/kg
SAR(1 g) = 0.671 mW/g; SAR(10 g) = 0.511 mW/g
Maximum value of SAR (measured) = 0.718 mW/g



#3

Date: 3/26/2016

GSM1900_GSM Voice_Left Cheek_Ch661

Communication System: GSM1900; Frequency: 1880.0 MHz; Duty Cycle: 1:8

Medium parameters used (interpolated): $f = 1880.0$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 40.3$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(7.54, 7.54, 7.54); Calibrated: 8/26/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 7/16/2015
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY5, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Left Cheek/Area Scan (121x61x1): Interpolated grid: $dx=1.0$ mm, $dy=1.0$ mm

Maximum value of SAR (interpolated) = 0.167 mW/g

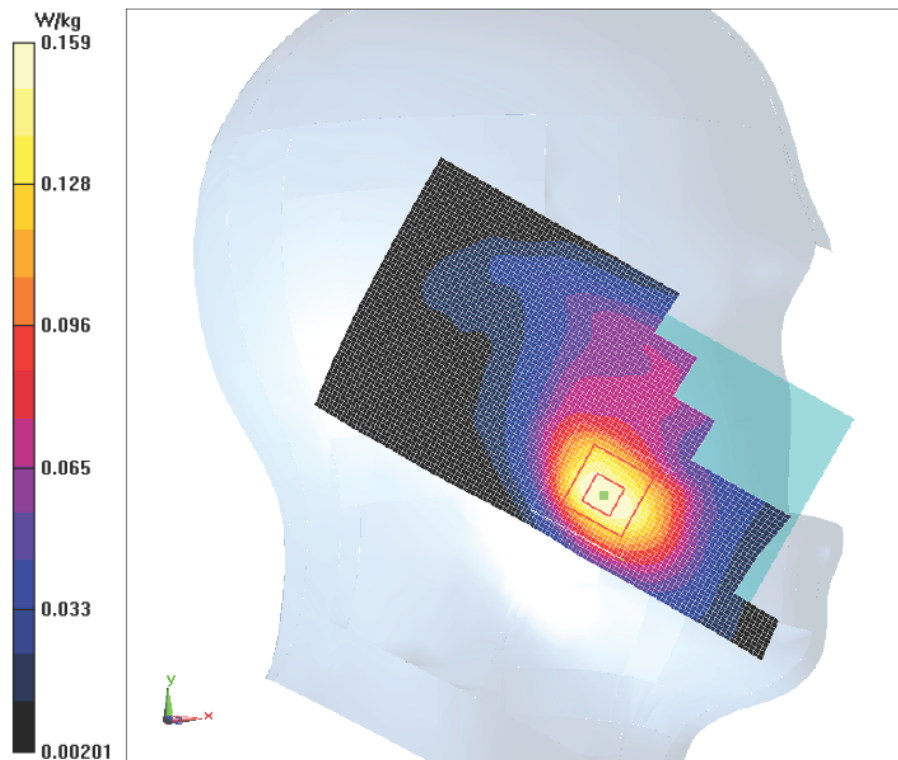
Left Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 3.154 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.219 W/kg

SAR(1 g) = 0.151 mW/g; SAR(10 g) = 0.089 mW/g

Maximum value of SAR (measured) = 0.161 mW/g



#4

Date: 3/28/2016

GSM1900_GPRS(4 Tx slots)_Back_1cm_Ch512

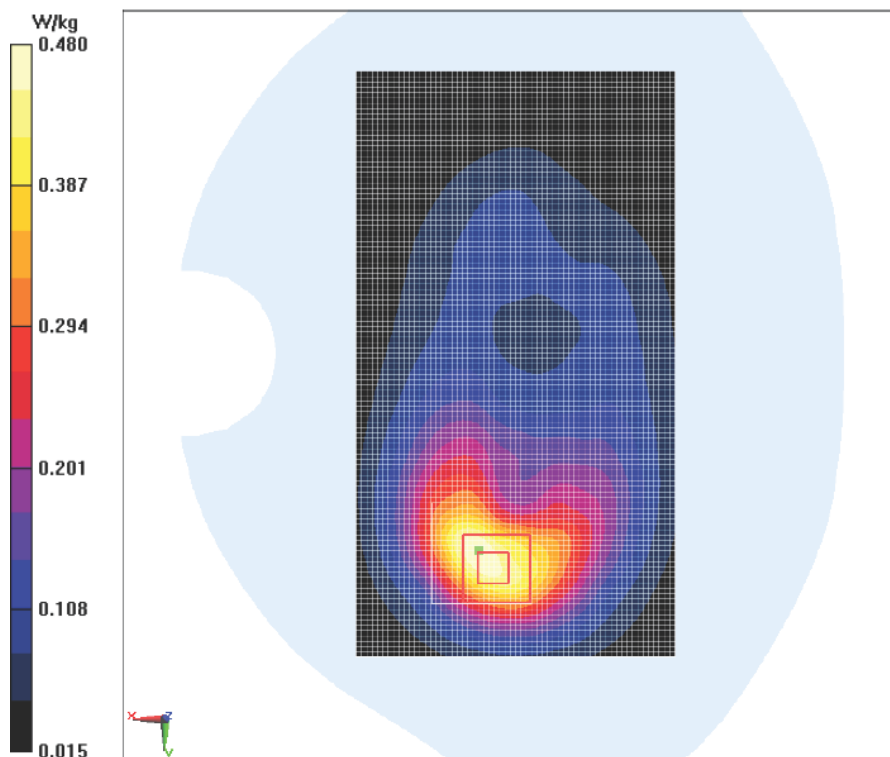
Communication System: GPRS1900; Frequency: 1850.2 MHz; Duty Cycle: 1:2
Medium parameters used: $f = 1850.0$ MHz; $\sigma = 1.51$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(7.29, 7.29, 7.29); Calibrated: 8/26/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 7/16/2015
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY5, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Back/Area Scan (61x111x1): Interpolated grid: $dx=1.0$ mm, $dy=1.0$ mm
Maximum value of SAR (interpolated) = 0.485 mW/g

Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm
Reference Value = 7.487 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.704 W/kg
SAR(1 g) = 0.451 mW/g; SAR(10 g) = 0.269 mW/g
Maximum value of SAR (measured) = 0.479 mW/g



#5

Date: 3/26/2016

WCDMA V_RMC 12.2K_ Left Cheek_Ch4132

Communication System: W850; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.0$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 40.2$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(9.04, 9.04, 9.04); Calibrated: 8/26/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 7/16/2015
- Phantom: SAM 1; Type: SAM; Serial: TP-1432
- Measurement SW: DASY5, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Left Cheek 2/Area Scan (121x71x1): Interpolated grid: $dx=1.0$ mm, $dy=1.0$ mm

Maximum value of SAR (interpolated) = 0.386 mW/g

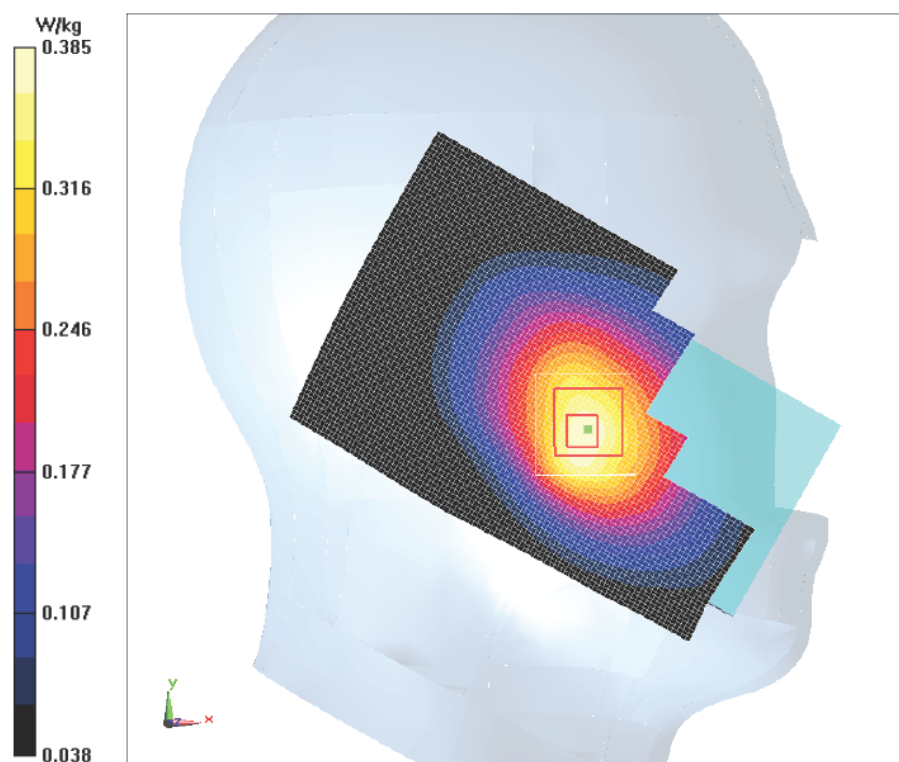
Left Cheek 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 6.656 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.475W/kg

SAR(1 g) = 0.361 mW/g; SAR(10 g) = 0.269 mW/g

Maximum value of SAR (measured) = 0.381 mW/g



#6

Date: 3/28/2016

WCDMA V_RMC 12.2K_Back_1cm_Ch4132

Communication System: W850; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 826.0$ MHz; $\sigma = 0.97$ mho/m; $\epsilon_r = 56.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(9.18, 9.18, 9.18); Calibrated: 8/26/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 7/16/2015
- Phantom: SAM 2; Type: SAM; Serial: TP-1432
- Measurement SW: DASY5, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Back /Area Scan (61x111x1): Interpolated grid: dx=1.0mm, dy=1.0mm

Maximum value of SAR (interpolated) = 0.87 mW/g

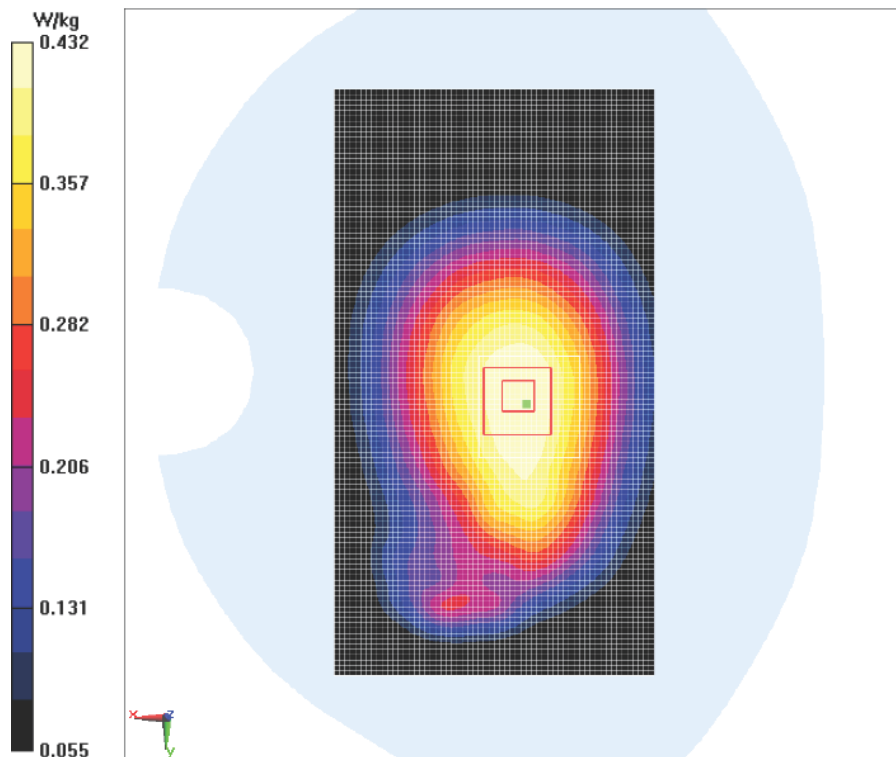
Back /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 20.853 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.518 W/kg

SAR(1 g) = 0.409 mW/g; SAR(10 g) = 0.308 mW/g

Maximum value of SAR (measured) = 0.428 mW/g



#7

Date: 3/26/2016

WCDMA II_RMC 12.2K_Left Cheek_Ch9262

Communication System: W1900; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1852.0$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(7.54, 7.54, 7.54); Calibrated: 8/26/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 7/16/2015
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY5, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Left Cheek/Area Scan (121x71x1): Interpolated grid: $dx=1.0$ mm, $dy=1.0$ mm

Maximum value of SAR (interpolated) = 0.205 mW/g

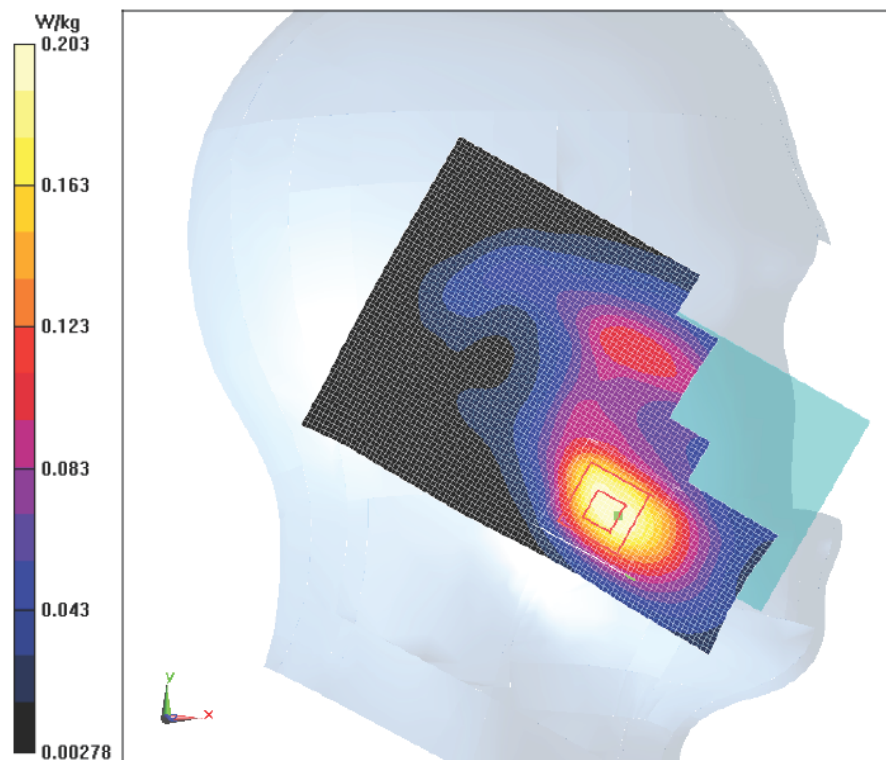
Left Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 4.959 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.307 W/kg

SAR(1 g) = 0.188 mW/g; SAR(10 g) = 0.108 mW/g

Maximum value of SAR (measured) = 0.201mW/g



#8

Date: 3/28/2016

WCDMA II_RMC 12.2K _Back_1cm_Ch9262

Communication System: W1900; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1852.0$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(7.29, 7.29, 7.29); Calibrated: 8/26/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 7/16/2015
- Phantom: SAM 1; Type: SAM; Serial: TP-1360
- Measurement SW: DASY5, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Back/Area Scan (61x111x1): Interpolated grid: $dx=1.0$ mm, $dy=1.0$ mm

Maximum value of SAR (interpolated) = 0.546 mW/g

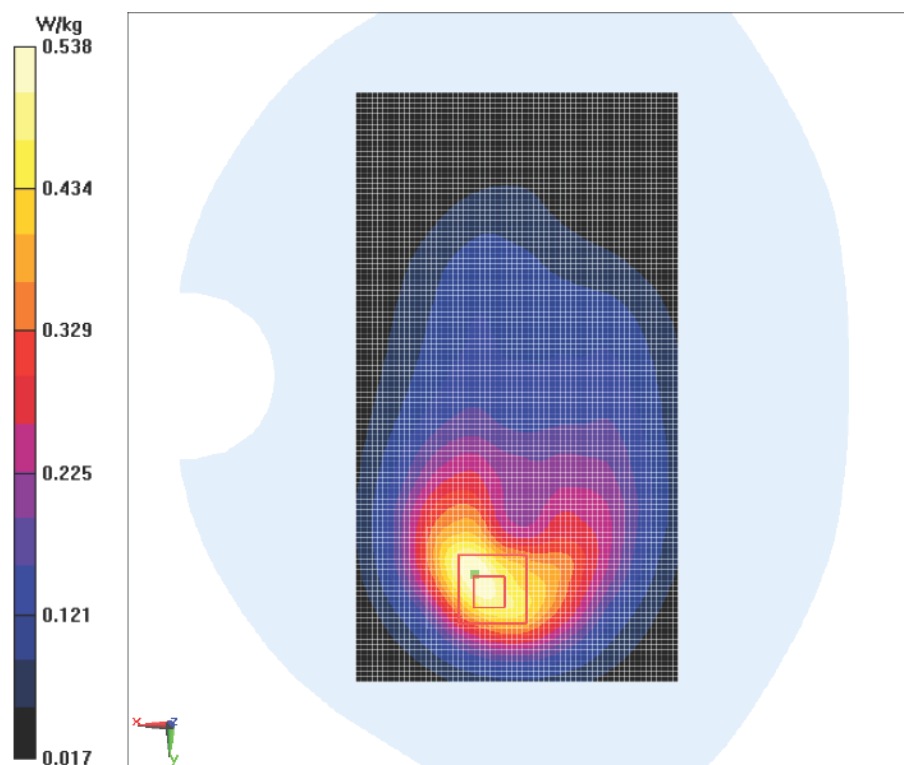
Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 9.921 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.783 W/kg

SAR(1 g) = 0.501 mW/g; SAR(10 g) = 0.301 mW/g

Maximum value of SAR (measured) = 0.532 mW/g.



6. Calibration Certificate

6.1. Probe Calibration Certificate

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 41, 8004 Zurich, Switzerland



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

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

Accreditation No.: **SCS 0108**

Client **CIQ (Shenzhen)**

Certificate No: **EX3-3842_Aug15**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3842**

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

Calibration date: **August 26, 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&PE 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: 55054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: 55277 (20a)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: 55129 (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: August 27, 2015

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

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

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.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_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f < 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: 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_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: 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_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 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_x (no uncertainty required).

EX3DV4 – SN:3842

August 26, 2015

Probe EX3DV4

SN:3842

Manufactured: October 25, 2011
Calibrated: August 26, 2015

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

EX3DV4- SN:3842

August 26, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^2$) ^A	0.34	0.53	0.42	$\pm 10.1 \%$
DCP (mV) ^B	101.6	99.9	99.5	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	152.0	$\pm 3.0 \%$
		Y	0.0	0.0	1.0		143.5	
		Z	0.0	0.0	1.0		147.4	

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

^A The uncertainties of Norm X,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

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

EX3DV4- SN:3842

August 26, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
450	43.5	0.94	10.24	10.24	10.24	0.18	1.20	± 13.3 %
750	41.9	0.89	9.45	9.45	9.45	0.34	0.93	± 12.0 %
835	41.5	0.90	9.04	9.04	9.04	0.18	1.60	± 12.0 %
900	41.5	0.97	8.92	8.92	8.92	0.22	1.45	± 12.0 %
1750	40.1	1.37	7.80	7.80	7.80	0.35	0.80	± 12.0 %
1900	40.0	1.40	7.54	7.54	7.54	0.29	0.80	± 12.0 %
2450	39.2	1.80	6.82	6.82	6.82	0.35	0.86	± 12.0 %
2600	39.0	1.96	6.74	6.74	6.74	0.37	0.92	± 12.0 %

^C 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 $\pm 10, 25, 40, 50$ 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.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to $\pm 10\%$ if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to $\pm 5\%$. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

EX3DV4- SN:3842

August 26, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
450	56.7	0.94	10.28	10.28	10.28	0.10	1.20	± 13.3 %
750	55.5	0.96	9.38	9.38	9.38	0.35	1.02	± 12.0 %
835	55.2	0.97	9.18	9.18	9.18	0.27	1.22	± 12.0 %
900	55.0	1.05	9.11	9.11	9.11	0.26	1.17	± 12.0 %
1750	53.4	1.49	7.46	7.46	7.46	0.35	0.80	± 12.0 %
1900	53.3	1.52	7.29	7.29	7.29	0.40	0.86	± 12.0 %
2450	52.7	1.95	6.87	6.87	6.87	0.34	0.80	± 12.0 %
2600	52.5	2.16	6.76	6.76	6.76	0.32	0.80	± 12.0 %

^C 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.

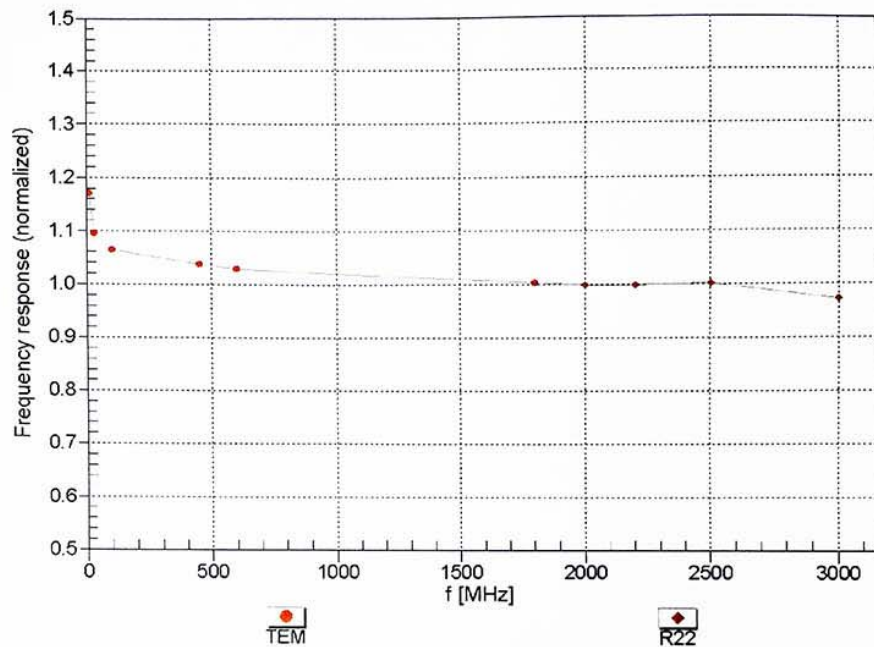
^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

EX3DV4- SN:3842

August 26, 2015

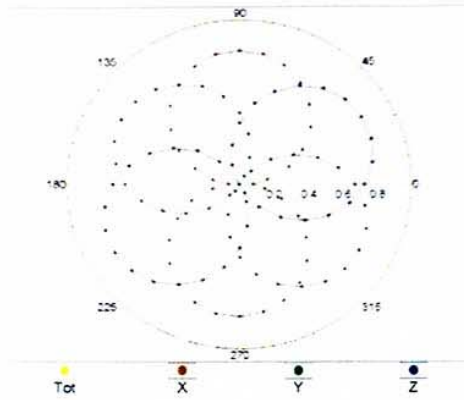
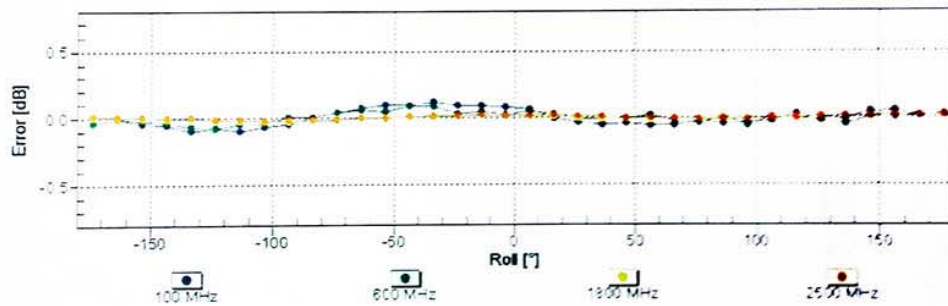
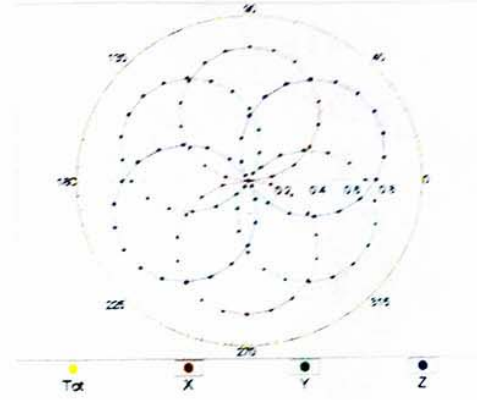
Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



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

EX3DV4- SN 3842

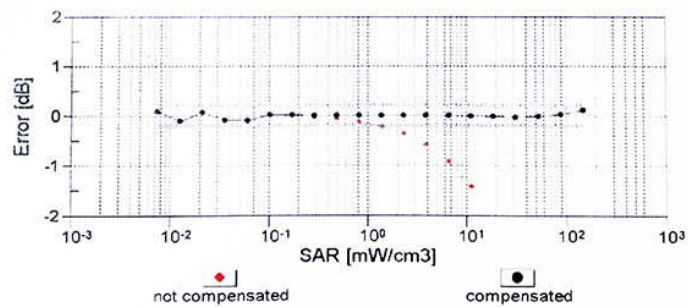
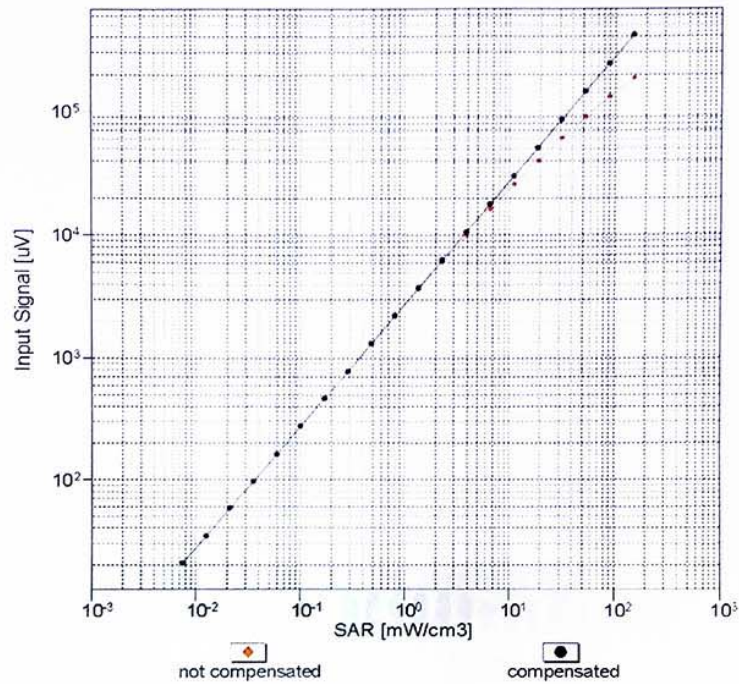
10/28/2015 2:25:15

Receiving Pattern (ϕ), $\theta = 0^\circ$ **f=600 MHz,TEM****f=1800 MHz,R22**Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

EX3DV4- SN:3842

August 26, 2015

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

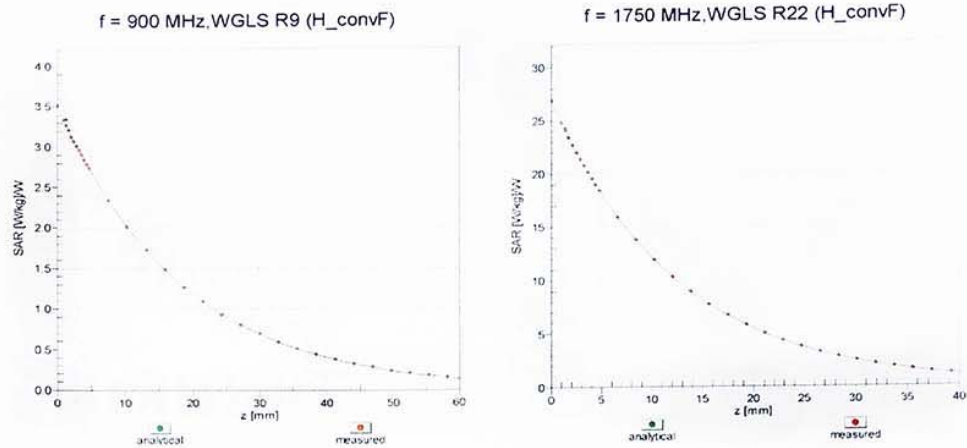


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

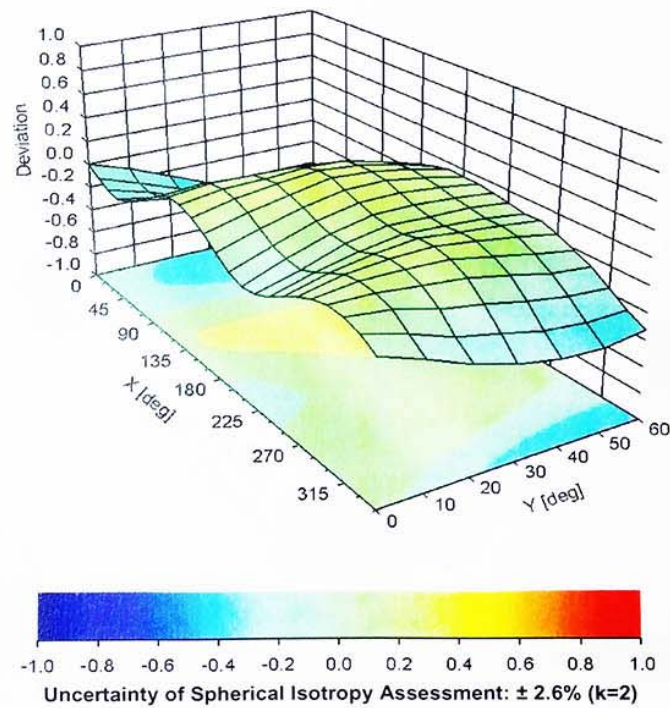
EX3DV4- SN:3842

August 26, 2015

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$ 

EX3DV4- SN:3842

August 26, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	66.3
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

6.2. D835V2 Dipole Calibration Certificate



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CALIBRATION
No. L0570

Client

SMQ

Certificate No: Z15-97116

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d141

Calibration Procedure(s) FD-Z11-2-003-01
Calibration Procedures for dipole validation kits

Calibration date: September 24, 2015

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

All calibrations have been conducted in the closed laboratory facility; environment temperature(22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101547	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Reference Probe EX3DV4	SN 3846	24-Sep-14(SPEAG, No.EX3-3846_Sep14)	Sep-15
DAE4	SN 910	16-Jun-15(SPEAG, No.DAE4-910_Jun15)	Jun-16
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	02-Feb-15 (CTTL, No.J15X00729)	Feb-16
Network Analyzer E5071C	MY46110673	03-Feb-15 (CTTL, No.J15X00728)	Feb-16

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: September 29, 2015

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



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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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



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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.0 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.33 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.45 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.51 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.11 mW / g $\pm$ 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	56.0 $\pm$ 6 %	0.98 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.39 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.51 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.57 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.25 mW / g $\pm$ 20.4 % (k=2)



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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.2Ω- 4.66jΩ
Return Loss	- 25.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.7Ω- 5.94jΩ
Return Loss	- 22.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.441 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
 No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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DASY5 Validation Report for Head TSL

Date: 09.18.2015

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d141

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835$ MHz; $\sigma = 0.886$ S/m; $\epsilon_r = 41.95$; $\rho = 1000$ kg/m³

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.18, 9.18, 9.18); Calibrated: 9/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/16/2015
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

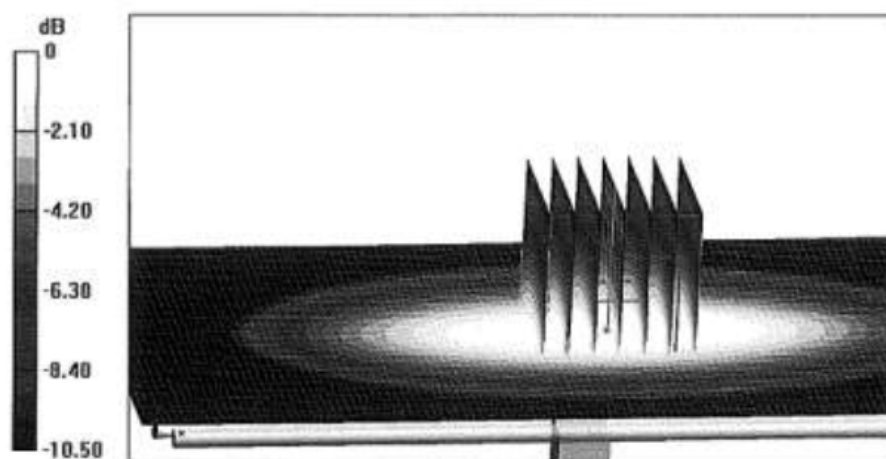
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.07 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.33 W/kg; SAR(10 g) = 1.51 W/kg

Maximum value of SAR (measured) = 2.95 W/kg



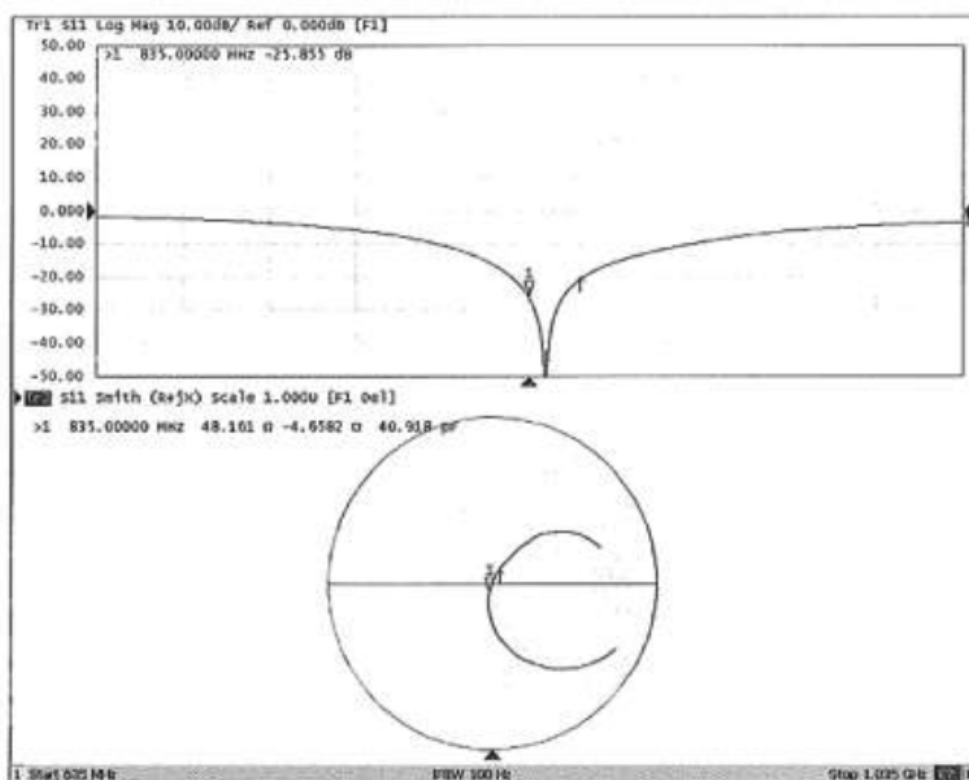
0 dB = 2.95 W/kg = 4.70 dBW/kg



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Impedance Measurement Plot for Head TSL





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DASY5 Validation Report for Body TSL

Date: 09.18.2015

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d141

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835$ MHz; $\sigma = 0.981$ S/m; $\epsilon_r = 55.99$; $\rho = 1000$ kg/m³

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(9.09,9.09, 9.09); Calibrated: 9/24/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/16/2015
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.07 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 3.04 W/kg

