Deutscher Akkreditierungs Rat

DAT-P-152/98-01

Appendix for the Report

Dosimetric Assessment of the Portable Device SiTel Semiconductors BV SC14CVMDECT (FCC ID: Y82-SC14A)

According to the FCC Requirements Calibration Data

March 17, 2011

IMST GmbH
Carl-Friedrich-Gauß-Str. 2
D-47475 Kamp-Lintfort

Customer

SiTel Semiconductors BV
Het Zuiderkruis 53
NL-5215 MV ´s-Hertogenbosch
The Netherlands

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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

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

Accreditation No.: SCS 108

Client IMST

Certificate No: ET3-1669_Feb11

CALIBRATION CERTIFICATE

Object	ET3DV6R - SN:1669
Calibration procedure(s)	QA CAL-01.v7, QA CAL-12.v6, QA CAL-23.v4, QA CAL-25.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	February 21, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: February 22, 2011

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 108**

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
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization ω	ω 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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,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*.
- *DCPx,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
- *Ax,y,z; Bx,y,z; Cx,y,z* are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- *VR:* VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- *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 *NORMx,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.

Probe ET3DV6R

SN:1669

Manufactured: February 8, 2002
Calibrated: February 21, 2011

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

DASY/EASY - Parameters of Probe: ET3DV6R - SN:1669

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.76	1.95	1.80	± 10.1 %
DCP (mV)[B]	97.6	98.3	97.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	145.7	±3.5 %
			Y	0.00	0.00	1.00	148.4	
			Z	0.00	0.00	1.00	142.7	

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 NormX,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.

DASY/EASY - Parameters of Probe: ET3DV6R - SN:1669

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	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.24	7.24	7.24	0.19	2.22	± 13.4 %
750	41.9	0.89	6.67	6.67	6.67	0.82	1.72	± 12.0 %
900	41.5	0.97	6.23	6.23	6.23	0.70	1.91	± 12.0 %
1750	40.1	1.37	5.34	5.34	5.34	0.56	2.35	± 12.0 %
1900	40.0	1.40	5.12	5.12	5.12	0.56	2.36	± 12.0 %
1950	40.0	1.40	4.94	4.94	4.94	0.57	2.28	± 12.0 %

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

DASY/EASY - Parameters of Probe: ET3DV6R- SN:1669

Calibration Parameter Determined in Body Tissue Simulating Media

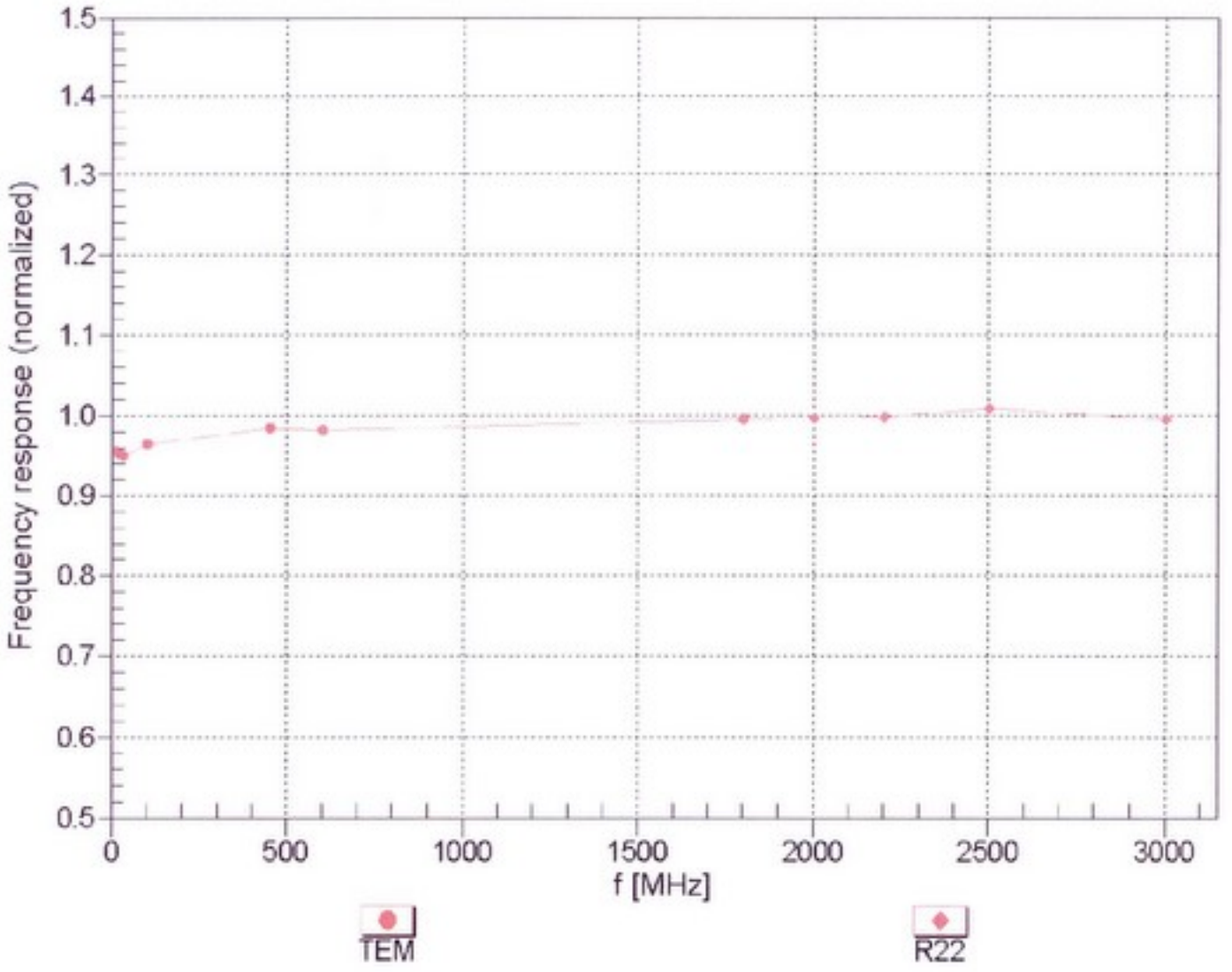
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.53	7.53	7.53	0.14	2.31	± 13.4 %
750	55.5	0.96	6.32	6.32	6.32	0.81	1.79	± 12.0 %
900	55.0	1.05	6.15	6.15	6.15	0.70	1.98	± 12.0 %
1750	53.4	1.49	4.75	4.75	4.75	0.60	2.86	± 12.0 %
1900	53.3	1.52	4.54	4.54	4.54	0.58	2.75	± 12.0 %
1950	53.3	1.52	4.63	4.63	4.63	0.58	2.77	± 12.0 %

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

[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.

Frequency Response of E-Field

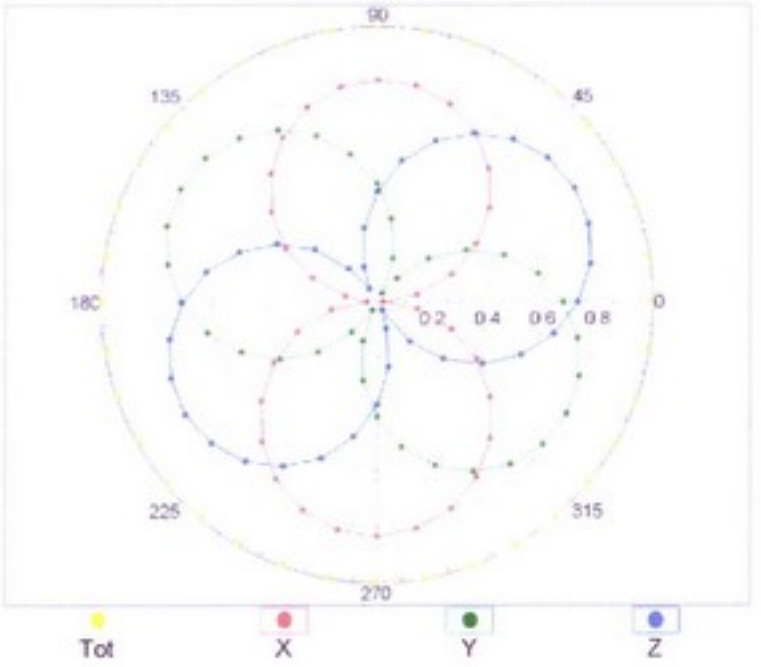
(TEM-Cell:ifi110 EXX, Waveguide: R22)



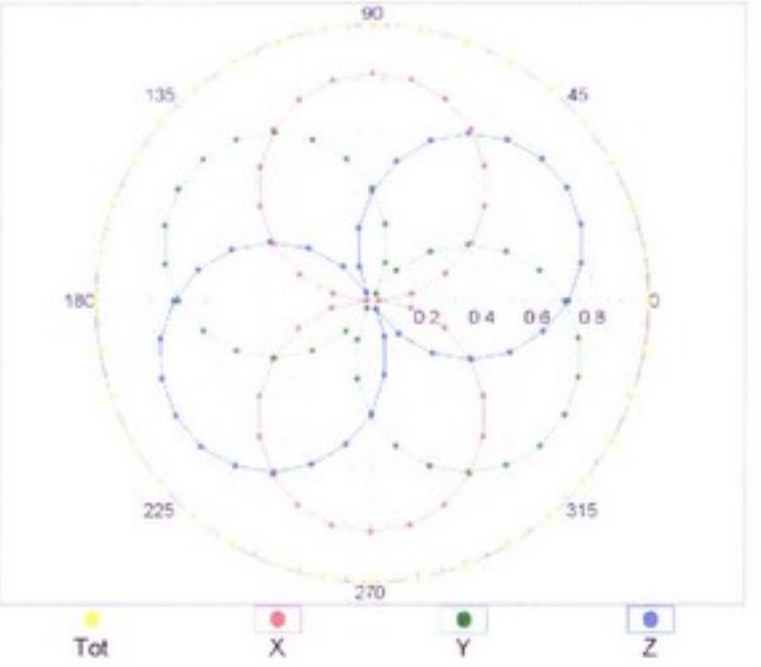
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

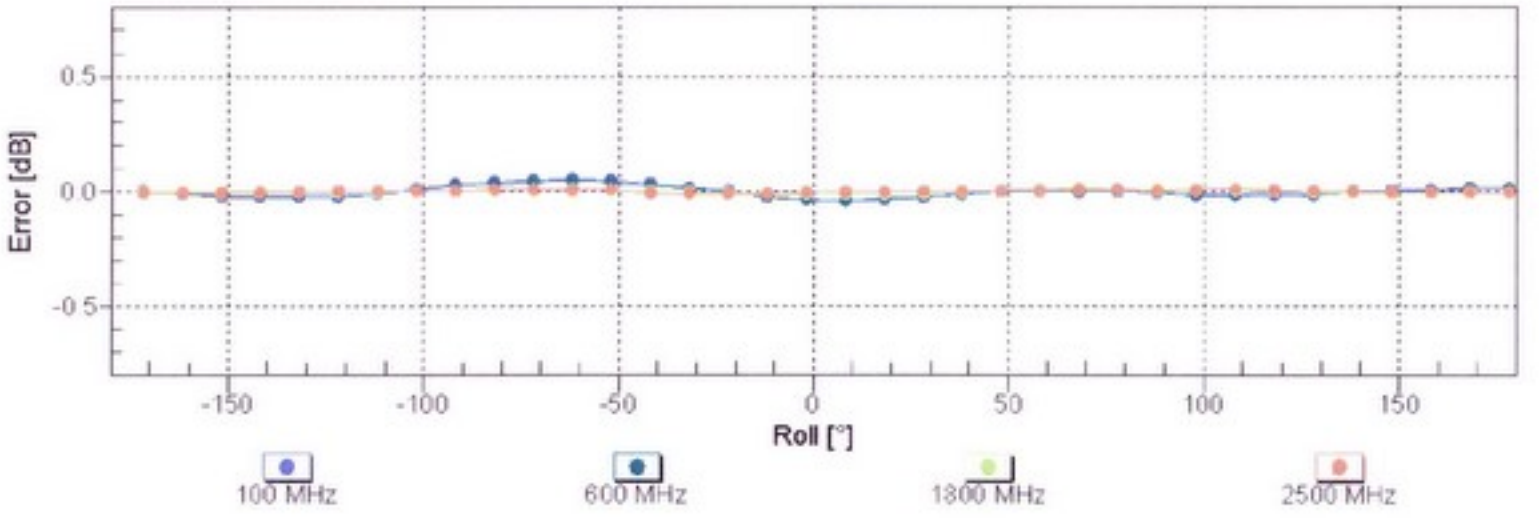
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



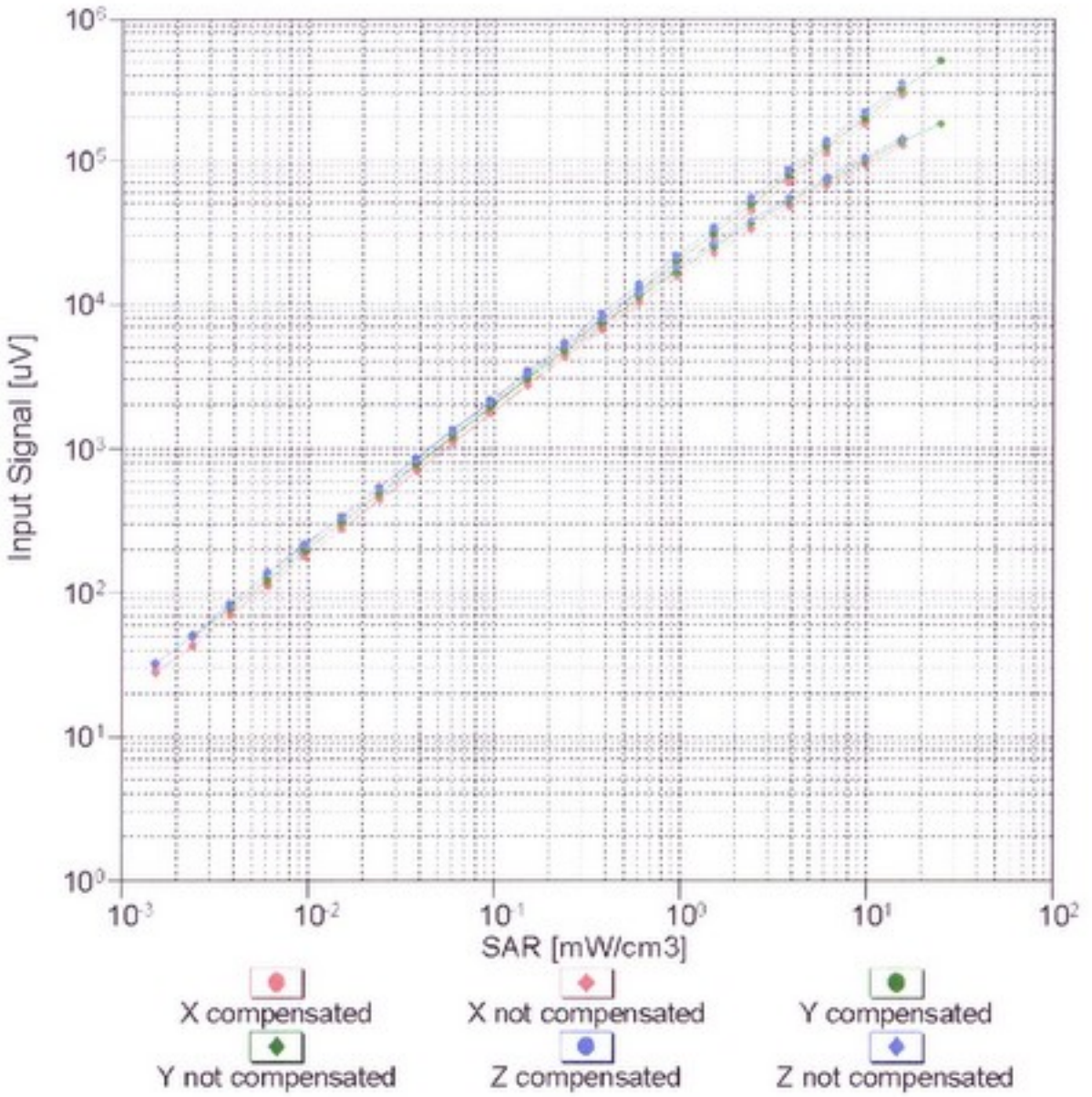
f=1800 MHz,R22

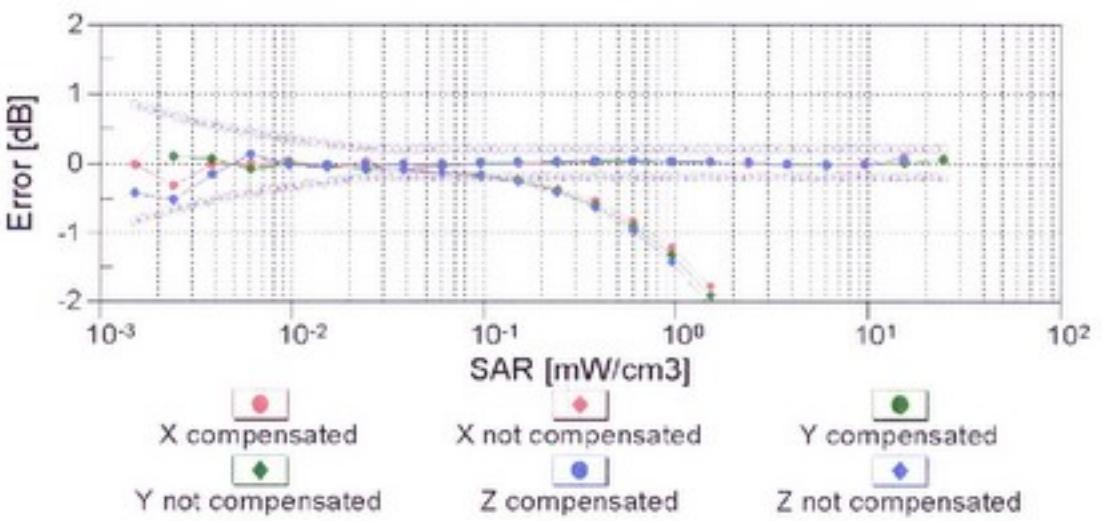




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

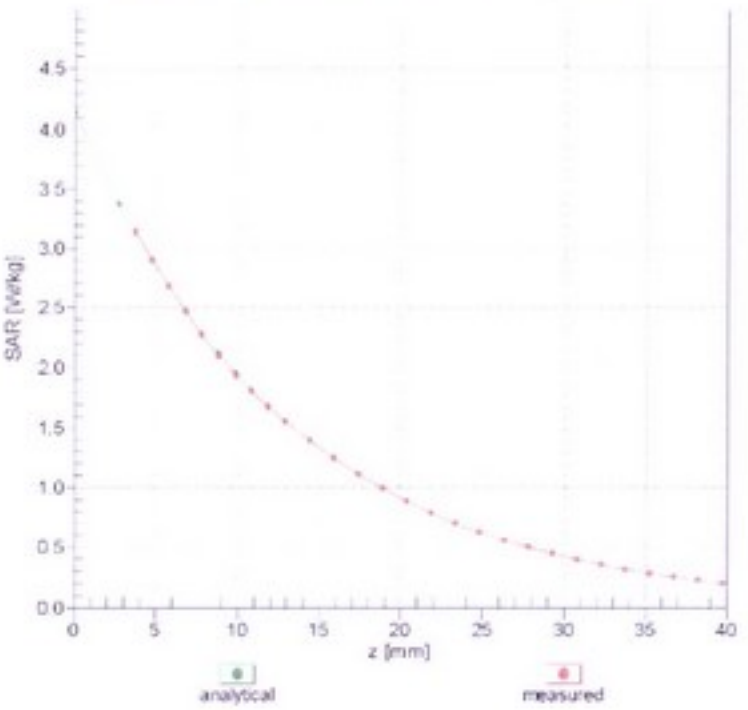




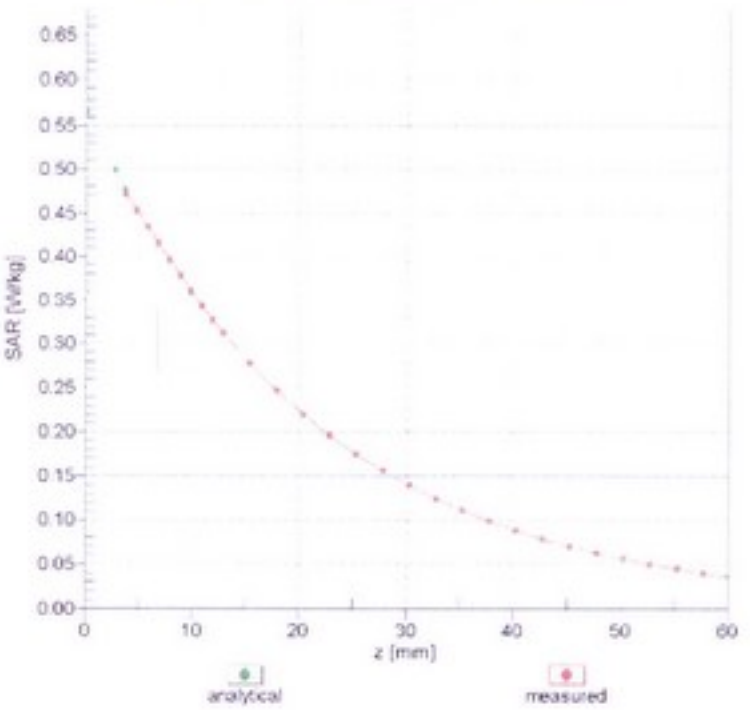
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 1750 MHz,WGLS R22 (H_convF)

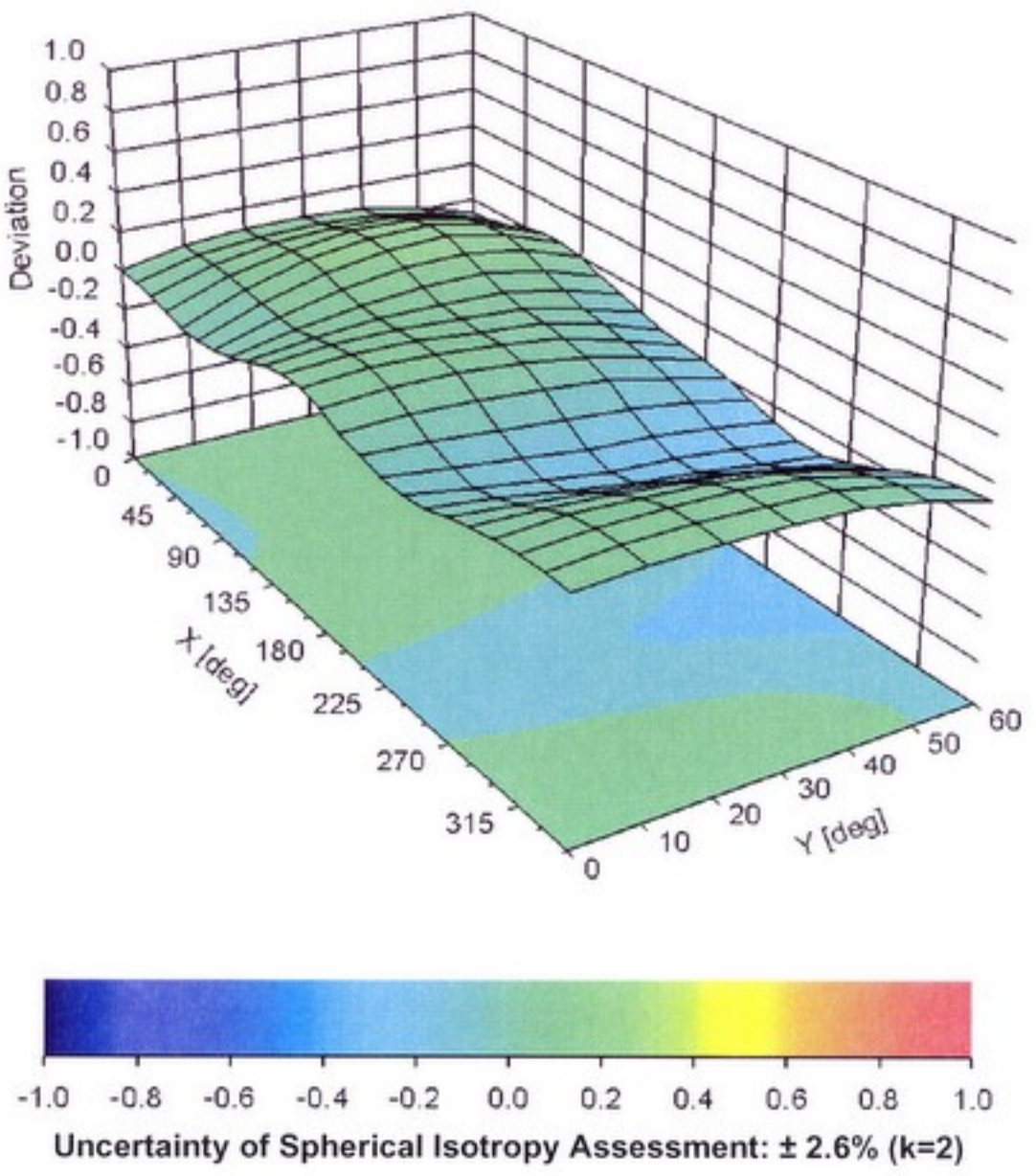


f = 750 MHz,WGLS R9 (H_convF)



Deviation from Isotropy in Air

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ET3DV6R - SN:1669

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
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	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

DAT-P-152/98-01

Calibration Certificate

Certificate No:	Cal_D1900V2_SN5d051_0909
Object:	D1900V2 SN: 5d051
Date of Calibration:	September 09, 2009
Next Calibration:	September 2011
Object Condition:	In Tolerance

Calibration Equipment used:

Test Equipment	Serial Number	Last calibration	Calibrated by	Next calibration
Powermeter E4416A	GB41050414	Dec 08	Agilent Techn. (ISO/IEC 17025, 1-1784162174-1)	Dec 10
Power Sensor E9301H	US40010212	Dec 08	Agilent Techn. (ISO/IEC 17025, 1-1784041195-1)	Dec 10
Powermeter E4417A	GB41050441	Dec 08	Agilent Techn. (ISO/IEC 17025, 1-1674038198-1)	Dec 10
Power Sensor E9301A	MY41495584	Dec 08	Agilent Techn. (ISO/IEC 17025, 1-1784041307-1)	Dec 10
Network Analyzer E5071C	MY46103220	Aug 09	Rohde& Schwarz (14967-DKD-00201-2009-08)	Aug 10
Reference Probe ET3DV6	SN 1669	Feb 09	SPEAG, No ET3-1669_Feb09	Feb 10
DAE3	SN 335	Feb 09	SPEAG, No DAE3-335_Feb09	Feb 10

Calibration is performed according the following standards:

IEEE 1528-2003

"IEEE Recommended Practice for Determining the Peak Spatial - Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Technique", December 2003

IEC 62209-1

"Procedure to measure the Specific Absorption Rate (SAR) for hand - held devices used in close proximity to the ear (frequency range of 300 MHz to 3GHz)", February 2005

Federal Communications Commission Office of Engineering & Technologies (FCCOET)

"Evaluating Compliance wit FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation: DASY 4 System Handbook

prepared by:		reviewed by:	
Alexander Rahn test engineer		André van den Bosch quality assurance engineer	

Measurement Conditions		
DASY Version:	Dasy 4;	V4.7
Phantom:	SAM Phantom	1340
Distance Dipole Center – TSL:	10mm	With spacer
Zoom Scan res.	dx, dy, dz = 5mm	
Frequency:	1900 MHz ± 1MHz	

Head TSL Parameters			
	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL Parameters	22.0	40.0	1.40
Measured Head TSL Parameters	22.0	40.3 ± 6%	1.45 S/m ± 6%

SAR result with Head TSL			
Averaged over 1g	SAR measured	250mW input power	9.10 mW/g
	SAR normalized	normalized to 1W	36.40 mW/g
	SAR for nominal Head TSL parameters	normalized to 1W	**35.90 mW/g ± 16.5 % (k=2)**
Averaged over 10g	SAR measured	250mW input power	4.76 mW/g
	SAR normalized	normalized to 1W	19.04 mW/g
	SAR for nominal Head TSL parameters	normalized to 1W	**18.96 mW/g ± 16.5 % (k=2)**

Body TSL Parameters			
	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL Parameters	22.0	53.30	1.52
Measured Body TSL Parameters	22.0	52.90 ± 6%	1.54 S/m ± 6%

SAR result with Body TSL			
Averaged over 1g	SAR measured	250mW input power	9.42 mW/g
	SAR normalized	normalized to 1W	37.68 mW/g
	SAR for nominal Body TSL parameters	normalized to 1W	**37.28 mW/g ± 16.5 % (k=2)**
Averaged over 10g	SAR measured	250mW input power	4.97 mW/g
	SAR normalized	normalized to 1W	19.88 mW/g
	SAR for nominal Body TSL parameters	normalized to 1W	**19.77 mW/g ± 16.5 % (k=2)**

General Antenna Parmeters		
Antenna Parameters with Head TSL	Impedance, transformed to feed point	48.2 jΩ - 1.3 jΩ
	Return Loss	-33.0 dB
Antenna Parameter with Body TSL	Impedance, transformed to feed point	53.9 jΩ - 0.4 jΩ
	Return Loss	-28.3 dB
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 semigrid 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.		

Additional EUT Data	
Manufactured by:	SPEAG
Manufactured on:	January 15, 1998

SAR result with Head TSL

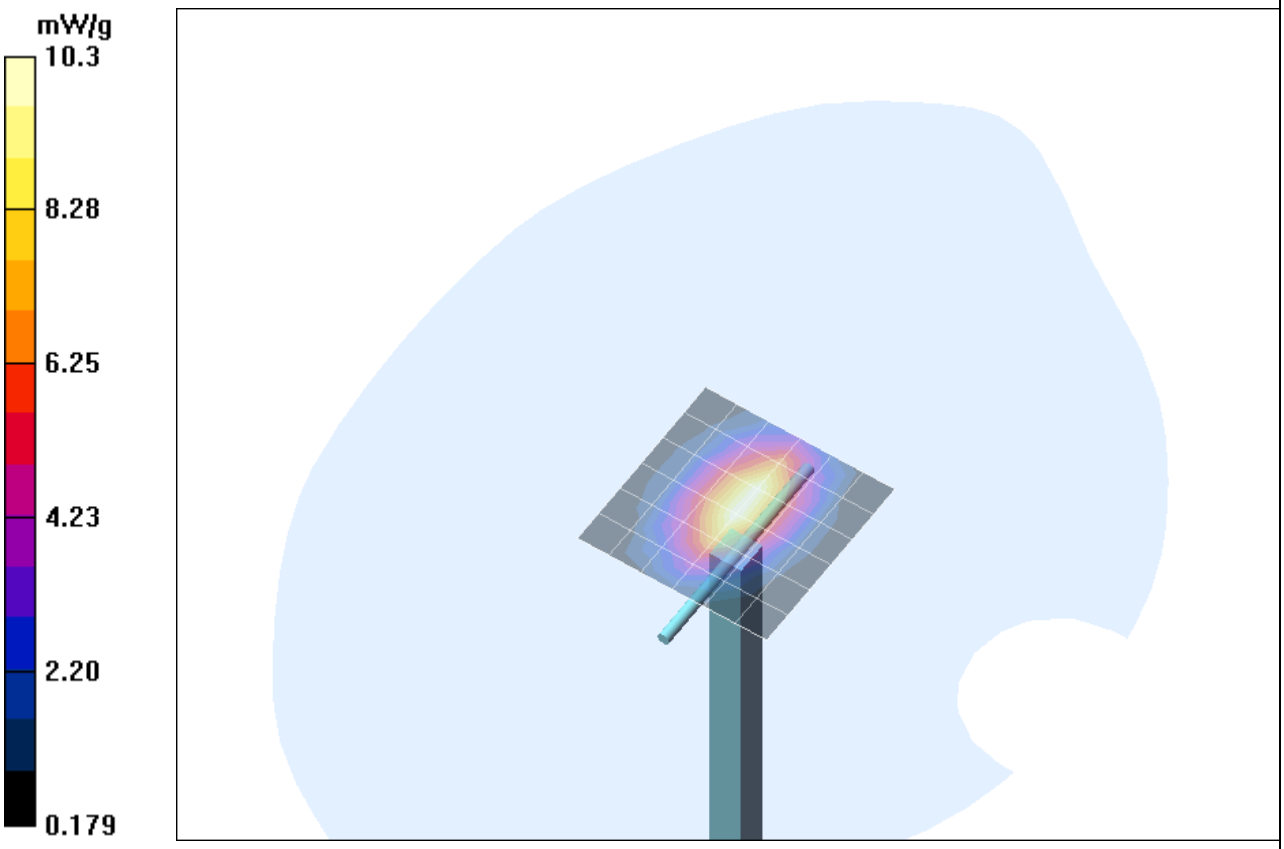
Test Laboratory: IMST GmbH, DASY Blue (I); File Name: 090909_b_1669.da4

DUT: Dipole 1900 MHz SN: 5d051; Type: D1900V2; Serial: D1900V2 - SN5d051
Program Name: System Performance Check at 1900 MHz

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6R - SN1669; ConvF(5.11, 5.11, 5.11); Calibrated: 10.02.2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn335; Calibrated: 09.02.2009
- Phantom: SAM Glycol 1176; Type: Speag; Serial: 1176
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 10.4 mW/g
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.3 V/m; Power Drift = -0.152 dB
Peak SAR (extrapolated) = 15.9 W/kg
SAR(1 g) = 9.1 mW/g; SAR(10 g) = 4.76 mW/g
Maximum value of SAR (measured) = 10.3 mW/g



SAR result with Body TSL

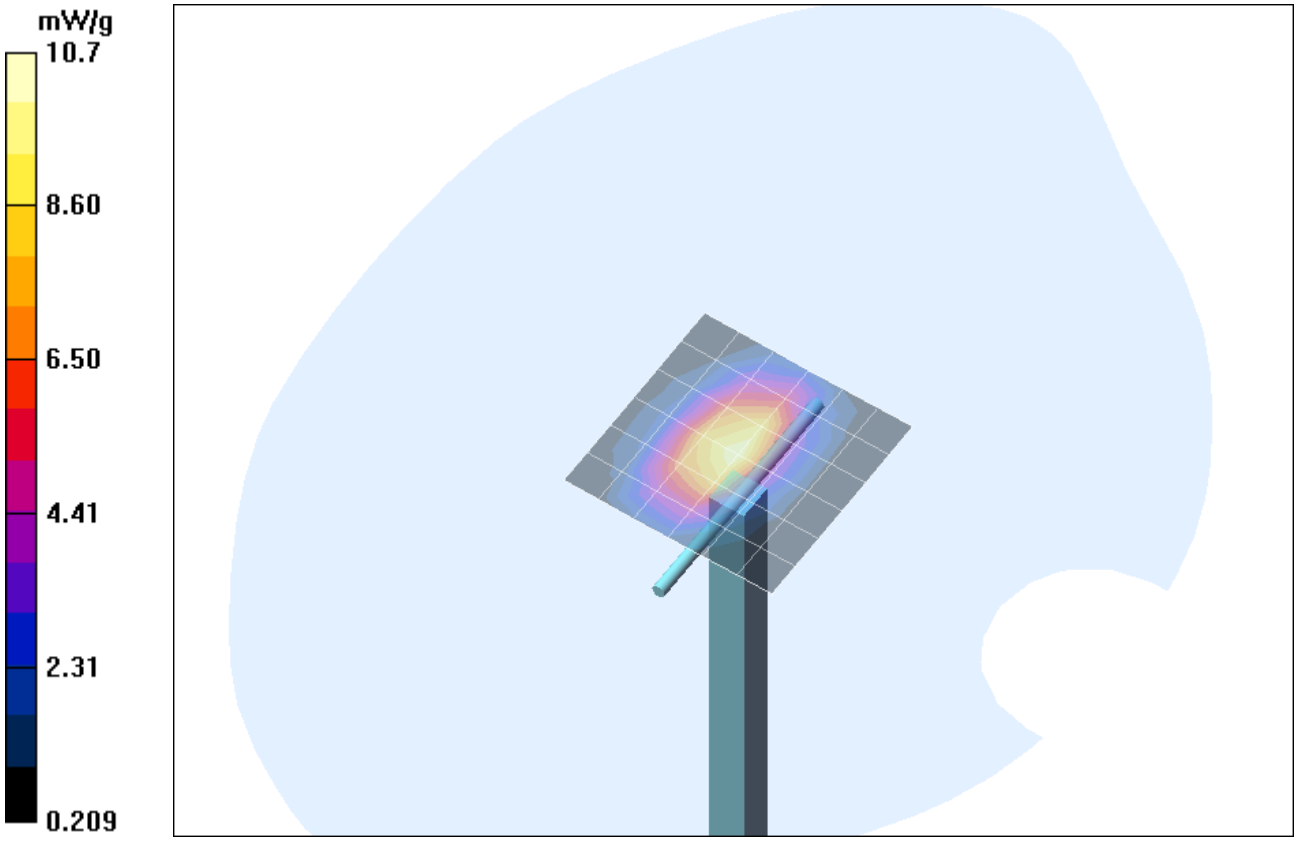
Test Laboratory: IMST GmbH, DASY Blue (I); File Name: 090909_b_1669.da4

DUT: Dipole 1900 MHz SN: 5d051; Type: D1900V2; Serial: D1900V2 - SN5d051
Program Name: System Performance Check at 1900 MHz

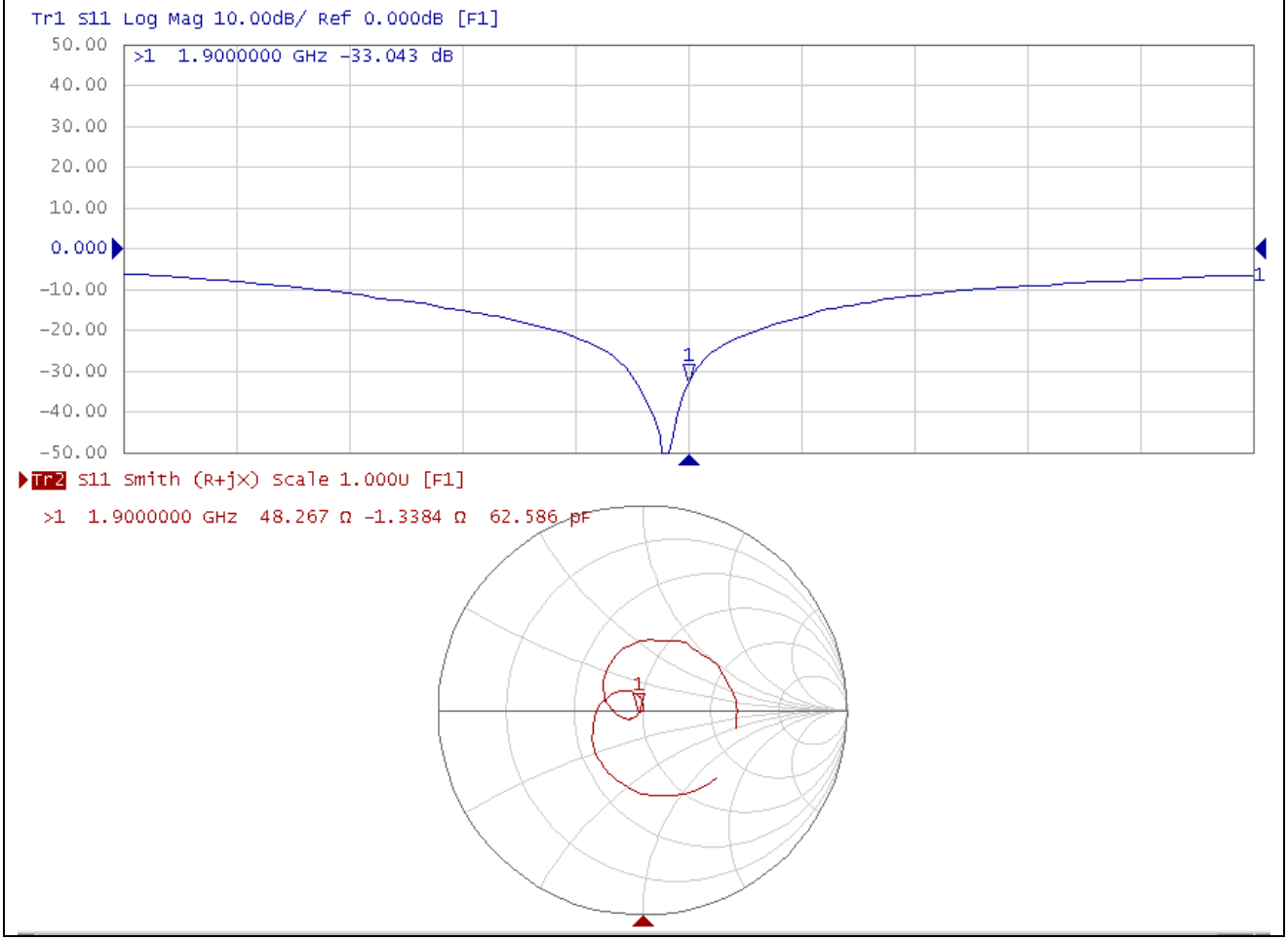
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.54 mho/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6R - SN1669; ConvF(4.69, 4.69, 4.69); Calibrated: 10.02.2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn335; Calibrated: 09.02.2009
- Phantom: SAM Glycol 1176; Type: Speag; Serial: 1176
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 10.1 mW/g
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.1 V/m; Power Drift = -0.064 dB
Peak SAR (extrapolated) = 16.5 W/kg
SAR(1 g) = 9.42 mW/g; SAR(10 g) = 4.97 mW/g
Maximum value of SAR (measured) = 10.7 mW/g



Impedance Measurements Plot for Head TSL



Impedance Measurements Plot for Body TSL