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Appendix to test report no. 2011SAR00034

Calibration certificate and Test positions



No. DGA-PL-114/01-02

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

Test Laboratory:

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ANNEX E PROBE CALIBRATION CERTIFICATE

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





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Swiss Calibration Service

Accreditation No.: SCS 108

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

Object	ES	3DV3-SN: 3149	
Calibration procedure(s)		CAL-01.v6 ibration procedure for dosimetric E-field	d probes
Calibration date:	Se	otember 25, 2010	
Condition of the calibrated it	tem In 1	Tolerance	
Calibration Equipment used (M Primary Standards	ID#	Cal Data (Calibrated by Certification NO.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-May-10 (METAS, NO. 251-00388)	May-11
Power sensor E4412A	MY41495277	5-May-10 (METAS, NO. 251-00388)	May-11
		10-Aug-10 (METAS, NO. 251-00403)	Aug-11
	SN:S5054 (3c)		
Reference 20 dB Attenuator	SN:S5086 (20b)	3-May-10 (METAS, NO. 251-00389)	May-11
Reference 20 dB Attenuator Reference 30 dB Attenuator	SN:S5086 (20b) SN:S5129 (30b)	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404)	Aug-11
Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4	SN:S5086 (20b) SN:S5129 (30b) SN:617	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404) 10-Jun-10 (SPEAG, NO.DAE4-907_Jun10)	Aug-11 Jun-11
Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4	SN:S5086 (20b) SN:S5129 (30b)	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404)	Aug-11
Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4 Reference Probe ES3DV2	SN:S5086 (20b) SN:S5129 (30b) SN:617	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404) 10-Jun-10 (SPEAG, NO.DAE4-907_Jun10)	Aug-11 Jun-11
Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4 Reference Probe ES3DV2 Secondary Standards	SN:S5086 (20b) SN:S5129 (30b) SN:617 SN: 3013	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404) 10-Jun-10 (SPEAG, NO.DAE4-907_Jun10) 12-Jan-10 (SPEAG, NO. ES3-3013_Jan10)	Aug-11 Jun-11 Jan-11
Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4 Reference Probe ES3DV2 Secondary Standards RF generator HP8648C	SN:S5086 (20b) SN:S5129 (30b) SN:617 SN: 3013	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404) 10-Jun-10 (SPEAG, NO. DAE4-907_Jun10) 12-Jan-10 (SPEAG, NO. ES3-3013_Jan10) Check Data (in house) 4-Aug-99(SPEAG, in house check Oct-09) 18-Oct-01(SPEAG, in house check Nov-09)	Aug-11 Jun-11 Jan-11 Scheduled Calibration In house check: Oct-10 In house check: Nov-10
Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4 Reference Probe ES3DV2 Secondary Standards RF generator HP8648C Network Analyzer HP 8753E	SN:S5086 (20b) SN:S5129 (30b) SN:617 SN: 3013 ID# US3642U01700 US37390585 Name	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404) 10-Jun-10 (SPEAG, NO.DAE4-907_Jun10) 12-Jan-10 (SPEAG, NO. ES3-3013_Jan10) Check Data (in house) 4-Aug-99(SPEAG, in house check Oct-09) 18-Oct-01(SPEAG, in house check Nov-09) Function	Aug-11 Jun-11 Jan-11 Scheduled Calibration In house check: Oct-10
Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4 Reference Probe ES3DV2 Secondary Standards RF generator HP8648C Network Analyzer HP 8753E	SN:S5086 (20b) SN:S5129 (30b) SN:617 SN: 3013 ID# US3642U01700 US37390585	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404) 10-Jun-10 (SPEAG, NO. DAE4-907_Jun10) 12-Jan-10 (SPEAG, NO. ES3-3013_Jan10) Check Data (in house) 4-Aug-99(SPEAG, in house check Oct-09) 18-Oct-01(SPEAG, in house check Nov-09)	Aug-11 Jun-11 Jan-11 Scheduled Calibration In house check: Oct-10 In house check: Nov-10
Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator DAE4 Reference Probe ES3DV2 Secondary Standards RF generator HP8648C Network Analyzer HP 8753E Calibrated by:	SN:S5086 (20b) SN:S5129 (30b) SN:617 SN: 3013 ID# US3642U01700 US37390585 Name	3-May-10 (METAS, NO. 251-00389) 10-Aug-10 (METAS, NO. 251-00404) 10-Jun-10 (SPEAG, NO.DAE4-907_Jun10) 12-Jan-10 (SPEAG, NO. ES3-3013_Jan10) Check Data (in house) 4-Aug-99(SPEAG, in house check Oct-09) 18-Oct-01(SPEAG, in house check Nov-09) Function	Aug-11 Jun-11 Jan-11 Scheduled Calibration In house check: Oct-10 In house check: Nov-10

Certificate No: ES3DV3-3149_Sep10

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



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Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

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

Glossary:

TSL NORMx,y,z ConF DCP Polarization ϕ Polarization 9 tissue simulating liquid sensitivity in free space sensitivity in TSL / NORMx,y,z diode compression point φ rotation around probe axis 9 rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., 9 = 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 9 = 0 (f ≤ 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 effect the E²-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 (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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.

Certificate No: ES3DV3-3149_Sep10

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ES3DV3 SN: 3149

September 25, 2010

Probe ES3DV3

SN: 3149

Manufactured:

June 12, 2007

Calibrated:

September 25, 2010

Calibrated for DASY4 System

Certificate No: ES3DV3-3149_Sep10

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ES3DV3 SN: 3149 September 25, 2010 DASY – Parameters of Probe: ES3DV3 SN:3149

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.14±10.1%	$\mu V/(V/m)^2$	DCP X	94mV
NormY	1.23±10.1%	$\mu V/(V/m)^2$	DCP Y	95mV
NormZ	1.29±10.1%	$\mu V/(V/m)^2$	DCP Z	91mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors) Please see Page 8

Boundary Effect

TSL	900MHz	Typical SAR gradient: 5% per r	nm	
Sensor Center SARbe[%] SARbe[%]	Witho	Surface Distance out Correction Algorithm Correction Algorithm	3.0 mm 3.8 0.8	4.0 mm 1.6 0.7
TSL	1810MHz	Typical SAR gradient: 10% per	mm	
Sensor Center SARbe[%] SARbe[%]	Witho	Surface Distance out Correction Algorithm Correction Algorithm	3.0 mm 6.8 0.4	4.0 mm 3.6 0.2
Sensor Offset				

Probe Tip to Sensor Center

2.0 mm

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

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8). ^B Numerical linearization parameter: uncertainty not required.

Certificate No: ES3DV3-3149_ Sep10

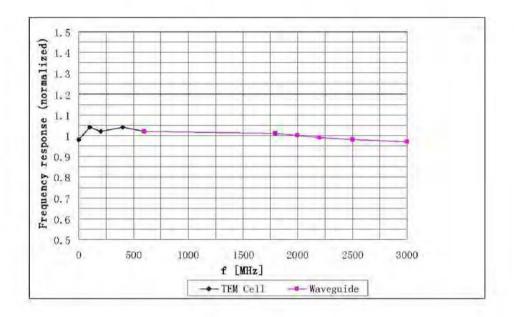
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ES3DV3 SN: 3149

September 25, 2010



Frequency Response of E-Field

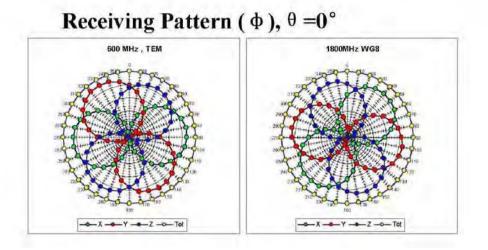
Uncertainty of Frequency Response of E-field: ±5.0% (k=2)

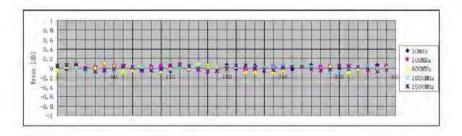


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ES3DV3 SN: 3149

September 25, 2010





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

Certificate No: ES3DV3-3149_Sep10

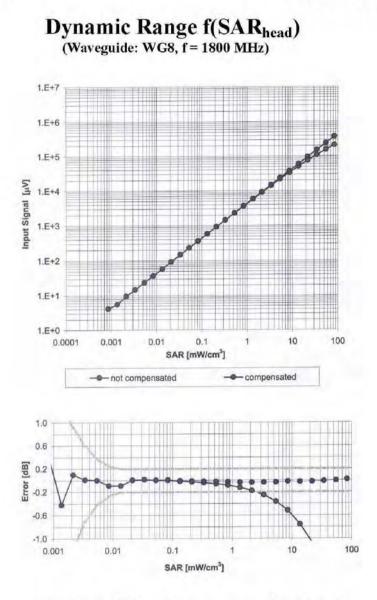
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ES3DV3 SN: 3149

September 25, 2010



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

Certificate No: ES3DV3-3149_ Sep10

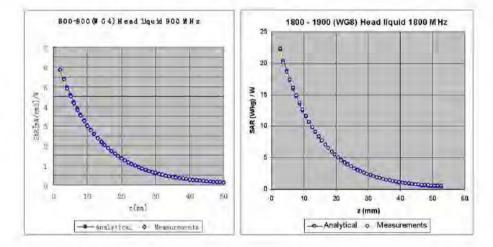
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ES3DV3 SN: 3149

September 25, 2010



Conversion Factor Assessment

f[MHz]	Validity[MHz] ^C	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
850	±50 /±100	Head	41.5±5%	0.90±5%	0.91	1.13	6.56	±11.0% (k=2)
900	±50 /±100	Head	41.5±5%	0.97±5%	0.83	1.26	6.34	±11.0% (k=2)
1800	±50 /±100	Head	40.0±5%	1.40±5%	0.69	1.47	5.18	±11.0% (k=2)
1900	±50 /±100	Head	40.0±5%	1.40±5%	0.72	1.38	5.03	±11.0% (k=2)
2100	±50 /±100	Head	39.8±5%	1.49±5%	0.66	1.34	4.58	±11.0% (k=2)
850	±50 /±100	Body	55.2±5%	0.97±5%	0.76	1.26	6.22	±11.0% (k=2)
900	±50 /±100	Body	55.0±5%	1.05±5%	0.99	1.06	6.02	±11.0% (k=2)
1800	±50 /±100	Body	53.3±5%	1.52±5%	0.75	1.34	4.97	±11.0% (k=2)
1900	±50 /±100	Body	53.3±5%	1.52±5%	0.62	1.33	4.68	±11.0% (k=2)
2100	±50 /±100	Body	53.5±5%	1.57±5%	0.68	1.34	4.35	±11.0% (k=2)

^c The validity of ±100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Certificate No: ES3DV3-3149_Sep10

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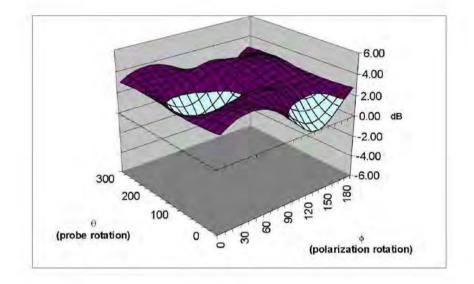


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ES3DV3 SN: 3149

September 25, 2010

Deviation from Isotropy Error (ϕ, θ) , f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ±2.5% (k=2)

Certificate No: ES3DV3-3149_Sep10

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





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Accreditation No.: SCS 108

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

Client TMC China

Certificate No: EX3DV4-3617_Jul10

Dbject	EX3DV4-SN: 3617
Calibration procedure(s)	QA CAL-01.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	July 9, 2010

This calibration certify 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 at an environment temperature (22±3)⁰C and humidity<70%

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID#	Cal Data (Calibrated by, Certification NO.)	Scheduled Calibration
Power meter E4419B	GB41293874	6-May-10 (METAS, NO. 251-00388)	May-11
Power sensor E4412A	MY41495277	6-May-10 (METAS, NO. 251-00388)	May-11
Reference 3 dB Attenuator	SN:S5054 (3c)	12-Aug-09 (METAS, NO. 251-00403)	Aug-10
Reference 20 dB Attenuator	SN:S5086 (20b)	4-May-10 (METAS, NO. 251-00389)	May-11
Reference 30 dB Attenuator	SN:S5129 (30b)	12-Aug-09 (METAS, NO. 251-00404)	Aug-10
DAE4	SN:617	11-Jun-10 (SPEAG, NO.DAE4-907_Jun10)	Jun-11
Reference Probe ES3DV2	SN: 3013	13-Jan-10 (SPEAG, NO. ES3-3013_Jan10)	Jan-11
Secondary Standards	ID#	Check Data (in house)	Scheduled Calibration
RF generator HP8648C	US3642U01700	4-Aug-99(SPEAG, in house check Oct-09)	In house check: Oct-10
Network Analyzer HP 8753E	US37390585	18-Oct-01(SPEAG, in house check Nov-09)	In house check: Nov-10
	Name	Function	Signature
Calibrated by:	Kalja Pokovic	Technical Manager	I have that
Approved by:	Niels Kuster	Quality Managar	Lat-
This satisfaction and firsts show	I not be separated as	and is 6.0 without written approval of the televisio	Issued: July 9, 2010
This calibration certificate sha	i not be reported ex	cept in full without written approval of the laborate	Jry.



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Accreditation No.: SCS 108

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

Glossary:

tissue simulating liquid TSL NORMX, V.Z sensitivity in free space sensitivity in TSL / NORMx,y,z ConF DCP diode compression point o rotation around probe axis Polarization (9 rotation around an axis that is in the plane normal to probe axis (at Polarization 9 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
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held b) 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 9 = 0 (f ≤ 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 effect the E²-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 (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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.

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EX3DV4 SN: 3617

July 9, 2010

Probe EX3DV4

SN: 3617

Manufactured: Calibrated: May 3, 2007 July 9, 2010

Calibrated for DASY4 System

Certificate No: EX3DV4-3617_Jul10

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EX3DV4 SN: 361		ters of Probe: I	EX3DV4 SM	July 9, 201 1:3617	0
Sensitivity in F	ree Space ^A		Diode (Compressio	n ^B
NormX NormY NormZ	0.420±10.1% 0.440±10.1% 0.310±10.1%	$\mu V/(V/m)^2$	DCP X DCP Y DCP Z	89mV 88mV 91mV	
Sensitivity in T Please see Pa		Liquid (Conversio	n Factors)		
Boundary Effe	ct				
TSL	2450MHz T	ypical SAR gradie	nt: 11% per n	nm	
Sensor Center SARbe[%] SARbe[%]		face Distance Correction Algorithm rection Algorithm	m	2.0 mm 3.7 0.1	3.0 mm 1.8 0.0
TSL	5200MHz Ty	pical SAR gradien	t: 25% per m	m	
Sensor Center SARbe[%] SARbe[%]		face Distance Correction Algorith rection Algorithm	m	2.0 mm 10.1 0.2	3.0 mm 3.7 0.1
Sansor Offsat					

Sensor Offset

Probe Tip to Sensor Center

1.0 mm

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

^R The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8). ^B Numerical linearization parameter: uncertainty not required,

Certificate No: EX3DV4-3617_Jul10

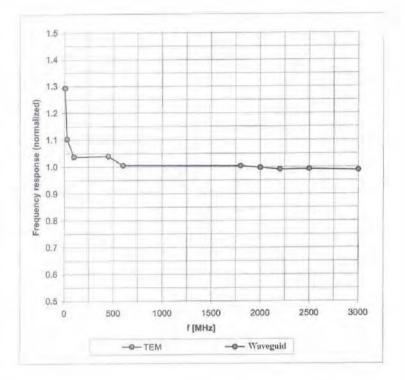
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EX3DV4 SN: 3617

July 9, 2010

Frequency Response of E-Field



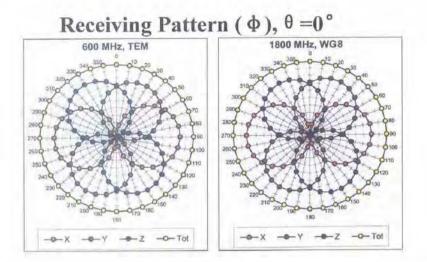
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

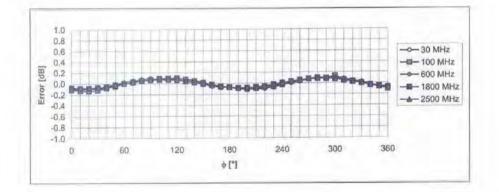
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EX3DV4 SN: 3617

July 9, 2010





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

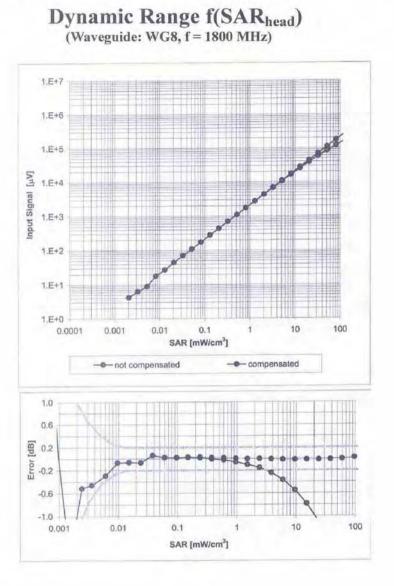
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EX3DV4 SN: 3617

July 9, 2010



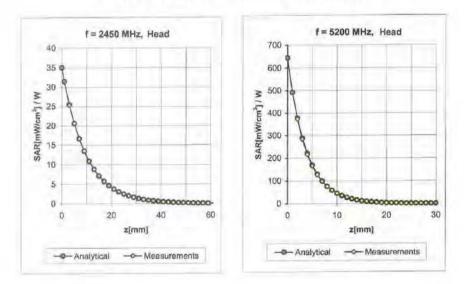
Uncertainty of Linearity Assessment: ±0.6% (k=2)

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EX3DV4 SN: 3617

July 9, 2010



Conversion Factor Assessment

f[MHz]	Validity [MHz] ^C	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
2300	$\pm 50 / \pm 100$	Head	39.5±5%	$1.67 \pm 5\%$	0.33	1.02	7.23	±11.8% (k=2)
2450	$\pm 50 / \pm 100$	Head	39.2±5%	$1.80 \pm 5\%$	0.33	1.00	7.19	±11.8% (k=2)
2600	$\pm 50 / \pm 100$	Head	39.0±5%	1.96±5%	0.36	1.21	7.16	±11.8% (k=2)
3500	$\pm 50/\pm 100$	Head	37.9±5%	2.91±5%	0.34	1.35	6.48	±11.8% (k=2)
5200	$\pm 50 / \pm 100$	Head	36.0±5%	4.66±5%	0.35	1.60	5.33	±13.1% (k=2)
5800	$\pm 50/\pm 100$	Head	35.3±5%	5.27±5%	0.35	1.60	4.69	±13.1% (k=2)
2300	±50/±100	Body	52.8±5%	1.85±5%	0.30	1.01	6.95	±11.8% (k=2)
2450	$\pm 50/\pm 100$	Body	52.7±5%	1.95±5%	0.36	1.00	6.88	±11.8% (k=2)
2600	$\pm 50/\pm 100$	Body	52.5±5%	2.16±5%	0.36	1.05	6.84	±11.8% (k=2)
3500	$\pm 50 / \pm 100$	Body	51.3±5%	$3.30 \pm 5\%$	0.33	1.40	5.02	±11.8% (k=2)
5200	$\pm 50 / \pm 100$	Body	49.0±5%	$5.30 \pm 5\%$	0.35	1.70	4.64	±13.1% (k=2)
5800	$\pm 50 / \pm 100$	Body	48.2±5%	6.00±5%	0.30	1.70	4.53	±13.1% (k=2)

^c The validity of ±100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Certificate No: EX3DV4-3617_Jul10

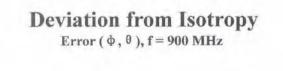
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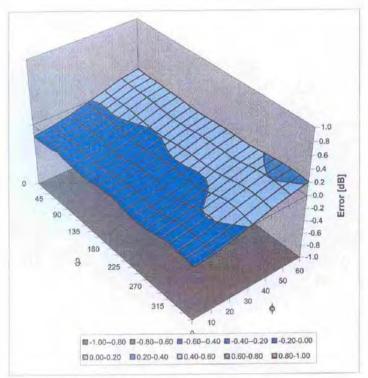


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EX3DV4 SN: 3617

July 9, 2010





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

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ANNEX F DIPOLE CALIBRATION CERTIFICATE

835 MHz Dipole Calibration Certificate

Client TMC		Certificate No: D835V2-	443_Feb10
CALIBRATION	CERTI	FICATE	
Object	1 2 9	D835V2 - SN: 443	-
~		No. of Contract of Contract of Contract	
Calibration Procedure(s)		TMC-XZ-01-027	
		Calibration procedure for dipole validation kits	
Calibration date:		February 26, 2010	
Condition of the calibrated	d item	In Tolerance	
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Glossary:

TSL ConvF N/A tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

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 300MHz to 3GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with 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:

d) DASY 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.

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Measurement Conditions

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
hantom	2mm Oval Phantom ELI4	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	

Frequency

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 ± 0.2) °C	41.6 ± 6 %	0.92mho/m ± 6 %
Head TSL temperature during test	(21.7 ± 0.2) °C		

835 MHz ± 1 MHz

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	1
SAR measured	250 mW input power	2.38 mW / g
SAR normalized	normalized to 1W	9.52 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	9.41 mW /g ± 17.0 % (k=2)

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.54 mW / g
SAR normalized	normalized to 1W	6.16 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	6.12 mW /g ± 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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TME

Body TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.5 ± 6%	0.97mho/m ± 6 %
Body TSL temperature during test	(21.9 ± 0.2) °C	the state	

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.41 mW/g
SAR normalized	normalized to 1W	9.64 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	9.57 mW /g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	The activity of the
SAR measured	250 mW input power	1.57 mW / g
SAR normalized	normalized to 1W	6.28 mW / g
SAR for nominal Body TSL parameters 2	normalized to 1W	6.24 mW /g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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Antenna Parameters with Body TSL

Return Loss

Impedance, transformed to feed point	49.4Ω - 5.1 jΩ	1.7
Return Loss	-25.6dB	

- 25.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 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. 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

Manufactured by	SPEAG
Manufactured on	September 3, 2001

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工业和信息化部通信计量中心 Telecommunication Metrology Center of MIIT

TMX

DASY5 Validation Report for Head TSL

Test Laboratory: TMC, Beijing, China

Date/Time: 2010-2-26 14:31:40

DUT: Dipole 835 MHz; Type: D835V2; Serial: SN: 443

Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1 Medium: Head 835MHz

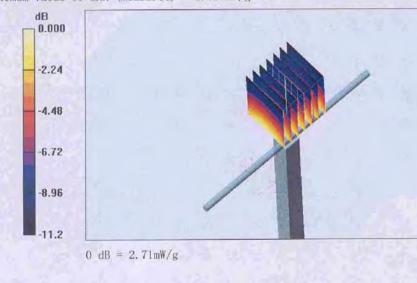
Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ϵ = 41.6; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 SN3149; ConvF(6.56, 6.56, 6.56); Calibrated: 25.09.09
- Electronics: DAE4 Sn771; Calibration: 19.11.09
- Phantom: 2mm Oval Phantom ELI4; Type: QDOVA001BB
- Measurement SW: DASY5, V5.0 Build 119.9; Postprocessing SW: SEMCAD, V13.2 Build 87

Pin=250mW; d=15mm/Zoom Scan (7x7x7)/Cube 0:

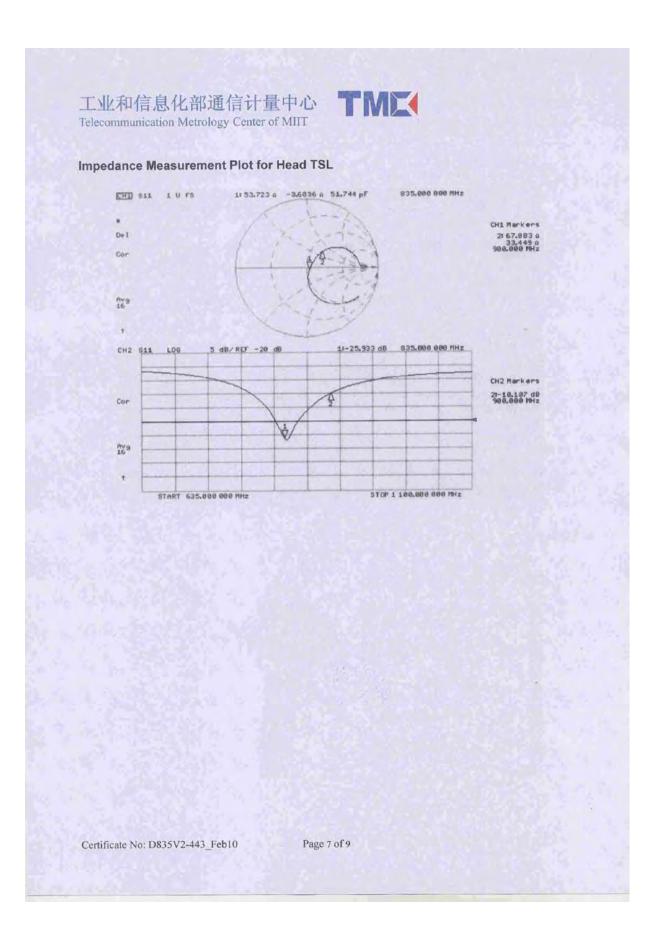
Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 54.8 V/m; Power Drift = -0.037 dB Peak SAR (extrapolated) = 3.11 W/kg SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.54 mW/g Maximum value of SAR (measured) = 2.71 mW/g



Certificate No: D835V2-443_Feb10

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工业和信息化部通信计量中心 Telecommunication Metrology Center of MIIT

DASY5 Validation Report for Body TSL

Date/Time: 2010-2-26 9:52:36

Test Laboratory: TMC, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: SN: 443

Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1 Medium: Body 835MHz Medium parameters used: f = 835 MHz; σ = 0.97 mho/m; ϵ_r = 54.5; ρ = 1000 kg/m³ Phantom section: Flat Section

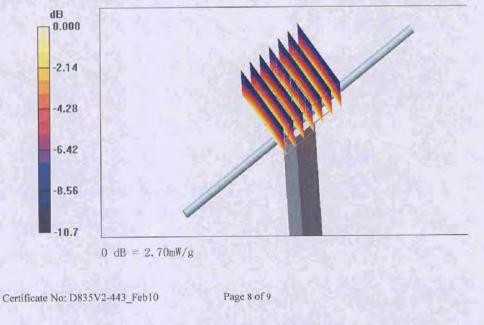
TMX

DASY5 Configuration:

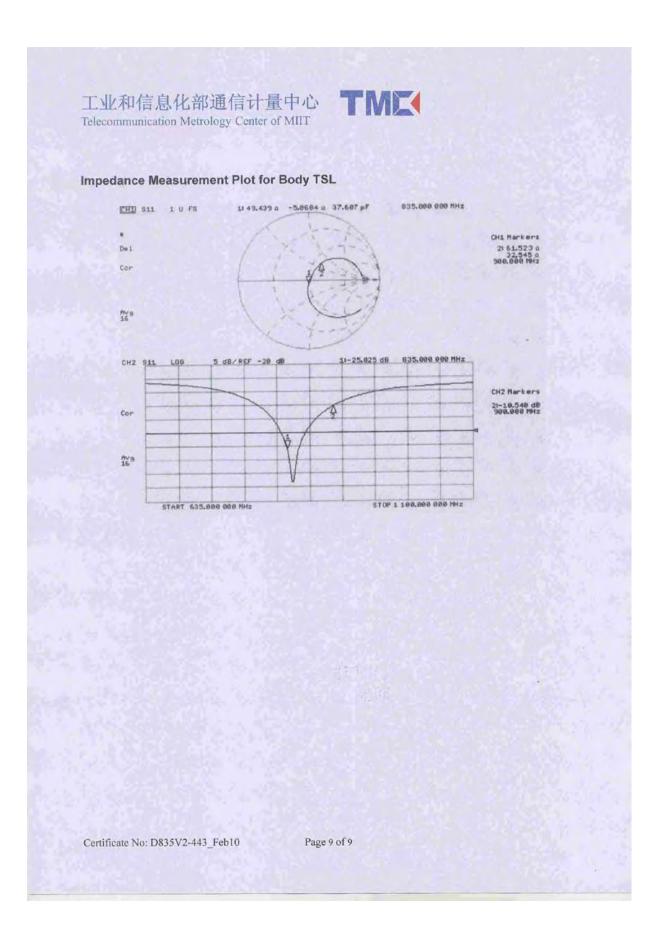
- Probe: ES3DV3 SN3149; ConvF(6.22, 6.22, 6.22); Calibrated: 25.09.09
- Electronics: DAE4 Sn771; Calibration: 19.11.09
- Phantom: 2mm Oval Phantom ELI4; Type: QDOVA001BB
- Measurement SW: DASY5, V5.0 Build 119.9; Postprocessing SW: SEMCAD, V13.2 Build 87

Pin=250mW; d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 54.0 V/m; Power Drift = -0.025 dB Peak SAR (extrapolated) = 3.78 W/kg SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.57 mW/g Maximum value of SAR (measured) = 2.70 mW/g









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1900 MHz Dipole Calibration Certificate

Client TMC	1	Certificate No: D1900V2-541_Feb10
CALIBRATIO	N CERT	TIFICATE
Object		D1900V2 - SN: 541
Calibration Procedure(s)		TMC-XZ-01-027 Calibration procedure for dipole validation kits
Calibration date:		February 26, 2010
Condition of the calibrat	ed item	In Tolerance
humidity<70%. Calibration Equipment u	ised (M&TE	
	I ID # 10125 10033 DV3 SN 3 SN 77 MY45	eritical for calibration) Cal Date(Calibrated by, Certificate No.) Scheduled Calibration Cal Date(Calibrated by, Certificate No.) Scheduled Calibration 3 04-Sep-09 (TMC, No. JZ09-248) Sep-10 33 04-Sep-09 (TMC, No. JZ09-248) Sep-10 149 25-Sep-09(SPEAG, No.ES3-3149_Sep09) Sep-10
humidity<70%. Calibration Equipment u Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe ES3E DAE4 RF generator E4438C	I ID # 10125 10033 DV3 SN 3 SN 77 MY45	d in the closed laboratory facility: environment temperature(22±3) C critical for calibration) Cal Date(Calibrated by, Certificate No.) Scheduled Calibrat 3 04-Sep-09 (TMC, No. JZ09-248) Sep-10 33 04-Sep-09 (TMC, No. JZ09-248) Sep-10 149 25-Sep-09(SPEAG, No.ES3-3149_Sep09) Sep-10 71 19-Nov-09(SPEAG, No.DAE4-771_Nov09) Nov-10 5092879 18-Jun-09(TMC, No.JZ09-302) Jun-10
humidity<70%. Calibration Equipment u Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe ES3E DAE4 RF generator E4438C	I ID # 10125 10033 DV3 SN 3 SN 77 MY45	d in the closed laboratory facility: environment temperature(22±3) ⁷ C critical for calibration) <u>Cal Date(Calibrated by, Certificate No.)</u> Scheduled Calibrat <u>Scheduled Calibrated</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u>Sep-10</u> <u></u>
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humidity<70%. Calibration Equipment u Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe ES3E DAE4 RF generator E4438C Network Analyzer 875	1 ID # 10125 10033 20V3 SN 3 SN 77 MY45 33E US384 Name	d in the closed laboratory facility: environment temperature(22±3) C critical for calibration) Cal Date(Calibrated by, Certificate No.) Scheduled Calibrat 3 04-Sep-09 (TMC, No. JZ09-248) Sep-10 33 04-Sep-09 (TMC, No. JZ09-248) Sep-10 149 25-Sep-09(SPEAG, No.ES3-3149_Sep09) Sep-10 71 19-Nov-09(SPEAG, No.DAE4-771_Nov09) Nov-10 5092879 18-Jun-09(TMC, No.JZ09-302) Jun-10 433212 29-Aug-09(TMC, No.JZ09-056) Aug-10 Function Signature SAR Test Engineer
humidity<70%. Calibration Equipment u Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe ES3E DAE4 RF generator E4438C Network Analyzer 875	used (M&TE 1 ID # 10125 1003: 50V3 SN 3 SN 77 MY45 53E US384 Name Lin Hao	d in the closed laboratory facility: environment temperature(22±3) C critical for calibration) Cal Date(Calibrated by, Certificate No.) Scheduled Calibrat 3 04-Sep-09 (TMC, No. JZ09-248) Sep-10 33 04-Sep-09 (TMC, No. JZ09-248) Sep-10 149 25-Sep-09(SPEAG, No.ES3-3149_Sep09) Sep-10 71 19-Nov-09(SPEAG, No.DAE4-771_Nov09) Nov-10 5092879 18-Jun-09(TMC, No.JZ09-302) Jun-10 433212 29-Aug-09(TMC, No.JZ09-056) Aug-10 Function Signature SAR Test Engineer Signature 140 SAR Project Leader Signature 7





Glossary:

TSL t ConvF s N/A n

tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

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 300MHz to 3GHz)", February 2005

c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with 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:

d) DASY 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.

Certificate No: D1900V2-541_Feb10

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Measurement Conditions

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	2mm Oval Phantom EL14	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.6 ± 6 %	1.40mho/m ± 6 %

SAR result with Head TSL

Head TSL temperature during test

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.91 mW/g
SAR normalized	normalized to 1W	39.6 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	39.4 mW /g ± 17.0 % (k=2)

(21.9 ± 0.2) °C

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	15000 10.00
SAR measured	250 mW input power	5.05 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	20.1 mW /g ± 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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Body TSL parameters The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6%	1.51 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 0.2) °C		

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.4 mW/g
SAR normalized	normalized to 1W	41.6 mW/g
SAR for nominal Body TSL parameters 2	normalized to 1W	41.4 mW /g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.24 mW / g
SAR normalized	normalized to 1W	21.0 mW/g
SAR for nominal Body TSL parameters ²	normalized to 1W	20.9 mW /g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.9Ω + 7.1 jΩ	
Return Loss	- 22.6dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 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. 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

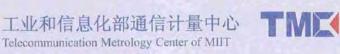
Manufactured by	SPEAG
Manufactured on	October 4, 2001

Certificate No: D1900V2-541_Feb10

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DASY5 Validation Report for Head TSL

Date/Time: 2010-2-26 15:20:47

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: SN: 541

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1 Medium: Head 1900MHz

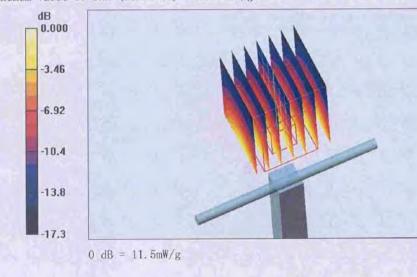
Medium parameters used: f = 1900 MHz; σ = 1.40 mho/m; $\epsilon_{\rm r}$ = 39.6; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 SN3149; ConvF(5.03, 5.03, 5.03); Calibrated: 25.09.09
- Electronics: DAE4 Sn771; Calibration: 19.11.09
- Phantom: 2mm Oval Phantom ELI4; Type: QDOVA001BB
- Measurement SW: DASY5, V5.0 Build 119.9; Postprocessing SW: SEMCAD, V13.2 Build 87

Pin=250mW; d=10mm/Zoom Scan (7x7x7)/Cube 0:

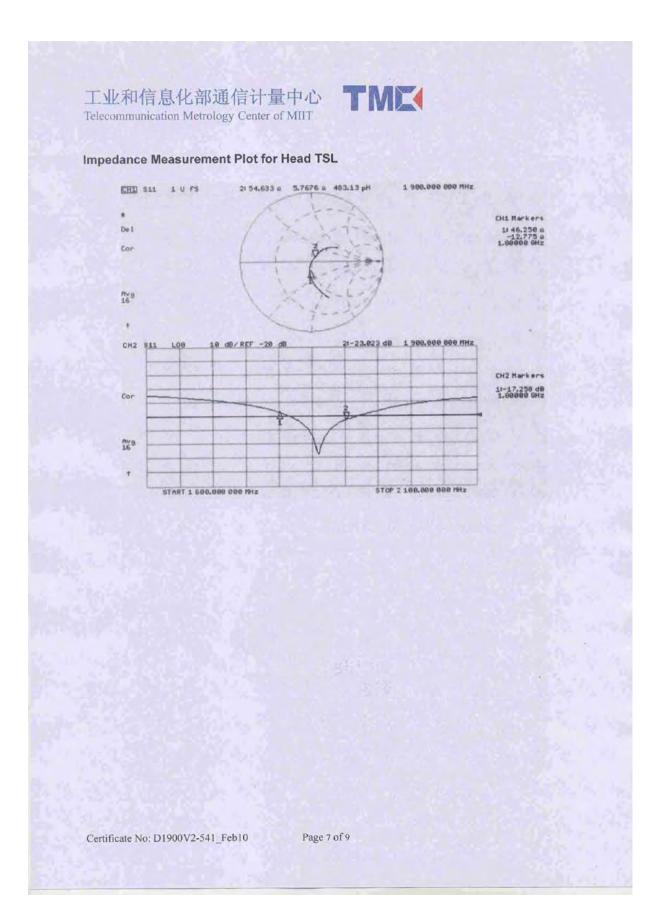
Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 85.1 V/m; Power Drift = -0.057 dB Peak SAR (extrapolated) = 18.8 W/kg SAR(1 g) = 9.91 mW/g; SAR(10 g) = 5.05 mW/g Maximum value of SAR (measured) = 11.5 mW/g



Certificate No: D1900V2-541_Feb10

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工业和信息化部通信计量中心 Telecommunication Metrology Center of MIIT

DASY5 Validation Report for Body TSL

Date/Time: 2010-2-26 10:41:08

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: SN: 541

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1 Medium: Body 1900MHz

Medium parameters used: f = 1900 MHz; σ = 1.51 mho/m; ϵ , = 52.5; ρ = 1000 kg/m³ Phantom section: Flat Section

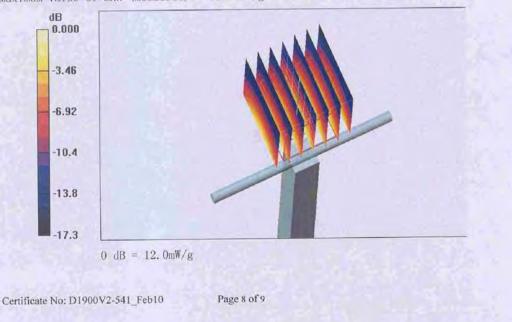
TMX

DASY5 Configuration:

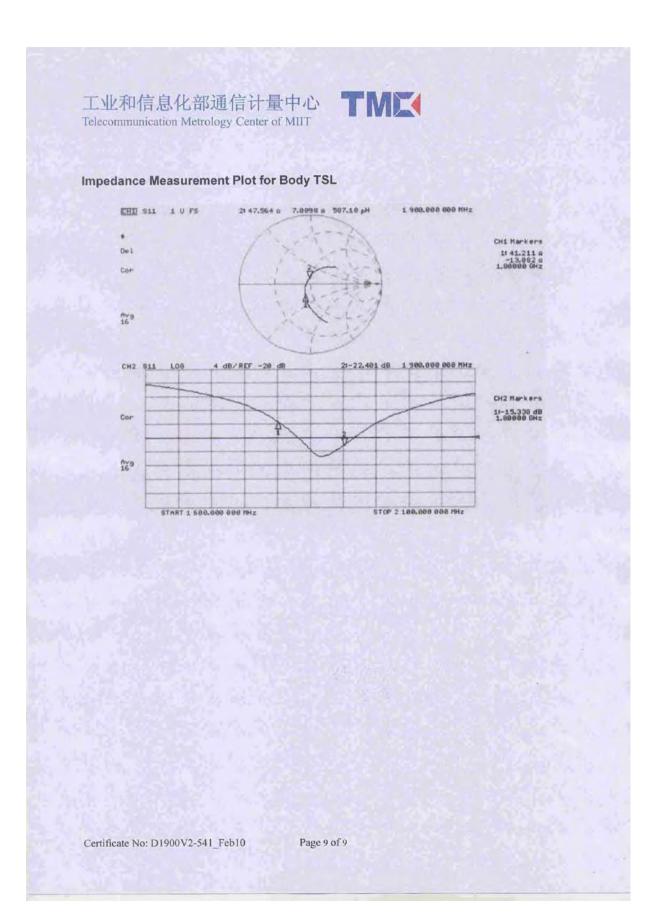
- Probe: ES3DV3 SN3149; ConvF(4,68, 4,68, 4,68); Calibrated: 25.09.09
- Electronics: DAE4 Sn771; Calibration: 19.11.09
- Phantom: 2mm Oval Phantom ELI4; Type: QDOVA001BB
- Measurement SW: DASY5, V5.0 Build 119.9; Postprocessing SW: SEMCAD, V13.2 Build 87

Pin=250mW; d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 80.2 V/m; Power Drift = -0.009 dB Peak SAR (extrapolated) = 19.1 W/kg SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.24 mW/g Maximum value of SAR (measured) = 12.0 mW/g









2450 MHz Dipole Calibration Certificate

Schmid & Partner Engineering AG Jeughausstrasse 43, 8004 Zuric	ry of	Hac MRA (C C Z	S Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura S wiss Calibration Service
Accredited by the Swiss Accredita The Swiss Accreditation Servic Aultilateral Agreement for the r	e is one of the signatorie	es to the EA	on No.: SCS 108
Client TMC (Auden)		Certificate	No: D2450V2-853_Sep10
	D2450V2 - SN: 8	A CONTRACTOR OF THE CONTRACTOR OF TO C	
Calibration procedure(s)	QA CAL-05.v7 Calibration proce	dure for dipole validation kits	
Calibration date:	September 27, 2	010	
The measurements and the unce	ertainties with confidence p	ional standards, which realize the physical u robability are given on the following pages a	and are part of the certificate.
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M&	ertainties with confidence p cted in the closed laborato TE critical for calibration)	ional standards, which realize the physical u probability are given on the following pages ary facility: environment temperature (22 \pm 3)	and are part of the certificate.
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M& Primary Standards	entainties with confidence p cted in the closed laborato TE critical for calibration) ID #	robability are given on the following pages ϵ ry facility: environment temperature (22 ± 3) Cal Date (Certificate No.)	and are part of the certificate. "C and humidity < 70%, Scheduled Calibration
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M& Primary Standards Power meter EPM-442A	tertainties with confidence p cted in the closed laborato TE critical for calibration) ID # GB37480704	robability are given on the following pages a ry facility: environment temperature (22 ± 3) Cal Date (Certificate No.) 06-Oct-09 (No. 217-01086)	and are part of the certificate. "C and humidity < 70%, Scheduled Calibration Oct-10
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A	entainties with confidence p cted in the closed laborato TE critical for calibration) ID #	robability are given on the following pages ϵ ry facility: environment temperature (22 ± 3) Cal Date (Certificate No.)	and are part of the certificate. "C and humidity < 70%, Scheduled Calibration
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination	tertainties with confidence p ted in the closed laborato TE critical for calibration) ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 / 06327	robability are given on the following pages a ry facility: environment temperature (22 ± 3) Cal Date (Certificate No.) 06-Oct-09 (No. 217-01086) 06-Oct-09 (No. 217-01086) 30-Mar-10 (No. 217-01158) 30-Mar-10 (No. 217-01162)	and are part of the certificate. PC and humidity < 70%, Scheduled Calibration Oct-10 Oct-10
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 / 06327 SN: 3205	Cal Date (Certificate No.) 06-Oct-09 (No. 217-01086) 06-Oct-09 (No. 217-01086) 30-Mar-10 (No. 217-01158) 30-Mar-10 (No. 217-01162) 30-Apr-10 (No. ES3-3205_Apr10)	and are part of the certificate. PC and humidity < 70%. Scheduled Calibration Oct-10 Oct-10 Mar-11 Mar-11 Apr-11
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Callbration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerlscher Kalibrierdienst S Service suisse d'étalonnage C Servizio svizzero di taratura S

Accreditation No.: SCS 108

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

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 1528-2003, "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
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with 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:

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
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

Certificate No: D2450V2-853_Sep10



Measurement Conditions

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

DASY Version	DASY5	VEOO
Extrapolation	Advanced Extrapolation	V52.2
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	with opacer
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters The following parameters and calculations were applied.

Temperature	Permittivity	Conductivity
22.0 °C	39.2	1.80 mho/m
(22.0 ± 0.2) °C	390+6%	
	and the second second	1.74 mho/m ± 6 %
		22.0 °C 39.2 (22.0 ± 0.2) °C 39.0 ± 6 %

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 mW / g
SAR normalized	normalized to 1W	52.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	53.2 mW /g ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6 16 -14/ /-
		6.16 mW / g

SAR measured	250 mW input power	6.16 mW / g	
SAR normalized	normalized to 1W	0	
SAR for nominal Head TSL parameters		24.6 mW / g	
and a normal fload for parameters	normalized to 1W	24.8 mW /g ± 16.5 % (k=2)	

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Body TSL parameters The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	
Body TSL temperature during test	(21.6 ± 0.2) °C		1.95 mho/m ± 6 %

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	
SAR normalized		12.9 mW / g
SAR for nominal Reduitor	normalized to 1W	51.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.5 mW / g ± 17.0 % (k=2)
SAR averaged over 10 cm3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5 00 mW//
SAR normalized		5.98 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	23.9 mW / g
and to normal body ISL parameters	normalized to 1W	23.9 mW / g ± 16.5 % (k=2)

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.6 Ω + 2.8 μΩ	1
Return Loss		
100011 2000	- 25.8 dB	

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.4 Ω + 4.4 ίΩ
Return Loss	45.4 22 + 4.4 j12
Heldin Loss	- 27.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	
Lecendar Deray (one direction)	1.164 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. 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

Advertise of the second s	
Manufactured by	SPEAG
Manufactured	OI LAG
Manufactured on	November 10, 2009

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DASY5 Validation Report for Head TSL

Date/Time: 24.09.2010 14:10:17

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:853

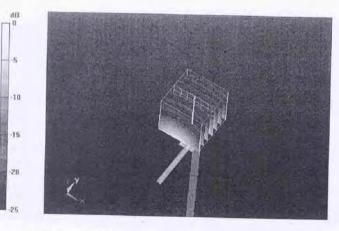
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium: HSL U12 BB Medium parameters used: f = 2450 MHz; σ = 1.74 mho/m; ε_r = 39; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin=250 mW/d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.7 V/m; Power Drift = 0.028 dB Peak SAR (extrapolated) = 26.7 W/kg SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.16 mW/gMaximum value of SAR (measured) = 16.7 mW/g



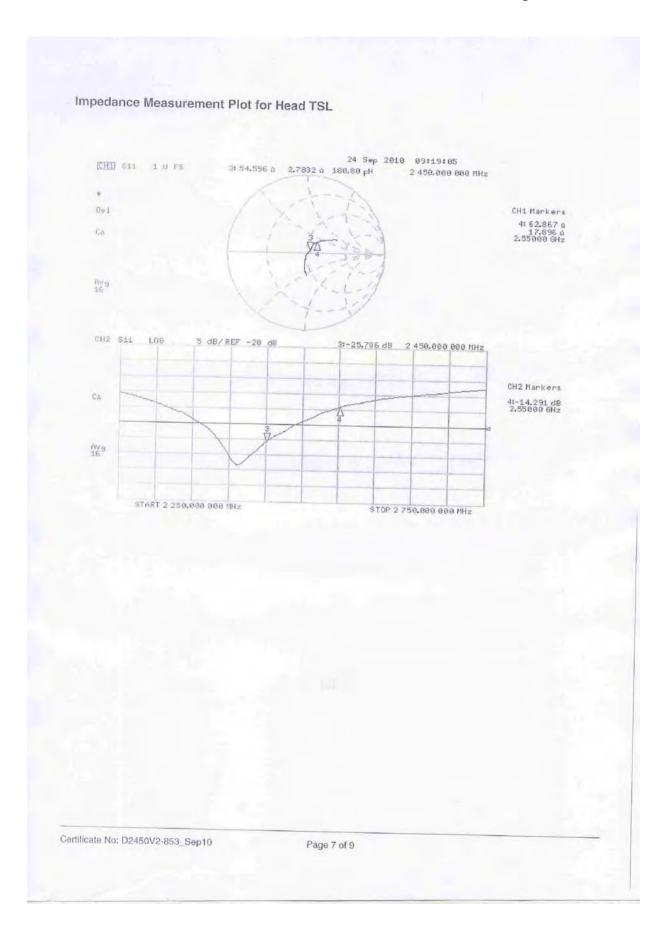
0 dB = 16.7 mW/g

Certificate No: D2450V2-853_Sep10

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Validation Report for Body

Date/Time: 27.09.2010 13:39:49

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:853

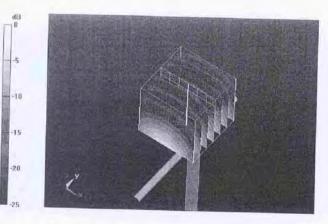
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium: MSL U12 BB Medium parameters used: f = 2450 MHz; $\sigma = 1.95$ mho/m; $\varepsilon_r = 52.6$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard; DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4,31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface; 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 95.7 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 27 W/kg SAR(1 g) = 12.9 mW/g; SAR(10 g) = 5.98 mW/gMaximum value of SAR (measured) = 16.9 mW/g



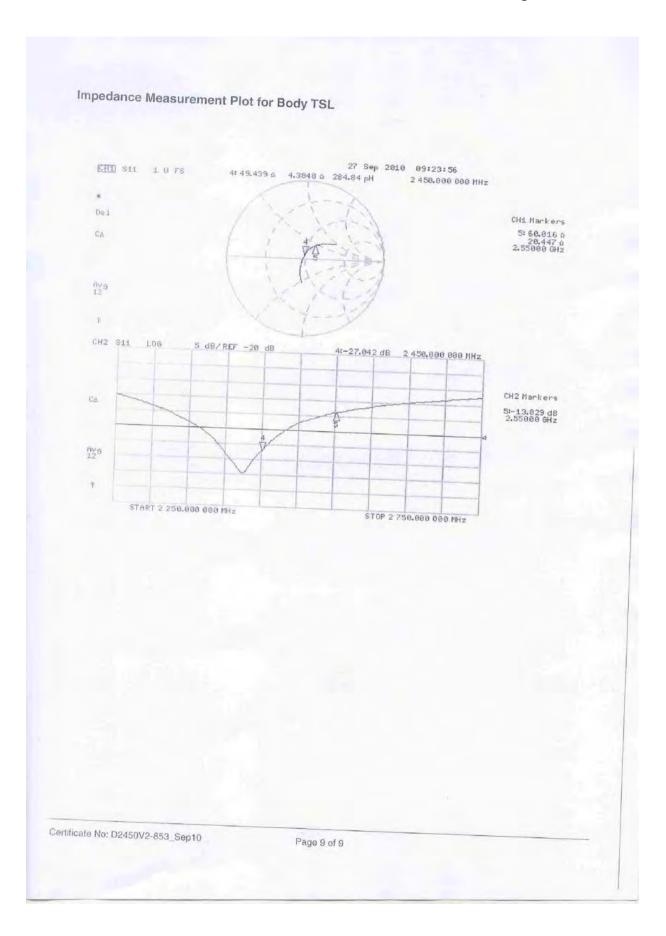
 $0 \, dB = 16.9 \, mW/g$

Certificate No: D2450V2-853_Sep10

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ANNEX G EUT APPEARANCE AND TEST POSITIONS



Picture G1: Constituents of the sample (Lithium Battery is in the Handset)



Picture G2: Left Hand Touch Cheek Position



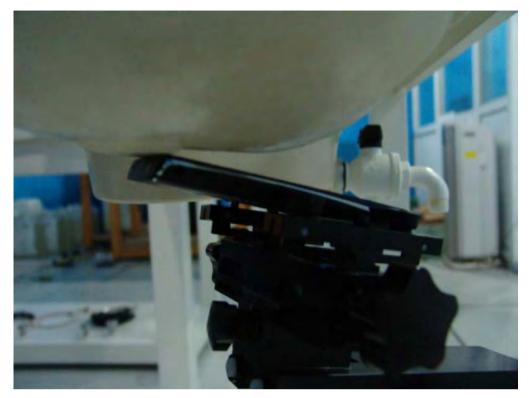


Picture G3: Left Hand Tilt 15° Position

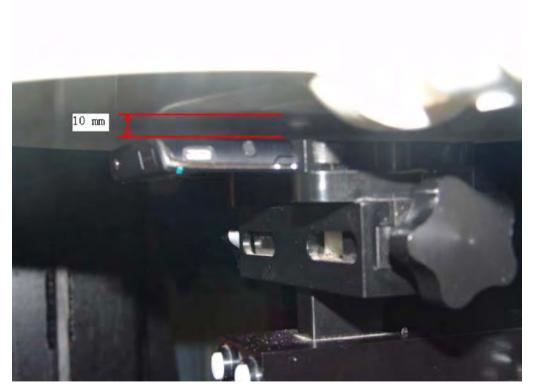


Picture G4: Right Hand Touch Cheek Position



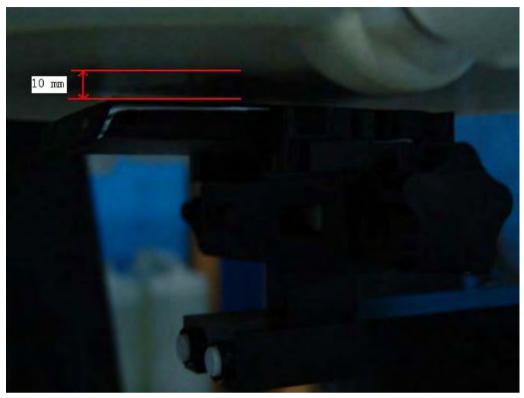


Picture G5: Right Hand Tilt 15° Position



Picture G6: Body-worn Position (towards ground, the distance from handset to the bottom of the Phantom is 10 mm)





Picture G7: Body-worn Position (towards phantom, the distance from handset to the bottom of the Phantom is 10 mm)



Picture G8: Body-worn Position with Headset (EUT towards ground, the distance from handset to the bottom of the Phantom is 10 mm)



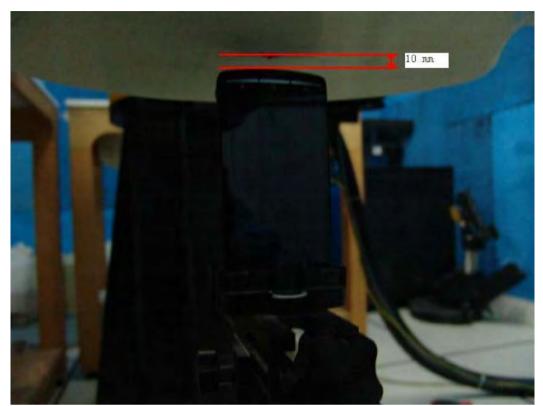


Picture G10: Body-worn Position (EUT'left side towards phantom, the distance from handset to the bottom of the Phantom is 10 mm)



Picture G9: Body-worn Position (EUT'right side towards phantom, the distance from handset to the bottom of the Phantom is 10 mm)





Picture G11: Body-worn Position (EUT'bottom side towards phantom, the distance from handset to the bottom of the Phantom is 10 mm)