

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02
PY7-PM0817 SAR FCC Test Report		Edition 2 Revision 0

APPENDIX D: PROBE CALIBRATION CERTIFICATE

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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 **Sony Mobile CN (PTT)**

Certificate No: EX3-3843_Feb14

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3843

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: February 21, 2014

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	GB41293674	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498097	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
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-13)	in house check: Oct-14

Calibrated by:	Name Israa El-Naouq	Function Laboratory Technician	Signature
Approved by:	Name Katja Pckovic	Function Technical Manager	Signature

issued: February 22, 2014

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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

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., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ 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 E²-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).

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02
PY7-PM0817 SAR FCC Test Report		Edition 2 Revision 0

EX3DV4 -- SN:3843

February 21, 2014

Probe EX3DV4

SN:3843

Manufactured: October 25, 2011
Calibrated: February 21, 2014

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

EX3DV4 - SN:3843

February 21, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3843

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.40	0.43	0.35	± 10.1 %
DCP (mV) ^B	99.1	99.2	105.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc ^F (k=2)
0	CW	X	0.0	0.0	1.0	0.00	122.9	±3.0 %
		Y	0.0	0.0	1.0		123.5	
		Z	0.0	0.0	1.0		134.5	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter; uncertainty not required.

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

EX3DV4- SN3843

February 21, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3843

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)	Unct. (k=2)
750	41.9	0.89	9.22	9.22	9.22	0.40	0.94	± 12.0 %
900	41.5	0.97	8.78	8.78	8.78	0.54	0.76	± 12.0 %
1450	40.5	1.20	8.16	8.16	8.16	0.80	0.64	± 12.0 %
1750	40.1	1.37	7.56	7.56	7.56	0.80	0.57	± 12.0 %
1900	40.0	1.40	7.33	7.33	7.33	0.65	0.64	± 12.0 %
2100	39.8	1.49	7.42	7.42	7.42	0.80	0.57	± 12.0 %
2300	39.5	1.67	6.92	6.92	6.92	0.40	0.79	± 12.0 %
2450	39.2	1.80	6.66	6.66	6.66	0.25	1.08	± 12.0 %
2600	39.0	1.96	6.44	6.44	6.44	0.43	0.81	± 12.0 %
3500	37.9	2.91	6.22	6.22	6.22	0.65	0.80	± 13.1 %
5200	36.0	4.66	4.49	4.49	4.49	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.29	4.29	4.29	0.40	1.80	± 13.1 %
5500	35.8	4.96	4.25	4.25	4.25	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.11	4.11	4.11	0.35	1.80	± 13.1 %
5800	35.3	5.27	3.99	3.99	3.99	0.45	1.80	± 13.1 %

^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 (σ and α) 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 (σ and α) 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:3843

February 21, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3843

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^d	Conductivity (S/m) ^e	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^h (mm)	Unct. (k=2)
750	55.5	0.96	8.69	8.69	8.69	0.80	0.64	± 12.0 %
900	55.0	1.05	8.50	8.50	8.50	0.80	0.50	± 12.0 %
1450	54.0	1.30	7.74	7.74	7.74	0.38	0.99	± 12.0 %
1750	53.4	1.49	7.68	7.68	7.68	0.40	1.01	± 12.0 %
1900	53.3	1.52	7.31	7.31	7.31	0.34	1.02	± 12.0 %
2100	53.2	1.62	7.51	7.51	7.51	0.35	1.05	± 12.0 %
2300	52.9	1.81	6.98	6.98	6.98	0.62	0.67	± 12.0 %
2450	52.7	1.95	6.60	6.60	6.60	0.80	0.57	± 12.0 %
2600	52.5	2.16	6.27	6.27	6.27	0.80	0.50	± 12.0 %
3500	51.3	3.31	5.90	5.90	5.90	0.42	1.04	± 13.1 %
5200	49.0	5.30	4.00	4.00	4.00	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.94	3.94	3.94	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.63	3.63	3.63	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.39	3.39	3.39	0.55	1.90	± 13.1 %
5800	48.2	6.00	3.72	3.72	3.72	0.55	1.90	± 13.1 %

^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.

^d 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.

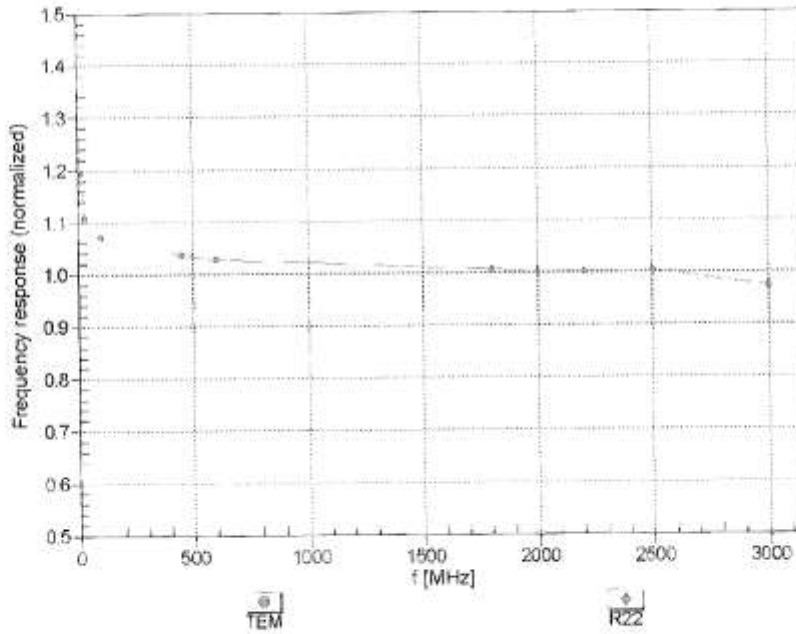
^g Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3843- SN:3843

February 21, 2014

Frequency Response of E-Field (TEM-Cell: iff110 EXX, Waveguide: R22)



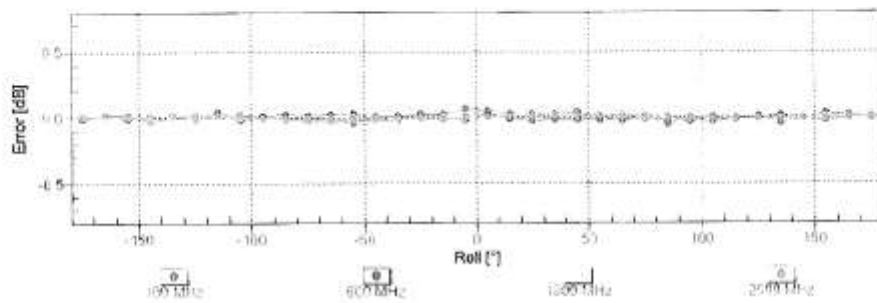
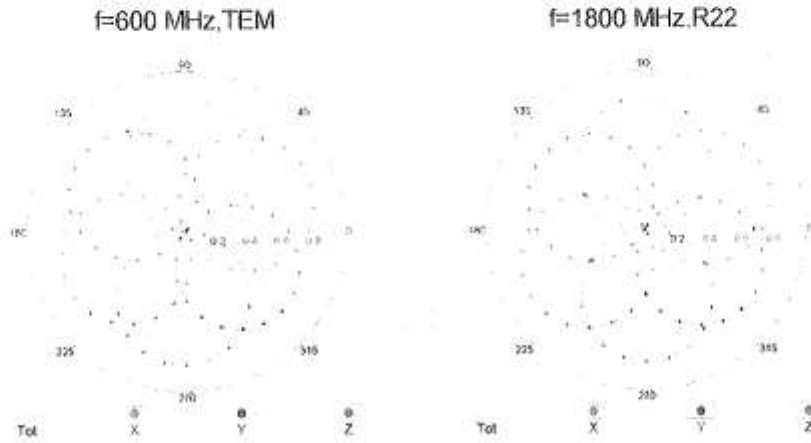
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3DV4-SN:3843

February 21, 2014

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



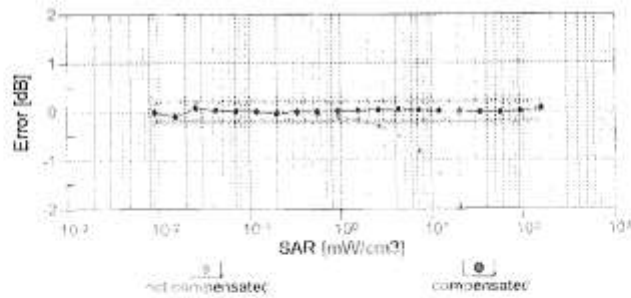
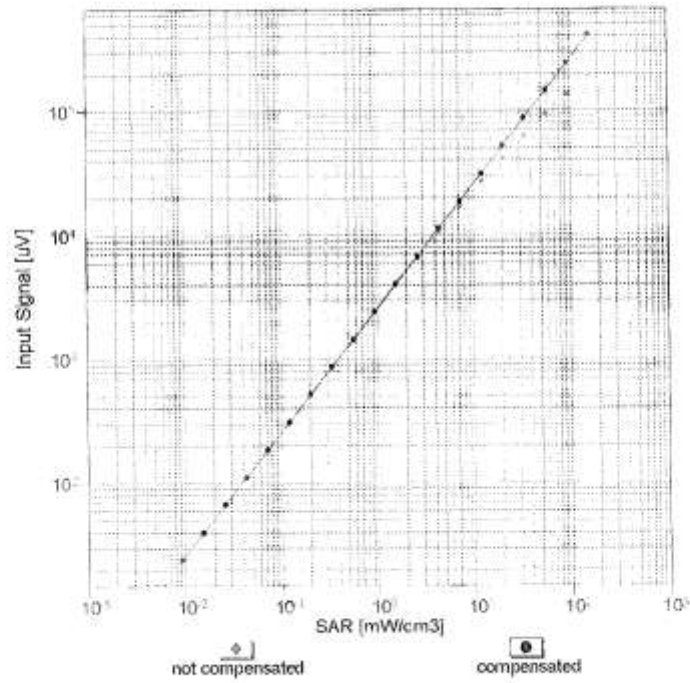
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3DV4- SN:3643

February 21, 2014

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



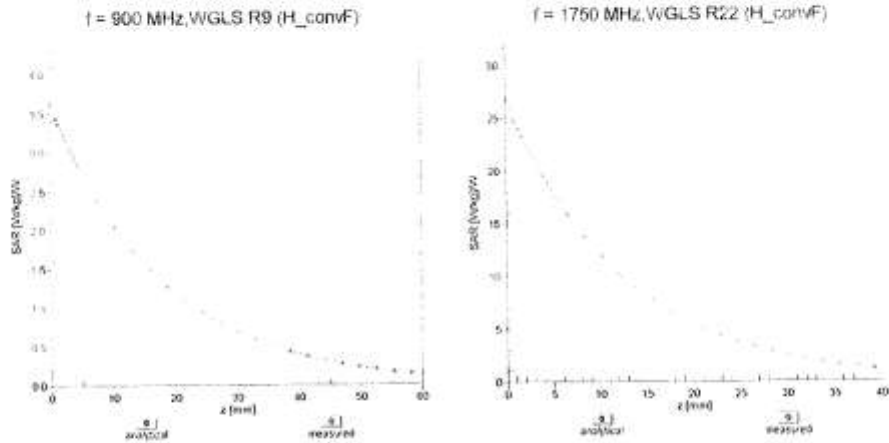
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

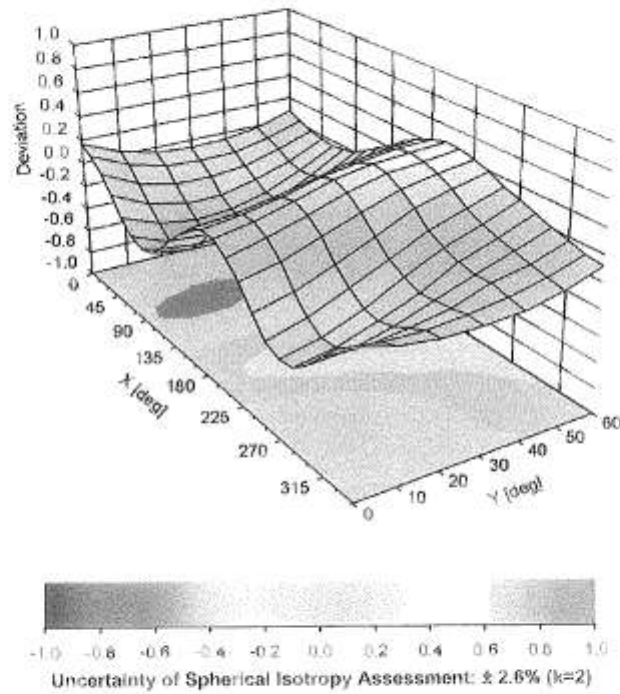
EX3DV4-SN:3843

February 21, 2014

Conversion Factor Assessment



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



SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3DV4- SN:3843

February 21, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3843

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-24.9
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	2 mm

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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 **Sony Mobile Factory (PTT)**

Certificate No: ES3-3169_Dec13

CALIBRATION CERTIFICATE	
Object	ES3DV3 - SN:3169
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	December 19, 2013
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&E critical for calibration)	

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8640C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Kolja Pokovic	Technical Manager	
			Issued: December 19, 2013
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

Certificate No: ES3-3169_Dec13

Page 1 of 11

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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**

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., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- 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 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ 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 E²-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).

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02
PY7-PM0817 SAR FCC Test Report		Edition 2 Revision 0

ES3DV3 – SN:3169

December 19, 2013

Probe ES3DV3

SN:3169

Manufactured: October 8, 2008
Calibrated: December 19, 2013

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

ES3DV3-SN:3169

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^{\text{N}}$) ^A	1.16	1.17	1.15	$\pm 10.1\%$
DCP (mV) ^B	101.4	98.0	95.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^C (k=2)
0	CW	X	0.0	0.0	1.0	0.00	145.9	$\pm 2.7\%$
		Y	0.0	0.0	1.0		148.1	
		Z	0.0	0.0	1.0		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 Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3169

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

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 (mm) ^g	Unct. (k=2)
750	41.9	0.69	6.56	6.56	6.56	0.37	1.61	± 12.0 %
900	41.5	0.97	6.33	6.33	6.33	0.49	1.40	± 12.0 %
1750	40.1	1.37	5.08	5.08	5.08	0.46	1.51	± 12.0 %
1900	40.0	1.40	4.96	4.96	4.96	0.80	1.15	± 12.0 %
2000	40.0	1.40	4.94	4.94	4.94	0.66	1.28	± 12.0 %
2450	39.2	1.80	4.42	4.42	4.42	0.74	1.32	± 12.0 %
2600	39.0	1.96	4.26	4.26	4.26	0.77	1.34	± 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.

^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.

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3169

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

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 (mm) ^d	Unct. (k=2)
750	55.5	0.96	6.07	6.07	6.07	0.53	1.40	± 12.0 %
900	55.0	1.05	5.96	5.96	5.96	0.53	1.39	± 12.0 %
1750	53.4	1.49	5.00	5.00	5.00	0.44	1.66	± 12.0 %
1900	53.3	1.52	4.77	4.77	4.77	0.46	1.70	± 12.0 %
2000	53.3	1.52	4.77	4.77	4.77	0.52	1.59	± 12.0 %
2450	52.7	1.95	4.27	4.27	4.27	0.80	1.12	± 12.0 %
2600	52.5	2.16	4.07	4.07	4.07	0.66	0.99	± 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.

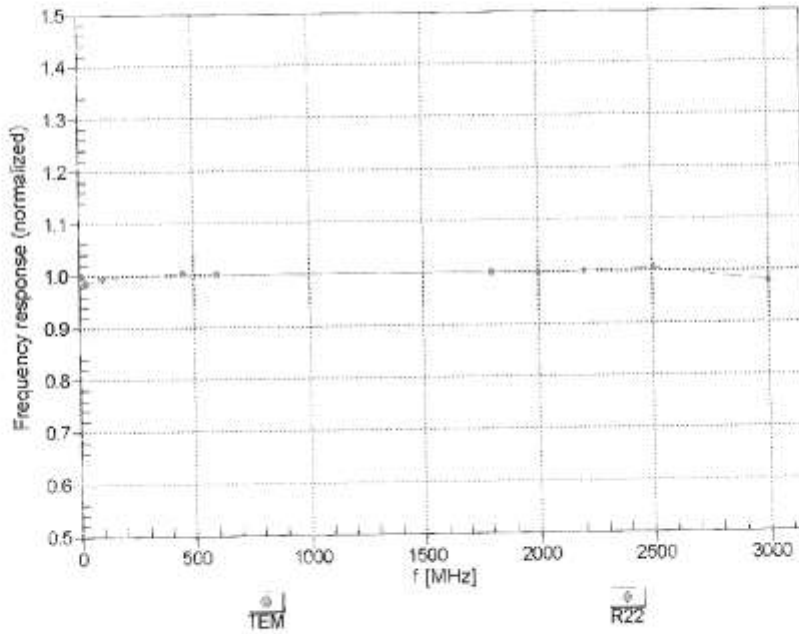
^g AlphaDepth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN.3169

December 19, 2013

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



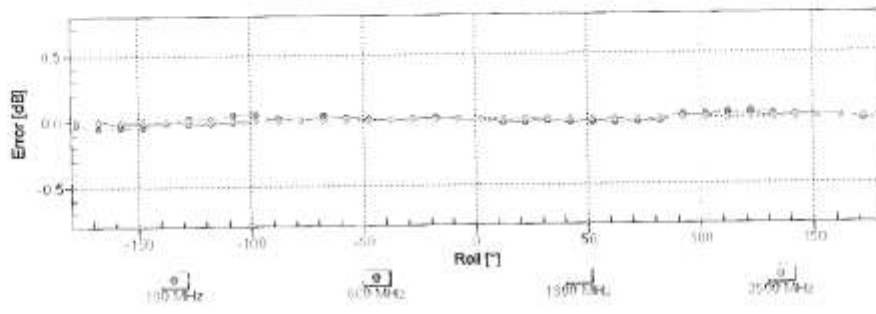
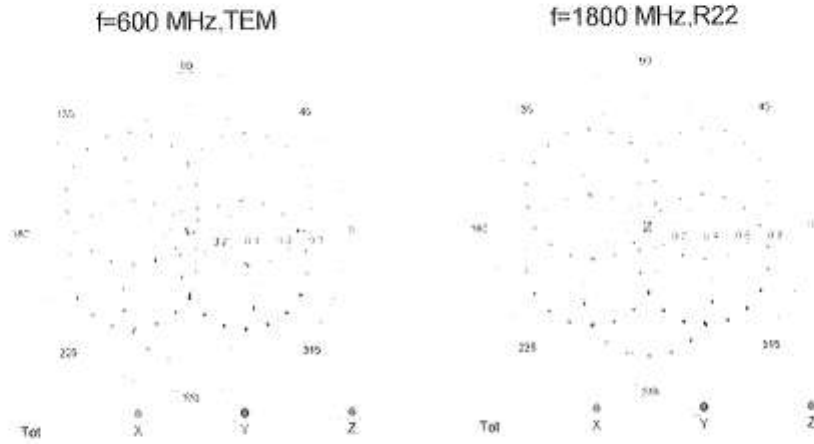
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3-SN:3169

December 19, 2013

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



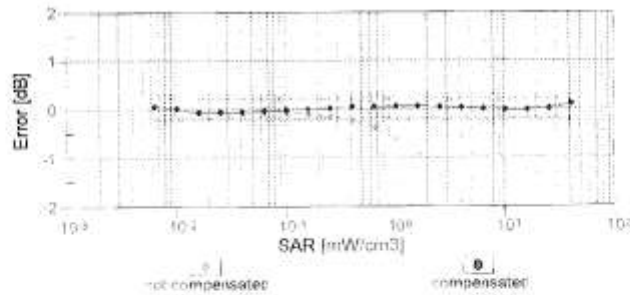
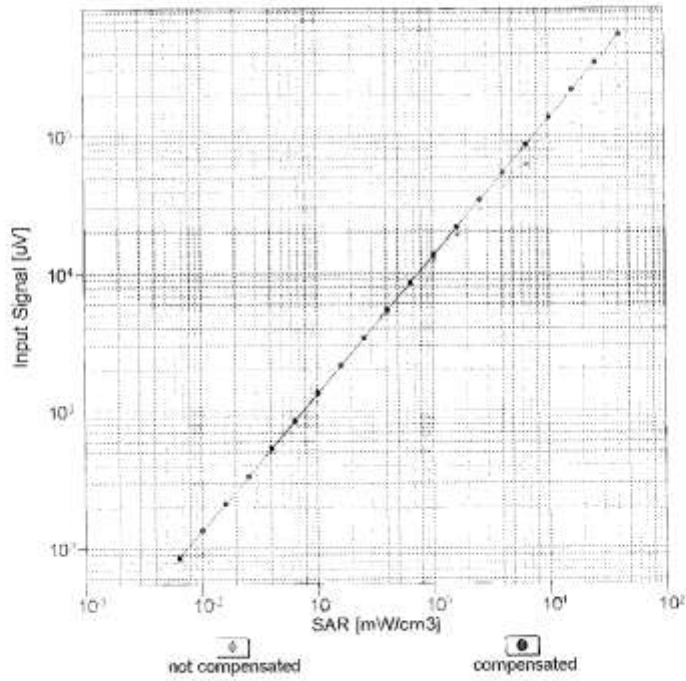
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ESJ0V3-SN:3169

December 19, 2013

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



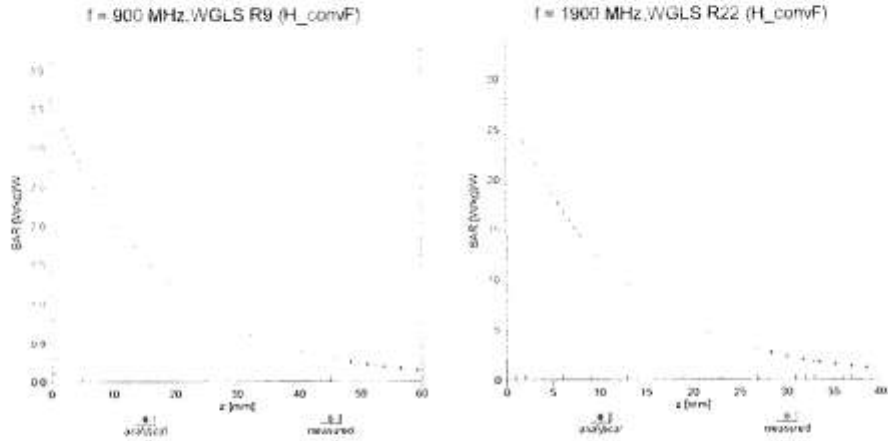
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3-SN:3169

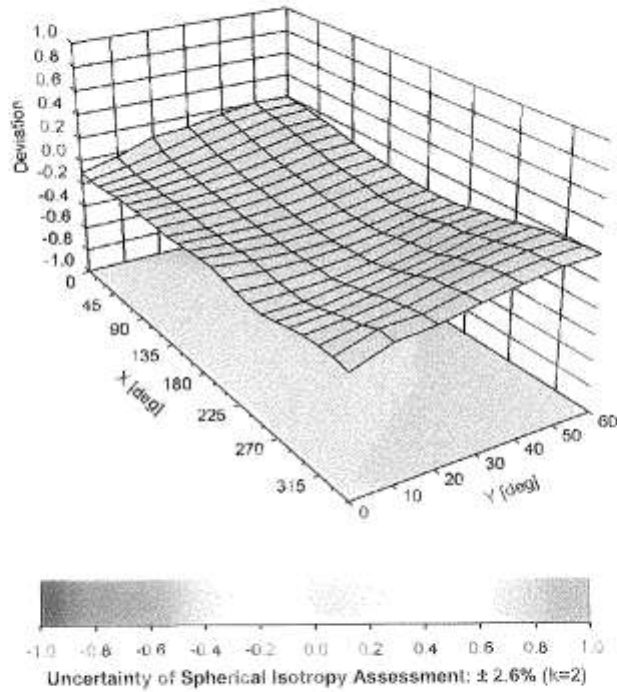
December 19, 2013

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), f = 900 MHz



SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3 - SN:3169

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-27.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
C 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 Sony Mobile Factory (PTT)

Certificate No: ES3-3170_Dec13

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3170
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	December 19, 2013

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&E critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 6648C	US3642UD1700	4-Aug-09 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: Approved by:	Name Jeton Kestrali Katja Polovic	Function Laboratory Technician Technical Manager	Signature Issued: December 19, 2013
--	---	--	--

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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



S Schweizerischer Kalibrierdienst
S 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

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., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- 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 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f < 900$ 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 E²-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 $f < 800$ 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).

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3 - SN:3170

December 19, 2013

Probe ES3DV3

SN:3170

Manufactured: January 23, 2008
 Calibrated: December 19, 2013

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3170

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3170

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(\sqrt{Hz})^2$) ^A	1.26	1.04	0.95	± 10.1 %
DCP (mV) ^B	101.6	100.2	112.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc ^C (k=2)
0	CW	X	0.0	0.0	1.0	0.00	154.5	±3.0 %
		Y	0.0	0.0	1.0		139.1	
		Z	0.0	0.0	1.0		140.1	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3170

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3170

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 ^h (mm)	Unct. (k=2)
835	41.5	0.90	6.39	6.39	6.39	0.62	1.26	± 12.0 %
1750	40.1	1.37	5.40	5.40	5.40	0.54	1.61	± 12.0 %
1900	40.0	1.40	5.15	5.15	5.15	0.71	1.27	± 12.0 %
2450	39.2	1.80	4.54	4.54	4.54	0.67	1.41	± 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.

^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.

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3170

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3170

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 (mm) ^g	Unct. (k=2)
835	55.2	0.97	6.08	6.08	6.08	0.56	1.34	± 12.0 %
1750	53.4	1.49	4.91	4.91	4.91	0.41	1.79	± 12.0 %
1900	53.3	1.52	4.70	4.70	4.70	0.48	1.54	± 12.0 %
2450	52.7	1.95	4.21	4.21	4.21	0.70	1.12	± 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.

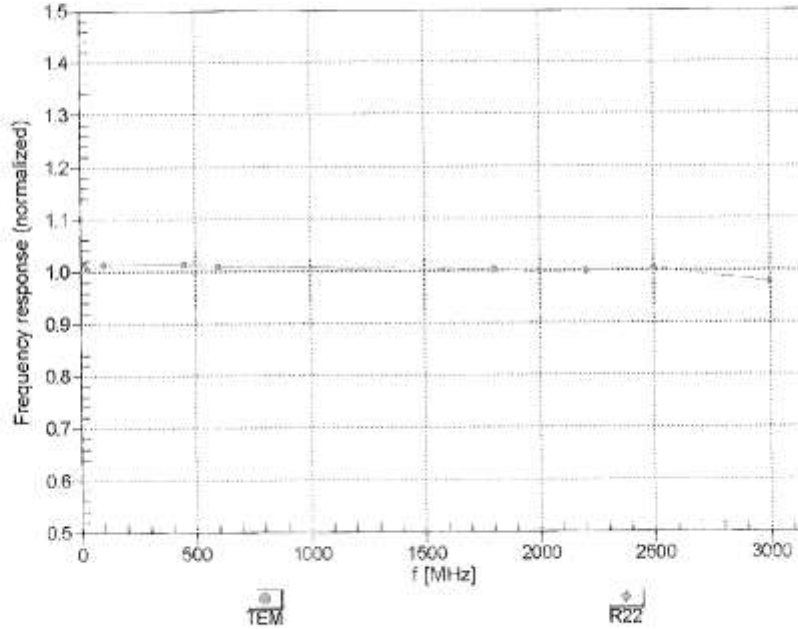
^g Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN.3170

December 19, 2013

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



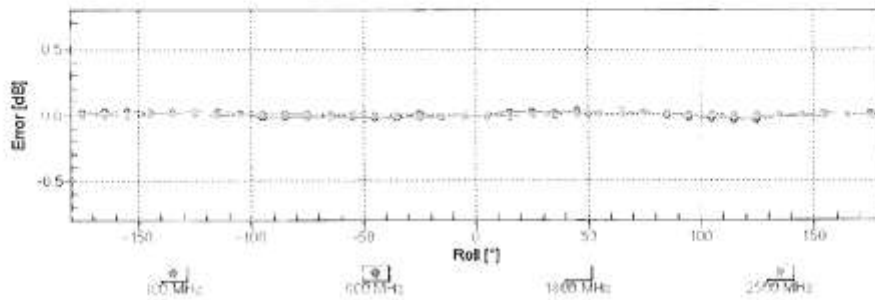
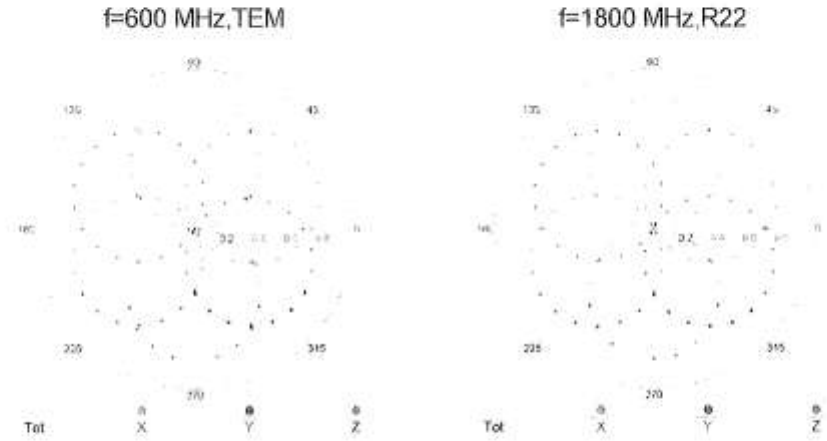
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3170

December 19, 2013

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



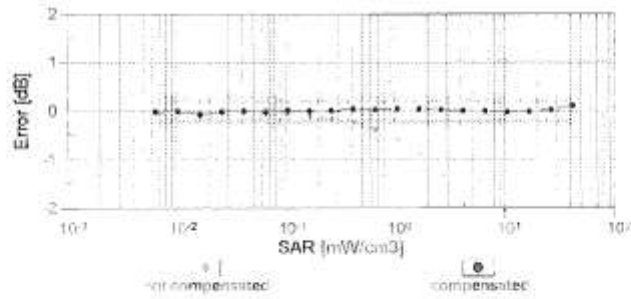
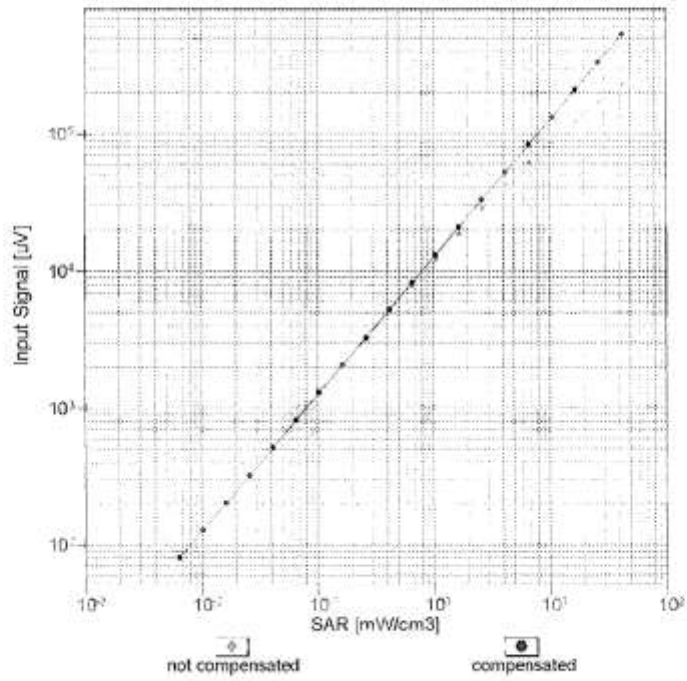
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3-SH 3170

December 19, 2013

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



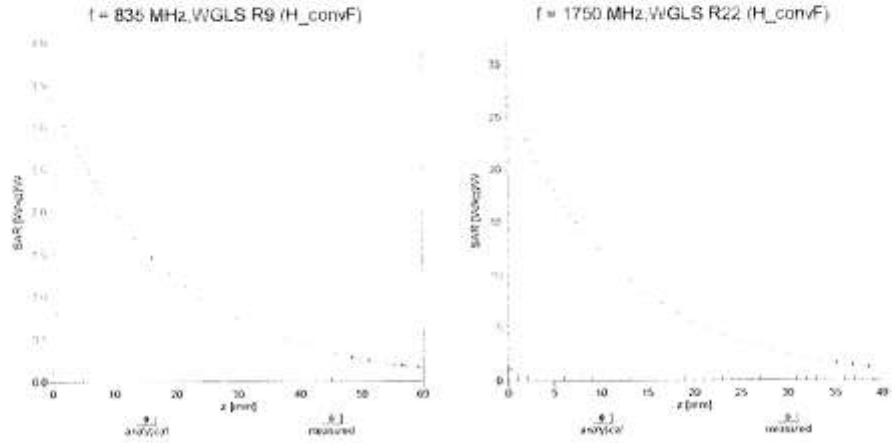
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3170

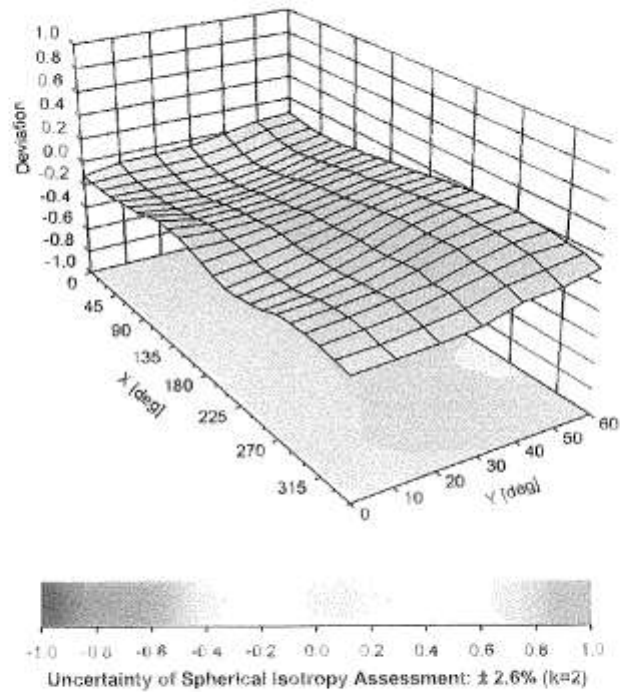
December 19, 2013

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900$ MHz



SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3170

December 19, 2013

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3170

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3169

December 16, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-25.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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 **Sony Mobile CN (Vitec)**

Certificate No: ES3-3169_Dec14

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3169

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

Calibration date: December 16, 2014

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	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20a)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 789	30-Apr-14 (No. DAE4-789_Apr14)	Apr-15
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642001700	4-Aug-09 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8733E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by:	Name Leif Klyzner	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature
			Issued: December 16, 2014

This calibration certificate shall only be reproduced or copied in full without the approval of the laboratory.

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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

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., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ 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 E²-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).

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3 - SN:3169

December 16, 2014

Probe ES3DV3

SN:3169

Manufactured: January 23, 2008
Calibrated: December 16, 2014

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3169

December 16, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^2$) ^a	1.17	1.17	1.16	$\pm 10.1\%$
DCP (mV) ^b	103.6	99.0	98.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^c (k=2)
0	CW	X	0.0	0.0	1.0	0.00	197.9	$\pm 3.5\%$
		Y	0.0	0.0	1.0		199.5	
		Z	0.0	0.0	1.0		190.3	

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 E²-field uncertainty inside TSL. (see Pages 5 and 6).

^b Numerical linearization parameter; uncertainty not required.

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

ES3DV3-SN:3169

December 16, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^e	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth (mm) ^d	Unct. (k=2)
750	41.9	0.89	6.49	6.49	6.49	0.44	1.53	± 12.0 %
835	41.5	0.90	6.31	6.31	6.31	0.70	1.21	± 12.0 %
900	41.5	0.97	6.22	6.22	6.22	0.30	1.91	± 12.0 %
1750	40.1	1.37	5.26	5.26	5.26	0.48	1.51	± 12.0 %
1900	40.0	1.40	5.07	5.07	5.07	0.73	1.30	± 12.0 %
2100	39.8	1.49	5.22	5.22	5.22	0.61	1.41	± 12.0 %
2450	39.2	1.80	4.55	4.55	4.55	0.68	1.37	± 12.0 %
2600	39.0	1.96	4.37	4.37	4.37	0.76	1.31	± 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 of calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 60 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 150 MHz.

^d At frequencies below 3 GHz, the validity of tissue parameters (μ 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 (μ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^e 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.

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3 - SN:3169

December 16, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3169

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^g	ConvF X	ConvF Y	ConvF Z	Alpha ^h	Depth ⁱ (mm)	Unct. (k=2)
750	55.5	0.96	6.06	6.06	6.06	0.25	2.11	± 12.0 %
835	55.2	0.97	6.05	6.05	6.05	0.80	1.16	± 12.0 %
900	55.0	1.05	5.95	5.95	5.95	0.80	1.15	± 12.0 %
1750	53.4	1.49	4.86	4.86	4.86	0.58	1.56	± 12.0 %
1900	53.3	1.52	4.58	4.58	4.58	0.54	1.64	± 12.0 %
2100	53.2	1.62	4.65	4.65	4.65	0.71	1.48	± 12.0 %
2450	52.7	1.95	4.09	4.09	4.09	0.80	1.19	± 12.0 %
2600	52.5	2.16	3.92	3.92	3.92	0.80	1.18	± 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.

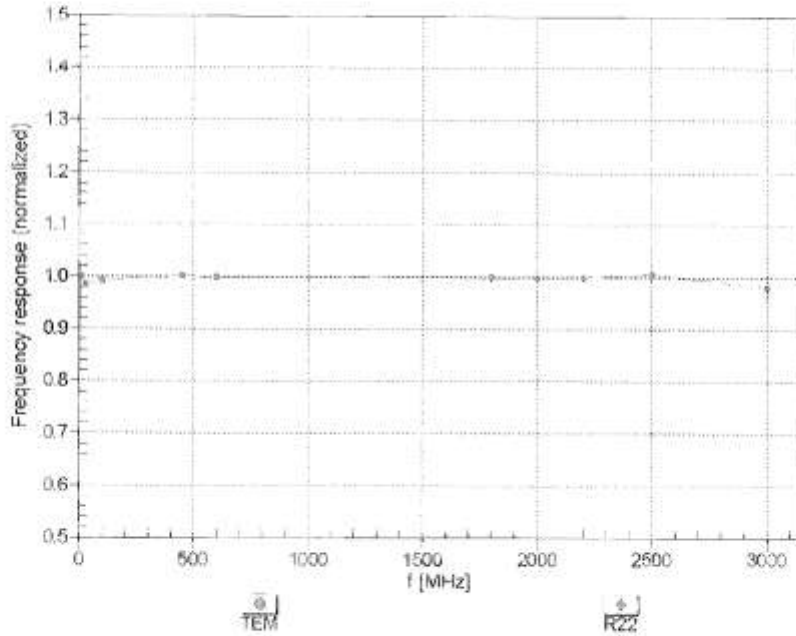
^h Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ESJ0V3-SH3169

December 16, 2014

Frequency Response of E-Field (TEM-Cell: if1110 EXX, Waveguide: R22)



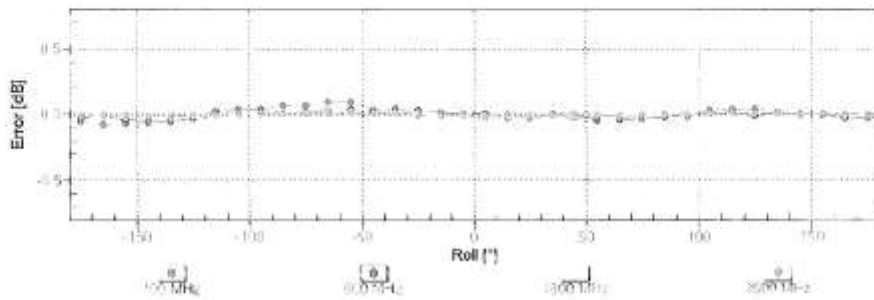
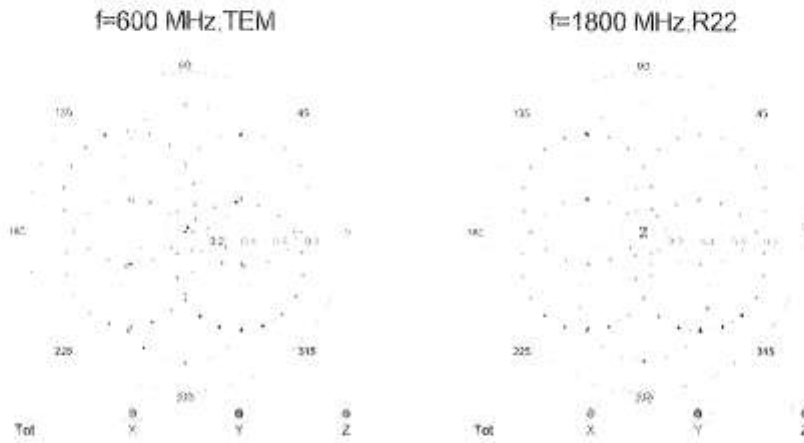
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ESJ0V3-SP11169

December 16, 2014

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



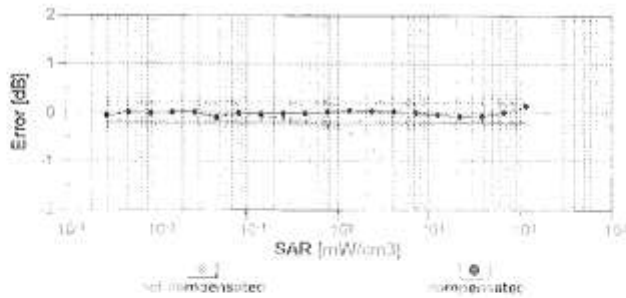
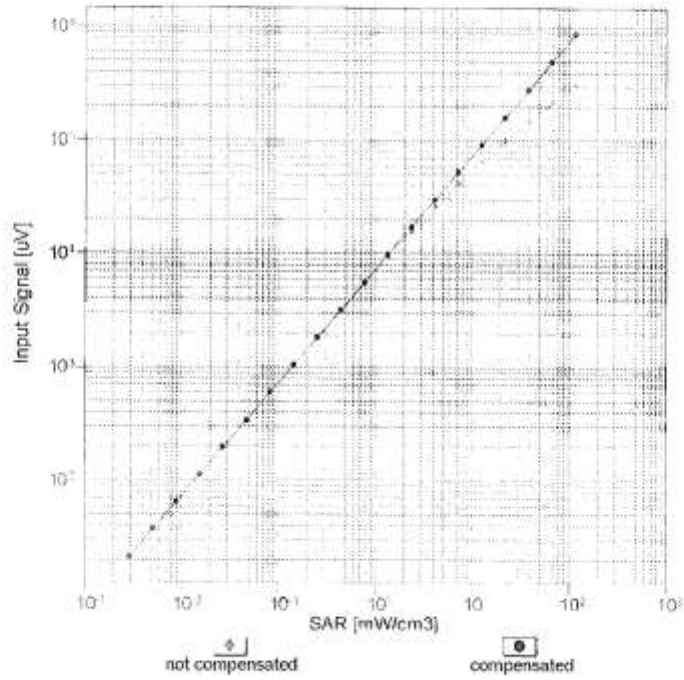
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES10V3-SN1169

December 16, 2014

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



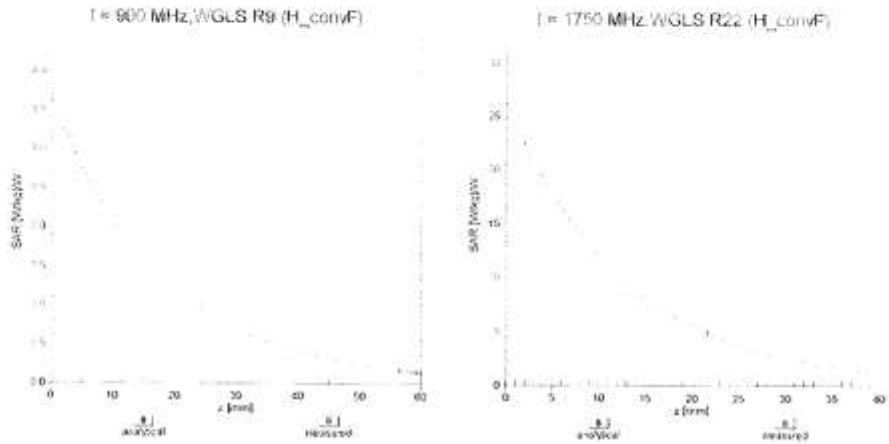
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3D/V3-SH-3169

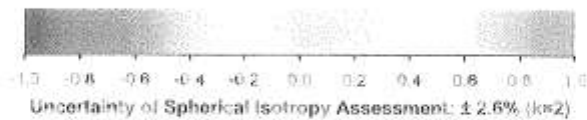
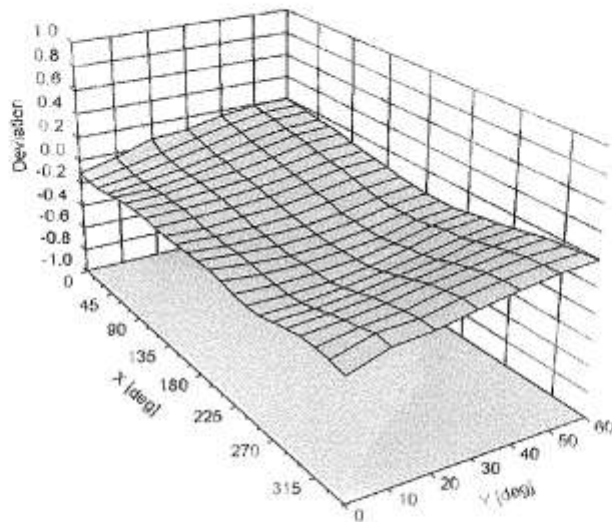
December 16, 2014

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900$ MHz



SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3DV4 - SN:3642

December 12, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3642

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	64.4
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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report		Edition 2

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 **Sony Mobile Factory (PTT)**

Certificate No: **ES3-3295_Mar14**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3295
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	March 14, 2014
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility, environment temperature (22 ± 3) °C and humidity < 70%.</p> <p>Calibration Equipment (used (M&TE critical for calibration))</p>	

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013, Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660, Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3842U01700	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-13)	in house check: Oct-14

Calibrated by:	Name Israe El-Neoug	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Technical Manager	
			Issued: March 14, 2014
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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



S Schweizerischer Kalibrierdienst
S 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

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., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- 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 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ 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 E²-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 $f < 800$ 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)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3 - SN 3295

March 14, 2014

Probe ES3DV3

SN:3295

Manufactured: July 6, 2010
 Repaired: March 11, 2014
 Calibrated: March 14, 2014

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3295

March 14, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3295

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^{2A}$) ^a	1.02	0.96	1.21	$\pm 10.1\%$
DCP (mV) ^b	106.0	105.0	103.5	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^c (k=2)
0	CW	X	0.0	0.0	1.0	0.00	193.2	$\pm 3.8\%$
		Y	0.0	0.0	1.0		191.5	
		Z	0.0	0.0	1.0		204.8	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^b Numerical linearization parameter: uncertainty not required.

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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3295

March 14, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3295

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 ^h (mm)	Unct. (k=2)
750	41.9	0.89	6.30	6.30	6.30	0.66	1.25	± 12.0 %
900	41.5	0.97	5.96	5.96	5.96	0.46	1.50	± 12.0 %
1450	40.5	1.20	5.52	5.52	5.52	0.32	1.80	± 12.0 %
1750	40.1	1.37	5.28	5.28	5.28	0.72	1.23	± 12.0 %
1900	40.0	1.40	5.11	5.11	5.11	0.54	1.45	± 12.0 %
2100	39.8	1.49	5.19	5.19	5.19	0.53	1.48	± 12.0 %
2450	39.2	1.80	4.53	4.53	4.53	0.80	1.25	± 12.0 %
2600	39.0	1.96	4.34	4.34	4.34	0.79	1.32	± 12.0 %

^c Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 60 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.

^g Alpha/Depth are determined during calibration. SPEAC 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.

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3 - SN:3295

March 14, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3295

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^e	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^h (mm)	Unct. (k=2)
750	55.5	0.96	6.16	6.16	6.16	0.35	1.78	± 12.0 %
900	55.0	1.05	5.99	5.99	5.99	0.50	1.49	± 12.0 %
1450	54.0	1.30	5.07	5.07	5.07	0.38	1.76	± 12.0 %
1750	53.4	1.49	4.83	4.83	4.83	0.55	1.50	± 12.0 %
1900	53.3	1.52	4.65	4.65	4.65	0.62	1.47	± 12.0 %
2100	53.2	1.62	4.80	4.80	4.80	0.53	1.61	± 12.0 %
2450	52.7	1.95	4.23	4.23	4.23	0.80	1.10	± 12.0 %
2800	52.5	2.16	4.04	4.04	4.04	0.75	1.09	± 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.

^e At frequencies below 3 GHz, the validity of tissue parameters (ϵ_r 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_r and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

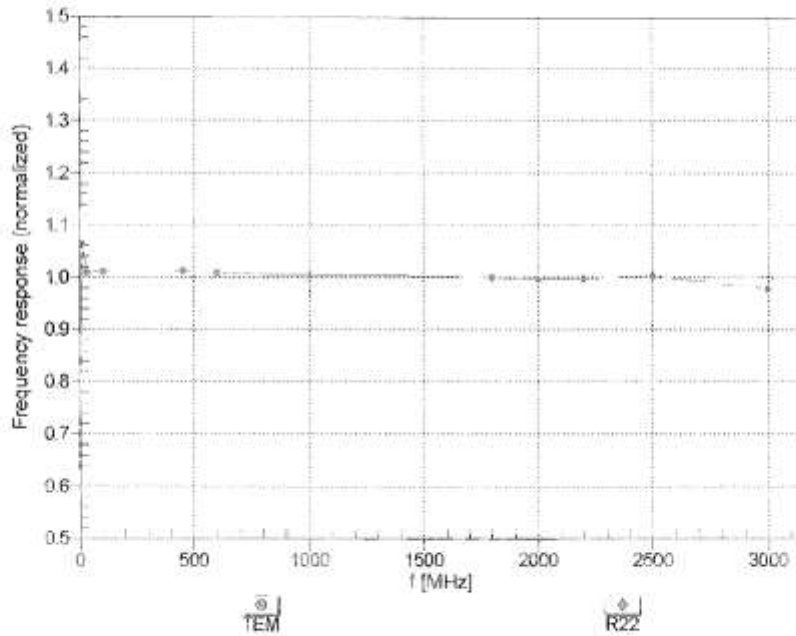
^h Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES30V3- SN 3295

March 14, 2014

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



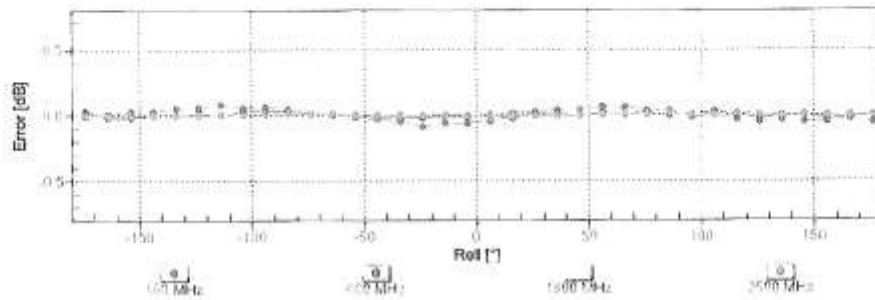
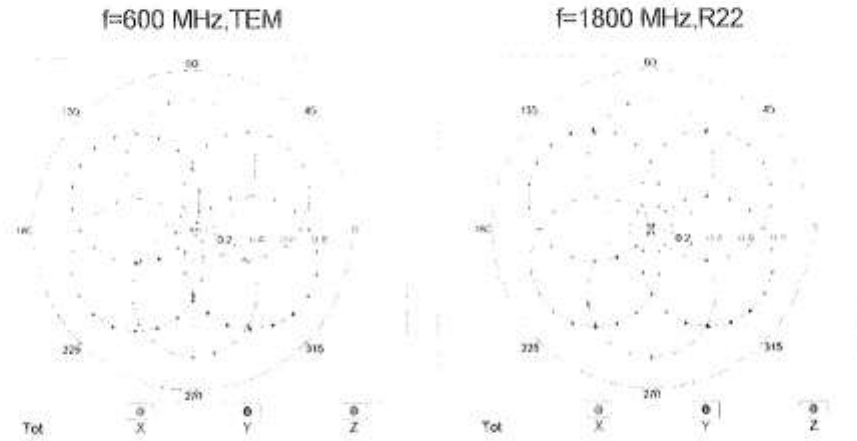
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES90V3-SN.3295

March 14, 2014

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

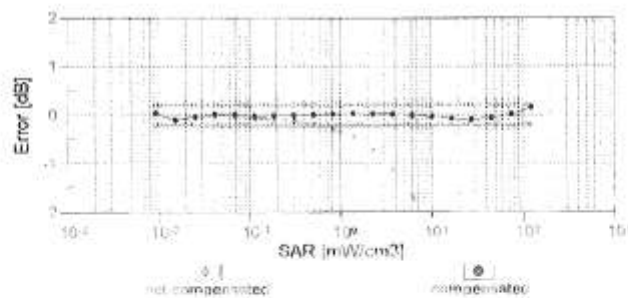
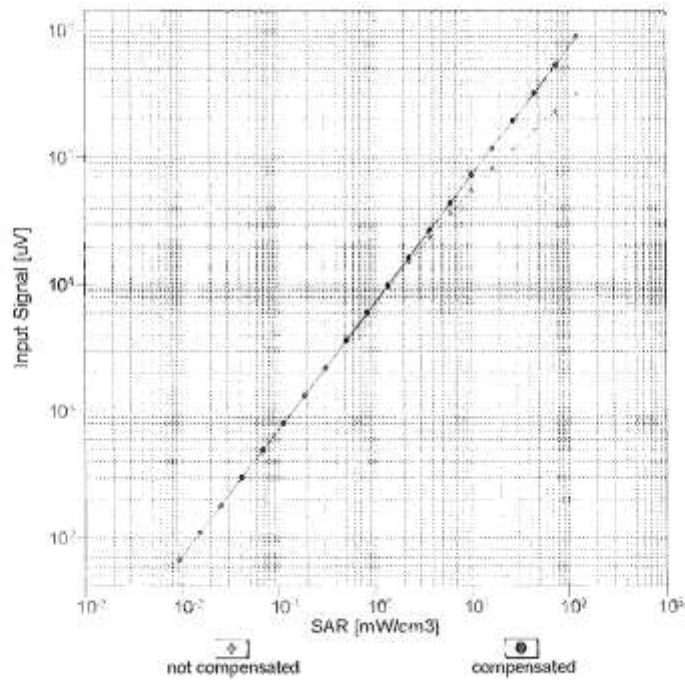


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ES30V3-SN3296

March 14, 2014

Dynamic Range f(SAR_{head})
(TEM cell, f_{eval} = 1900 MHz)



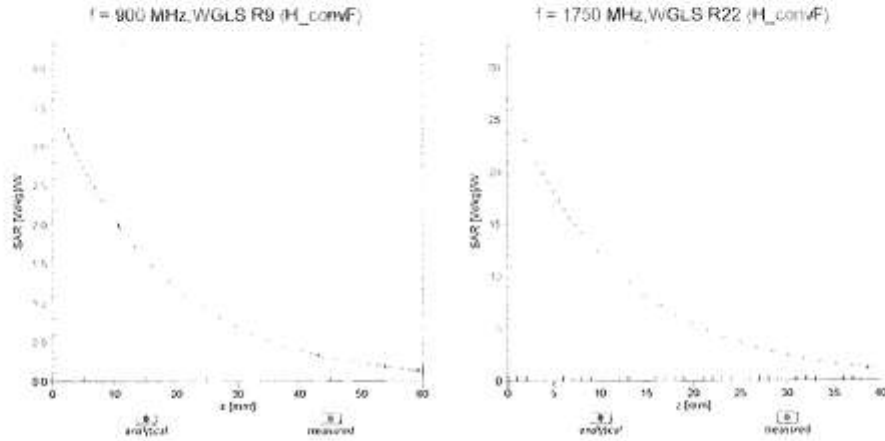
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

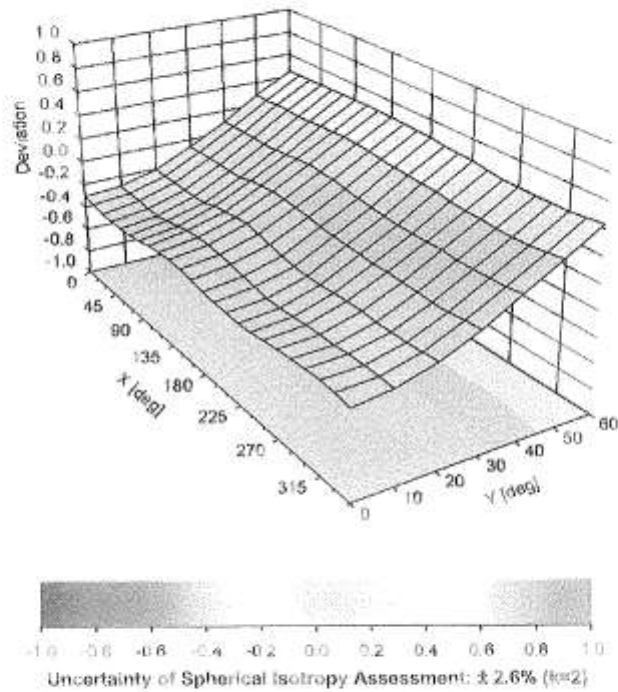
ES30V3- SN:3295

March 14, 2014

Conversion Factor Assessment



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



SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

ES3DV3- SN:3295

March 14, 2014

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3295

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-63.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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



S Schweizerischer Kalibrierdienst
S 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 Sony Mobile CN (Vitec)

Certificate No: EX3-3642_Dec14

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3642

Calibration procedure(s) QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: December 12, 2014

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&PE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41496087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20c)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 880	13-Dec-13 (No. DAE4-880_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8048C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP B753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israa El-Nacouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
			Issued: December 12, 2014
This calibration certificate shall not be reprinted except in full without written approval of the laboratory.			

Certificate No: EX3-3642 Dec14

Page 1 of 11

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
S Servizio svizzero di taratura
S 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
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., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- 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 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ 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 E²-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 $f < 800$ 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,y,z} (no uncertainty required).

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3DV4 - SN:3642

December 12, 2014

Probe EX3DV4

SN:3642

Manufactured: January 8, 2008
 Calibrated: December 12, 2014

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

EX3DV4- SN:3642

December 12, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3642

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm $(\mu V/(V/m)^{0.5})^A$	0.31	0.32	0.38	$\pm 10.1\%$
DCP $(mV)^B$	95.6	93.5	100.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc (k=2)
0	CW	X	0.0	0.0	1.0	0.00	144.2	$\pm 3.3\%$
		Y	0.0	0.0	1.0		134.5	
		Z	0.0	0.0	1.0		133.4	

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 NormX, Y, Z do not affect the E₁ field uncertainty inside TSI. (see Pages 5 and 6)

^B Numerical linearization parameter: uncertainty not required.

^C 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:3642

December 12, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3642

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^e	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^h (mm)	Unct. (k=2)
750	41.9	0.89	9.59	9.59	9.59	0.80	0.56	± 12.0 %
835	41.5	0.90	9.29	9.29	9.29	0.36	0.83	± 12.0 %
900	41.5	0.97	9.07	9.07	9.07	0.16	1.29	± 12.0 %
1450	40.5	1.20	8.69	8.69	8.69	0.41	1.03	± 12.0 %
1750	40.1	1.37	7.80	7.80	7.80	0.55	0.68	± 12.0 %
1900	40.0	1.40	7.47	7.47	7.47	0.40	0.80	± 12.0 %
2100	39.8	1.49	7.56	7.56	7.56	0.80	0.57	± 12.0 %
2450	39.2	1.80	6.81	6.81	6.81	0.38	0.85	± 12.0 %
2600	39.0	1.96	6.67	6.67	6.67	0.49	0.69	± 12.0 %
3500	37.9	2.91	6.90	6.90	6.90	0.44	0.99	± 13.1 %
5200	36.0	4.66	4.79	4.79	4.79	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.55	4.55	4.55	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.49	4.49	4.49	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.27	4.27	4.27	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.22	4.22	4.22	0.40	1.80	± 13.1 %

^e 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, 54, 120, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 150 MHz.

^f At frequencies below 3 GHz, the validity of tissue parameters (ρ 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 (ρ 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:3642

December 12, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3642

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 ^h (mm)	Unc. (k=2)
750	55.5	0.96	9.04	9.04	9.04	0.46	0.80	± 12.0 %
835	55.2	0.97	8.97	8.97	8.97	0.80	0.60	± 12.0 %
900	55.0	1.05	8.82	8.82	8.82	0.63	0.67	± 12.0 %
1450	54.0	1.30	7.74	7.74	7.74	0.61	0.71	± 12.0 %
1750	53.4	1.49	8.42	8.42	8.42	0.40	0.97	± 12.0 %
1900	53.3	1.52	7.99	7.99	7.99	0.48	0.82	± 12.0 %
2100	53.2	1.62	8.26	8.26	8.26	0.59	0.71	± 12.0 %
2450	52.7	1.95	7.47	7.47	7.47	0.80	0.60	± 12.0 %
2600	52.5	2.16	7.15	7.15	7.15	0.80	0.62	± 12.0 %
3500	51.3	3.31	6.40	6.40	6.40	0.29	1.33	± 13.1 %
5200	49.0	5.30	4.11	4.11	4.11	0.40	1.90	± 13.1 %
5300	48.9	5.42	3.97	3.97	3.97	0.40	1.90	± 13.1 %
5500	48.6	5.65	3.73	3.73	3.73	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.68	3.68	3.68	0.45	1.90	± 13.1 %
5800	48.2	6.00	3.83	3.83	3.83	0.45	1.90	± 13.1 %

^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, 180 and 220 MHz respectively. Above 6 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.

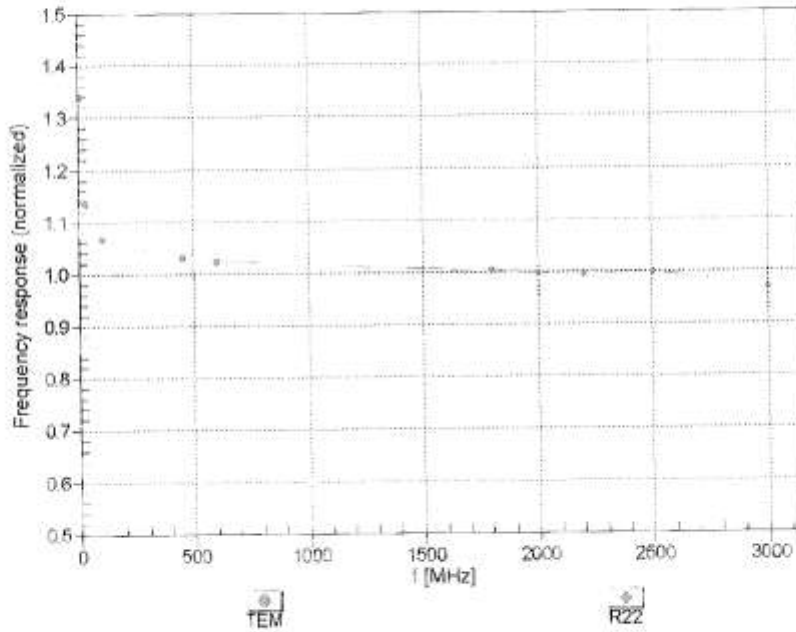
^g Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX30V4-SN:3642

December 12, 2014

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



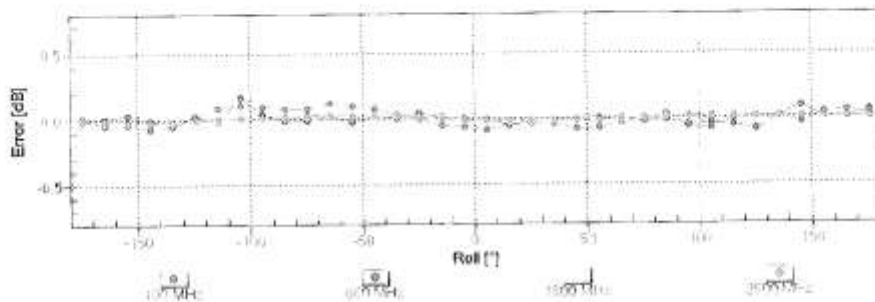
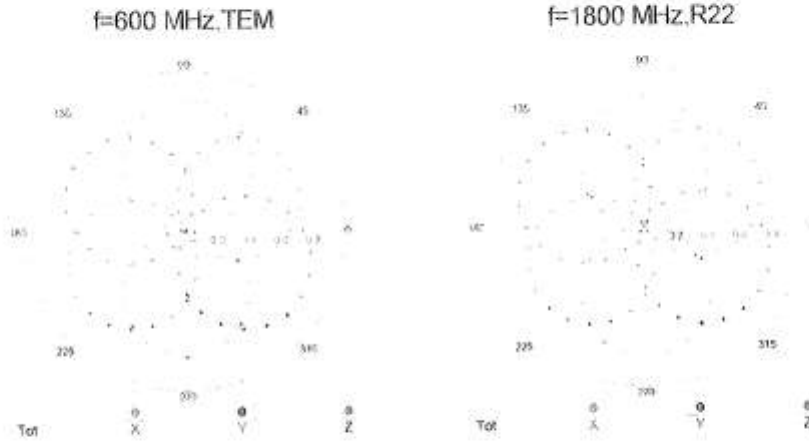
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX30V4-SN3642

December 12, 2014

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



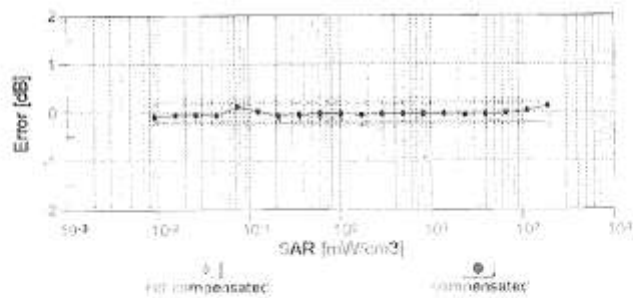
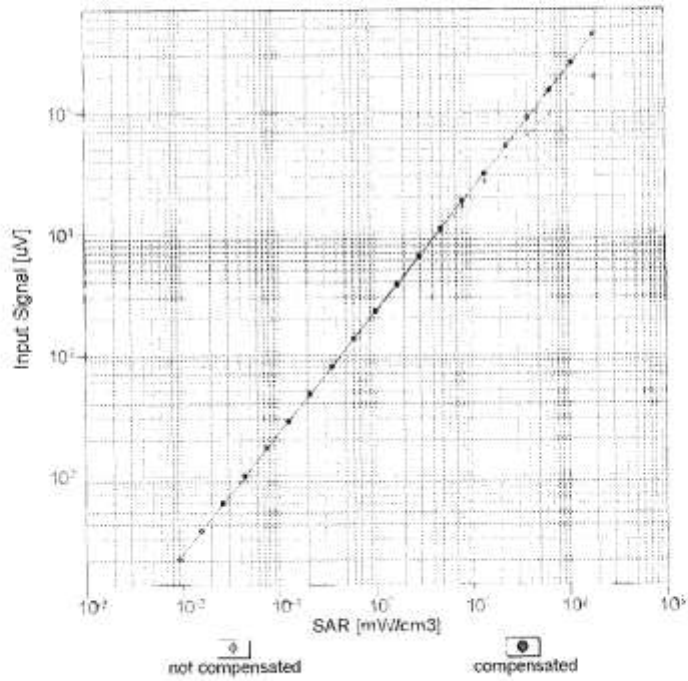
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3014-SN3642

December 12, 2014

Dynamic Range $f(SAR_{head})$ (TEM cell, $f_{eval} = 1900$ MHz)



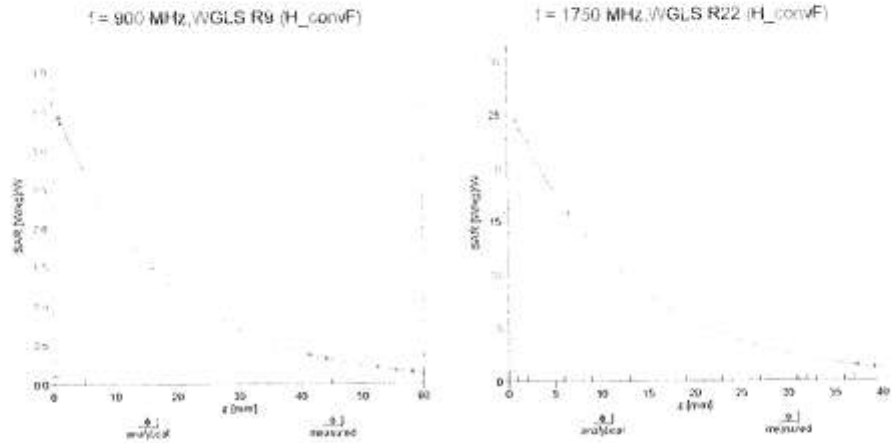
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report		Edition 2

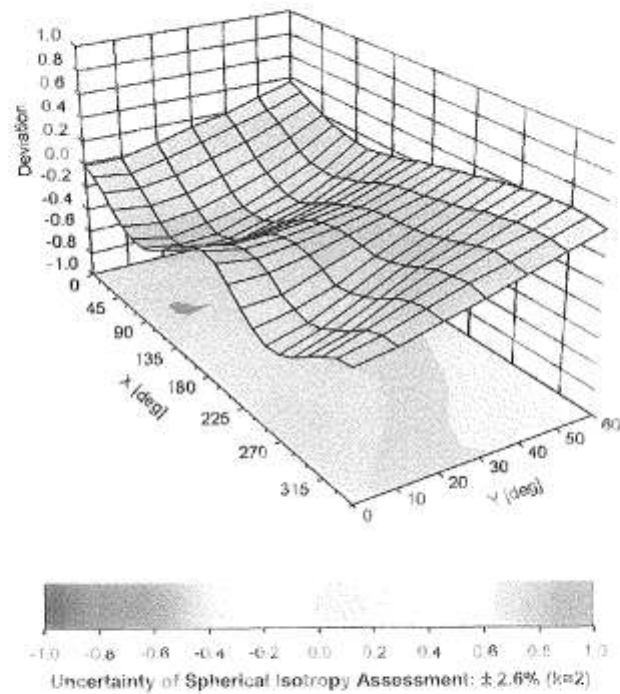
EX3DM4-SN3642

December 12, 2014

Conversion Factor Assessment



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



SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report		Edition 2

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



S Schweizerischer Kalibrierdienst
S 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 **Sony Mobile CN (PTT)**

Certificate No: EX3-7306_Jul14

CALIBRATION CERTIFICATE	
Object	EX3DV4 - SN:7306
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	July 16, 2014
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility, environment temperature (22 ± 3) °C and humidity < 70%.</p> <p>Calibration Equipment used (I&M&E critical for calibration)</p>	

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41499087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3D13	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 860	13-Dec-13 (No. DAE4-860_Dec13)	Dec-14
Secondary Standards		Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642US1700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by:	Name Jeton Kasrati	Function Laboratory Technician	Signature
Approved by:	Name Katja Polovic	Function Technical Manager	Signature
Issued: July 16 2014			
<small>This calibration certificate is valid for the date, scope and conditions stated on the certificate.</small>			

Certificate No: EX3-7306_Jul14

Date: 1 of 11

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

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



S Schweizerischer Kalibrierdienst
S 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

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 β	β rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\beta = 0$ 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:

- 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 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\beta = 0$ ($f \leq 900$ 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 E²-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 rotation from isotropy):** is 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,y,z} (uncertainty required).

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3DV4 - SN:7306

July 16, 2014

Probe EX3DV4

SN:7306

Manufactured: March 11, 2014
 Calibrated: July 16, 2014

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

Certificate No. EX37106-0414

Page 1 of 25

EX3DV4 - SN:7306

July 16, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7306

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^{2.5}$) ^A	0.53	0.43	0.41	$\pm 10.1\%$
DCP (mV) ^B	98.6	100.3	99.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc (k=2)
0	CW	X	0.0	0.0	1.0	0.00	143.3	$\pm 3.0\%$
		Y	0.0	0.0	1.0		149.3	
		Z	0.0	0.0	1.0		146.6	

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 E²-field uncertainty inside TSL (see Pages 5 and 6).
^B Numerical linearization parameter, uncertainty not required.
^C 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:7306

July 16, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7306

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^E	Conductivity (S/m) ^A	ConvF X	ConvF Y	ConvF Z	Alpha ^D	Depth ^H (mm)	Unct. (k=2)
750	41.9	0.89	10.55	10.55	10.55	0.41	0.82	± 12.0 %
900	41.5	0.97	9.81	9.81	9.81	0.50	0.74	± 12.0 %
1450	40.5	1.20	8.65	8.65	8.65	0.27	1.15	± 12.0 %
1750	40.1	1.37	8.42	8.42	8.42	0.40	0.96	± 12.0 %
2300	39.5	1.67	7.55	7.55	7.55	0.23	1.26	± 12.0 %
3500	37.9	2.91	7.09	7.09	7.09	0.35	1.05	± 13.1 %
5200	36.0	4.66	5.04	5.04	5.04	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.85	4.85	4.85	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.69	4.69	4.69	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.51	4.51	4.51	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.57	4.57	4.57	0.45	1.80	± 13.1 %

^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, 60 and 70 MHz for ConvF assessments at 30, 64, 126, 150 and 226 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^E 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.

^H 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:7306

July 16, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7306

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^d	Conductivity (S/m) ^e	ConvF X	ConvF Y	ConvF Z	Alpha ^c	Depth ^h (mm)	Unct. (k=2)
750	55.5	0.96	9.97	9.97	9.97	0.31	1.10	± 12.0 %
900	55.0	1.05	9.69	9.69	9.69	0.80	0.61	± 12.0 %
1450	54.0	1.30	8.81	8.81	8.81	0.80	0.60	± 12.0 %
1750	53.4	1.49	8.23	8.23	8.23	0.44	0.81	± 12.0 %
2300	52.9	1.81	7.66	7.66	7.66	0.59	0.67	± 12.0 %
3500	51.3	3.31	6.70	6.70	6.70	0.41	1.07	± 13.1 %
5200	49.0	5.30	4.68	4.68	4.68	0.40	1.90	± 13.1 %
5300	48.9	5.42	4.48	4.48	4.48	0.40	1.90	± 13.1 %
5500	48.6	5.65	4.22	4.22	4.22	0.40	1.90	± 13.1 %
5600	48.5	5.77	4.12	4.12	4.12	0.40	1.90	± 13.1 %
5800	48.2	6.00	4.31	4.31	4.31	0.45	1.90	± 13.1 %

^c Frequency validity above 300 MHz of 1-100 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.

^d 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.

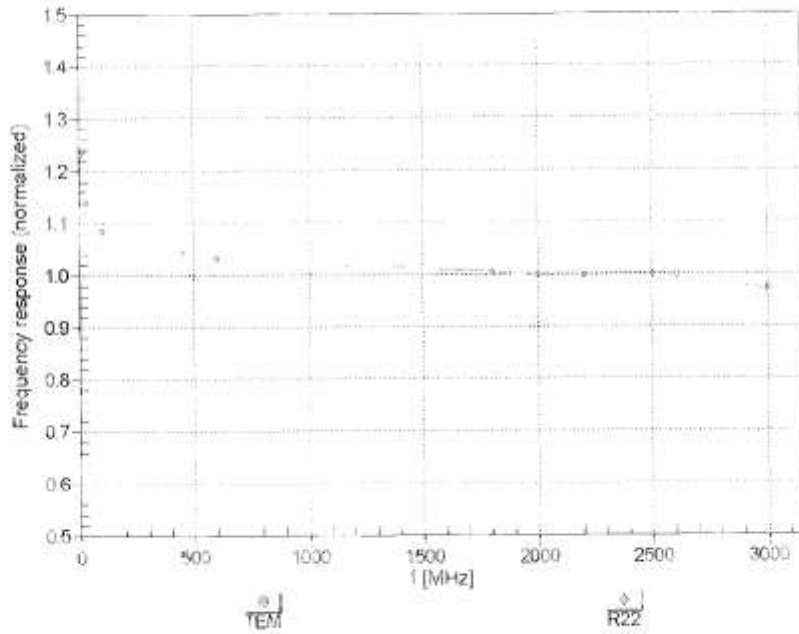
^h Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from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

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX30746-SH7306

July 16, 2014

Frequency Response of E-Field (TEM-Cell:if1110 EXX, Waveguide: R22)



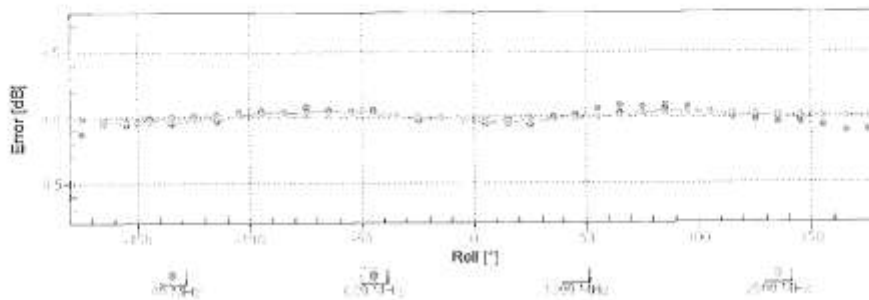
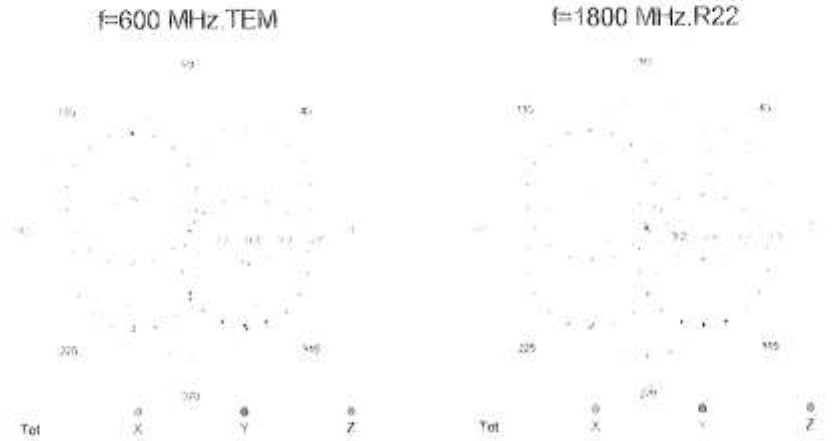
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX007/W-5077/06

July 16, 2014

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



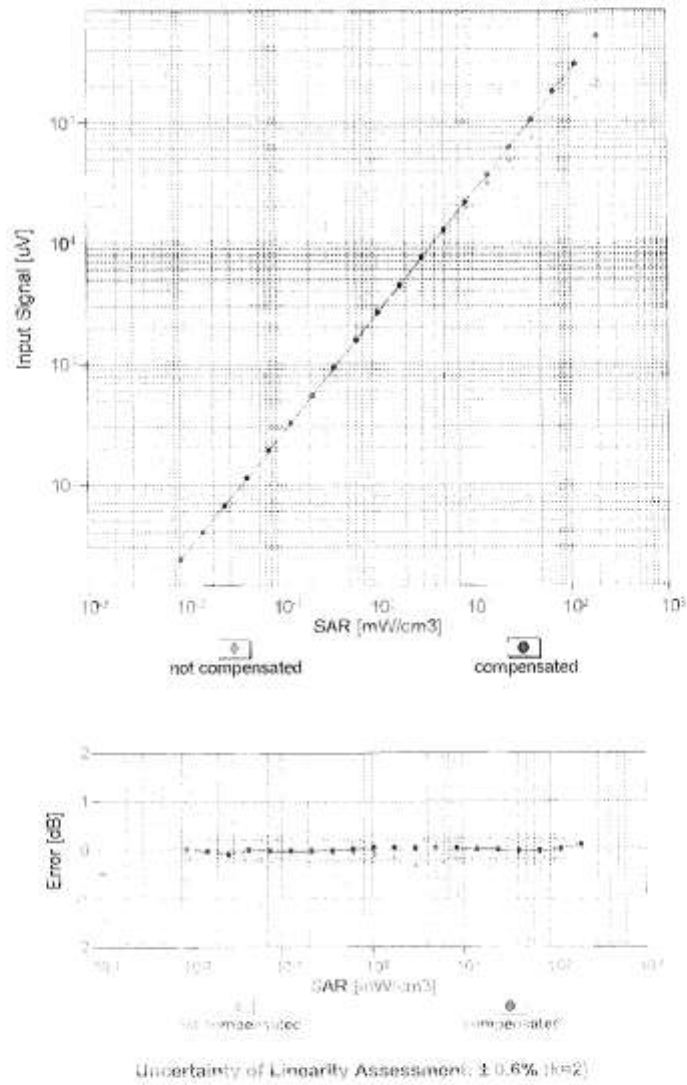
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3UV4-SN7206

July 06, 2014

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

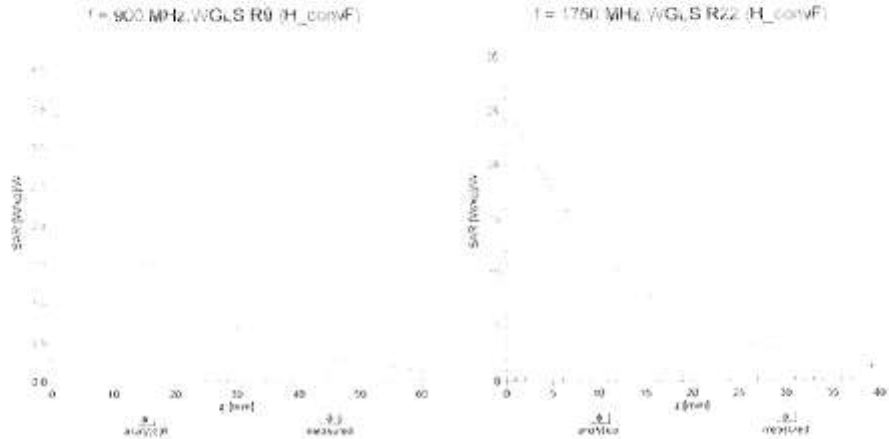


SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

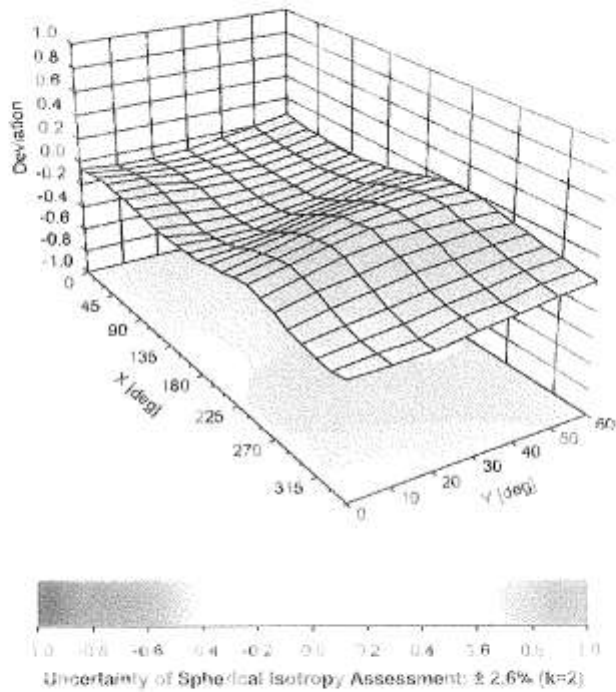
EX030V4 - 8H 7/08

July 16, 2014

Conversion Factor Assessment



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



SONY	Sony Mobile Communications (China) Co., Ltd. Test Laboratory	Report No.: TARC-PY7-PM0817- SAR-FCC-02	
	PY7-PM0817 SAR FCC Test Report	Edition 2	Revision 0

EX3DV4 - SN:7306

July 16, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7306

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-104.7
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