

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

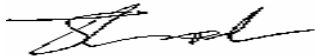
To: OET Bulletin 65 Supplement C: (2001-01)

Test Report Serial No:
RFI/SARE1/RP73067JD08A

**This Test Report Is Issued Under The Authority
Of Steve Flooks, Radio Performance Service Leader:**

A handwritten signature in blue ink, appearing to read 'S Flooks', is written over a light blue rectangular background.

Checked By: Joe Lomako

A handwritten signature in black ink, appearing to read 'Joe Lomako', is written over a light blue rectangular background.

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Test Dates: 15 February 2008

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This report may be copied in full. The results in this report apply only to the sample(s) tested.

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Registered in England and Wales. Company number: 2117901

**Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i**

To: OET Bulletin 65 Supplement C: (2001-01)

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Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

Table of Contents

1. Customer Information	4
2. Equipment Under Test (EUT)	5
3. Test Specification, Methods and Procedures	8
4. Deviations from the Test Specification	8
5. Operation and Configuration of the EUT during Testing	9
6. Summary of Test Results	11
7. Measurements, Examinations and Derived Results	12
Appendix 1. Test Equipment Used	20
Appendix 2. Measurement Methods	23
Appendix 3. SAR Distribution Scans	25
Appendix 4. Photographs	36
Appendix 5. Validation of System	53
Appendix 6. Simulated Tissues	54
Appendix 7. DASY4 System Details	55

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

1. Customer Information

Company Name:	Panasonic Mobile Comms Dev of Europe Ltd
Address:	2 Gables Way Colthrop Thatcham Berkshire RG19 4ZB
Contact Name:	Mr. M Hargreaves

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

2. Equipment Under Test (EUT)

The following information (with the exception of the date of receipt) has been supplied by the customer:

2.1. Description of EUT

The equipment under test is a dual mode (W-CDMA/GSM) Cellular Mobile Telephone with *Bluetooth* and GPRS Capabilities.

2.2. Identification of Equipment Under Test (EUT)

Description:	Mobile Handset
Brand Name:	Panasonic
Model Name or Number:	P906i (Sample C9)
Serial Number:	None Stated
IMEI Number:	35 7015010018932
Hardware Version Number:	Rev C
Software Version Number:	A: 01.03.001; C: 05.01.02.00
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	UCE208006A
Country of Manufacture:	Japan
Date of Receipt:	13 February 2008

2.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

2.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Personal Hands-free Kit - Separate Mic & Stereo Earphones
Brand Name:	Panasonic
Model Name or Number:	NTT Do Co Mo (Sample P22)
Serial Number:	None Stated
Cable Length and Type:	2m multi-core stereo cable unique to manufacturer
Country of Manufacture:	None Stated
Connected to Port	Audio port Unique to manufacturer

Description:	Battery
Brand Name:	Panasonic
Model Name or Number:	P16
Serial Number:	AAP29219
Cable Length and Type:	Not Applicable
Country of Manufacture:	Japan
Connected to Port	3 Pins contact unique to manufacturer

2.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Radio Communication Analyser
Brand Name:	Anritsu
Model Name or Number:	MT8820A
Serial Number:	6K00000647
Cable Length and Type:	1.5m Utiflex Cable
Connected to Port:	RF (Input/Output) Air Link

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

2.6. Additional Information Related to Testing

Equipment Category	PCS1900 / GPRS1900 / <i>Bluetooth</i>		
Type of Unit	Portable Transceiver		
Intended Operating Environment:	Within GSM and <i>Bluetooth</i> Coverage		
Transmitter Maximum Output Power Characteristics:	PCS1900	30 dBm	
Transmitter Frequency Range:	PCS1900	(1850 to 1910) MHz	
Transmitter Frequency Allocation of EUT When Under Test:	Channel Number	Channel Description	Frequency (MHz)
	512	Low	1850.2
	660	Middle	1879.8
	810	High	1909.8
Modulation(s):	GMSK 217 Hz		
Modulation Scheme (Crest Factor):	GSM 8.3; GPRS 4		
Antenna Type:	Internal		
Antenna Length:	Unknown		
Number of Antenna Positions:	1 Fixed		
Power Supply Requirement:	3.7 V DC / 770 mAh		
Battery Type(s):	Li-ion		

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

3. Test Specification, Methods and Procedures

3.1. Test Specification

Reference:	OET Bulletin 65 Supplement C: (2001-01)
Title:	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in OET Bulletin 65 Supplement C: (2001-01) using the SAR averaging method as described in the test specification above.

3.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

Federal Communications Commission, "Evaluating compliance with FCC Guidelines for human exposure to radio frequency electromagnetic fields", OET Bulletin 65 Supplement C, FCC, Washington, D.C, 20554, 2001.

Thomas Schmid, Oliver Egger and Neils Kuster, "Automated E-field scanning system for dosimetric assessments", IEEE Transaction on microwave theory and techniques, Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, "Dosimetric evaluation of mobile communications equipment with know precision", IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

There were no deviations from the test specification.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

5. Operation and Configuration of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating mode(s) unless otherwise stated:

- GPRS1900 data allocated with *Bluetooth* enabled
- PCS1900 call allocated with *Bluetooth* enabled

The reason for choosing this configuration was that it has been defined by the customer as being typical of normal use and likely to be worst case.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

5.2. Configuration and Peripherals

The EUT was tested in the following configuration(s) unless otherwise stated:

- Head and body-worn configuration with PHF attached in body-worn configuration.
- standalone battery powered

Head Configuration

- a) The handset was placed in a normal operating position with the centre of the ear-piece aligned with the ear canal on the phantom.
- b) With the ear-piece touching the phantom the centre line of the handset was aligned with an imaginary plane (X and Y axis) consisting of three lines connecting both ears and the mouth.
- c) For the cheek position the handset was gradually moved towards the cheek until any point of the mouth-piece or keypad touched the cheek.
- d) For the tilted position the EUT was positioned as for the cheek position, and then the horizontal angle was increased by fifteen degrees (the phone keypad was moved away from the cheek by fifteen degrees).
- e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.
- f) The device was keyed to operate continuously in the transmit mode for the duration of the test.
- g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the handset and its antenna.
- h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

Body Configuration

- a) The EUT was placed in a normal operating position where the centre of EUT was aligned with the centre reference point on the flat section of the 'SAM' phantom.
- b) With the EUT touching the phantom at an imaginary centre line. The EUT was aligned with a marked plane (X and Y axis) consisting of two lines.
- c) For the touch-safe position the handset was gradually moved towards the flat section of the 'SAM' phantom until any point of the EUT touched the phantom.
- d) For position(s) greater than 0mm separation the EUT was positioned as per the touch-safe position, and then the vertical height was decreased/adjusted as required.
- e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.
- f) The device was keyed to operate continuously in the transmit mode for the duration of the test.
- g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the handset and its antenna.
- h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

6. Summary of Test Results

Test Name	Specification Reference	Compliance Status
Specific Absorption Rate-PCS1900 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS1900 Body Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-PCS1900 Body Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

7.2. Test Results

7.2.1. Specific Absorption Rate - PCS1900 Head Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.388

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Touch	Left	660	0.370	1.600	1.230	-	Complied
Tilt	Left	660	0.161	1.600	1.439	-	Complied
Touch	Right	660	0.388	1.600	1.212	-	Complied
Tilt	Right	660	0.159	1.600	1.441	-	Complied

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

7.2.2. Specific Absorption Rate - GPRS1900 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.453

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Front of EUT Open Facing Phantom	Flat (SAM)	660	0.347	1.600	1.253	1	Complied
Rear of EUT Open Facing Phantom	Flat (SAM)	660	0.453	1.600	1.147	1	Complied
Rear of EUT Open Facing Phantom With PHF	Flat (SAM)	660	0.440	1.600	1.160	1	Complied

Note(s):

1. SAR measurements were performed with the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

7.2.3. Specific Absorption Rate - PCS1900 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.243

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Front of EUT Open Facing Phantom	Flat (SAM)	660	0.243	1.600	1.357	1	Complied

Note(s):

1. SAR measurements were performed with the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

7.2.4. EIRP/ERP Measurement

Channel Number	Frequency (MHZ)	TX Power before Test (dBm)	Note
512	1850.2	27.3	EIRP
660	1879.8	27.4	EIRP
810	1909.8	27.8	EIRP

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

7.2.5. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Test Name	Confidence Level	Calculated Uncertainty
Specific Absorption Rate-PCS1900 Head Configuration 10g	95%	17.42%
Specific Absorption Rate-PCS1900 Body Configuration 10g	95%	17.33%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

Measurement Uncertainty (Continued)

7.3. Specific Absorption Rate Uncertainty at 1900 MHz Head 10g, PCS Modulation Scheme calculated in accordance with IEC 62209-1 & IEEE 1528

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (10g)	Standard Uncertainty		u _i or u _{eff}
							+ u (%)	- u (%)	
B	Probe calibration	11.000	11.000	normal (k=2)	2.0000	1.0000	5.500	5.500	∞
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.560	0.560	normal (k=2)	2.0000	1.0000	0.280	0.280	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	0.584	0.584	normal (k=1)	1.0000	1.0000	0.584	0.584	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.4300	1.241	1.241	∞
A	Liquid Conductivity (measured value)	4.370	4.370	normal (k=1)	1.0000	0.4300	1.879	1.879	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.4900	1.415	1.415	∞
A	Liquid Permittivity (measured value)	4.450	4.450	normal (k=1)	1.0000	0.4900	2.181	2.181	5
	Combined standard uncertainty			t-distribution			8.89	8.89	>500
	Expanded uncertainty			k = 1.96			17.42	17.42	>500

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

Measurement Uncertainty (Continued)

7.4. Specific Absorption Rate Uncertainty at 1900 MHz Body 10g, PCS Modulation Scheme calculated in accordance with IEC 62209-1 & IEEE 1528

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C _i (10g)	Standard Uncertainty		v _i or v _{eff}
							+ u (%)	- u (%)	
B	Probe calibration	11.000	11.000	normal (k=2)	2.0000	1.0000	5.500	5.500	∞
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.560	0.560	normal (k=2)	2.0000	1.0000	0.280	0.280	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	0.584	0.584	normal (k=1)	1.0000	1.0000	0.584	0.584	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.4300	1.241	1.241	∞
A	Liquid Conductivity (measured value)	4.170	4.170	normal (k=1)	1.0000	0.4300	1.793	1.793	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.4900	1.415	1.415	∞
A	Liquid Permittivity (measured value)	4.230	4.230	normal (k=1)	1.0000	0.4900	2.073	2.073	5
	Combined standard uncertainty			t-distribution			8.84	8.84	>500
	Expanded uncertainty			k = 1.96			17.33	17.33	>500

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A034	Narda 20W Termination	Narda	374BNM	8706	Calibrated as part of system	-
A1094	Digital Camera	Sony	MVC - FD81	125805	-	-
A1097	SMA Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1137	3dB Attenuator	Narda	779	04690	Calibrated as part of system	-
A1174	Dielectric Probe Kit	Agilent Technologies	85070C	Us99360072	Calibrated before use	-
A1328	Handset Positioner	Schmid & Partners	Modification	SD 000 H01 DA	-	-
A1184	Data Acquisition Electronics	Schmid & Partner	DAE3	394	24 May 2007	12
A1185	Probe	Schmid & Partner	ET3 DV6	1528	06 July 2007	12
A1238	SAM Phantom	Schmid & Partners	SAM b	001	Calibrated before use	-
A1566	SAM Phantom	Schmid & Partners	SAM a	002	Calibrated before use	-
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	11 June 2007	24
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A512	Double ridged Horn	EMCO	3115	3993	17 Sept 2004 (Monitoring use only)	-
C1144	Cable	Rosenberger MICRO-COAX	FA147AF00 1503030	41842-1	Calibrated as part of system	-
C1145	Cable	Rosenberger MICRO-COAX	FA147AF00 3003030	41843-1	Calibrated as part of system	-

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
C1146	Cable	Rosenberger MICRO-COAX	FA147AF03 0003030	41752-1	Calibrated as part of system	-
C1092	Cable	RS Components	293-334	1087200-3 3402	Internal Calibration	-
G051	Signal Generator	Gigatronics	7100/.01-20	749472	Calibrated before use	-
G0528	Robot Power Supply	Schmid & Partner	DASY	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M010	NRV Power Meter	Rohde & Schwarz	NRV	882 317/065	06 July 2007	12
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	24 September 2007	12
M1047	Robot Arm	Staubli	RX908 L	F00/SD89A1/A /01	Calibrated before use	-
M1069	Diode Power Sensor	Rohde & Schwarz	NRV-Z2	838824/010	19 April 2007	12
M1129	Power Sensor	Rohde & Schwarz	URY-Z2	890242/16	12 June 2007	12
M136	Temperature/Humidity/Pressure Meter	RS Components	None	None	Internal Calibration	-
M509	Thermometer	Testo	110	40378800433	20 April 2007	12
M1140	Radio Communication Analyser	Anritsu	MT8820A	6K0000047	16 March 2006 (Calibration Not Required)	-
M1270	Temperature/Humidity/Pressure Meter	RS Components	None	None	Internal Calibration	-
M1093	Communications Test Set	Will tek	4202S	0513018	-	-
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

A.1.1. Calibration Certificates

This section contains the calibration certificates and data for the Probe(s) and Dipole(s) used, which are not included in the total number of pages for this report.



A1185
 12/07/07 NM

Accredited by the Swiss Federal Office of Metrology and Accreditation
 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

RFI

Certificate No: **ET3-1528_Jul07**

CALIBRATION CERTIFICATE

Object

ET3DV6 - SN:1528

Calibration procedure(s)

QA CAL-01.v6

Calibration procedure for dosimetric E-field probes

Calibration date:

July 6, 2007

Condition of the calibrated item

In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07
Calibrated by:	Name Katja Pokovic	Function Technical Manager	Signature
Approved by:	Name Niels Kuster	Function Quality Manager	Signature

Issued: July 6, 2007

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



Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held 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 $\vartheta = 0$ ($f \leq 900$ 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 effect 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 (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ 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.

Probe ET3DV6

SN:1528

Manufactured:	March 21, 2000
Last calibrated:	July 12, 2006
Recalibrated:	July 6, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1528**Sensitivity in Free Space^A****Diode Compression^B**

NormX	1.52 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	96 mV
NormY	1.83 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	94 mV
NormZ	1.57 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	96 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect**TSL 900 MHz Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	8.9	4.7
SAR _{be} [%]	With Correction Algorithm	0.1	0.2

TSL 1750 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	10.1	5.9
SAR _{be} [%]	With Correction Algorithm	0.3	0.6

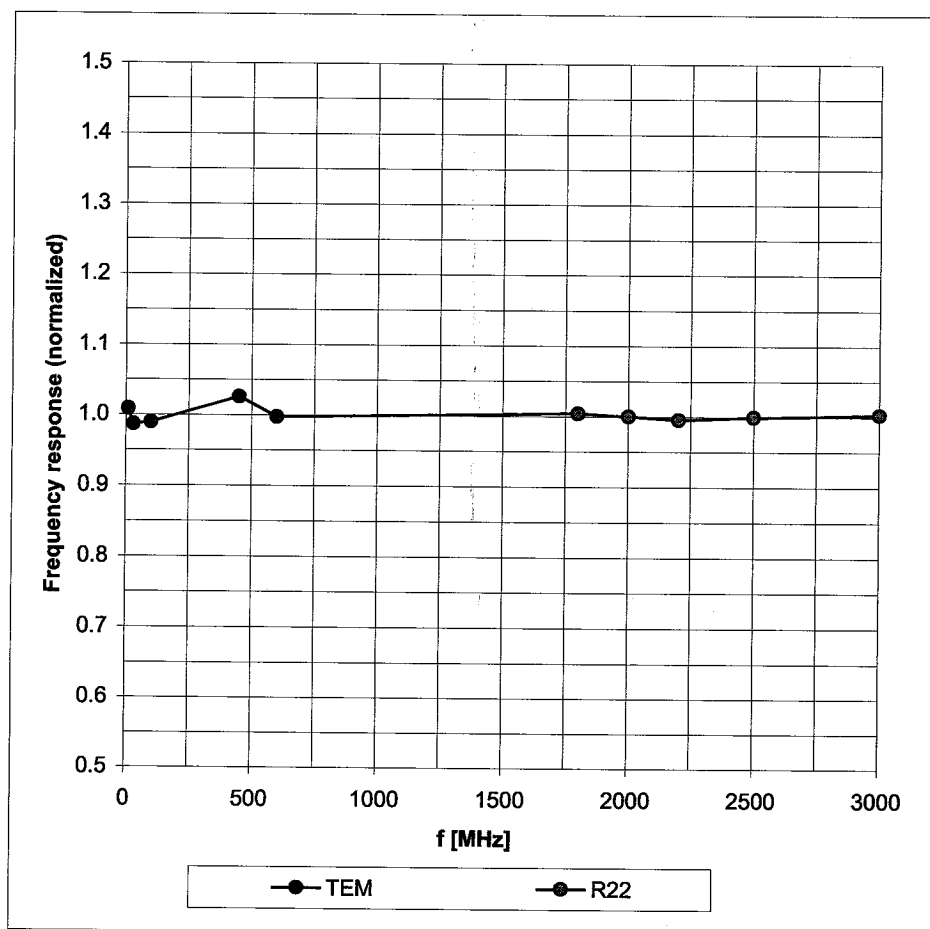
Sensor OffsetProbe Tip to Sensor Center **2.7 mm**

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal 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 Page 8).^B Numerical linearization parameter: uncertainty not required.

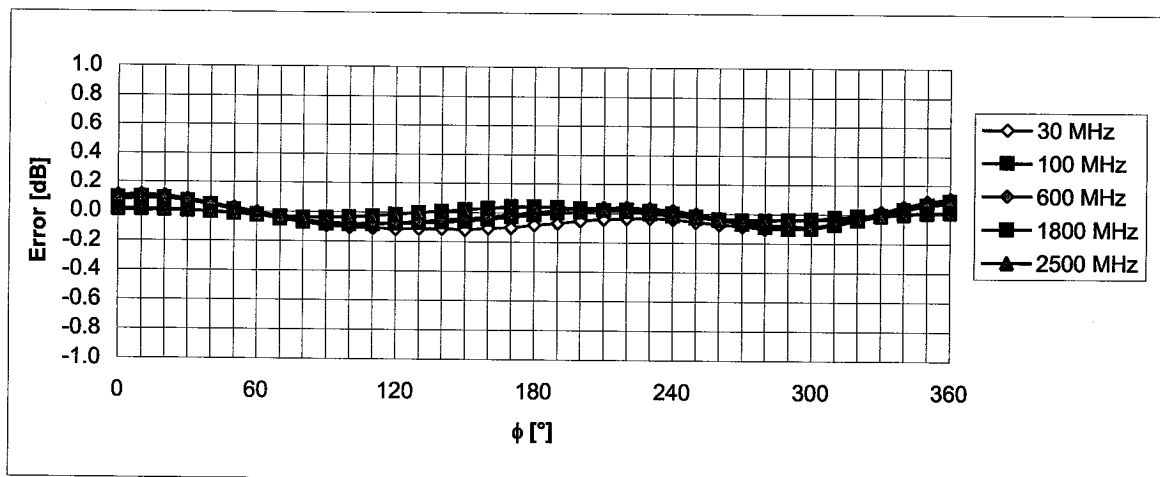
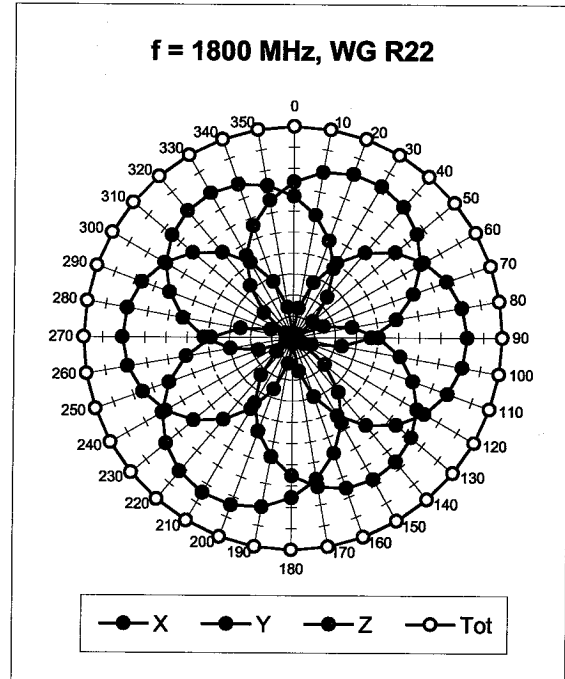
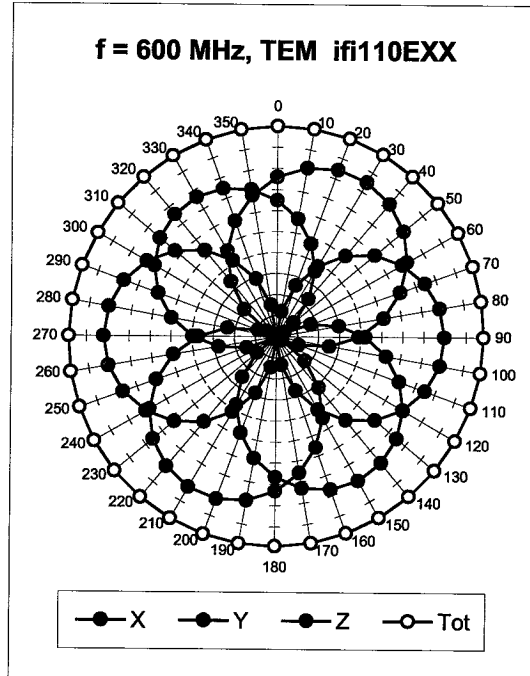
Frequency Response of E-Field

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



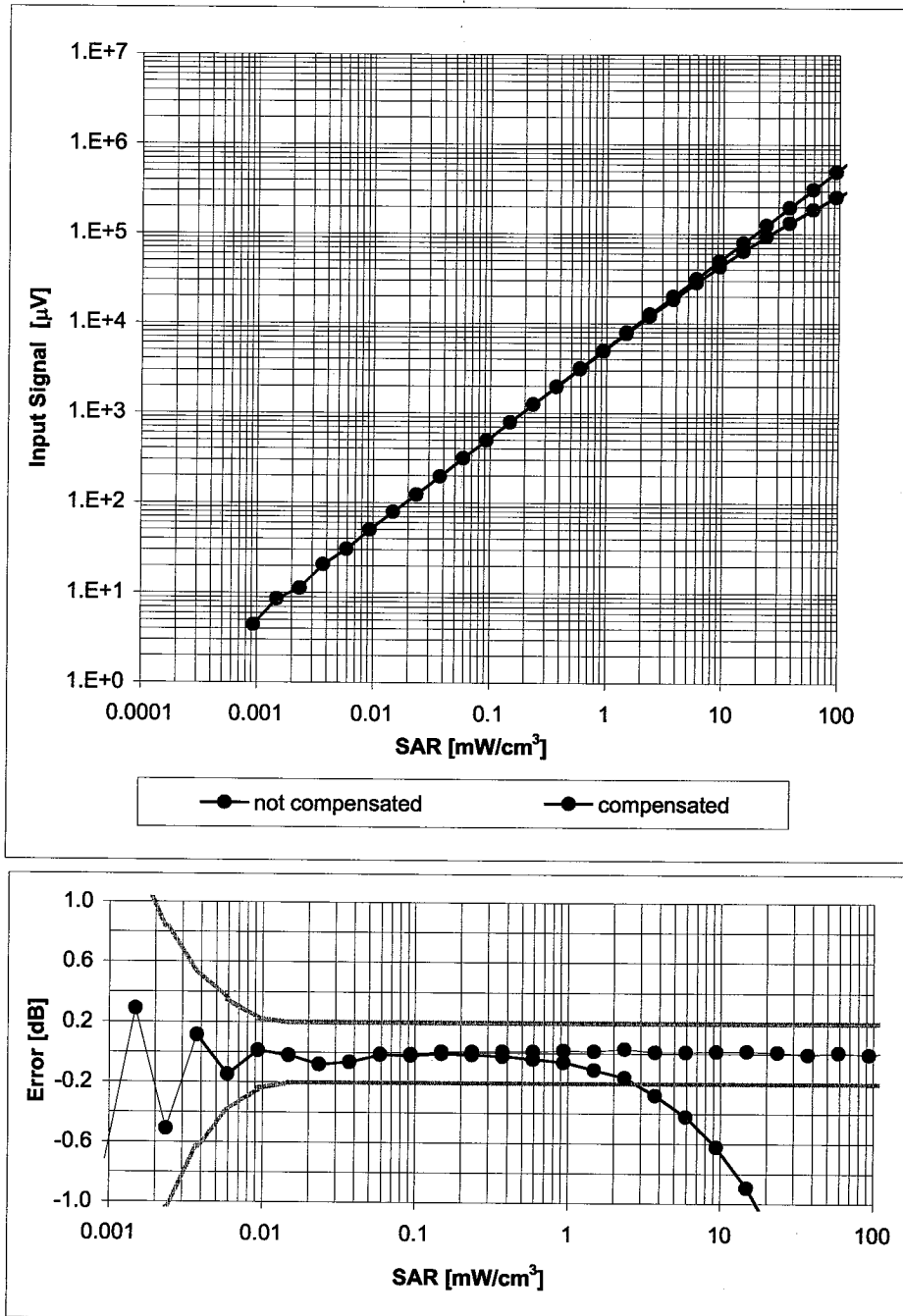
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



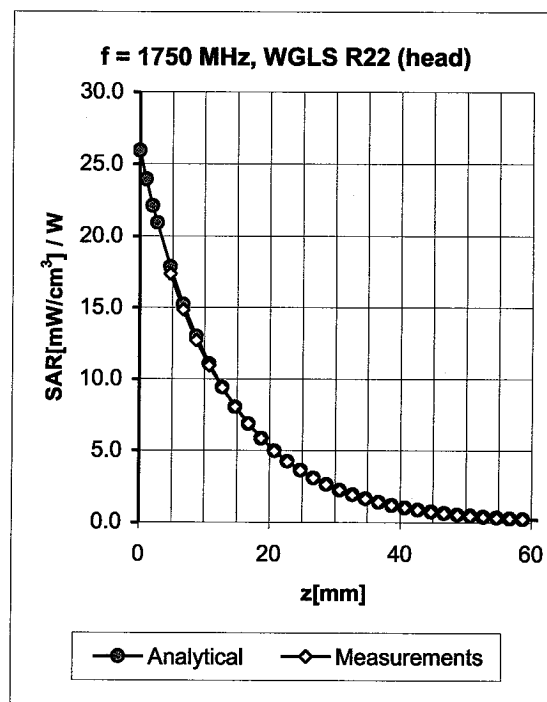
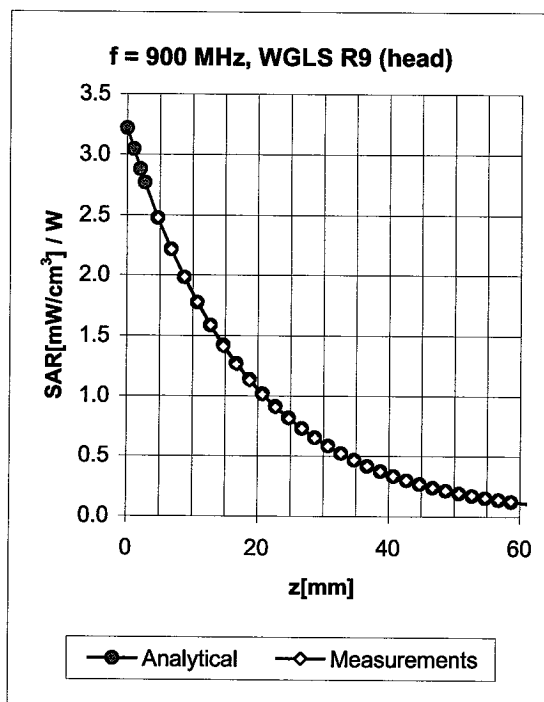
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



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

Conversion Factor Assessment

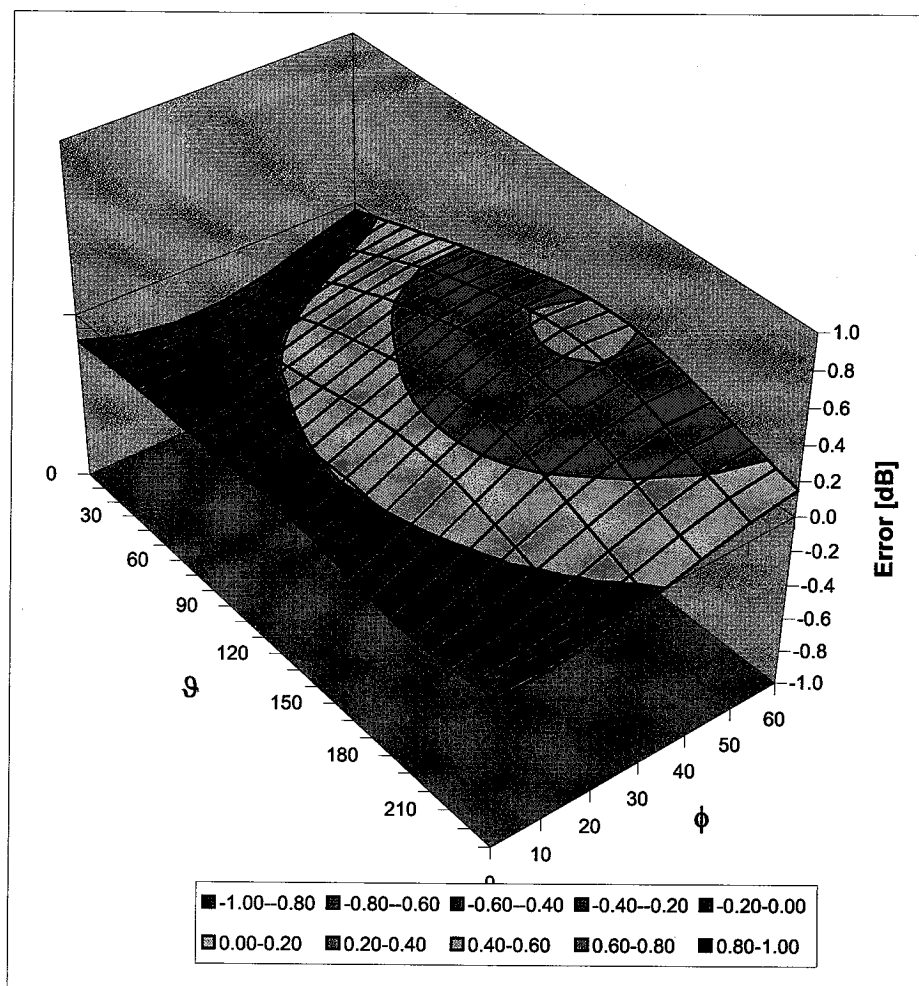


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 99	Head	41.5 ± 5%	0.90 ± 5%	0.32	2.62	6.39 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.37	2.41	6.30 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.51	2.72	5.12 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.58	2.53	4.98 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.31	2.80	6.19 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.32	2.89	5.90 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.67	2.32	4.78 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.75	2.22	4.57 ± 11.0% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ , ϑ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)



A1237

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NM

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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client

RFI

Certificate No: **D1900V2-540_Jun07**

CALIBRATION CERTIFICATE

Object

D1900V2 - SN: 540

Calibration procedure(s)

QA CAL-05.v7

Calibration procedure for dipole validation kits

Calibration date:

June 11, 2007

Condition of the calibrated item

In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6	SN: 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
Reference Probe ES3DV3	SN: 3025	19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

Calibrated by:

Name

Claudio Leubler

Function

Laboratory Technician

Signature

Approved by:

Katja Pokovic

Technical Manager

Issued: June 14, 2007

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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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	39.7 \pm 6 %	1.46 mho/m \pm 6 %
Head TSL temperature during test	(21.5 \pm 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	9.25 mW / g
SAR normalized	normalized to 1W	37.0 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	36.1 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.89 mW / g
SAR normalized	normalized to 1W	19.6 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	19.3 mW / g \pm 16.5 % (k=2)

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

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	1.58 mho/m ± 6 %
Body TSL temperature during test	(21.2 ± 0.2) °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.52 mW / g
SAR normalized	normalized to 1W	38.1 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	38.0 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 mW / g
SAR normalized	normalized to 1W	20.6 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	20.7 mW / g ± 16.5 % (k=2)

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$51.9 \Omega + 5.1 j\Omega$
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.7 \Omega + 4.8 j\Omega$
Return Loss	- 25.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 26, 2001

DASY4 Validation Report for Head TSL

Date/Time: 11.06.2007 10:40:22

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 39.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

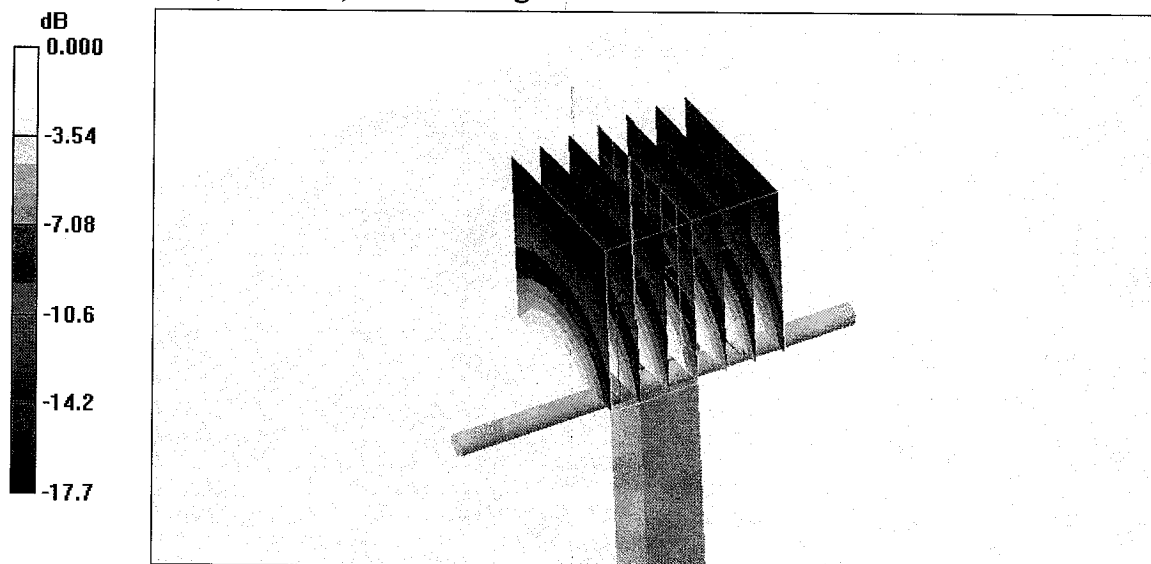
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.9 V/m; Power Drift = 0.054 dB

Peak SAR (extrapolated) = 15.7 W/kg

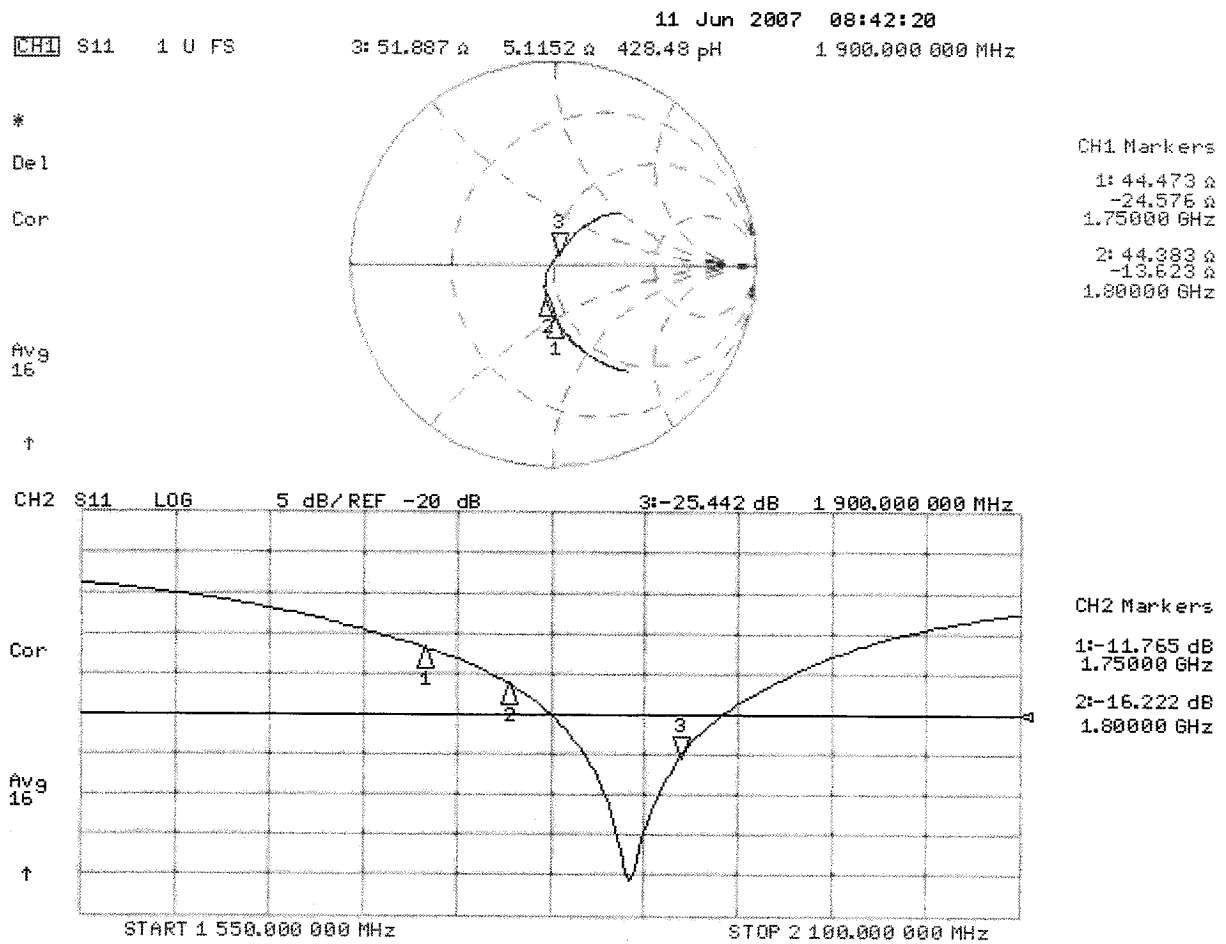
SAR(1 g) = 9.25 mW/g; SAR(10 g) = 4.89 mW/g

Maximum value of SAR (measured) = 10.2 mW/g



0 dB = 10.2mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 11.06.2007 11:24:00

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 55.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.43, 4.43, 4.43); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

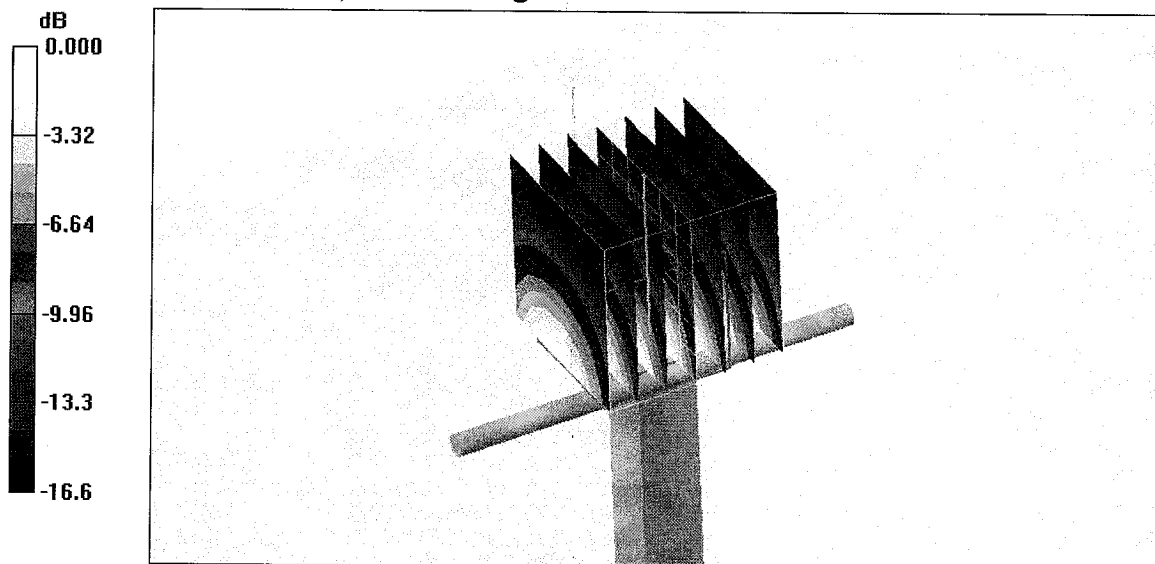
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.9 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 15.8 W/kg

SAR(1 g) = 9.52 mW/g; SAR(10 g) = 5.14 mW/g

Maximum value of SAR (measured) = 10.6 mW/g



0 dB = 10.6mW/g

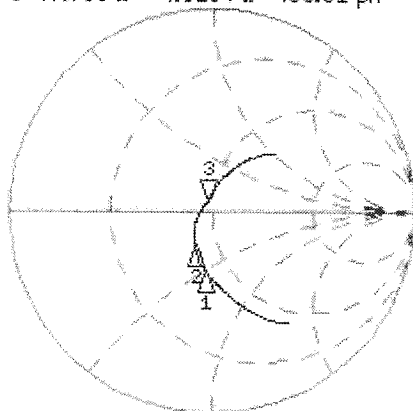
Impedance Measurement Plot for Body TSL

11 Jun 2007 08:43:19
 CH1 S11 1 U FS 3: 47.736 Ω 4.8184 Ω 403.61 pF 1 900.000 000 MHz

*
 Del
 Cor

Avg
 16

↑



CH1 Markers

1: 39.707 Ω
 -25.889 Ω
 1.75000 GHz

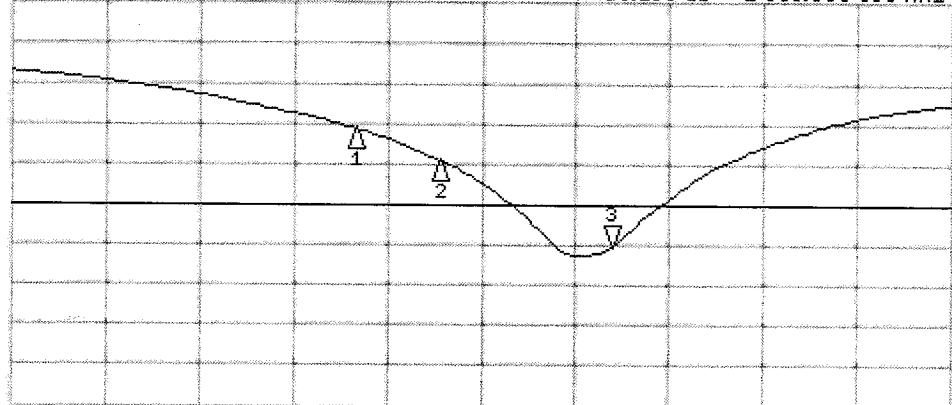
2: 40.176 Ω
 -14.076 Ω
 1.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 3: -25.286 dB 1 900.000 000 MHz

Cor

Avg
 16

↑



CH2 Markers

1: -10.505 dB
 1.75000 GHz

2: -14.514 dB
 1.80000 GHz

START 1 550.000 000 MHz

STOP 2 100.000 000 MHz

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

Appendix 2. Measurement Methods

A.2.1. Evaluation Procedure

The Specific Absorption Rate (SAR) evaluation was performed in the following manner:

- a) (i) The evaluation was performed in an applicable area of the phantom depending on the type of device being tested. For devices worn about the ear during normal operation, both the left and right ear positions were evaluated at the centre frequency of the band at maximum power. The side, which produced the greatest SAR, determined which side of the phantom would be used for the entire evaluation. The positioning of the head worn device relative to the phantom was dictated by the test specification identified in section 3.1 of this report.

(ii) For body worn devices or devices which can be operated within 20 cm of the body, the flat section of the SAM phantom was used where the size of the device(s) is normal. For bigger devices and base station the 2mm Oval phantom is used for evaluation. The type of device being evaluated dictated the distance of the EUT to the outer surface of the phantom flat section.
- b) The SAR was determined by a pre-defined procedure within the DASY4 software. The exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm or appropriate resolution.
- c) A 5x5x7 matrix was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.
- d) If the EUT had any appreciable drift over the course of the evaluation, then the EUT was re-evaluated. Any unusual anomalies over the course of the test also warranted a re-evaluation.

Test of: Panasonic Mobile Comms Dev of Europe Ltd
P906i

To: OET Bulletin 65 Supplement C: (2001-01)

A.2.2. Specific Absorption Rate (SAR) Measurements to OET Bulletin 65 Supplement C: (2001-01)

Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

SAR measurements were performed in accordance with Appendix D of the standard FCC OET Bulletin 65 Supplement C: 2001, against appropriate limits for each measurement position in accordance with the standard.

The test was performed in a shielded enclosure with the temperature controlled to remain between +18.0°C and +25.0°C. The tissue equivalent material fluid temperature was controlled to give a maximum variation of $\pm 2.0^{\circ}\text{C}$

Prior to any SAR measurements on the EUT, system validation and material dielectric property measurements were conducted. In the absence of a detailed procedure within the specification, system validation and material dielectric property measurements were performed in accordance with Appendix C and Appendix D of FCC OET Bulletin 65 Supplement C: 2001.

Following the successful system validation and material dielectric property measurements, a SAR versus time sweep shall be performed within 10 mm of the phantom inner surface. If the EUT power output is stable after three minutes then the measurement probe will perform a coarse surface level scan at each test position in order to ascertain the location of the maximum local SAR level. Once this area had been established, a 5x5x7 cube of 343 points (5 mm spacing in each axis $\approx 27\text{g}$) will be centred at the area of concern. Extrapolation and interpolation will then be carried out on the 27g of tissue and the highest averaged SAR over a 10g cube determined.

Once the maximum interpolated SAR measurement is complete; the coarse scan is visually assessed to check for secondary peaks within 50% of the maximum SAR level. If there are any further SAR measurements required, extra 5x5x7 cubes shall be centred on each of these extra local SAR maxima.

At the end of each position test case a second time sweep shall be performed to check whether the EUT has remained stable throughout the test.