TEST REPORT

TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Aingeal General Monitoring System

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

Test Report Serial No:
RFI/SAR/RP78483JD03A V4.0

Version 4.0 supersedes all previous versions

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:	(APPROVED SIGNATORY)
Checked By: Richelieu Quoi	(APPROVED SIGNATORY)
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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 9
5. Operation and Configuration of the EUT during Testing 10
6. Summary of Test Results 11
7. Measurements, Examinations and Derived Results 12
8. Measurement Uncertainty 16
Appendix 1. Test Equipment Used 18
Appendix 2. Measurement Methods 21
Appendix 3. SAR Distribution Scans 23
Appendix 4. Photographs 34
Appendix 5. Validation of System 46
Appendix 6. Simulated Tissues 47
Appendix 7. DASY4 System Details 48

1. Customer Information

Company Name:	Intelesens Limited
Address:	4 Heron Road Belfast Northern Ireland BT3 9LE United Kingdom

2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT)

Description:	Aingeal General Monitoring System
Brand Name:	Vitalsens
Model Name or Number:	Aingeal (VS200)
Serial Number:	QB002S0000013 (Configured to transmit at CH6)
IMEI Number:	Not Applicable
Hardware Version Number:	QB002 Rev.0
Software Version Number:	Aingeal_FCC.txt
FCC ID Number:	YVF-VS200
Country of Manufacture:	None stated
Date of Receipt:	01 October 2010

Description:	Aingeal General Monitoring System
Brand Name:	Vitalsens
Model Name or Number:	Aingeal (VS200)
Serial Number:	QB002S0000008 (Configured to transmit at CH11)
IMEI Number:	Not Applicable
Hardware Version Number:	QB002 Rev.0
Software Version Number:	Aingeal_FCC.txt
FCC ID Number:	YVF-VS200
Country of Manufacture:	None stated
Date of Receipt:	01 October 2010

Description:	Aingeal General Monitoring System
Brand Name:	Vitalsens
Model Name or Number:	Aingeal (VS200)
Serial Number:	QB002S0000005 (Configured to transmit at CH1)
IMEI Number:	Not Applicable
Hardware Version Number:	QB002 Rev.0
Software Version Number:	Aingeal_FCC.txt
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	YVF-VS200
Country of Manufacture:	None stated
Date of Receipt:	01 October 2010

2.2. Description of EUT

The Equipments Under Test were a Wi-Fi 802.11b/g respiration, ECG analysis and cardiac event detection system, suitable for use on adult patients who are ambulatory or non-ambulatory, in health care facilities. There were 3 EUT tested where each was program in a single channel to test Low, Middle and High channels.

2.3. Modifications Incorporated in the EUT

There was no modification incorporated in the EUT during testing.

2.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Aingeal pre-gelled single lead ECG Electrode Array Patch
Brand Name:	Intelesens
Model Name or Number:	ELECTRODE012
Serial Number:	Not Applicable
Cable Length and Type:	~0.54m
Country of Manufacture:	None Stated
Connected to Port	5 Point Contact Unique to Manufacturer

2.5. Additional Information Related to Testing

Equipment Category	WiFi 802.11b/g		
Type of Unit	Portable Transmitter		
Intended Operating Environment:	Within WiFi 802.11 b/g Coverage		
Transmitter Maximum Output Power Characteristics:	WiFi 802.11b/g	Measured Average 12.3 dBm	
Transmitter Frequency Range:	WiFi 802.11b/g	(2412 to 2462) MHz	
Transmitter Frequency Allocation of EUT When Under Test:	**Channel Number**	**Channel Description**	**Frequency (MHz)**
	1	Low	2412
	6	Middle	2437
	11	High	2462
Modulation(s):	0 Hz		
Modulation Scheme (Crest Factor):	1		
Antenna Type:	Internal		
Antenna Length:	Unknown		
Number of Antenna Positions:	1 Fixed		
Power Supply Requirement:	3.7v		
Battery Type(s):	Li-ion		

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.

KDB 447498 D01 Mobile Portable RF Exposure v04

KDB 248227 D01 SAR measurement Procedure for 802 11 a/b/g Transmitters v01r02

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

Test was performed with consideration to IEEE 1528, FCC OET Bulletin 65 Supplement C 01-01, KDB 447498 and KDB 248227.

Prior to commencement of SAR test the FCC was contacted on the test configuration of the device. The proposed test configuration and power level was detailed in the PBA. The following PBA tracking number 555341 was assigned to the inquiry. As per the PBA both the front and rear of the EUT was tested. The EUT was tested at 1 Mbps, 6Mbps, 11 Mbps and 54 Mbps data rates. The Front of the EUT Facing Phantom was tested with the Electrode Array Attached and the EUT sandwich with a fluid in a plastic bag to compensate for supine-in-bed patient with front of device contacting arm away from wrist. The Fluid in the plastic had a depth of 10 cm.

The three identical EUT's were used to test on Rear configuration as the SAR level in the middle exceeded 50% of the SAR limit. Each use was setup to transmit on a separate channel, low, middle and high channels respectively. The EUT with serial numbers QB002S0000013, QB002S0000008 and QB002S0000005 were configured to transmit at channel 6, 11 and 1 respectively.

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:

- WiFi 802.11 g data test mode with device transmitting at 6 Mbps and 54 Mbps
- WiFi 802.11 b data test mode with device transmitting at 1 Mbps and 11 Mbps
- EUTs were tested transmitting at maximum power as per customer setting in the Low, Middle and High channels.
- As per KDB publication 248227, SAR test was performed with the test software that allowed the device t o transmit at a maximum duty cycle of 100%. The measured SAR levels were all within the SAR limit, therefore it was not necessary to apply further reduction factor to the measured SAR levels as this account for the most conservative usage without applying the normal operation duty factor.

5.2. Configuration and Peripherals

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

- Standalone battery operated
- EUT was tested in the body-worn configuration as it would be worn in the normal configuration. The EUT was in direct contact with the SAR phantom.
- The Front of the EUT Facing Phantom was tested with the Electrode Array Attached and the EUT sandwich with a fluid in a plastic bag to compensate for supine-in-bed patient with front of device contacting arm away from wrist.

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 EUT 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 then 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 EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

6. Summary of Test Results

Test Name	Specification Reference	Result
Specific Absorption Rate-WiFi 2450 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, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG United Kingdom

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.

7.2. Test Results

7.2.1.Specific Absorption Rate - WiFi 802.11b/g Body Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.878

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	6	0.0523	1.600	1.548	1	Complied
Rear of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	6	0.0384	1.600	1.562	2	Complied
Rear of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	6	0.0518	1.600	1.548	3	Complied
Rear of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	6	0.0234	1.600	1.577	4	Complied

Specific Absorption Rate - WiFi 802.11b/g Body Configuration 1g (Continued)							
EUT Position	**Phantom Configuration**	**Channel Number**	**Level (W/kg)**	**Limit (W/kg)**	**Margin (W/kg)**	**Note(s)**	**Result**
Front of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	6	0.861	1.600	0.739	1, 5	Complied
Front of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	1	0.878	1.600	0.722	1, 5	Complied
Front of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	11	0.824	1.600	0.776	1, 5	Complied
Front of EUT Facing Phantom With Electrode Array Attached	Flat (SAM)	6	0.823	1.600	0.777	1, 6	Complied

Note(s):

1. 802.11b (1Mbps)
2. 802.11g (6Mbps)
3. 802.11b (11Mbps)
4. 802.11g (54Mbps)
5. 10 cm thick liquid-filled plastic bag "sandwiching" the EUT at centre of ‘SAM’ phantom flat section.
6. Without liquid sandwiching the EUT

* The measured SAR levels were all within the SAR limit using a duty factor of 100% as per the test software configuration. Therefore it was not necessary to apply further reduction factor to the measured SAR levels as this account for the most conservative usage without applying the normal operation duty factor.

7.2.2. EIRP Measurement WiFi 802.11b/g

Channel Number	Frequency (MHZ)	Average TX EIRP(dBm)	Ant. Gain (dBm)	Average TX Conducted = Ant. Gain + Average TX EIRP (dBm)	Note
1	2412.0	7.7	-1.2	8.9	2.4GHz 802.11b (1Mbps)
6	2437.0	7.4	-1.2	8.6	
11	2462.0	8.0	-1.2	9.2	
1	2412.0	10.5	-1.2	11.7	2.4GHz 802.11b (11Mbps)
6	2437.0	10.1	-1.2	11.3	
11	2462.0	10.8	-1.2	12.0	
1	2412.0	8.8	-1.2	10.0	2.4GHz 802.11g (6Mbps)
6	2437.0	8.5	-1.2	9.7	
11	2462.0	9.0	-1.2	10.2	
1	2412.0	10.9	-1.2	12.1	2.4GHz 802.11g (54Mbps)
6	2437.0	10.2	-1.2	11.4	
11	2462.0	11.1	-1.2	**12.3**	

8. 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- Wi-Fi 802.11 b/g Body Configuration 1g	95%	±19.34%

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.

8.1. Specific Absorption Rate- WLAN 802.11b/g Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	5.500	5.500	normal (k=1)	1.0000	1.0000	5.500	5.500	∞
B	Axial Isotropy	0.250	0.500	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	2.600	normal (k=1)	1.0000	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	0.346	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	0.160	0.320	normal (k=2)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
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	2.570	2.570	normal (k=1)	1.0000	1.0000	2.570	2.570	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	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.900	4.900	normal (k=1)	1.0000	0.6400	3.136	3.136	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.920	4.920	normal (k=1)	1.0000	0.6000	2.952	2.952	5
	Combined standard uncertainty			t-distribution			9.87	9.87	>200
	Expanded uncertainty			k = 1.96			19.34	19.34	>200

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	-
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 & Partner Engineering AG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	Schmid & Partner Engineering AG	V3.0	None	-	-
A1184	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	394	19 April 2010	12
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b	001	Calibrated before use	-
A1378	Probe	Schmid & Partner Engineering AG	EX3 DV3	3508	15 July 2010	12
A1322	2450 MHz Dipole Kit	Schmid & Partner Engineering AG	D2450V2	725	08 Jan 2009	24
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
A1566	SAM Phantom	Schmid & Partner Engineering AG	SAM a	002	Calibrated before use	-
A1990	Digital Camera	Samsung	E515	A23WC90 8A05431K	-	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1531	Antenna	AARONIA AG	7025	02458	-	-
C1042	Network Analyzer Cable	Agilent	8120-4779	349	-	-
C1145	Cable	Rosenberger MICRO COAX	FA147A F003003030	41843-1	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	27 Sept 2010	12
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 16 August 2010	4
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1270	Temperature/ Humidity/ Pressure Meter	RS Components	None	None	Internal Checked 31 March 2010	12
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1044	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/019	26 May 2010	12
M265	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/017	26 May 2010	12
M263	Dual Channel Power Meter	Rohde & Schwarz	NRVD	826558/004	27 May 2010	12

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.

Checked by: AQ
DATE: 19-07-2010

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

RFI Asset: A1378

Client RFI

Certificate No: EX3-3508_Jul10

CALIBRATION CERTIFICATE

Object: EX3DV3 - SN:3508

Calibration procedure(s): QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes

Calibration date: July 15, 2010 (Additional Conversion Factors)

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	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: July 15, 2010

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

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* 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 *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV3

SN:3508

Additional Conversion Factors

Manufactured:	December 19, 2003
Last calibrated:	February 19, 2010
Recalibrated:	July 15, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV3 SN:3508

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.77	0.63	0.65	± 10.1%
DCP (mV)[B]	99.8	95.0	92.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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

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

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV3 SN:3508

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	10.81	10.81	10.81	0.11	1.00	± 13.3%
750	± 50 / ± 100	41.9 ± 5%	0.89 ± 5%	10.80	10.80	10.80	0.38	0.75	± 11.0%
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	10.08	10.08	10.08	0.38	0.77	± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	9.09	9.09	9.09	0.52	0.63	± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	8.75	8.75	8.75	0.35	0.76	± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.95	7.95	7.95	0.31	0.80	± 11.0%

[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.

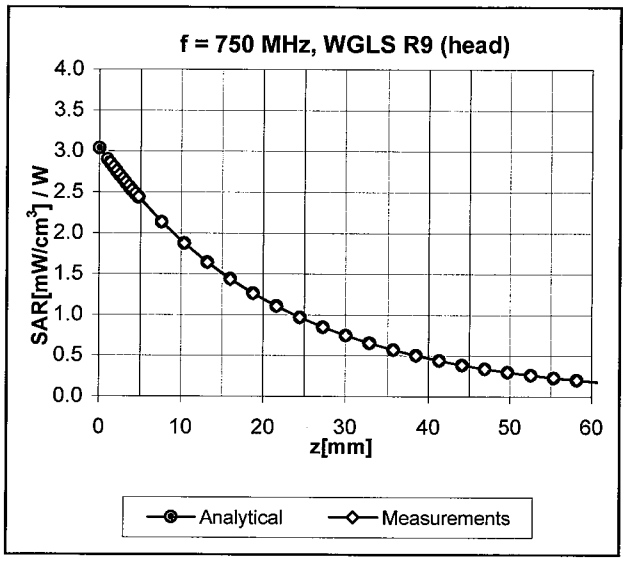
DASY/EASY - Parameters of Probe: EX3DV3 SN:3508

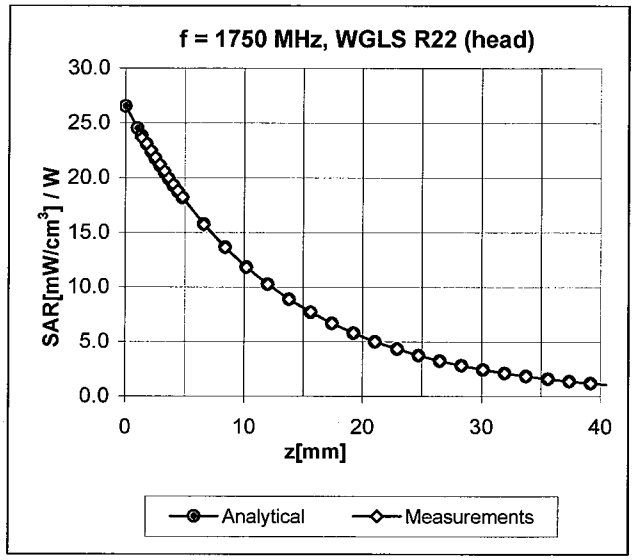
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	11.71	11.71	11.71	0.02	1.00	± 13.3%
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	10.45	10.45	10.45	0.50	0.74	± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	8.79	8.79	8.79	0.39	0.77	± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	8.45	8.45	8.45	0.36	0.80	± 11.0%
2150	± 50 / ± 100	53.0 ± 5%	1.75 ± 5%	8.50	8.50	8.50	0.22	1.14	± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	8.19	8.19	8.19	0.34	0.80	± 11.0%

[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.

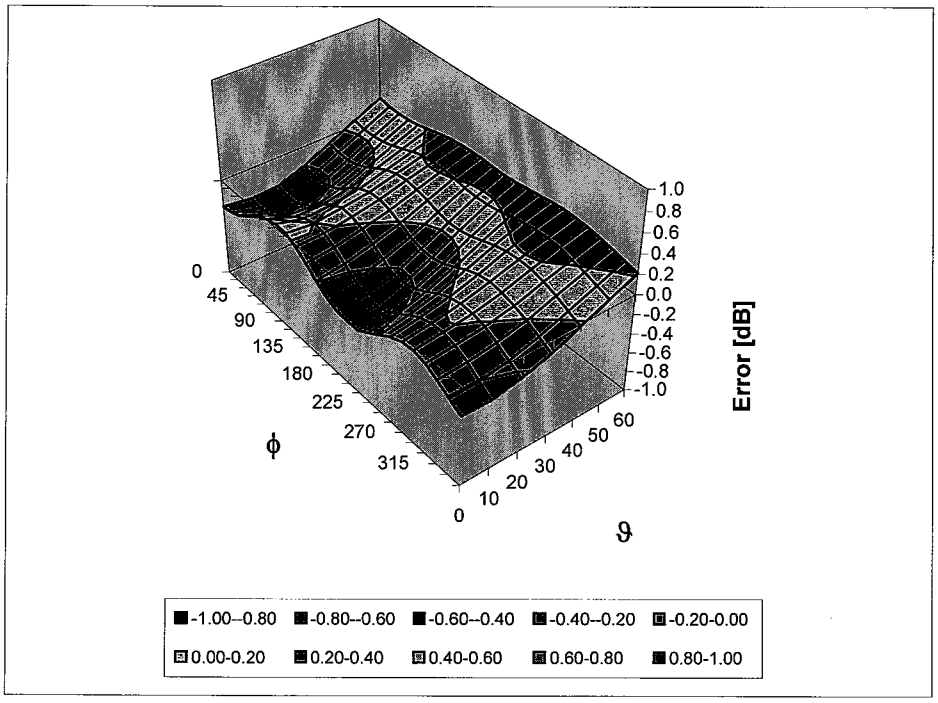
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	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

A1322

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 RFI

Certificate No: D2450V2-725_Jan09

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 725
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	January 08, 2009
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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: S5086 (20g)	01-Jul-08 (No. 217-00864)	Jul-09
Type-N mismatch combination	SN: 5047.2 / 06327	01-Jul-08 (No. 217-00867)	Jul-09
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

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

Issued: January 12, 2009

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna 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	DASY5	V5.0
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	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.3 ± 6 %	1.83 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 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	13.2 mW / g
SAR normalized	normalized to 1W	52.8 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**52.1 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.12 mW / g
SAR normalized	normalized to 1W	24.5 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**24.3 mW /g ± 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.8 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR normalized	normalized to 1W	52.8 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**52.2 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.19 mW / g
SAR normalized	normalized to 1W	24.8 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**24.7 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	54.4 Ω + 5.3 jΩ
Return Loss	- 23.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.0 Ω + 6.7 jΩ
Return Loss	- 23.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 16, 2002

DASY5 Validation Report for Head TSL

Date/Time: 08.01.2009 10:04:18

Test Laboratory: SPEAG, Zurich, Switzerland

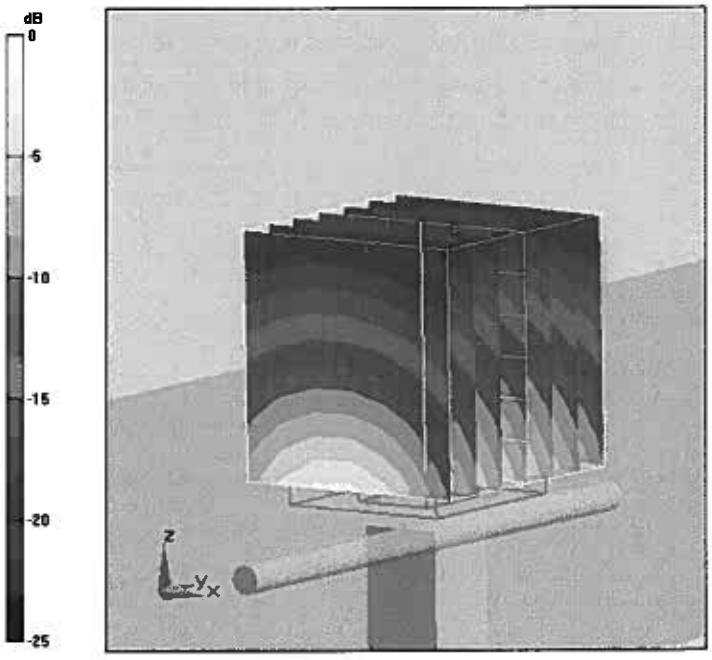
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN725

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

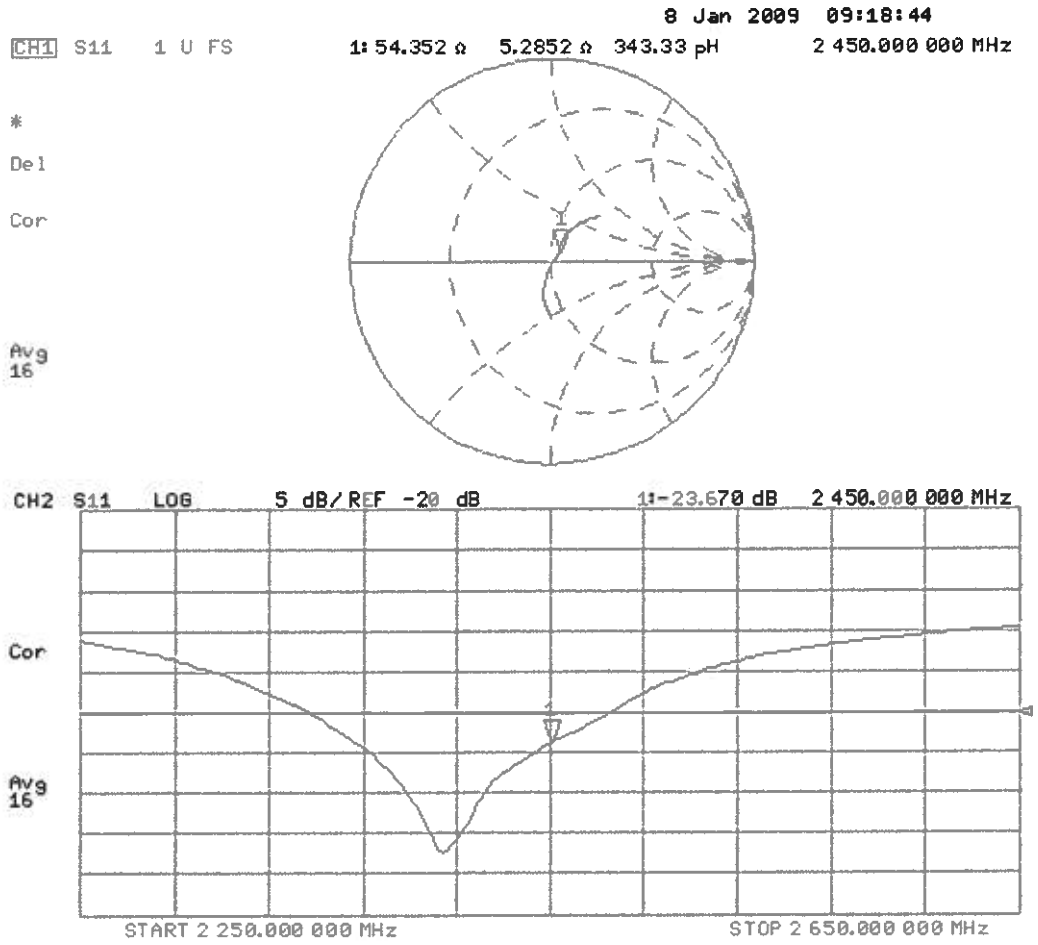
- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.8 V/m; Power Drift = 0.035 dB
Peak SAR (extrapolated) = 27.7 W/kg
SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.12 mW/g
Maximum value of SAR (measured) = 15.9 mW/g



0 dB = 15.9mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 08.01.2009 12:28:21

Test Laboratory: SPEAG, Zurich, Switzerland

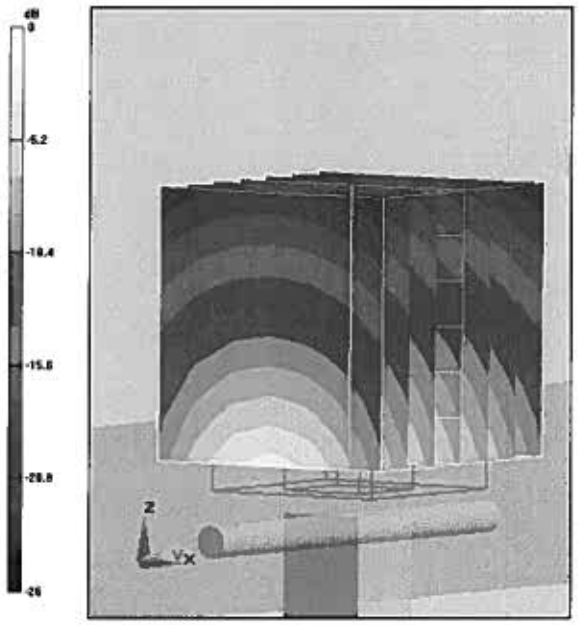
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

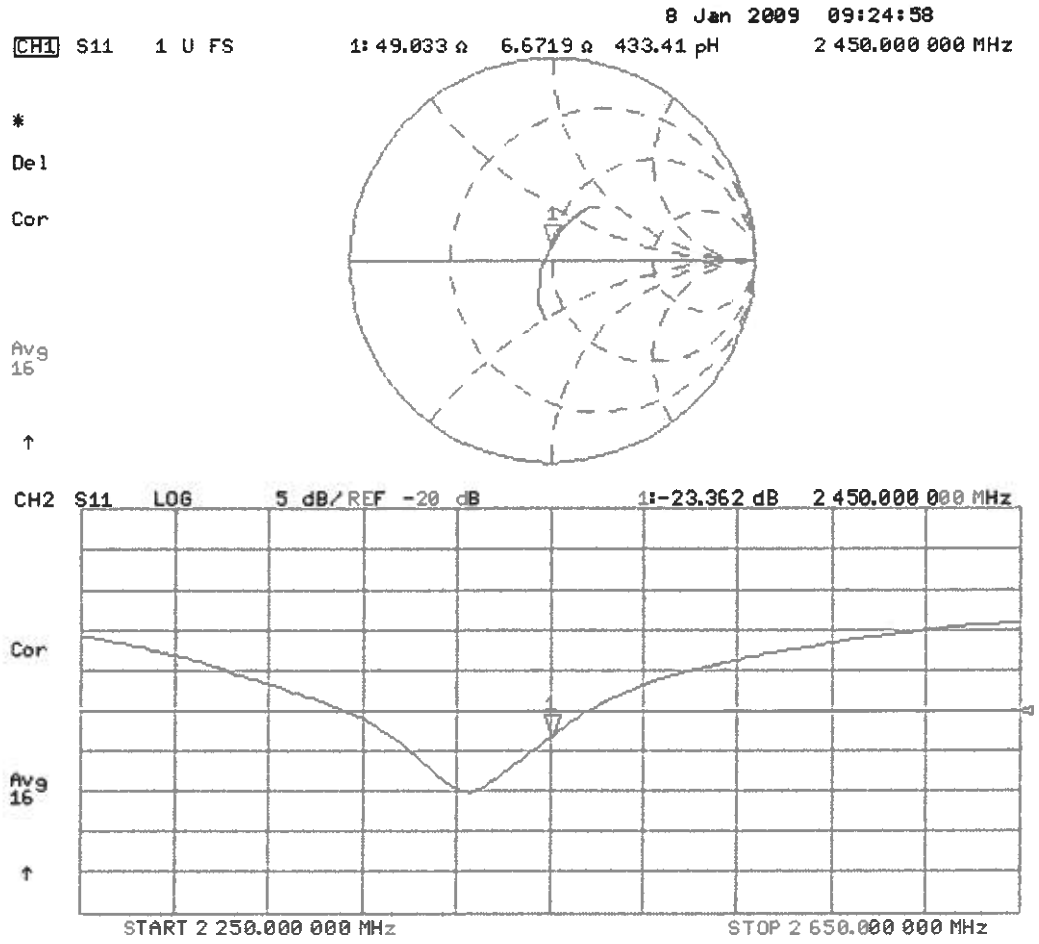
- Probe: ES3DV2 - SN3025; ConvF(4.07, 4.07, 4.07); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.1 V/m; Power Drift = 0.00372 dB
Peak SAR (extrapolated) = 26.6 W/kg
SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.19 mW/g
Maximum value of SAR (measured) = 16.5 mW/g



0 dB = 16.5mW/g

Impedance Measurement Plot for Body TSL



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 were 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.

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, IEEE 1528 and FCC KDB procedures, against appropriate limits for each measurement position in accordance with the standard. In some cases the FCC was contacted using a PBA or KDB process to ensure test is performed correctly.

The test was performed in a shielded enclosure with the temperature controlled to remain between +18.0ºC and +25.0ºC. The tissue equivalent material fluid temperature was controlled to give a maximum variation of ± 2.0ºC

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 and FCC KDB publication 450824.

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 ≈ 27g) 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.

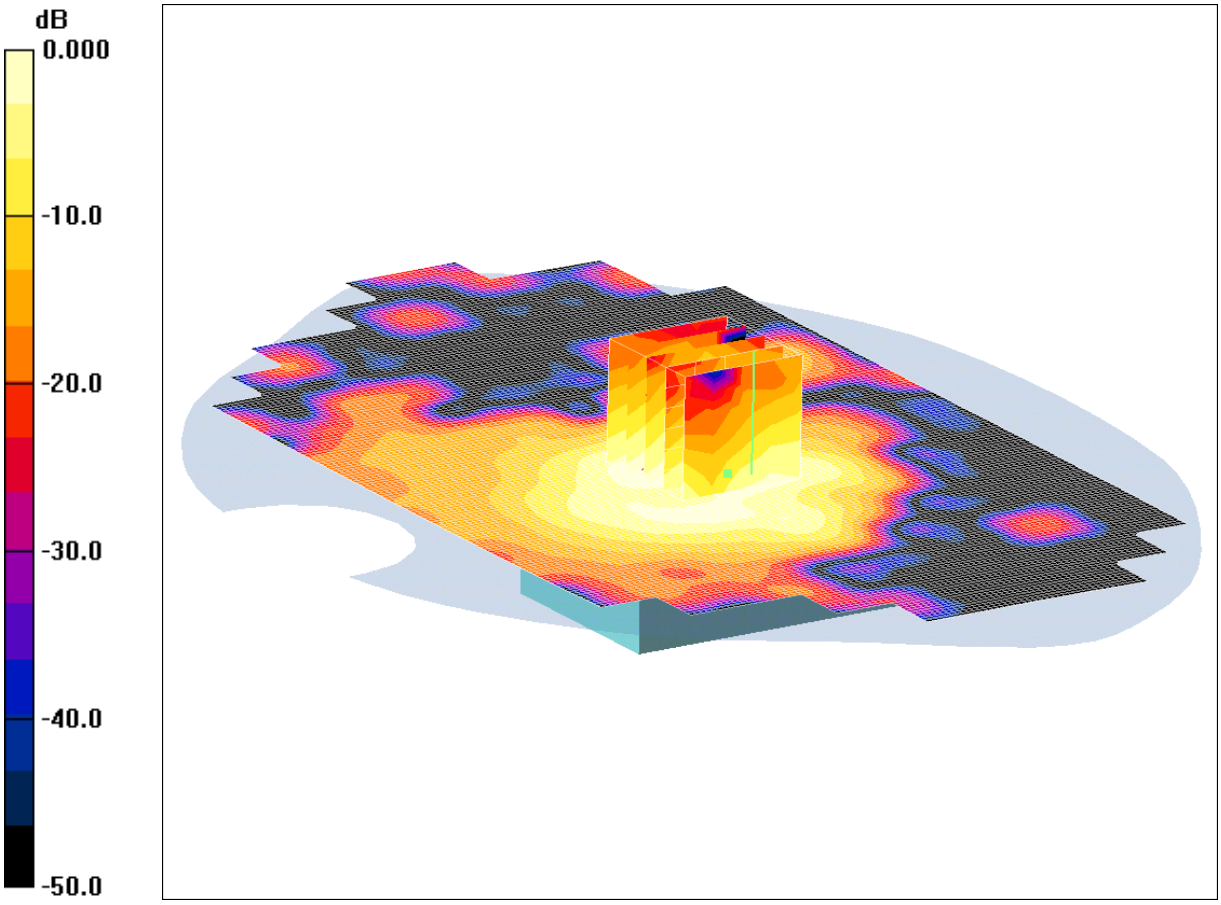
At the end of each position test case a second time sweep shall be performed to check whether the EUT has remained stable throughout the test.

Appendix 3. SAR Distribution Scans

This appendix contains SAR distribution scans which are not included in the total number of pages for this report.

Scan Reference Number	Title
SCN/78483JD03/001	Rear of EUT Facing Phantom With Electrode Array Attached CH6 1Mbps
SCN/78483JD03/002	Rear of EUT Facing Phantom With Electrode Array Attached CH6 6Mbps
SCN/78483JD03/003	Rear of EUT Facing Phantom With Electrode Array Attached CH6 11Mbps
SCN/78483JD03/004	Rear of EUT Facing Phantom With Electrode Array Attached CH6 54Mbps
SCN/78483JD03/005	Front of EUT Facing Phantom With Electrode Array Attached And liquid-filled plastic bag “sandwiching” the EUT CH6 1Mbps
SCN/78483JD03/006	Front of EUT Facing Phantom With Electrode Array Attached and liquid-filled plastic bag "sandwiching" the EUT CH1 1Mbps
SCN/78483JD03/007	Front of EUT Facing Phantom With Electrode Array Attached And liquid-filled plastic bag “sandwiching” the EUT CH11 1Mbps
SCN/78483JD03/008	Front of EUT Facing Phantom With Electrode Array Attached Without Liquid Sandwiching the EUT CH6 1Mbps
SCN/78483JD03/009	System Performance Check 2450MHz Body 01 10 10
SCN/78483JD03/010	System Performance Check 2450MHz Body 07 12 10

SCN/78483JD03/001: Rear of EUT Facing Phantom With Electrode Array Attached CH6 1Mbps
Date: 01/10/2010
DUT: Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000013 + Aingeal Electrode Array



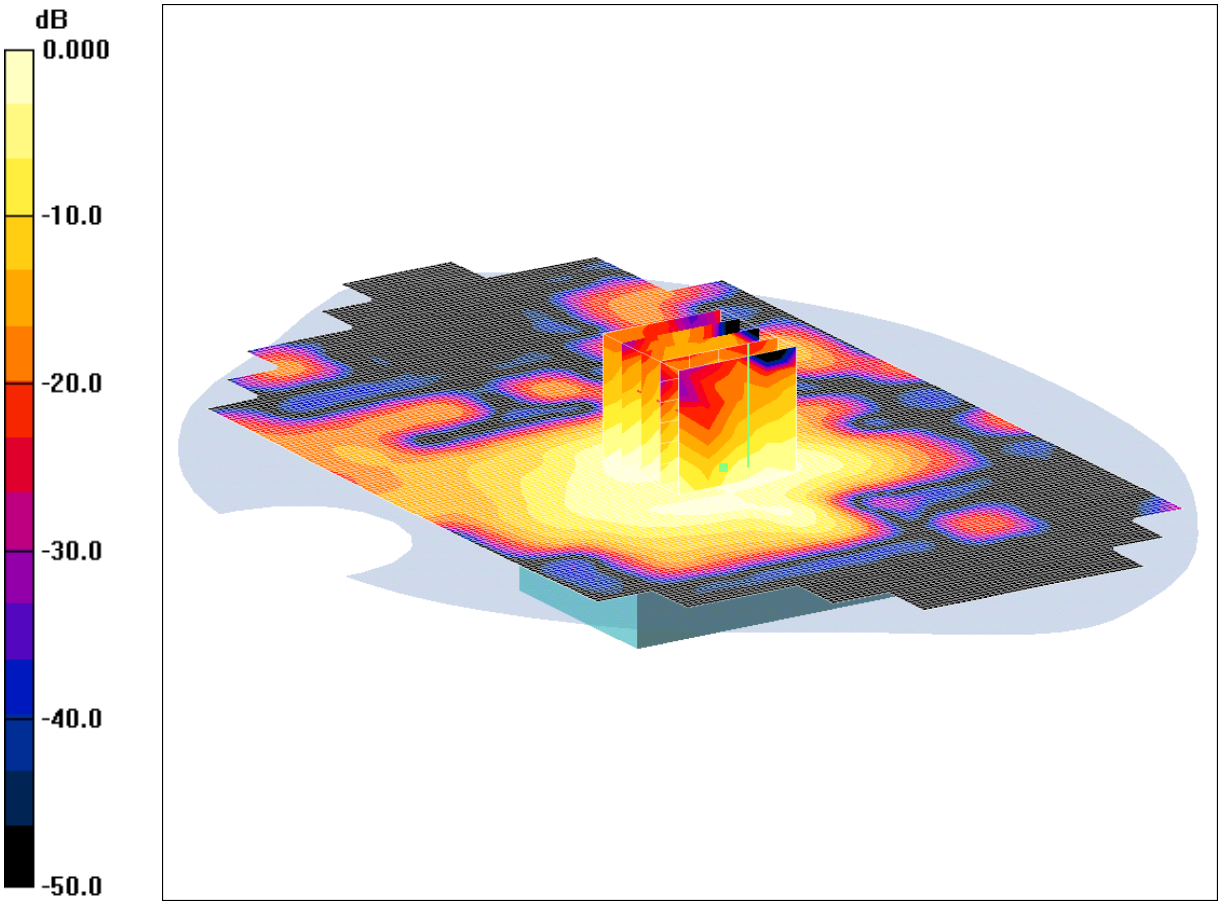
0 dB = 0.057mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.93 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x181x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.055 mW/g

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.09 V/m; Power Drift = -0.240 dB
Peak SAR (extrapolated) = 0.094 W/kg
SAR(1 g) = 0.052 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.057 mW/g

SCN/78483JD03/002: Rear of EUT Facing Phantom With Electrode Array Attached CH6 6Mbps
Date: 01/10/2010
DUT: Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000013 + Aingeal Electrode Array



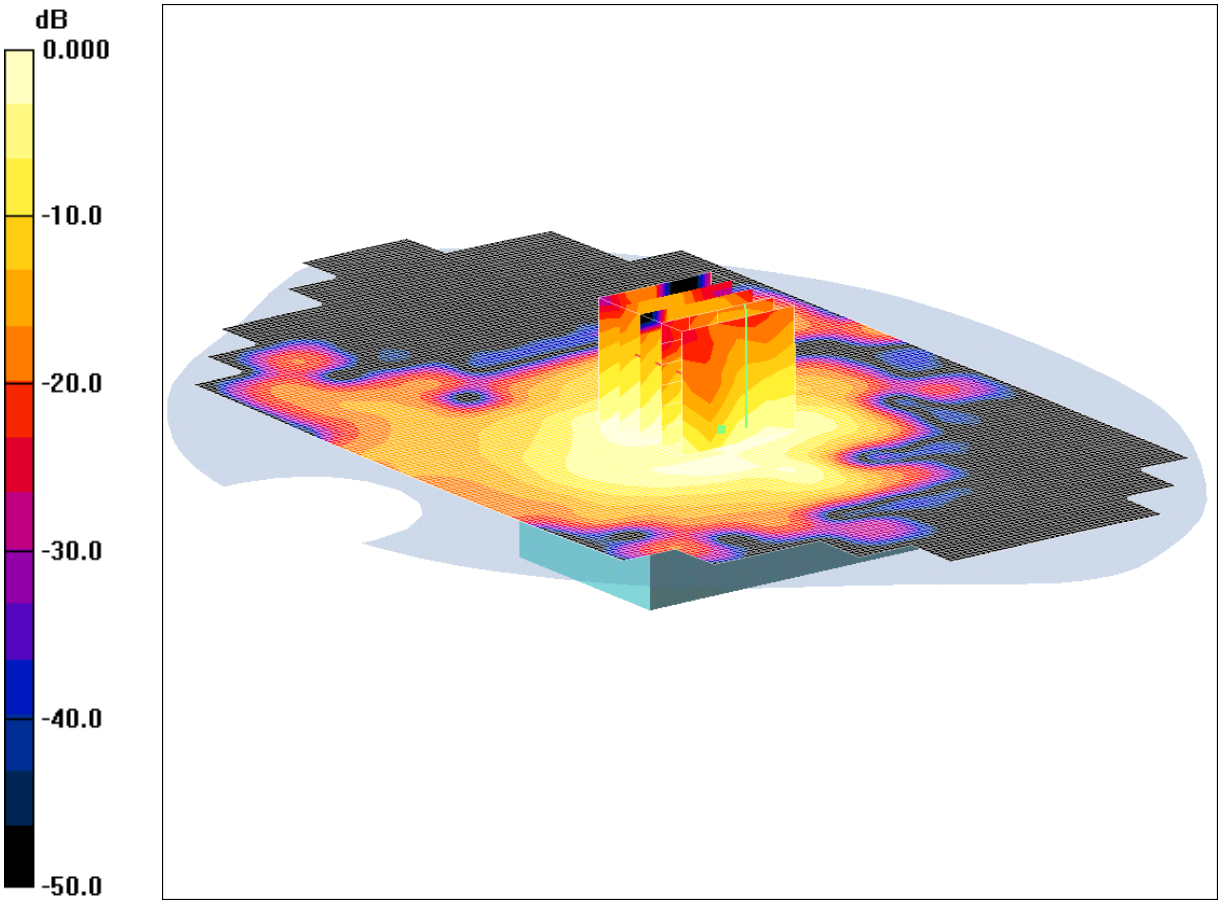
0 dB = 0.043mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.93 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x181x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.039 mW/g

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.67 V/m; Power Drift = -0.333 dB
Peak SAR (extrapolated) = 0.069 W/kg
SAR(1 g) = 0.038 mW/g; SAR(10 g) = 0.020 mW/g
Maximum value of SAR (measured) = 0.043 mW/g

SCN/78483JD03/003: Rear of EUT Facing Phantom With Electrode Array Attached CH6 11Mbps
Date: 01/10/2010
DUT: Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000013 + Aingeal Electrode Array



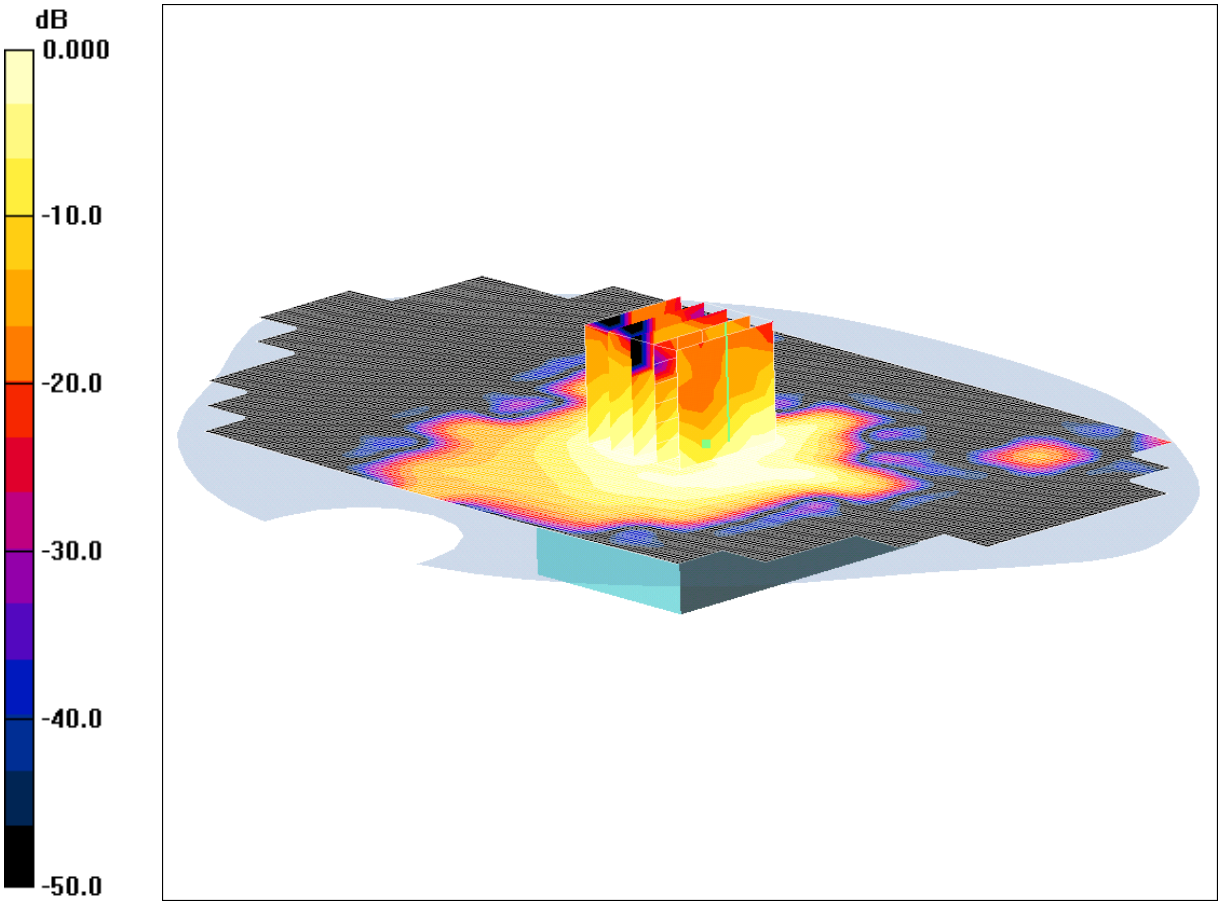
0 dB = 0.055mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.93 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x181x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.051 mW/g

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.16 V/m; Power Drift = -0.066 dB
Peak SAR (extrapolated) = 0.095 W/kg
SAR(1 g) = 0.052 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.055 mW/g

SCN/78483JD03/004: Rear of EUT Facing Phantom With Electrode Array Attached CH6 54Mbps
Date: 01/10/2010
DUT: Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000013 + Aingeal Electrode Array



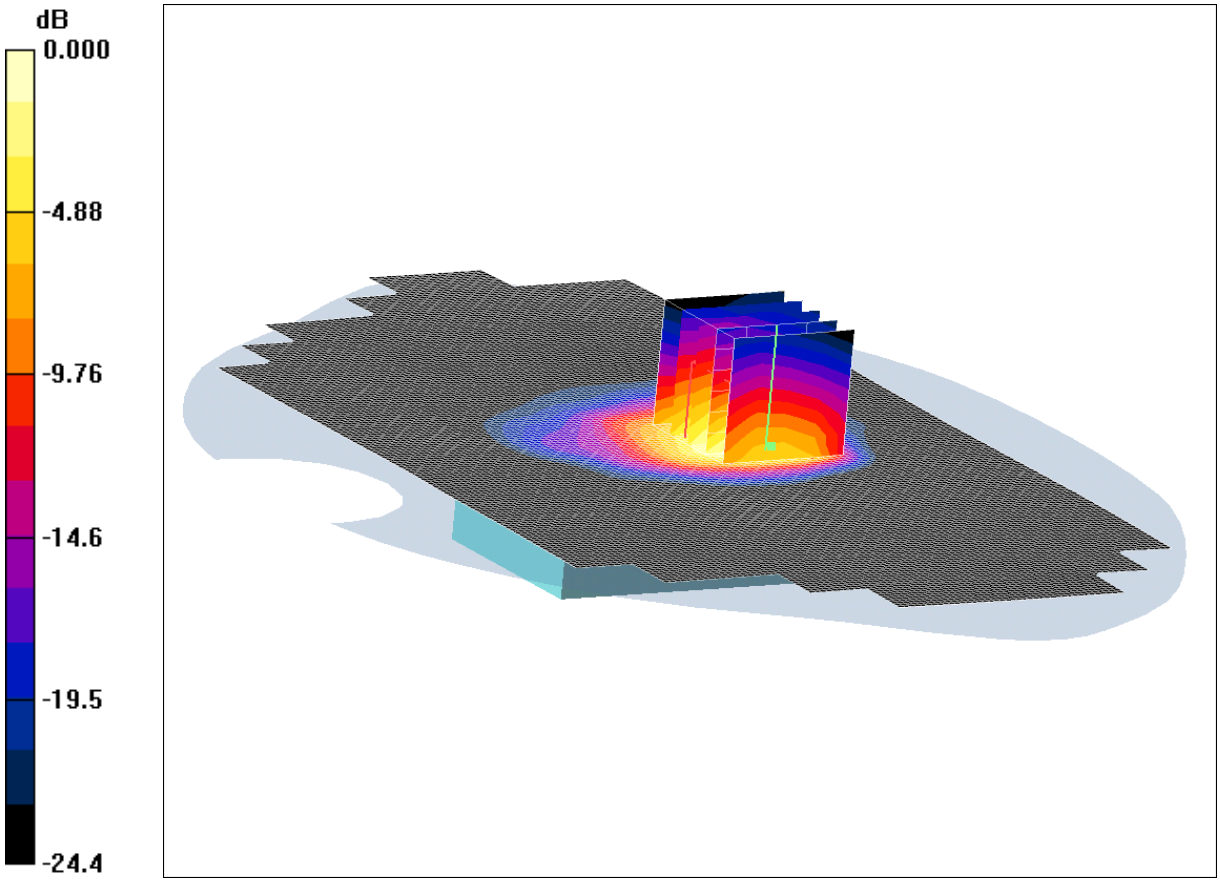
0 dB = 0.026mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 1.93 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x181x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.028 mW/g

Rear of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.28 V/m; Power Drift = -0.442 dB
Peak SAR (extrapolated) = 0.049 W/kg
SAR(1 g) = 0.023 mW/g; SAR(10 g) = 0.012 mW/g
Maximum value of SAR (measured) = 0.026 mW/g

SCN/78483JD03/005: Front of EUT Facing Phantom With Electrode Array Attached And liquid-filled plastic bag "sandwiching" the EUT CH6 1Mbps
Date 07/12/2010
DUT: Intelesens - Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000013 + Aingeal Electrode Array



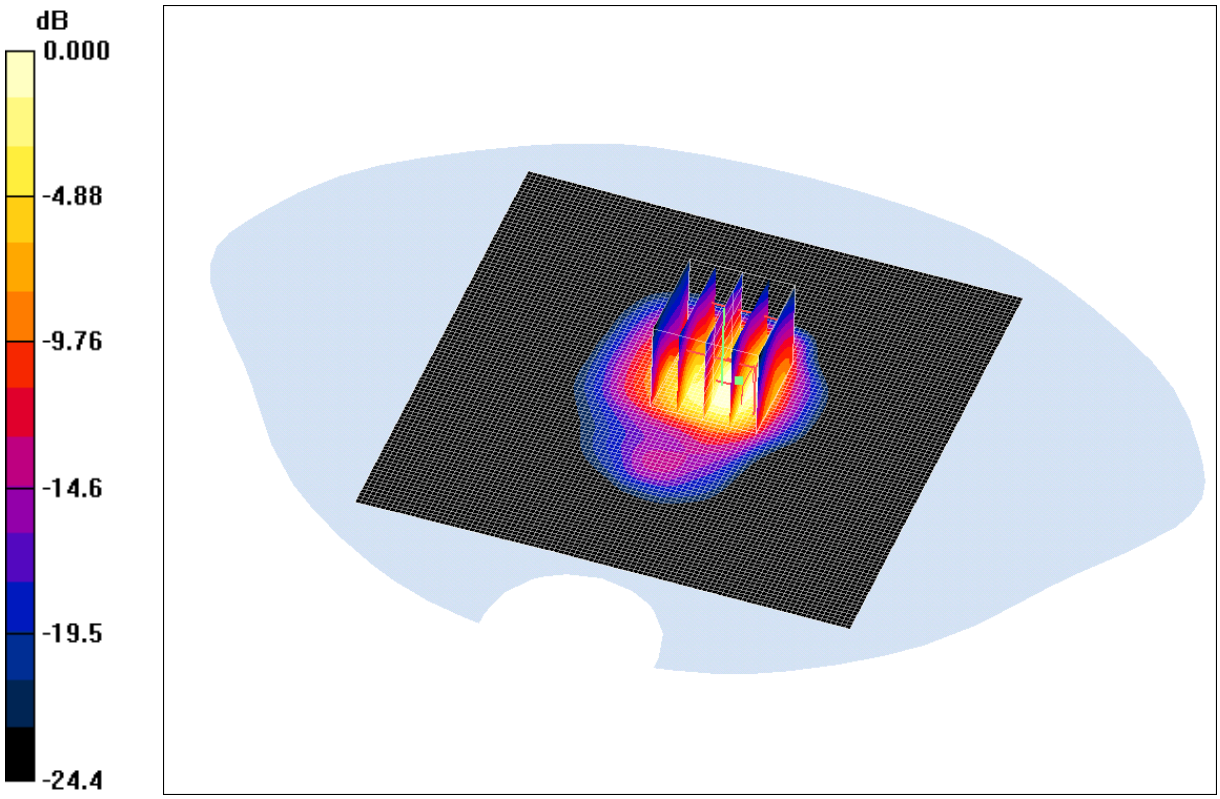
0 dB = 0.963mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 2 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x181x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.65 mW/g

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.2 V/m; Power Drift = 0.137 dB
Peak SAR (extrapolated) = 2.34 W/kg
SAR(1 g) = 0.861 mW/g; SAR(10 g) = 0.396 mW/g
Maximum value of SAR (measured) = 0.963 mW/g

SCN/78483JD03/006: Front of EUT Facing Phantom With Electrode Array Attached And liquid-filled plastic bag "sandwiching" the EUT CH1 1Mbps
Date: 07/12/2010
DUT: Intelesens - Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000005 + Aingeal Electrode Array



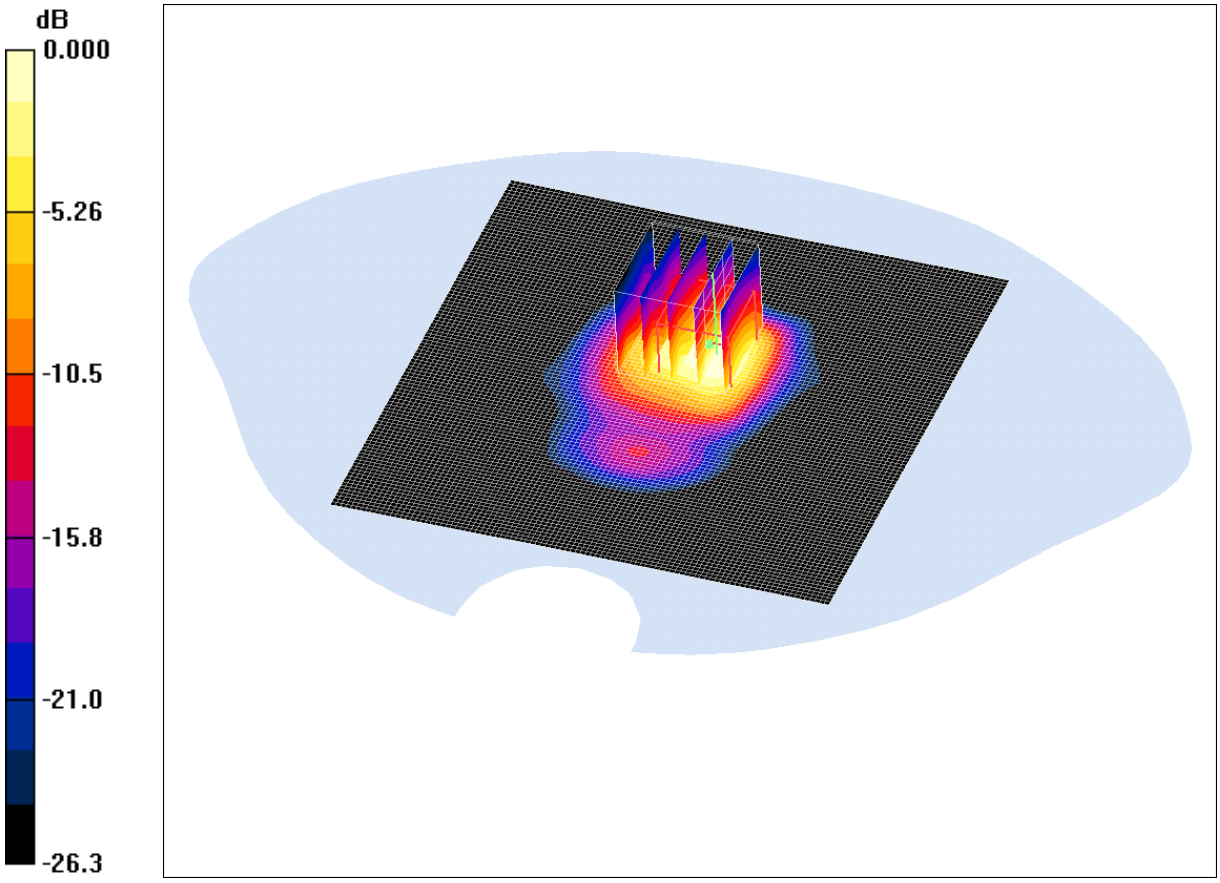
0 dB = 0.964mW/g

Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2412 MHz; σ = 1.97 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.11 mW/g

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.5 V/m; Power Drift = 0.169 dB
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 0.878 mW/g; SAR(10 g) = 0.392 mW/g
Maximum value of SAR (measured) = 0.964 mW/g

SCN/78483JD03/007: Front of EUT Facing Phantom With Electrode Array Attached And liquid-filled plastic bag "sandwiching" the EUT CH11 1Mbps
Date: 07/12/2010
DUT: Intelesens - Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000008 + Aingeal Electrode Array



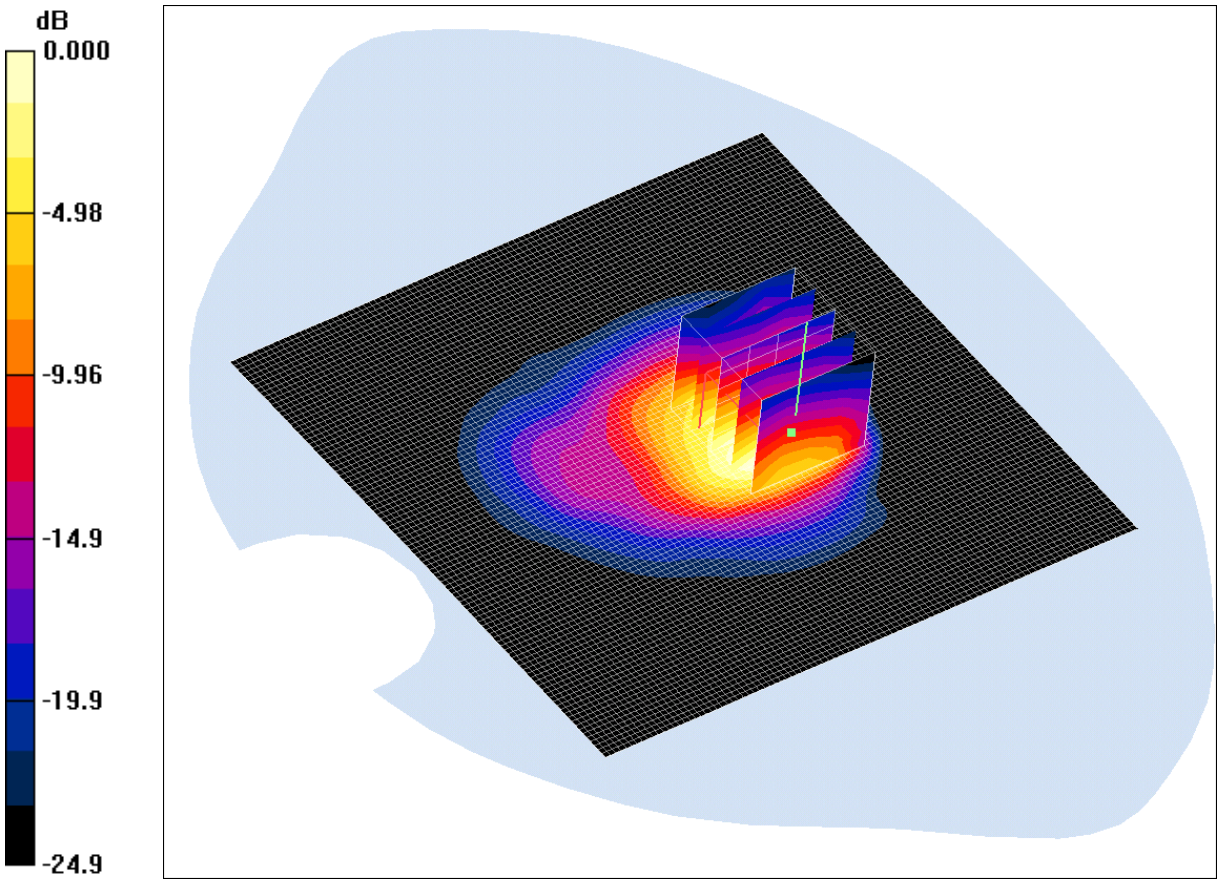
0 dB = 0.959mW/g

Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2462 MHz; σ = 2.03 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.26 mW/g

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.73 V/m; Power Drift = 0.317 dB
Peak SAR (extrapolated) = 2.14 W/kg
SAR(1 g) = 0.824 mW/g; SAR(10 g) = 0.369 mW/g
Maximum value of SAR (measured) = 0.959 mW/g

SCN/78483JD03/008: Front of EUT Facing Phantom With Electrode Array Attached Without Liquid Sandwiching the EUT CH6 1Mbps
Date: 07/12/2010
DUT: Intelesens - Aingeal General Monitoring System; Type: Aingeal Monitoring Unit + ELECTRODE012; Serial: QB002S0000013 + Aingeal Electrode Array



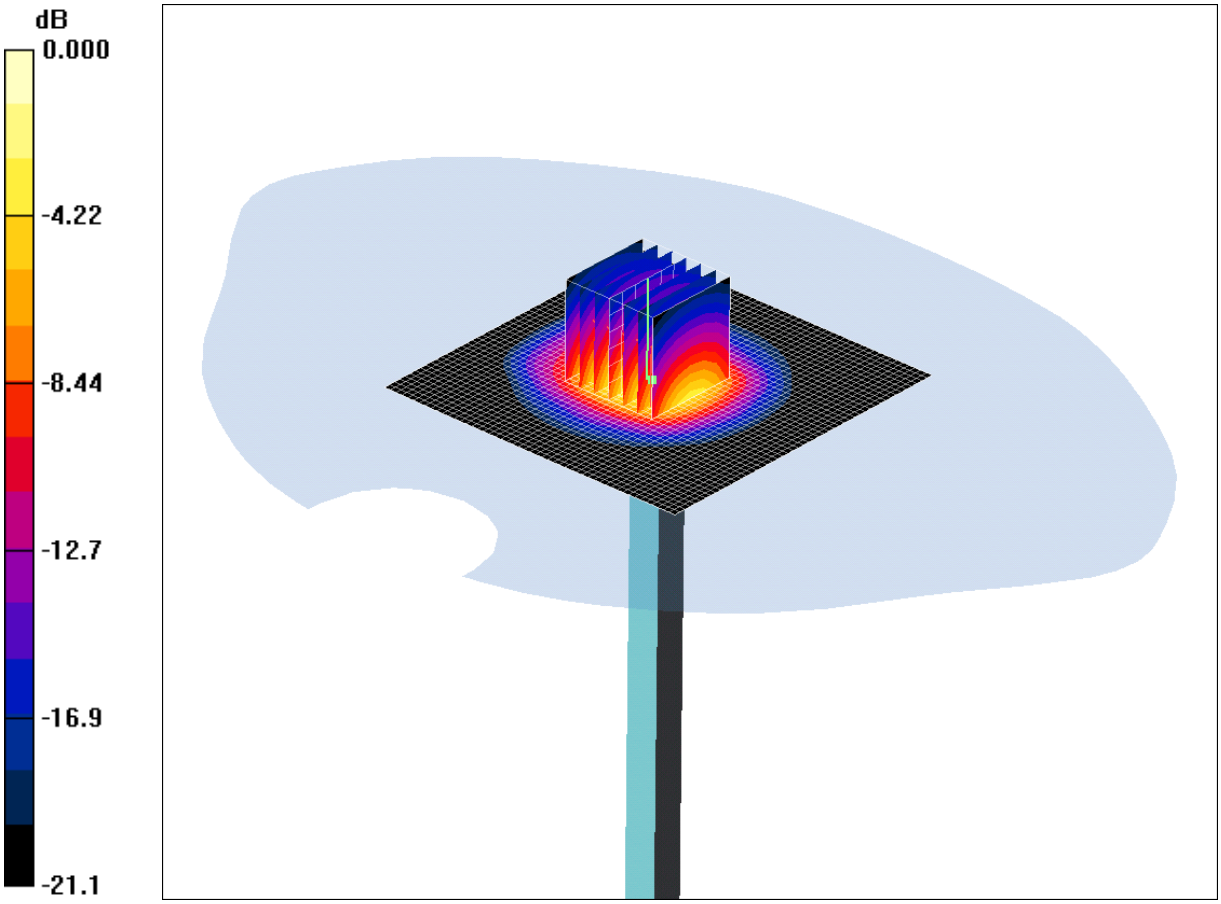
0 dB = 0.933mW/g

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used (interpolated): f = 2437 MHz; σ = 2 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Area Scan (101x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.36 mW/g

Front of EUT Facing Phantom With Electrode Array Attached - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.9 V/m; Power Drift = 0.031 dB
Peak SAR (extrapolated) = 2.20 W/kg
SAR(1 g) = 0.823 mW/g; SAR(10 g) = 0.388 mW/g
Maximum value of SAR (measured) = 0.933 mW/g

SCN/78483JD03/009: System Performance Check 2450MHz Body 01 10 10
Date: 01/10/2010
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725



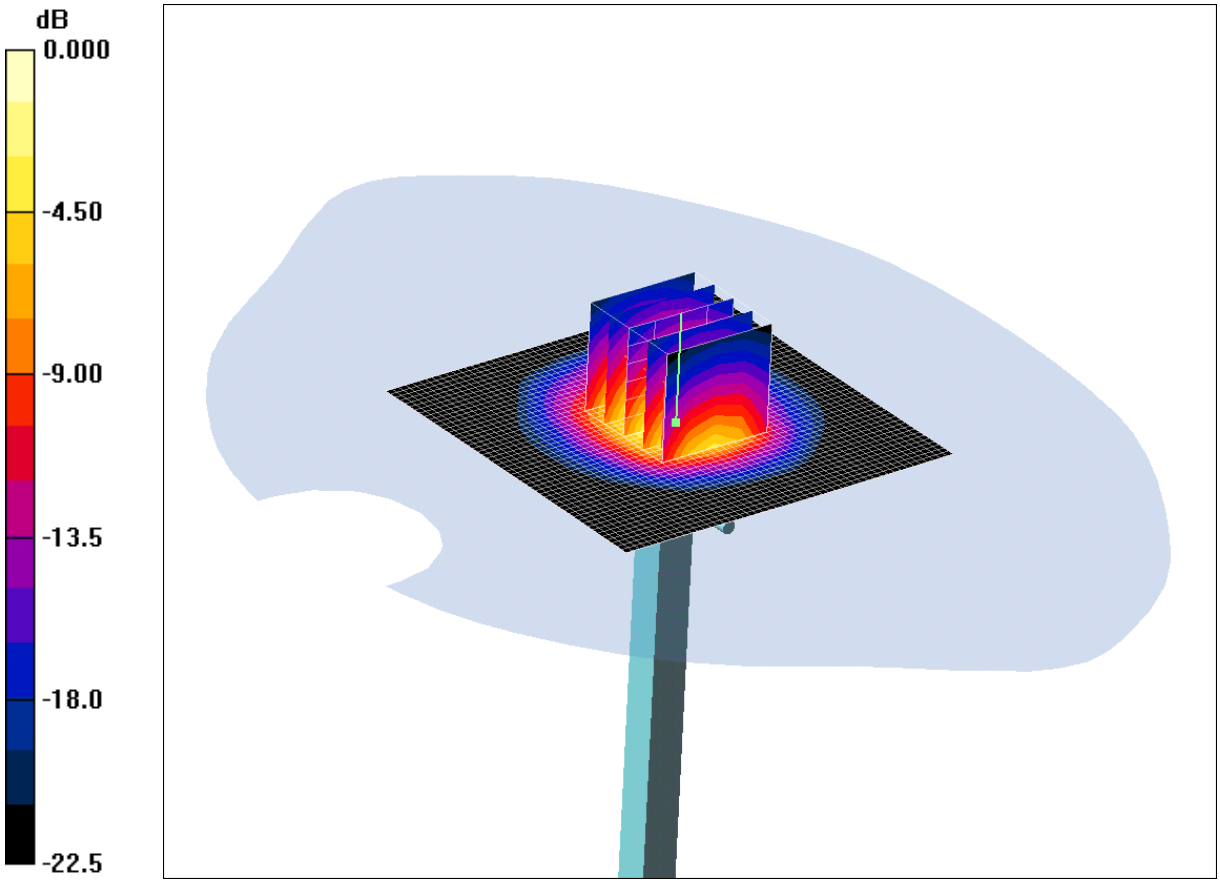
0 dB = 14.9mW/g

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used: f = 2450 MHz; σ = 1.95 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=10mm, Pin=250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 18.0 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.7 V/m; Power Drift = 0.140 dB
Peak SAR (extrapolated) = 26.5 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.08 mW/g
Maximum value of SAR (measured) = 14.9 mW/g

SCN/78483JD03/010: System Performance Check 2450MHz Body 07 12 10
Date 07/12/2010
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725



0 dB = 15.5mW/g

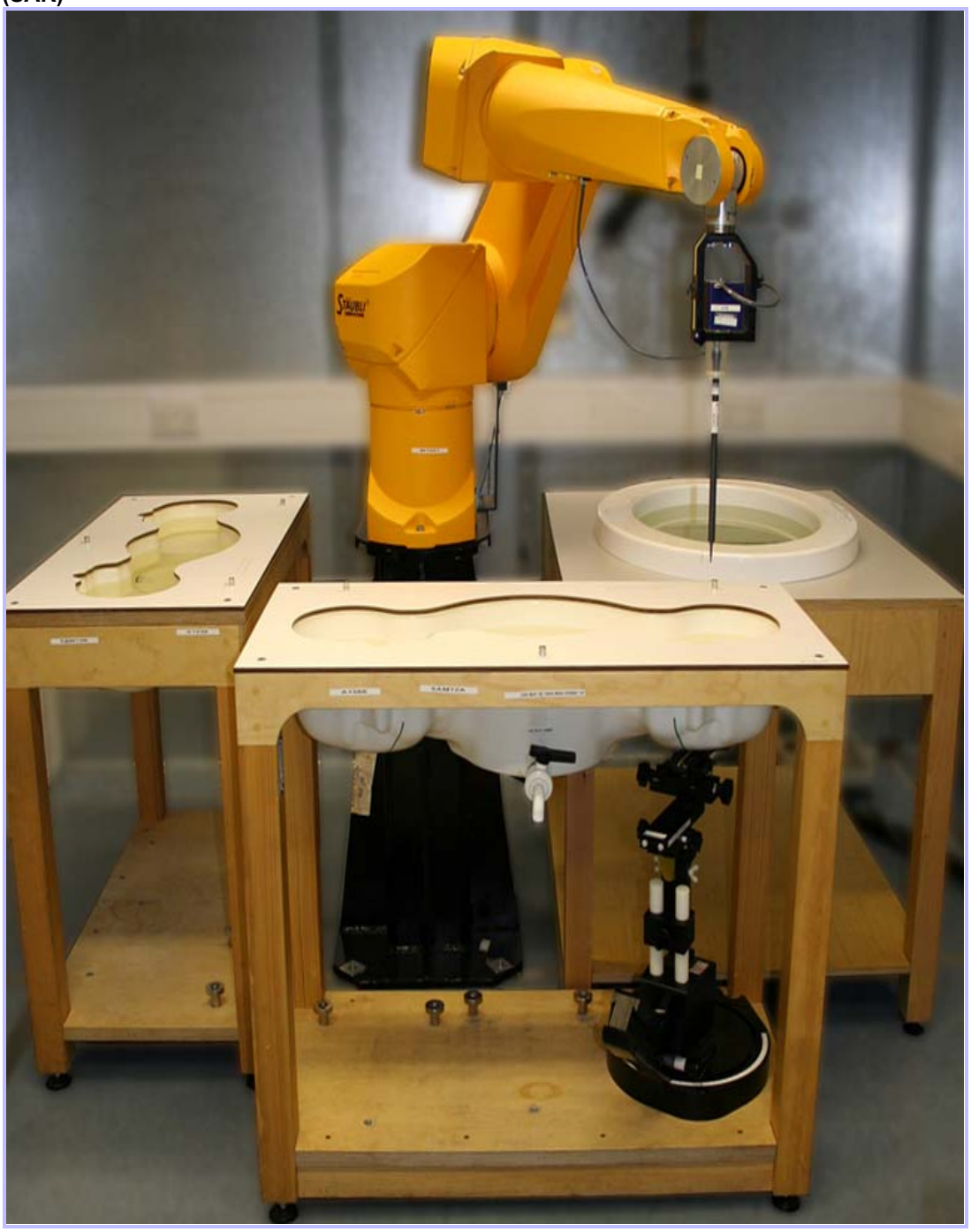
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 MHz MSL Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.19, 8.19, 8.19); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176
d=10mm, Pin=250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 18.8 mW/g
d=10mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 87.1 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.34 mW/g
Maximum value of SAR (measured) = 15.5 mW/g

Appendix 4. Photographs

This appendix contains the following photographs:

Photo Reference Number	Title
PHT/78483JD03/001	Test configuration for the measurement of Specific Absorption Rate (SAR)
PHT/78483JD03/002	Rear of EUT Facing Phantom With Electrode Array Attached
PHT/78483JD03/003	Front of EUT Facing Phantom With Electrode Array Attached And liquid-filled plastic bag “sandwiching” the EUT
PHT/78483JD03/004	Front of EUT Facing Phantom With Electrode Array Attached
PHT/78483JD03/005	Front View of EUT
PHT/78483JD03/006	Rear View of EUT (Configured to Transmitting at CH6)
PHT/78483JD03/007	Rear View of EUT (Configured to Transmitting at CH11)
PHT/78483JD03/008	Rear View of EUT (Configured to Transmitting at CH1)
PHT/78483JD03/009	Internal View EUT
PHT/78483JD03/010	Electrode Array
PHT/78483JD03/011	2450 MHz Body Fluid Level

PHT/78483JD03/001: Test configuration for the measurement of Specific Absorption Rate (SAR)



PHT/78483JD03/002: Rear of EUT Facing Phantom With Electrode Array Attached

PHT/78483JD03/003: Front of EUT Facing Phantom With Electrode Array Attached And liquid-filled plastic bag "sandwiching" the EUT

PHT/78483JD03/004: Front of EUT Facing Phantom With Electrode Array Attached

PHT/78483JD03/005: Front View of EUT

PHT/78483JD03/006: Rear View of EUT (Configured to Transmitting at CH6)

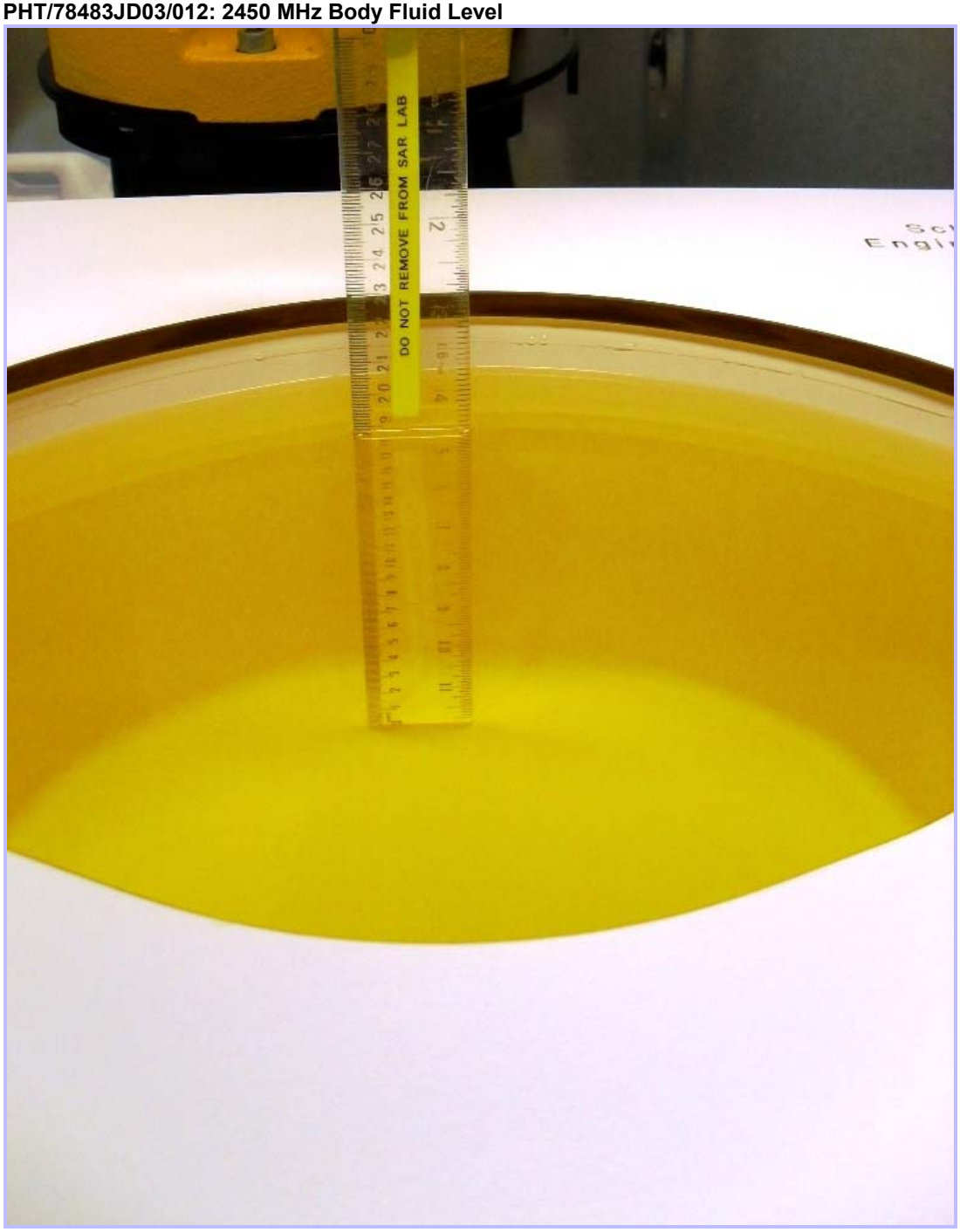
PHT/78483JD03/007: Rear View of EUT (Configured to Transmitting at CH11)

PHT/78483JD03/009: Rear View of EUT (Configured to Transmitting at CH1)

PHT/78483JD03/010: Internal View EUT

PHT/78483JD03/011: Electrode Array

PHT/78483JD03/012: 2450 MHz Body Fluid Level



Appendix 5. Validation of System

Prior to the assessment, the system was verified in the flat region of the phantom.
A 2450 MHz dipole was used. A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±5% for the 2450 MHz dipole. The applicable verification (normalised to 1 Watt).

Date: 01/10/2010
Validation Dipole and Serial Number: D2450V2; SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0 ºC	23.0 ºC	ε_r	52.70	52.20	-0.95	5.00
				σ	1.95	1.94	-0.34	5.00
				1g SAR	52.20	52.40	0.38	5.00
				10g SAR	24.70	24.32	-1.54	5.00

Date: 07/12/2010
Validation Dipole and Serial Number: D2450V2; SN: 725

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	2450	23.0 ºC	22.8 ºC	ε_r	52.70	52.50	-0.39	5.00
				σ	1.95	2.01	3.03	5.00
				1g SAR	52.20	54.80	4.98	5.00
				10g SAR	24.70	25.36	2.67	5.00

Appendix 6. Simulated Tissues

The body mixture consists of De-Ionized Water, Salt and Polysorbate. Visual inspection is made to ensure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.

Ingredient	Frequency
	2450 MHz Body
De-Ionized Water	71.70 %
Polysorbate 20 (Tween 20)	28.00 %
Salt	0.30 %

Appendix 7. DASY4 System Details

A.7.1. DASY4 SAR Measurement System

RFI Global Services Ltd, SAR measurement facility utilises the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, and the SAM phantom containing brain or muscle equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller; teach pendant (Joystick), and remote control. This is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. The data acquisition electronics (DAE) performs signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection etc. The DAE is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE3 utilises a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching mulitplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

A.7.2. DASY4 SAR System Specifications

Robot System	
Positioner:	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability:	0.025 mm
No. of Axis:	6
Serial Number:	F00/SD89A1/A/01
Reach:	1185 mm
Payload:	3.5 kg
Control Unit:	CS7
Programming Language:	V+
Data Acquisition Electronic (DAE) System	
Serial Number:	DAE3 SN:394
PC Controller	
PC:	Dell Precision 340
Operating System:	Windows 2000
Data Card:	DASY4 Measurement Server
Serial Number:	1080
Data Converter	
Features:	Signal Amplifier, multiplexer, A/D converted and control logic.
Software:	DASY4 Software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock.
PC Interface Card	
Function:	24 bit (64 MHz) DSP for real time processing Link to DAE3 16 nit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.

DASY4 SAR System Specifications (Continued)	
E-Field Probe	
Model:	EX3DV3
Serial No:	3508
Construction:	Triangular core
Frequency:	10 MHz to >6 GHz
Linearity:	±0.2 dB (30 MHz to 6 GHz)
Probe Length (mm):	330
Probe Diameter (mm):	12
Tip Length (mm):	20
Tip Diameter (mm):	2.5
Sensor X Offset (mm):	1
Sensor Y Offset (mm):	1
Sensor Z Offset (mm):	1
Phantom	
Phantom:	SAM Phantom
Shell Material:	Fibreglass
Thickness:	2.0 ±0.1 mm