



# TEST REPORT

**Test of: S41CS1**

**To: KDB 865664 D01 SAR Measurement 100MHz to 6GHz**

**FCC ID: UCE214060A**

**Test Report Serial No:  
UL-SAR-RP10060149JD06 V3.0**

**Version 3.0 supersedes all previous versions**

**This Test Report Is Issued Under The Authority  
Of Richelieu Quoi, SAR Technology Consultant:**

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PP  
(APPROVED SIGNATORY)

**Checked By: Sandhya Menon**

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(APPROVED SIGNATORY)

**Issue Date:**

**12 December 2013**

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## TABLE OF CONTENTS

1. Customer Information.....	4
2. Summary of Test Results .....	5
3. Test Specification, Methods and Procedures .....	8
4. Equipment Under Test (EUT).....	9
5. Deviations from the Test Specification .....	11
6. Operation and Configuration of the EUT during Testing .....	12
7. Measurements, Examinations and Derived Results .....	15
8. Measurement Uncertainty .....	20
Appendix 1. Test Equipment Used .....	21
Appendix 2. Measurement Methods .....	23
Appendix 3. SAR Distribution Scans.....	27
Appendix 4. Photographs.....	46
Appendix 5. System Check .....	68
Appendix 6. Simulated Tissues.....	69
Appendix 7. DASY4 System Details.....	70
Appendix 8. Antenna Schematics.....	73

## 1. Customer Information

<b>Company Name:</b>	Panasonic Mobile Comms Dev of Europe Ltd
<b>Address:</b>	Panasonic House Willoughby Road Bracknell Berkshire RG12 8FP United Kingdom

## 2. Summary of Test Results

Test Name	Specification Reference	Result
Specific Absorption Rate – PCS 1900	KDB 865664 D01 SAR Measurement 100MHz to 6 GHz ANSI C95.1-1992	
<b>Key to Results</b>		 = Complied  = Did not comply

## 2.1. Highest Standalone Reported SAR

### Individual Transmitter Evaluation per Band:

Exposure Configuration	Technology Band	Mode	Highest Reported 1g -SAR (W/kg)	Equipment Class	Max Rated Avg Power + Max Tolerance [dBm]
HEAD (Separation Distance 0mm)	PCS 1900	Voice	1.046	PCE	30.5
BODY-WORN (Separation Distance 10mm)	PCS 1900	Data	0.853	PCE	28.5

### Note(s):

As per FCC KDB 447498 D01, Bluetooth maximum source based time average power was below the allowed threshold for 10 separation distances.

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] [\sqrt{f_{(\text{GHz})}} / x]$  W/kg for test separation distances  $\leq 50$  mm;  
where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.

For the estimated SAR level calculation, the Maximum Target power + Upper tolerance for *Bluetooth* =  $0.0 + 2.0$  dBm ( $\sim 1.58$  mW) is considered.

- 10mm Bluetooth estimated SAR level:

$$\text{Estimated Bluetooth SAR} = (1.58\text{mW}/10\text{mm}) * (\sqrt{1.9} / 7.5) = 0.029 \text{ W/kg}$$

## 2.2. Highest Reported Simultaneous Transmission SAR:

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.

### Simultaneous Transmitter Evaluation:

Exposure Configuration	Technology Band	Highest Reported 1g SAR (W/kg)	Equipment Class	Max Rated Avg Power + Max Tolerance [dBm]	Highest Reported Sum-SAR 1g-SAR (W/kg)	SPLSR Ratio
BODY-WORN (Separation Distance 10mm)	PCS 1900	0.853	PCE	30.5	0.882	N/A
	Bluetooth	0.029	DSS	2.0		

### Note(s):

1. As per FCC KDB publication 447498 SAR peak location separation ratio (SPLSR) was not required as the sum of the combination of WWAN+WPAN  $< 1.6$  w/kg.
2. Bluetooth estimated SAR level calculation is shown in section 2.1 in this report

### 2.3. SAR measurement variability and measurement uncertainty analysis:

The SAR measurement variability and measurement uncertainty analysis was not required as the maximum measured SAR is < 0.8 W/kg.

#### Note(s):

The condition for SAR variability was met as the SAR level measured and calculated was below the specified threshold as per KDB publication 865664 D01, section 2.8.1

### 2.4. Location of Tests

All the measurements described in this report were performed at the premises of UL, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG United Kingdom

### 2.5. Nominal and Maximum Output power:

Bands	Speech (Voice Mode)	
	Max Rated Average Power (dBm)	Tolerances (dB)
PCS 1900	29.0	-1.0 ~ +1.5

Bands	GPRS (Data)			
	Tx Slot 1		Tx Slot 2	
	Max Rated Average Power (dBm)	Tolerances (dB)	Max Rated Average Power (dBm)	Tolerances (dB)
PCS 1900	29.0	-1.0 ~ +1.5	27.0	-1.0 ~ +1.5

Band	Max Rated Average Power (dBm)	Tolerances (dB)
Bluetooth	0.0	-4.0 ~ +2.0

#### Note:

- As per KDB865664 D02 SAR Reporting v01r01, 2.1.4(a), the nominal and maximum average source based rated power, declared by manufacturer are shown in the above tables.
- These are specified maximum allowed average power for all the wireless modes and frequency bands supported as indicated by manufacturer.

### 3. Test Specification, Methods and Procedures

#### 3.1. Test Specification

Reference:	KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz
Title:	SAR Measurement Requirements for 100 MHz to 6 GHz
Purpose of Test:	Field probes, tissue dielectric properties, SAR scans, measurement accuracy and variability of the measured results are discussed. The field probe and SAR scan requirements are derived from criteria considered in draft standard IEEE P1528-2011. The similar requirements in Supplement C 01-01 are generally superseded by the procedures in this document, and which are required to be used to qualify for TCB equipment approval.

The Equipment Under Test complied with the Specific Absorption Rate for general population/uncontrolled exposure limit of 1.6 W/kg as specified in FCC 47 CFR part 2 (2.1093) and ANSI C95.1-1992 and has been tested in accordance with the reference documents in section 3.2 of this report.

#### 3.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

IEEE 1528: 2003

IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

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 known precision", IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

#### FCC KDB Publication:

KDB 447498 D01 General RF Exposure Guidance v05r01

KDB 648474 D04 Handset SAR v01r02

KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r02

KDB 865664 D02 RF Exposure Reporting v01r01

KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01

#### 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. Equipment Under Test (EUT)

### 4.1. Identification of Equipment Under Test (EUT)

Description:	Dual Mode GSM/UMTS Mobile Phone with <i>Bluetooth</i>	
Brand Name:	SoftBank	
Serial Number:	C24	C14
IMEI Number:	004401221308139	004401221308089
Hardware Version Number:	Revision E	
Software Version Number:	ACPU: B-S41CS1-13.01.001.srec CCPU: S41CS1_Cv52030205_foma11.srec	
FCC ID Number:	UCE214060A	
Country of Manufacture:	None Stated	
Date of Receipt:	13 November 2013	
<b>Note(s):</b>		

IMEI: 004401221308139 was used to perform WWAN SAR measurements only.

IMEI: 004401221308089 was used to perform WWAN conducted Average power measurements only.

### 4.2. Description of EUT

The Equipment Under Test is a Flip style Mobile Phone with Dual Mode GSM/UMTS band. The EUT has PCS 1900 (with Voice and Data GPRS class 10) and *Bluetooth* capabilities.

### 4.3. Modifications Incorporated in the EUT

There were no modification during the course of testing the device

### 4.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Personal Hands-Free Kit (PHF)	Battery
Brand Name:	SoftBank	SoftBank
Model Name or Number:	SoftBank ZTBBA1	PMBBH1
Serial Number:	Accessory Sample #301	None Stated
Cable Length and Type:	~1.37 m	Not Applicable
Country of Manufacture:	None Stated	None Stated
Connected to Port	3.5mm Audio jack and custom type	3 pin contact

### 4.5. Support Equipment

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

Description:	Wireless Communication Test Set
Brand Name:	Anritsu
Model Name or Number:	MT8820C
Serial Number:	6200938937
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

#### 4.6. Additional Information Related to Testing

<b>Equipment Category</b>	PCS 1900	Voice, GPRS					
<b>Type of Unit</b>	Portable Transceiver						
<b>Intended Operating Environment:</b>	Within GSM and Bluetooth Coverage for General Population / Uncontrolled Exposure category.						
<b>Transmitter Maximum Output Power Characteristics:</b>	PCS 1900	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) Setting of 0.					
	Bluetooth	:= 1.58 mW or ~ 2 dBm					
<b>Transmitter Frequency Range:</b>	PCS 1900	1850.2 to 1909.8 MHz					
	Bluetooth	2402 to 2480 MHz					
<b>Transmitter Frequency Allocation of EUT When Under Test:</b>	<b>Bands</b>	<b>Channel Number</b>	<b>Channel Description</b>	<b>Frequency (MHz)</b>			
	PCS 1900	512	Low	1850.2			
		661	Middle	1880.0			
		810	High	1909.8			
<b>Modulation(s):</b>	GMSK (GSM / GPRS)			217 Hz			
<b>Modulation Scheme (Crest Factor for technologies SAR tested):</b>	GMSK (GPRS 1900)			2			
<b>Antenna Type:</b>	Internal integral						
<b>Antenna Length:</b>	Unknown						
<b>Number of Antenna Positions:</b>	WWAN ~ GSM			1 fixed			
	WPAN ~ BT			1 fixed			
<b>Power Supply Requirement:</b>	3.7 V (Nominal)						
<b>Battery Type(s):</b>	Li-ion						

## 5. Deviations from the Test Specification

Test was performed as per reference documents and FCC KDB publication procedures listed in section 3.2 of this report.

## 6. Operation and Configuration of the EUT during Testing

### 6.1. Operating Modes

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

- PCS1900 - Voice allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.
- GPRS1900 – Data allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0. Tested using 2 Uplink time slots with CS1 for GPRS.

PCS1900: Power Control Level (PCL) vs Nominal Power (dBm)	
Power Control Level PCL	Nominal Power (dBm)
22 ... 29	Reserved
30	33
31	32
<b>0</b>	<b>30</b>
1	28
2	26
3	24
4	22
5	20
6	18
7	16
8	14
9	12
10	10
11	8
12	6
13	4
14	2
15	0
16 ... 21	Reserved

## 6.2. Configuration and Peripherals

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

- Standalone fully charged battery powered.
- Head and Body-worn configurations were evaluated.

### Head Configuration

- The EUT was placed in a normal operating position with the centre of the ear-piece aligned with the ear canal on the phantom.
- With the ear-piece touching the phantom the centre line of the EUT was aligned with an imaginary plane (X and Y axis) consisting of three lines connecting both ears and the mouth.
- For the cheek position the EUT was gradually moved towards the cheek until any point of the mouth-piece or keypad touched the cheek.
- 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).
- 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.
- The device was keyed to operate continuously in the transmit mode for the duration of the test.
- The location of the maximum spatial SAR distribution (hot spot) was determined relative to the EUT and its antenna.
- The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

### Body Configuration

- 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.
- 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.
- 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.
- 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.
- 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.
- The device was keyed to operate continuously in the transmit mode for the duration of the test.
- The location of the maximum spatial SAR distribution (hot spot) was determined relative to the EUT and its antenna.
- The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

### 6.3. SAR Test Exclusion Consideration

Frequency Band	Configuration(s)			
	Head	Exclusion Threshold	Body-worn	Exclusion Threshold
PCS 1900	No	>3.0	No	>3.0
Bluetooth <sup>1</sup>	N/A	N/A	Yes	<3.0

#### Note:

1. As per KDB 447498 D01 General RF Exposure Guidance v05, The Frequency Bands with Rated Power including Upper tolerance, which qualify for **Standalone SAR Test Exclusion**, are as per the above table.

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f_{(\text{GHz})}}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

**For the SAR Test Exclusion consideration, the Maximum Target power + Upper tolerance for Bluetooth = 0.0 + 2.0 = 2.0 dBm (~ 1.58 mW) is considered.**

Applying the above formula for *Bluetooth* Body-worn we get:

$$\gg \text{For 2450MHz, } [(1.58)/15] * [\sqrt{2.4}] = 0.105 \leq 3.0$$

Hence, testing is not required on *Bluetooth* Body-worn configurations.

2. The details for the **Maximum Rated Power** and tolerance(s) can be found in section 2.5.

## 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. RF Output Power Measurement

### 7.2.1. PCS1900

#### Voice Mode GSM (GMSK)

Channel Number	Frequency (MHZ)	Avg Power (dBm)
512	1850.2	29.0
661	1880.0	29.0
810	1909.8	29.1

#### GPRS (GMSK) – Coding Scheme: CS1

Channel Number	Frequency (MHZ)	Avg Burst Power (dBm)		Frame Power (dBm)	
		1Uplink	2Uplink	1Uplink	2Uplink
512	1850.2	29.0	27.0	20.0	21.0
661	1880.0	29.0	27.0	20.0	21.0
810	1909.8	29.1	27.0	20.1	21.0

#### Note:

##### Scale factor for uplink time slot:

- 1 Uplink: time slot ratio = 8:1 =>  $10 \log(8/1) = 9.03 \text{ dB}$
- 2 Uplink: time slot ratio = 8:2 =>  $10 \log(8/2) = 6.02 \text{ dB}$
- The worst-case configuration and mode for SAR testing is determined to be as follows:
  - Head & Body-worn (Voice Mode) Accessory: GMSK Voice Mode
  - Body-worn (Data) Mode: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above

**7.3. Test Results****For All SAR measurement in this report the SAR limit tested to is 1.6 W/Kg****7.3.1. Specific Absorption Rate - PCS 1900 Head Configuration 1g****Test Summary:**

<b>Tissue Volume:</b>	1g
<b>Maximum Measured Level (W/kg):</b>	0.758
<b>Maximum Reported Level (W/kg):</b>	1.046

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	24.0 to 24.0
<b>Temperature Variation in Liquid (°C):</b>	22.0 to 22.0

**Results:**

Scan No.	EUT Position	Channel Number	Meas. Avg Power (dBm)	Max Rated Power (dBm)	Meas. Level (W/kg)	Reported SAR (W/kg)	Note(s)	Mod.
001	Touch Left	661	29.0	30.5	0.637	0.900	1	GMSK
002	Touch Left	512	29.0	30.5	0.557	0.787	1	GMSK
003	Touch Left	810	29.1	30.5	0.648	0.894	1	GMSK
004	Tilt Left	661	29.0	30.5	0.405	0.572	1	GMSK
005	Touch Right	661	29.0	30.5	0.610	0.862	1	GMSK
006	Touch Right	512	29.0	30.5	0.645	0.911	1	GMSK
007	Touch Right	810	29.1	30.5	0.758	1.046	1	GMSK
008	Tilt Right	661	29.0	30.5	0.359	0.507	1	GMSK

**Note(s):**

1. Voice Mode

**7.3.2. Specific Absorption Rate - GPRS 1900 Body-Worn Configuration 1g****Test Summary:**

<b>Tissue Volume:</b>	1g
<b>Maximum Measured Level (W/kg):</b>	0.604
<b>Maximum Reported Level (W/kg):</b>	0.853

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	24.0 to 24.0
<b>Temperature Variation in Liquid (°C):</b>	22.0 to 22.0

**Results:**

Scan No.	EUT Position	Channel Number	Meas. Avg Power (dBm)	Max Rated Power (dBm)	Meas. Level (W/kg)	Reported SAR (W/kg)	Note (s)	Mod.
009	Front EUT Open	661	27.0	28.5	0.404	0.571	1, 2	GMSK
010	Back EUT Open	661	27.0	28.5	0.577	0.815	1, 2	GMSK
011	Back EUT Open	512	27.0	28.5	0.604	0.853	1, 2	GMSK
012	Back EUT Open	810	27.0	28.5	0.603	0.852	1, 2	GMSK
013	Front EUT Closed	661	27.0	28.5	0.318	0.449	1, 2	GMSK
014	Back EUT Closed	661	27.0	28.5	0.463	0.654	1, 2	GMSK

**Note(s):**

1. Data - SAR measurements were performed using 2 uplink timeslots
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.

**7.3.3. Specific Absorption Rate - PCS 1900 Body-Worn Configuration 1g****Test Summary:**

<b>Tissue Volume:</b>	1g
<b>Maximum Measured Level (W/kg):</b>	0.493
<b>Maximum Reported Level (W/kg):</b>	0.696

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	24.0 to 24.0
<b>Temperature Variation in Liquid (°C):</b>	22.0 to 22.0

**Results:**

Scan No.	EUT Position	Channel Number	Meas. Avg Power (dBm)	Max Rated Power (dBm)	Meas. Level (W/kg)	Reported SAR (W/kg)	Note(s)	Mod.
015	Front EUT Open	661	29.0	30.5	0.365	0.516	1, 2	GMSK
016	Back EUT Open	661	29.0	30.5	0.493	0.696	1, 2	GMSK

**Note(s):**

1. Voice Mode
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.

\*As per 648474 D04 SAR Handsets Multi Xmter and Ant v01, "When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset". Hence, Body worn configurations were not evaluated with PHF attached.

## 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- PCS 1900 Head Configuration 1g	95%	±23.70%
Specific Absorption Rate- GSM / GPRS 1900 Body-Worn Configurations 1g	95%	±20.18%

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.

**Note:**

1. See Appendix 2 section A.2.3 for table calculations and parameters

## Appendix 1. Test Equipment Used

UL 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	-
M1755	DAK Fluid probe	Schmid & Partner Engineering AG	SM DAK 040 CA	1089	Calibrated before use	-
A1328	Handset Positioner	Schmid & Partner Engineering AG	Modification	SD 000 H01 DA	-	-
A2109	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	417	17 April 2013	12
A2243	Probe	Schmid & Partner Engineering AG	ES3DV3	3304	02 September 2013	12
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	23 May 2013	12
A2403	Amplifier	Mini-Circuits	zhl-42w (sma)	15542	Calibrated as part of system	-
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM (Site 56)	TP-1031	Calibrated before use	-
A1566	SAM Phantom	Schmid & Partner Engineering AG	SAM (Site 56)	TP-1031	Calibrated before use	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1137	3dB Attenuator	Narda	779	04690	Calibrated as part of system	-
A2263	Digital Camera	Samsung	PL211	9453C90B 607487L	-	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	04 Oct 2013	12
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	F01/5J86A1/C/01	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1047	Robot Arm	Staubli	RX908 L	F00/SD89A1/A/01	Calibrated before use	-
M1768	Signal Generator	Rohde & Schwarz	SME 06	8482064/033	Internal Calibration 01 Nov 2013	4
M1270	Digital Thermometer	RS	N/A	N/A	03 May 2013	12
M1023	Dual Channel Power Meter	R & S	NRVD	863715/030	06 Jun 2013	12
S256	SAR Lab	UL	Site 56	N/A	Calibrated before use	-

#### **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.

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



checked by *DR* DATE: 06 SEPT - 2013  
**S** Schweizerischer Kalibrierdienst  
**S** Service suisse d'étalonnage  
**C** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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

Client **UL-RFI**

Accreditation No.: **SCS 108**

*A 2243*

Certificate No: **ES3-3304\_Sep13**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3304**

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

Calibration date: **September 2, 2013**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: September 2, 2013

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Accreditation No.: **SCS 108**

### Glossary:

TS	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TS / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ 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<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TS (see below *ConvF*).
- NORM(f)x,y,z = NORM<sub>x,y,z</sub> \* frequency\_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCPx,y,z**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>; A, B, C, D** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TS corresponds to  $NORM<sub>x,y,z</sub> * ConvF$  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  $\pm 50$  MHz to  $\pm 100$  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 ES3DV3

**SN:3304**

Manufactured: August 27, 2010  
Calibrated: September 2, 2013

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

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3304

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.14	1.34	1.34	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	101.8	100.5	98.3	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	154.9	$\pm 3.0\%$
		Y	0.0	0.0	1.0		164.5	
		Z	0.0	0.0	1.0		166.6	

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

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3304

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.40	6.40	6.40	0.30	1.82	± 12.0 %
835	41.5	0.90	6.21	6.21	6.21	0.32	1.72	± 12.0 %
900	41.5	0.97	6.11	6.11	6.11	0.29	1.85	± 12.0 %
1750	40.1	1.37	5.27	5.27	5.27	0.67	1.22	± 12.0 %
1900	40.0	1.40	5.12	5.12	5.12	0.76	1.15	± 12.0 %
2100	39.8	1.49	5.11	5.11	5.11	0.80	1.17	± 12.0 %
2450	39.2	1.80	4.51	4.51	4.51	0.74	1.23	± 12.0 %
2600	39.0	1.96	4.40	4.40	4.40	0.64	1.42	± 12.0 %

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

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3304

### Calibration Parameter Determined in Body Tissue Simulating Media

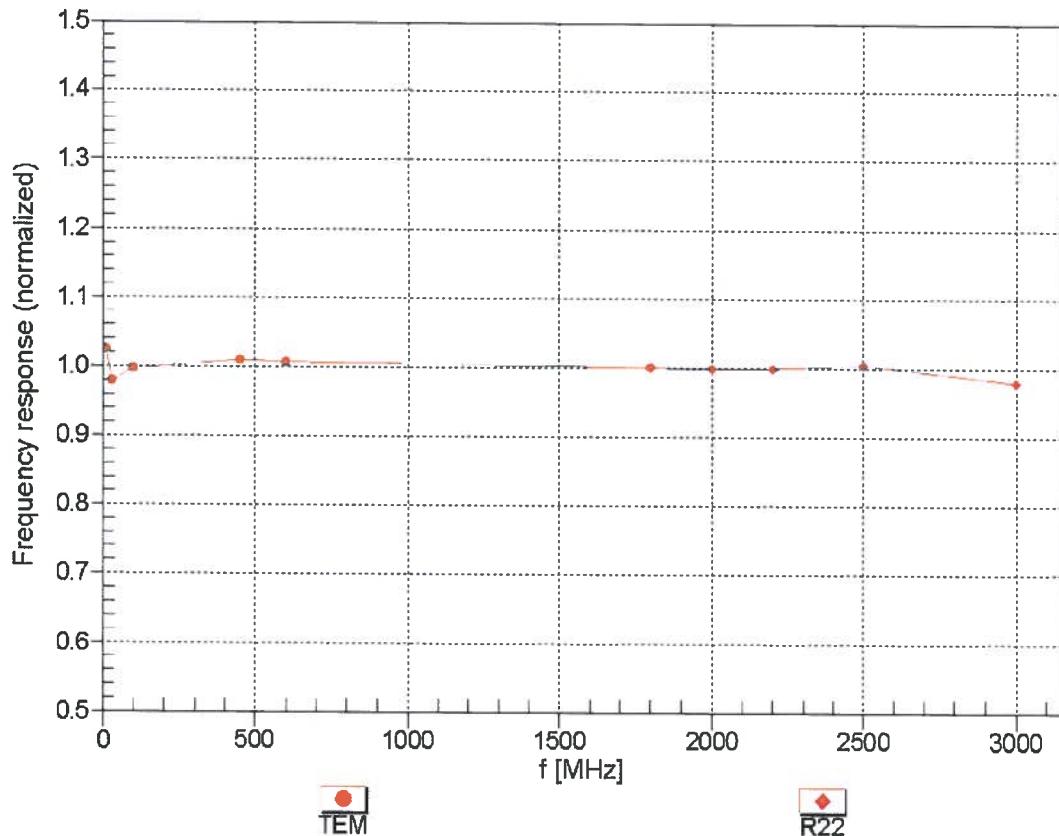
f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.07	6.07	6.07	0.42	1.61	± 12.0 %
835	55.2	0.97	6.07	6.07	6.07	0.80	1.17	± 12.0 %
900	55.0	1.05	5.95	5.95	5.95	0.64	1.30	± 12.0 %
1750	53.4	1.49	4.89	4.89	4.89	0.64	1.38	± 12.0 %
1900	53.3	1.52	4.67	4.67	4.67	0.40	1.75	± 12.0 %
2100	53.2	1.62	4.78	4.78	4.78	0.51	1.60	± 12.0 %
2450	52.7	1.95	4.22	4.22	4.22	0.80	1.14	± 12.0 %
2600	52.5	2.16	4.07	4.07	4.07	0.66	0.98	± 12.0 %

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

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## Frequency Response of E-Field

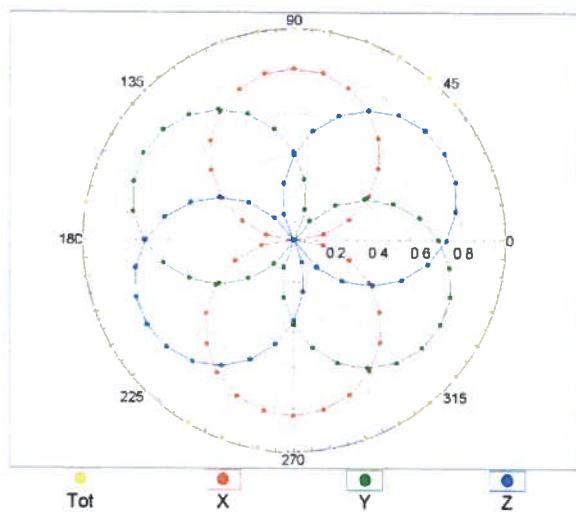
(TEM-Cell:ifi110 EXX, Waveguide: R22)



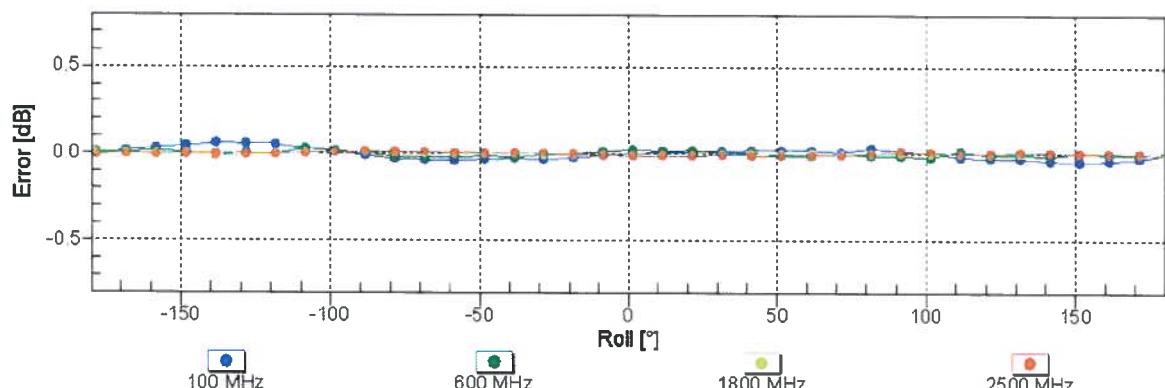
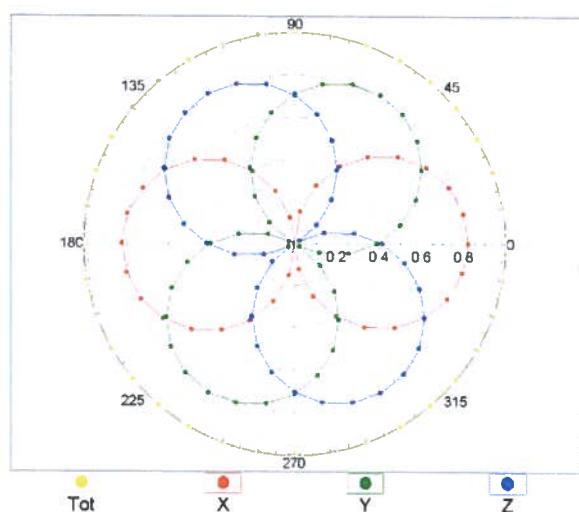
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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

$f=600$  MHz, TEM



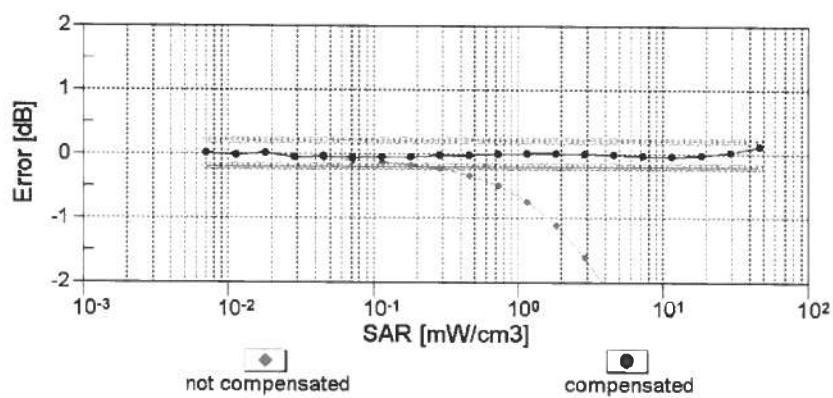
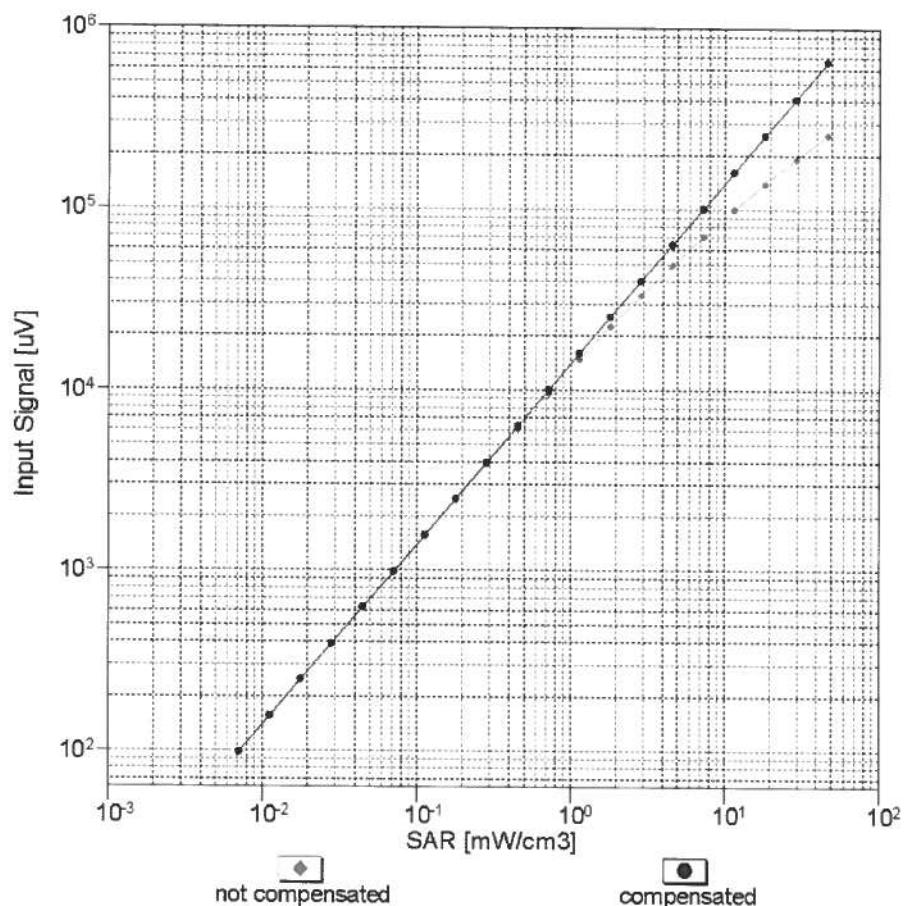
$f=1800$  MHz, R22



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

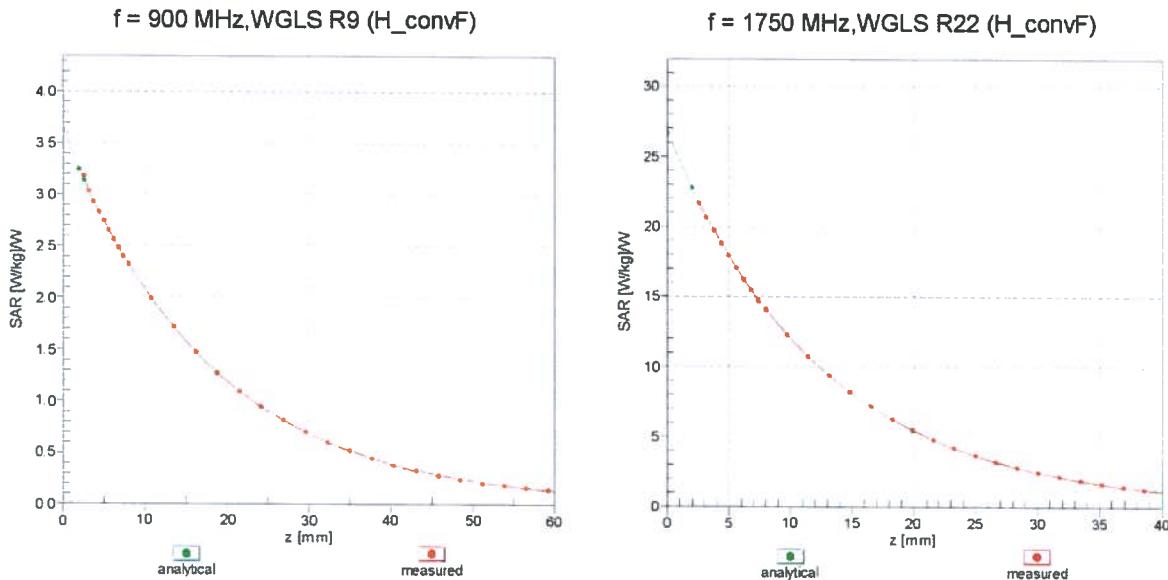
## Dynamic Range f(SAR<sub>head</sub>)

(TEM cell , f = 900 MHz)

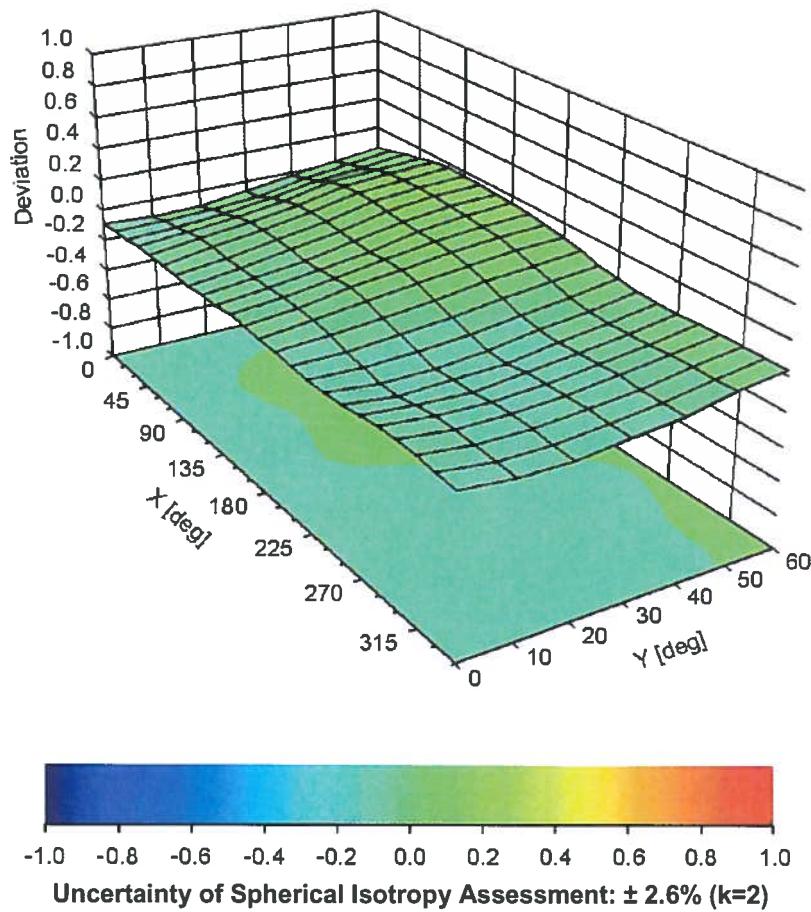


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  (k=2)

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), $f = 900 \text{ MHz}$



## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3304

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-58.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

checked by *D. Röss* A1237 DATE: 24-JUNE-2013  
Calibration Laboratory of  
Schmid & Partner  
Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland



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

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Client **UL-RFI**

Accreditation No.: **SCS 108**

Certificate No: **D1900V2-540\_May13**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 540**

Calibration procedure(s) **QA CAL-05.v9**  
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **May 23, 2013**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name	Function	Signature
	Dimce Iliev	Laboratory Technician	<i>D. Iliev</i>
Approved by:	Katja Pokovic	Technical Manager	<i>K. Pokovic</i>

Issued: May 24, 2013

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Accreditation No.: SCS 108

#### Glossary:

TS	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.

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%.

## Measurement Conditions

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

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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	39.3 $\pm$ 6 %	1.35 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

## SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.4 W/kg $\pm$ 16.5 % (k=2)

## 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 $\pm$ 0.2) °C	53.6 $\pm$ 6 %	1.49 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	41.3 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.9 W/kg $\pm$ 16.5 % (k=2)

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.7 \Omega + 4.6 \text{ j}\Omega$
Return Loss	- 24.9 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.7 \Omega + 5.0 \text{ j}\Omega$
Return Loss	- 25.7 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.120 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

# DASY5 Validation Report for Head TSL

Date: 23.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.35$  S/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

## Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

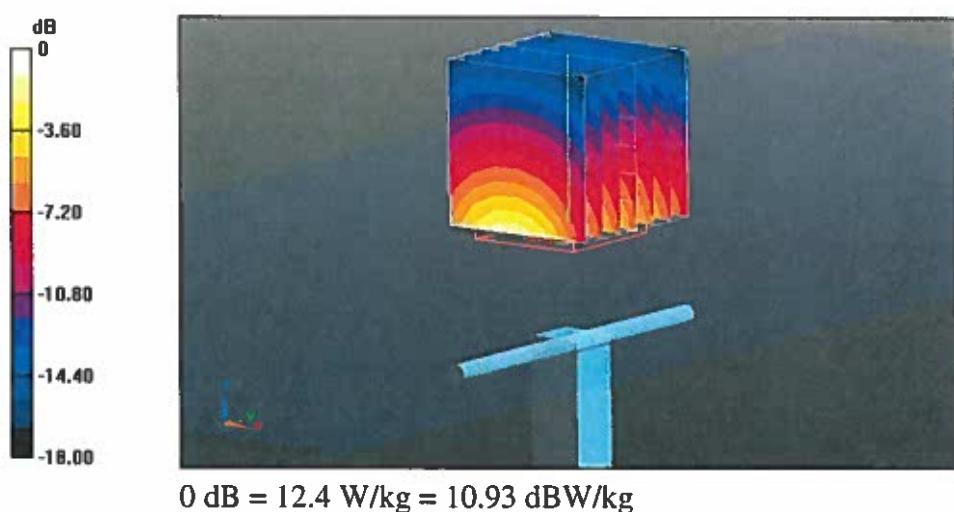
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.521 V/m; Power Drift = 0.05 dB

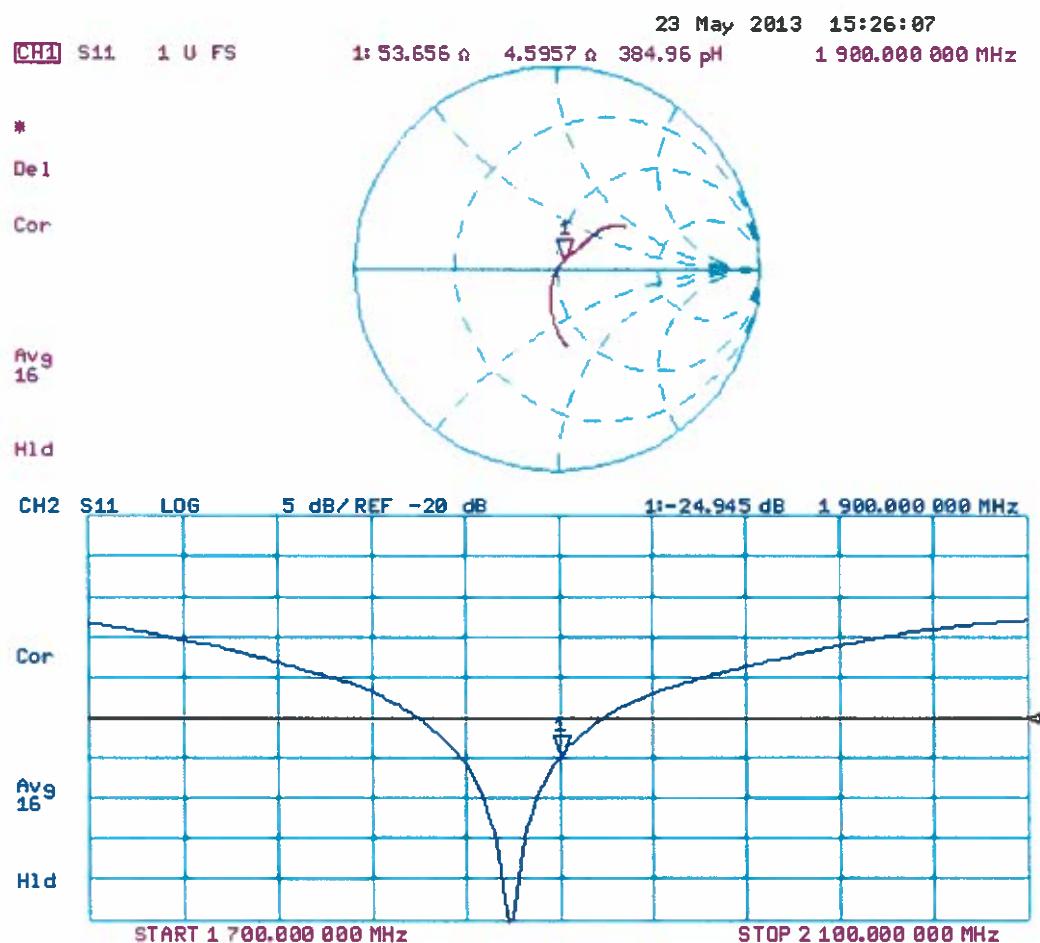
Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 10 W/kg; SAR(10 g) = 5.28 W/kg

Maximum value of SAR (measured) = 12.4 W/kg



## Impedance Measurement Plot for Head TSL



# DASY5 Validation Report for Body TSL

Date: 23.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.49$  S/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

## Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

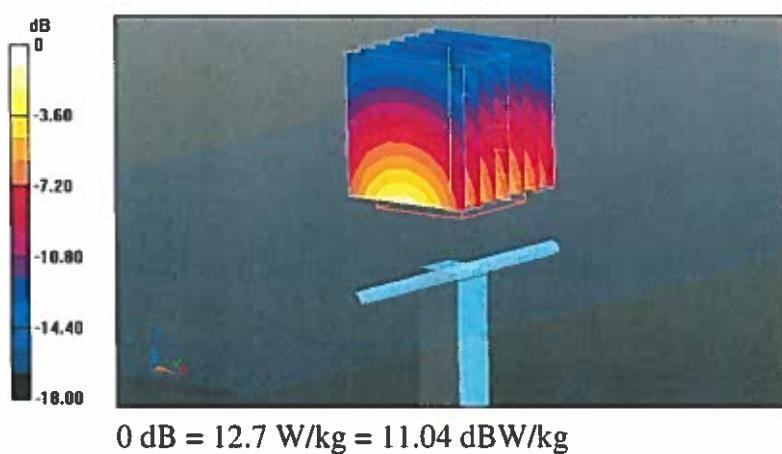
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.521 V/m; Power Drift = 0.03 dB

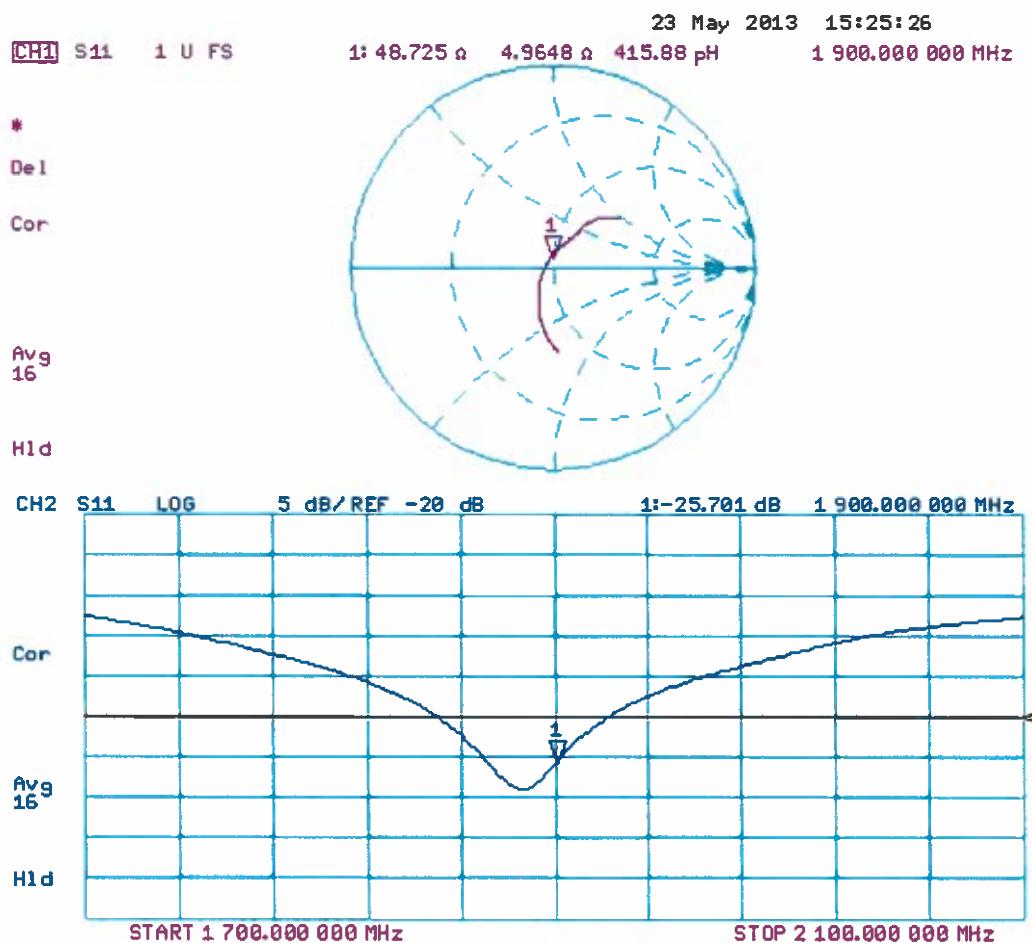
Peak SAR (extrapolated) = 17.3 W/kg

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.44 W/kg

Maximum value of SAR (measured) = 12.7 W/kg



## 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 for measurement < 2.0 GHz, 7x7x7 matrix for measurement 2.0 GHz to 3.0 GHz, and 7x7x12 for > 5.0 GHz 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 865664 D01 SAR Measurement 100 MHz to 6MHz**

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

SAR measurements were performed in accordance with 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 +18.0°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 Check and material dielectric property measurements were conducted. In the absence of a detailed procedure within the specification, system Check and material dielectric property measurements were performed in accordance with FCC KDB publication 865664 D01.

Following the successful system Check 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 175 points for frequency below 2.0 GHz, above 2.0GHz up to 3.0 GHz 7x7x7 cube of 343 points and a 7x7x12 cube of 588 points for frequency 5.0 GHz and above 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 1g 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 or 7x7x7 or 7x7x12 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.

### A.2.3. Measurement Uncertainty Tables

#### A.2.3.1 Specific Absorption Rate-PCS 1900 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	c <sub>i</sub> (1g)	Standard Uncertainty		v <sub>i</sub> or v <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	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	0.600	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	0.160	0.160	normal (k=1)	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	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	6.500	6.500	normal (k=1)	1.0000	1.0000	6.500	6.500	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)	5.000	5.000	normal (k=1)	1.0000	0.6400	3.200	3.200	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	5.000	5.000	normal (k=1)	1.0000	0.6000	3.000	3.000	5
	Combined standard uncertainty			t-distribution			11.85	11.85	>200
	Expanded uncertainty			k = 2			23.70	23.70	>200

**A.2.3.2 Specific Absorption Rate-PCS / GPRS 1900 Body Configuration 1g**

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	c <sub>i</sub> (1g)	Standard Uncertainty		v <sub>i</sub> or v <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	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	0.600	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	0.160	0.160	normal (k=1)	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	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	2.800	2.800	normal (k=1)	1.0000	1.0000	2.800	2.800	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)	5.000	5.000	normal (k=1)	1.0000	0.6400	3.200	3.200	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	5.000	5.000	normal (k=1)	1.0000	0.6000	3.000	3.000	5
	Combined standard uncertainty			t-distribution			10.30	10.30	>250
	Expanded uncertainty			k = 1.96			20.18	20.18	>250

### Appendix 3. SAR Distribution Scans

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

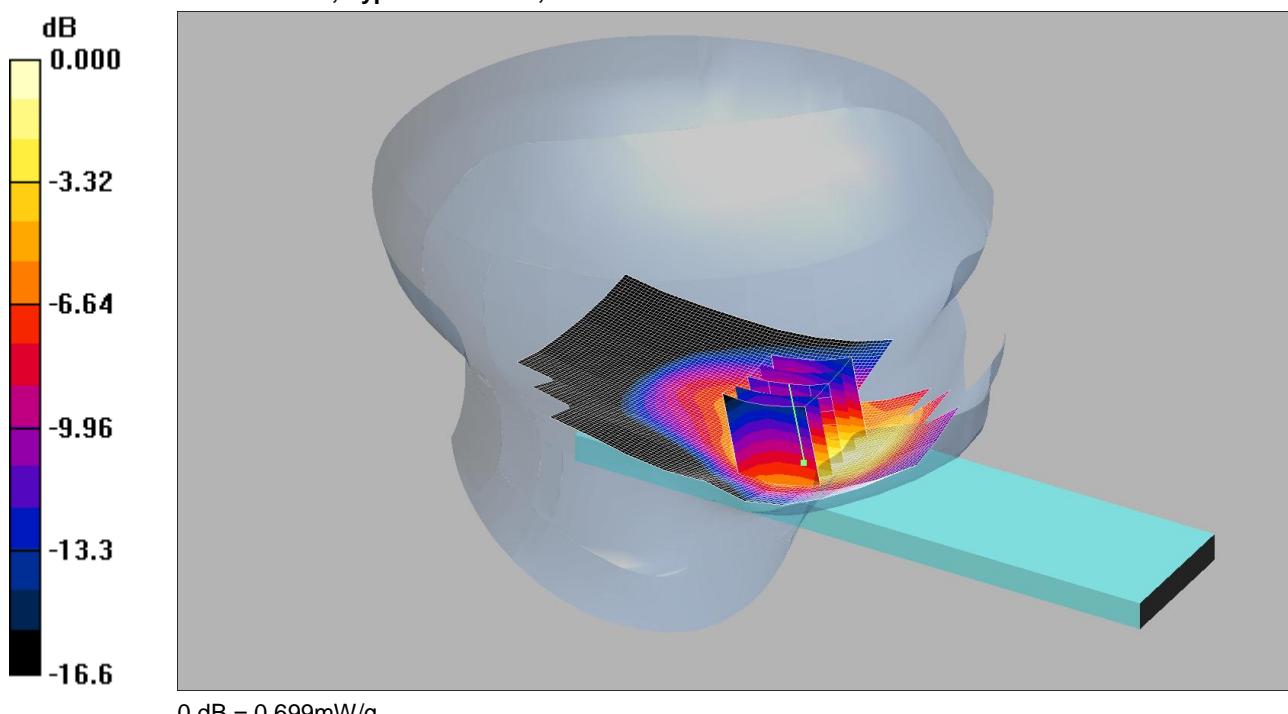
Scan Reference Number	Title
001	Touch Left PCS 1900 CH661
002	Touch Left PCS 1900 CH512
003	Touch Left PCS 1900 CH810
004	Tilt Left PCS 1900 CH661
005	Touch Right PCS 1900 CH661
006	Touch Right PCS 1900 CH512
007	Touch Right PCS 1900 CH810
008	Tilt Right PCS 1900 CH661
009	Front of EUT Open Facing Phantom GPRS 1900 2TX CH661
010	Back of EUT Open Facing Phantom GPRS 1900 2TX CH661
011	Back of EUT Open Facing Phantom GPRS 1900 2TX CH512
012	Back of EUT Open Facing Phantom GPRS 1900 2TX CH810
013	Front of EUT Closed Facing Phantom GPRS 1900 2TX CH661
014	Back of EUT Closed Facing Phantom GPRS 1900 2TX CH661
015	Front of EUT Open Facing Phantom PCS 1900 CH661
016	Back of EUT Open Facing Phantom PCS 1900 CH661
017	System Performance Check 1900MHz Head 14 11 13
018	System Performance Check 1900MHz Body 14 11 13

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001: Touch Left PCS 1900 CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Touch Left - Middle/Area Scan (71x131x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.710 mW/g

**Touch Left - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.75 V/m; Power Drift = 0.047 dB

Peak SAR (extrapolated) = 0.991 W/kg

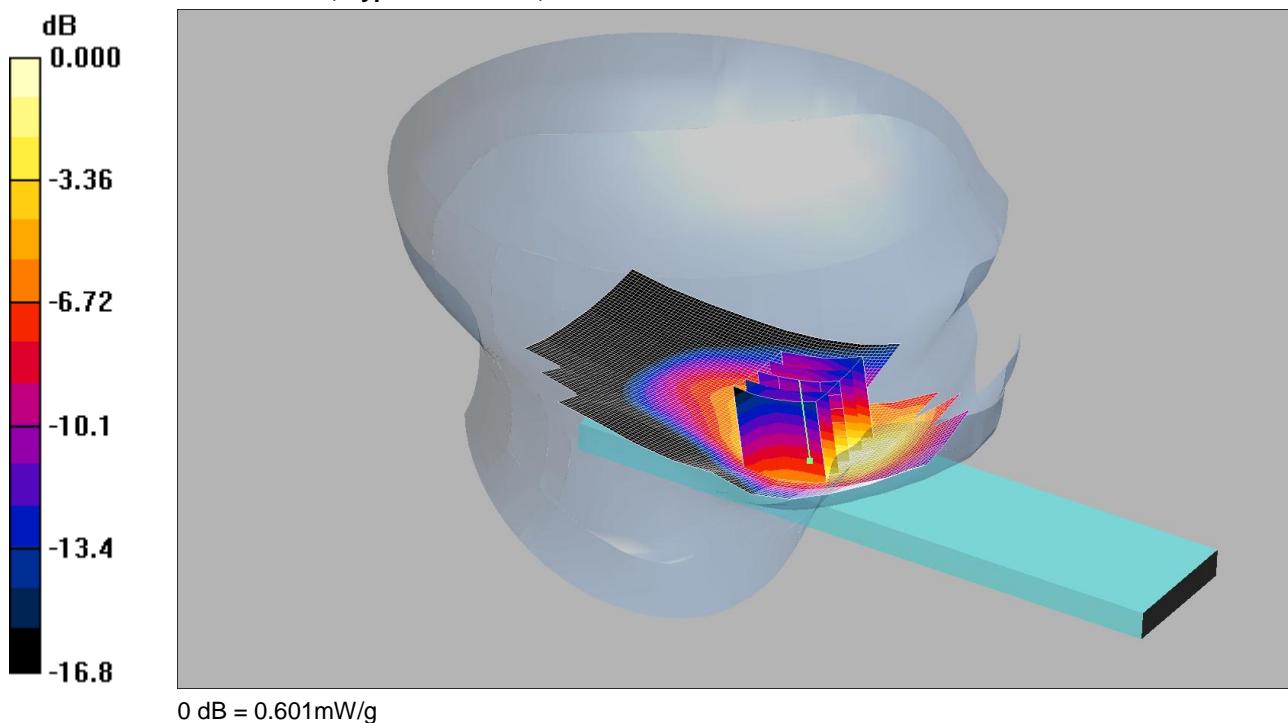
**SAR(1 g) = 0.637 mW/g; SAR(10 g) = 0.383 mW/g**

Maximum value of SAR (measured) = 0.699 mW/g

002: Touch Left PCS 1900 CH512

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Touch Left - Middle/Area Scan (71x131x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.623 mW/g

**Touch Left - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.42 V/m; Power Drift = 0.132 dB

Peak SAR (extrapolated) = 0.868 W/kg

**SAR(1 g) = 0.557 mW/g; SAR(10 g) = 0.336 mW/g**

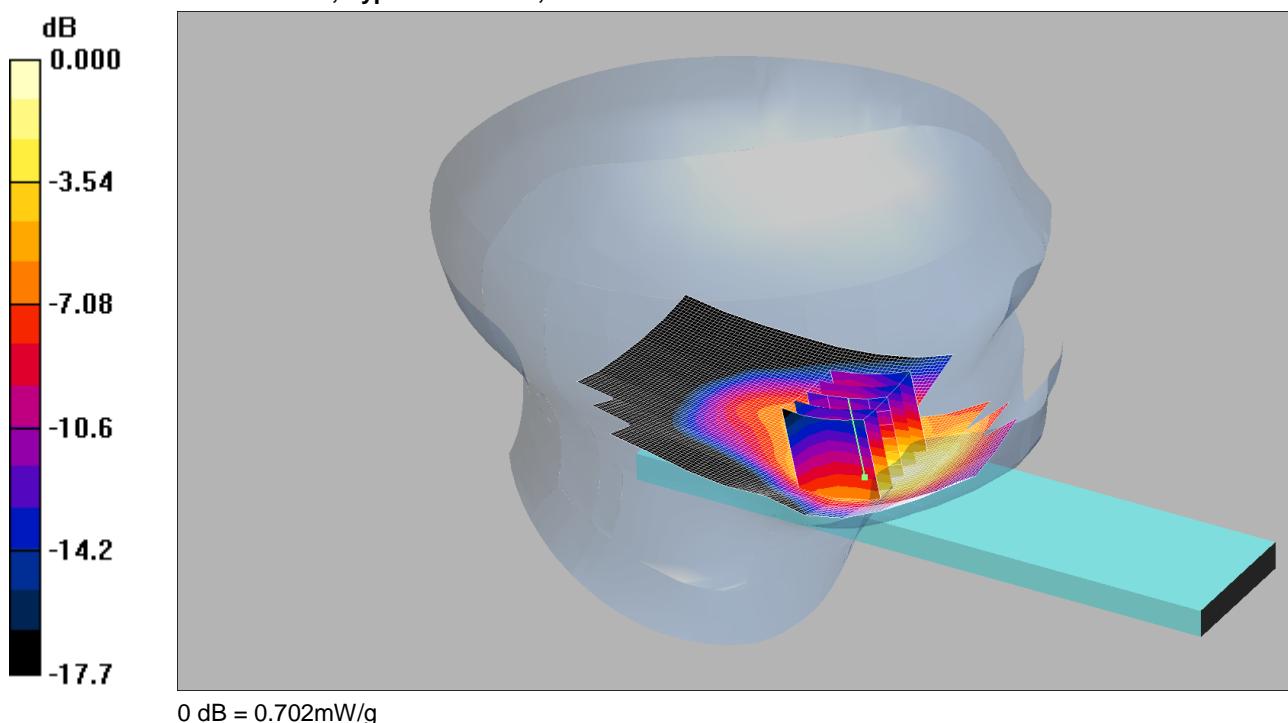
Maximum value of SAR (measured) = 0.601 mW/g

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003: Touch Left PCS 1900 CH810

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



0 dB = 0.702mW/g

Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.43$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Touch Left - Middle/Area Scan (71x131x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.716 mW/g

**Touch Left - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.12 V/m; Power Drift = 0.033 dB

Peak SAR (extrapolated) = 1.03 W/kg

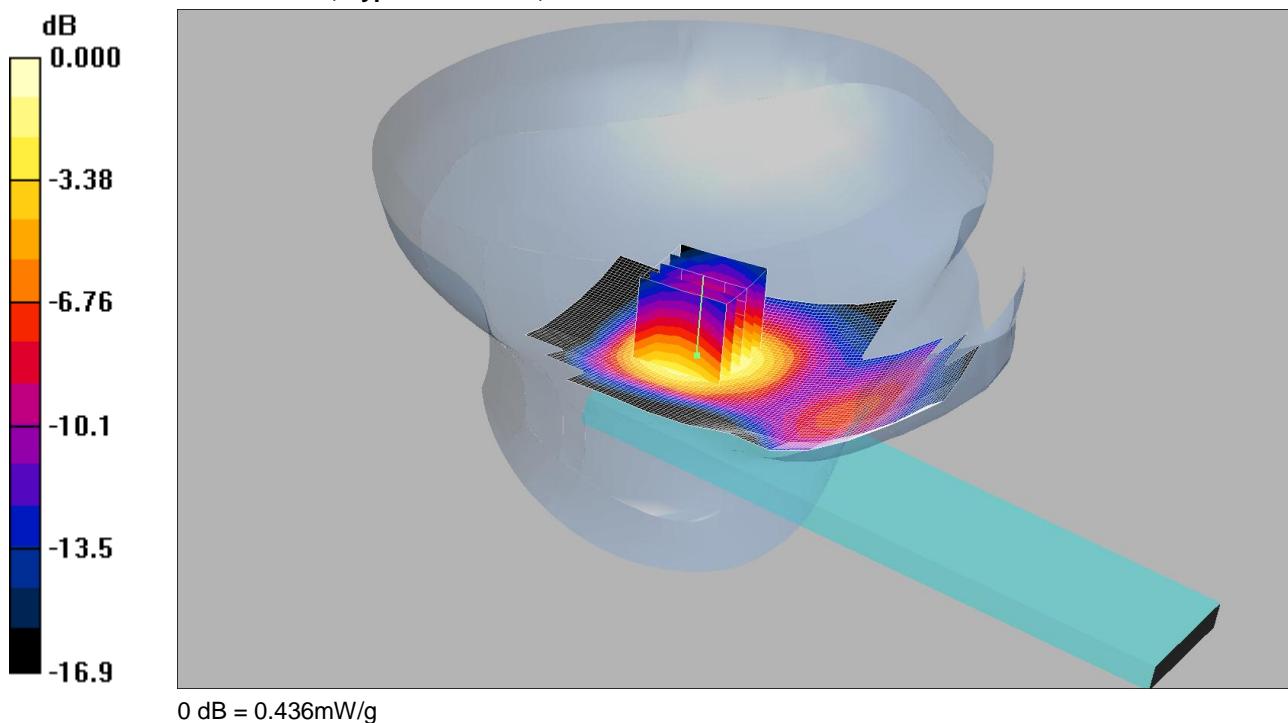
**SAR(1 g) = 0.648 mW/g; SAR(10 g) = 0.388 mW/g**

Maximum value of SAR (measured) = 0.702 mW/g

004: Tilt Left PCS 1900 CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt Left - Middle/Area Scan (71x131x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.470 mW/g

Tilt Left - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.1 V/m; Power Drift = -0.025 dB

Peak SAR (extrapolated) = 0.624 W/kg

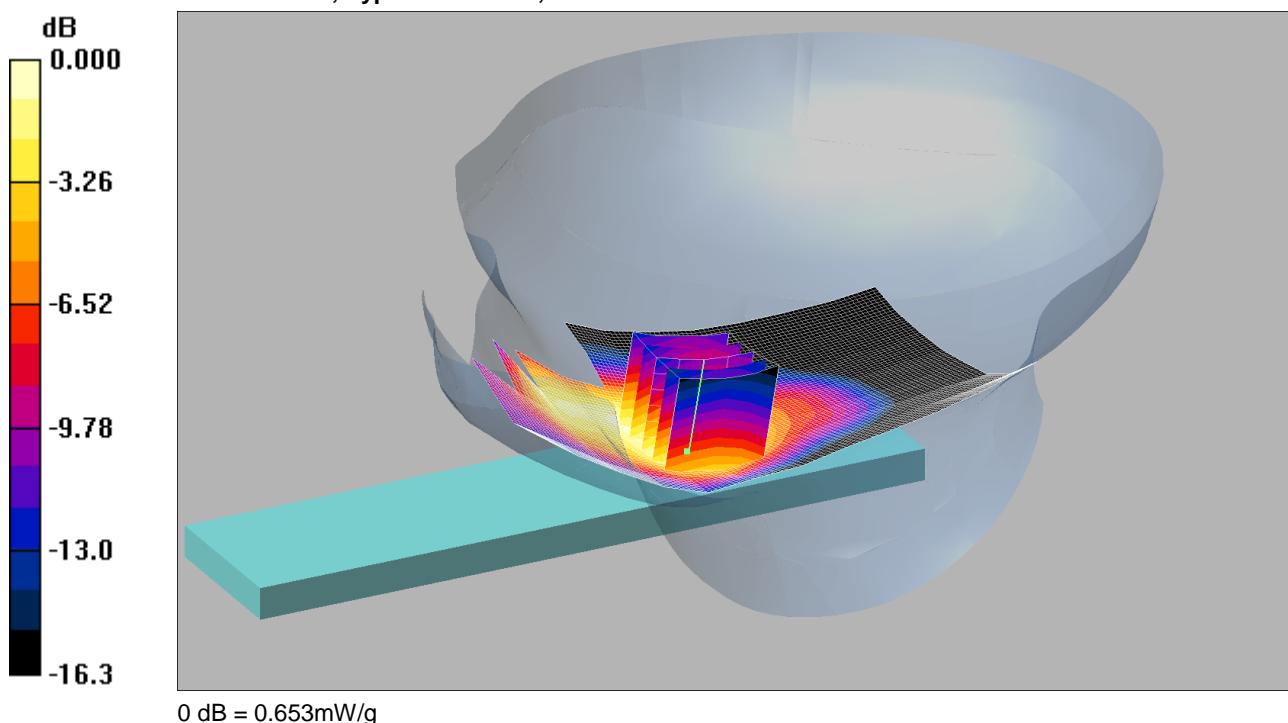
**SAR(1 g) = 0.405 mW/g; SAR(10 g) = 0.248 mW/g**

Maximum value of SAR (measured) = 0.436 mW/g

005: Touch Right PCS 1900 CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Touch Right - Middle/Area Scan (71x131x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.732 mW/g

**Touch Right - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.10 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 0.922 W/kg

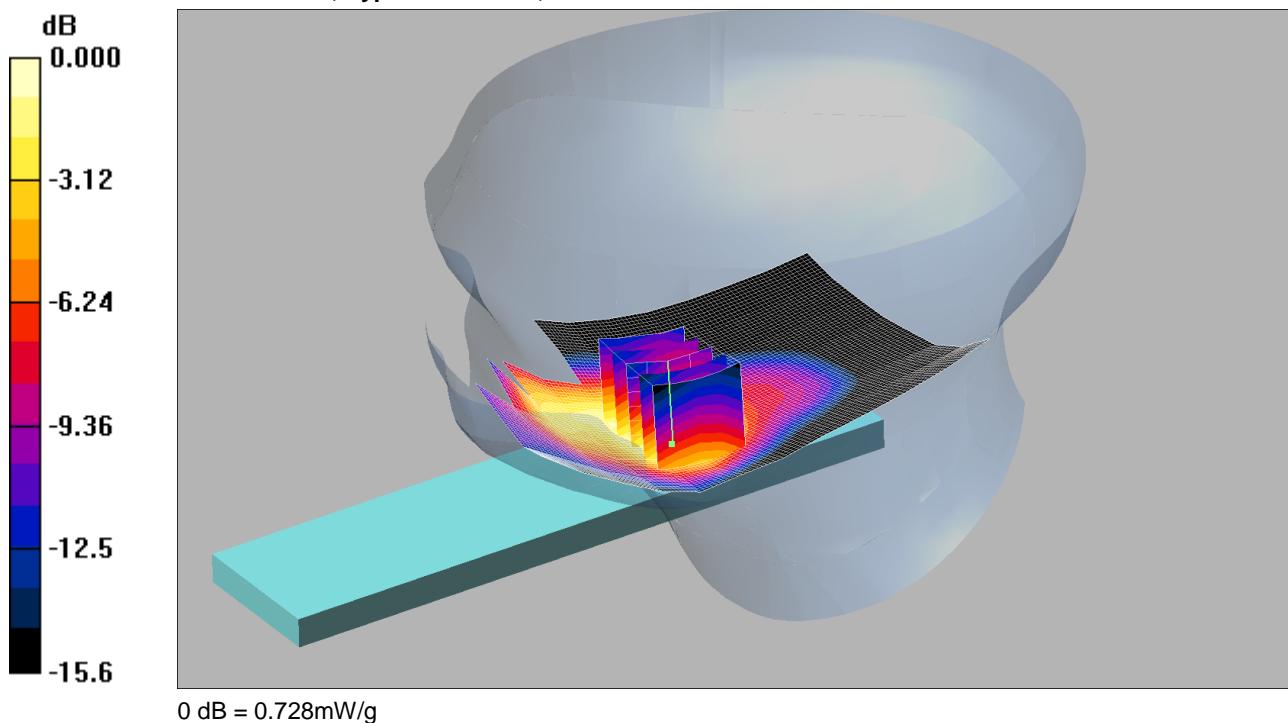
**SAR(1 g) = 0.610 mW/g; SAR(10 g) = 0.397 mW/g**

Maximum value of SAR (measured) = 0.653 mW/g

006: Touch Right PCS 1900 CH512

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Touch Right - Middle/Area Scan (71x131x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.720 mW/g

**Touch Right - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.78 V/m; Power Drift = 0.004 dB

Peak SAR (extrapolated) = 0.953 W/kg

**SAR(1 g) = 0.645 mW/g; SAR(10 g) = 0.411 mW/g**

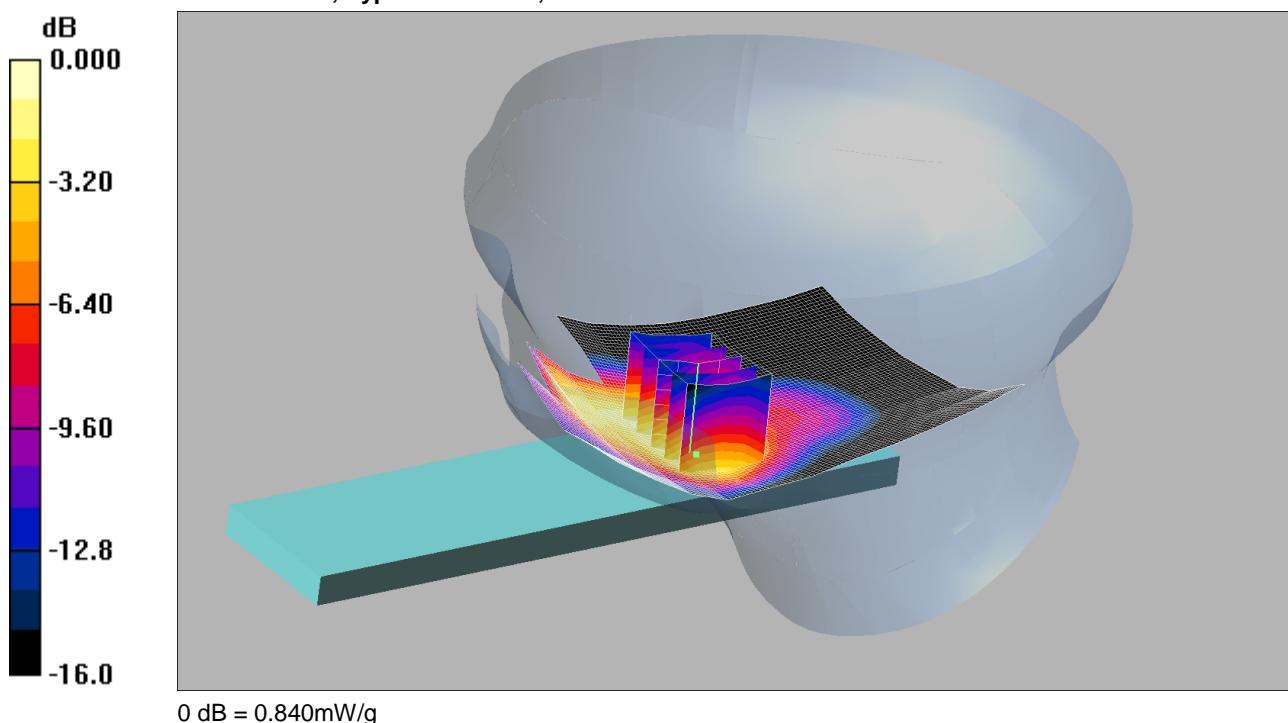
Maximum value of SAR (measured) = 0.728 mW/g

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007: Touch Right PCS 1900 CH810

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.43$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Touch Right - Middle/Area Scan (71x131x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.860 mW/g

**Touch Right - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.56 V/m; Power Drift = 0.174 dB

Peak SAR (extrapolated) = 1.12 W/kg

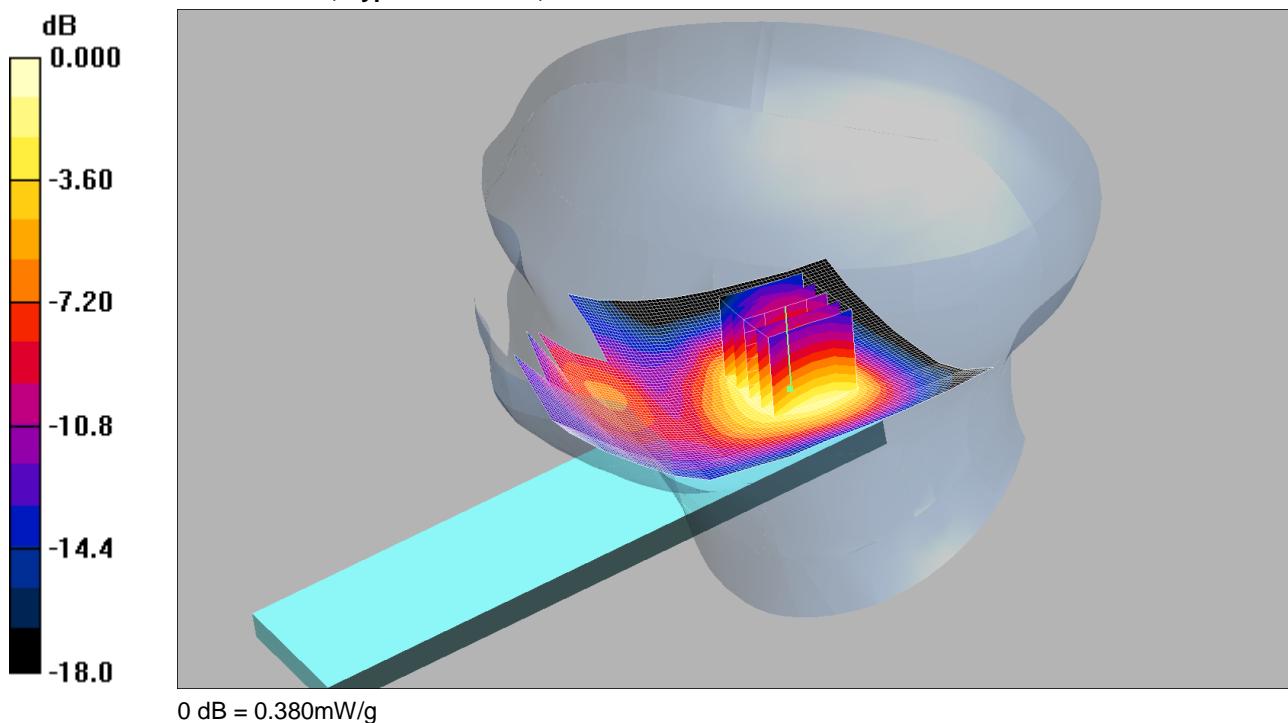
**SAR(1 g) = 0.758 mW/g; SAR(10 g) = 0.470 mW/g**

Maximum value of SAR (measured) = 0.840 mW/g

008: Tilt Right PCS 1900 CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Tilt Right - Middle/Area Scan (71x131x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.396 mW/g

**Tilt Right - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.5 V/m; Power Drift = 0.017 dB

Peak SAR (extrapolated) = 0.537 W/kg

**SAR(1 g) = 0.359 mW/g; SAR(10 g) = 0.226 mW/g**

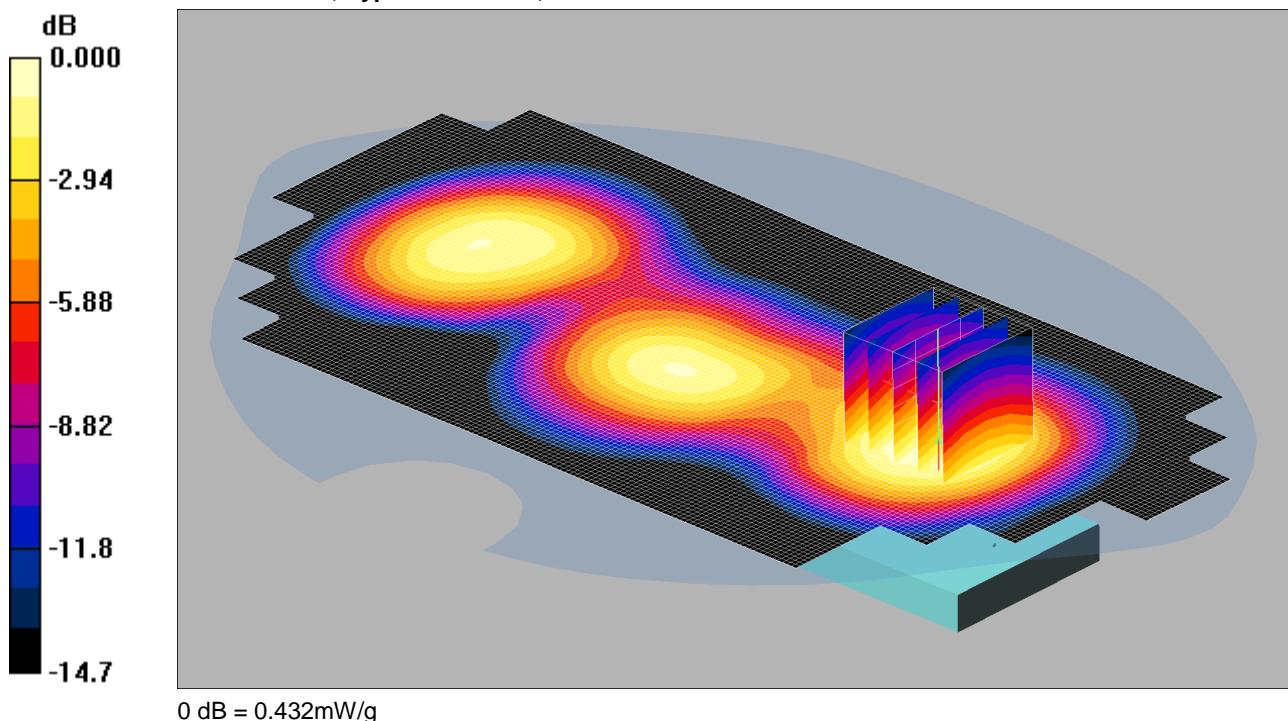
Maximum value of SAR (measured) = 0.380 mW/g

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009: Front of EUT Open Facing Phantom GPRS 1900 2Tx CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: GPRS 1900 2Tx; Frequency: 1880 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12b (Site 56); Type: SAM 4.0; Serial: TP:1192
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Front of EUT Facing Phantom - Middle/Area Scan (91x181x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.465 mW/g

**Front of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) 2 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.4 V/m; Power Drift = -0.008 dB

Peak SAR (extrapolated) = 0.609 W/kg

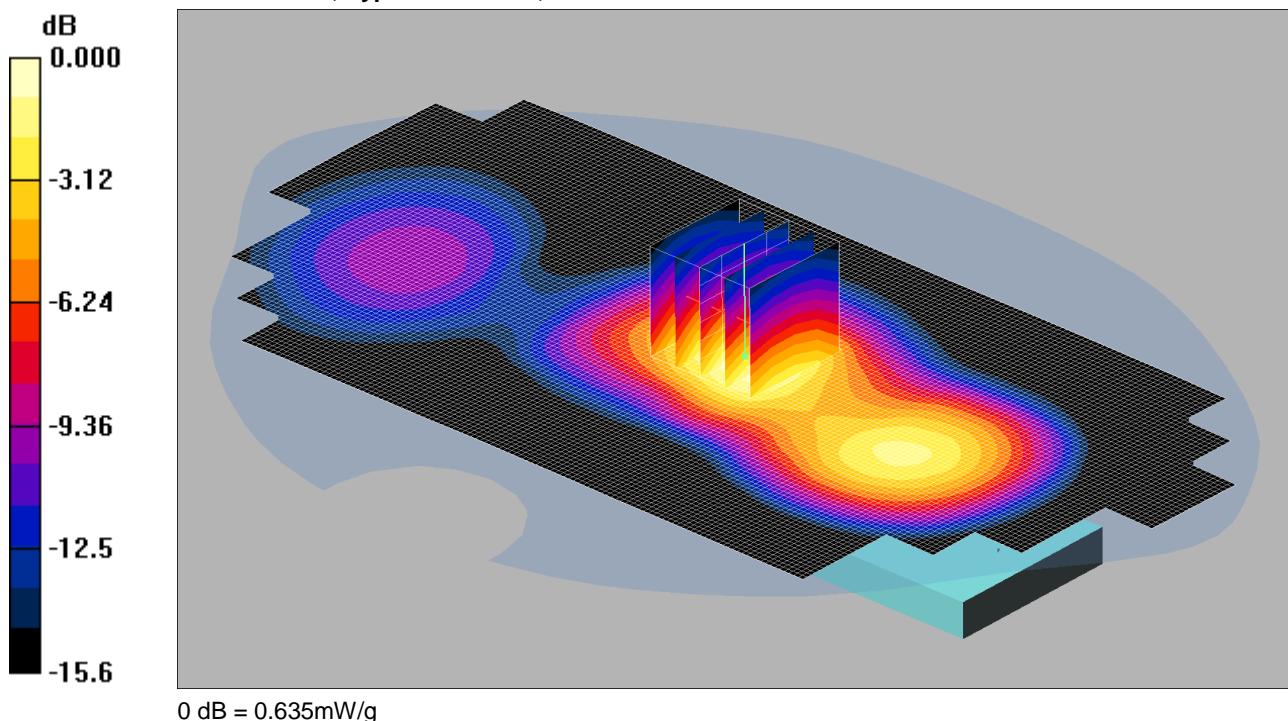
**SAR(1 g) = 0.404 mW/g; SAR(10 g) = 0.258 mW/g**

Maximum value of SAR (measured) = 0.432 mW/g

010: Back of EUT Open Facing Phantom GPRS 1900 2Tx CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: GPRS 1900 2Tx; Frequency: 1880 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12b (Site 56); Type: SAM 4.0; Serial: TP:1192
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Back of EUT Facing Phantom - Middle/Area Scan (91x181x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.627 mW/g

**Back of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.7 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 0.962 W/kg

**SAR(1 g) = 0.577 mW/g; SAR(10 g) = 0.331 mW/g**

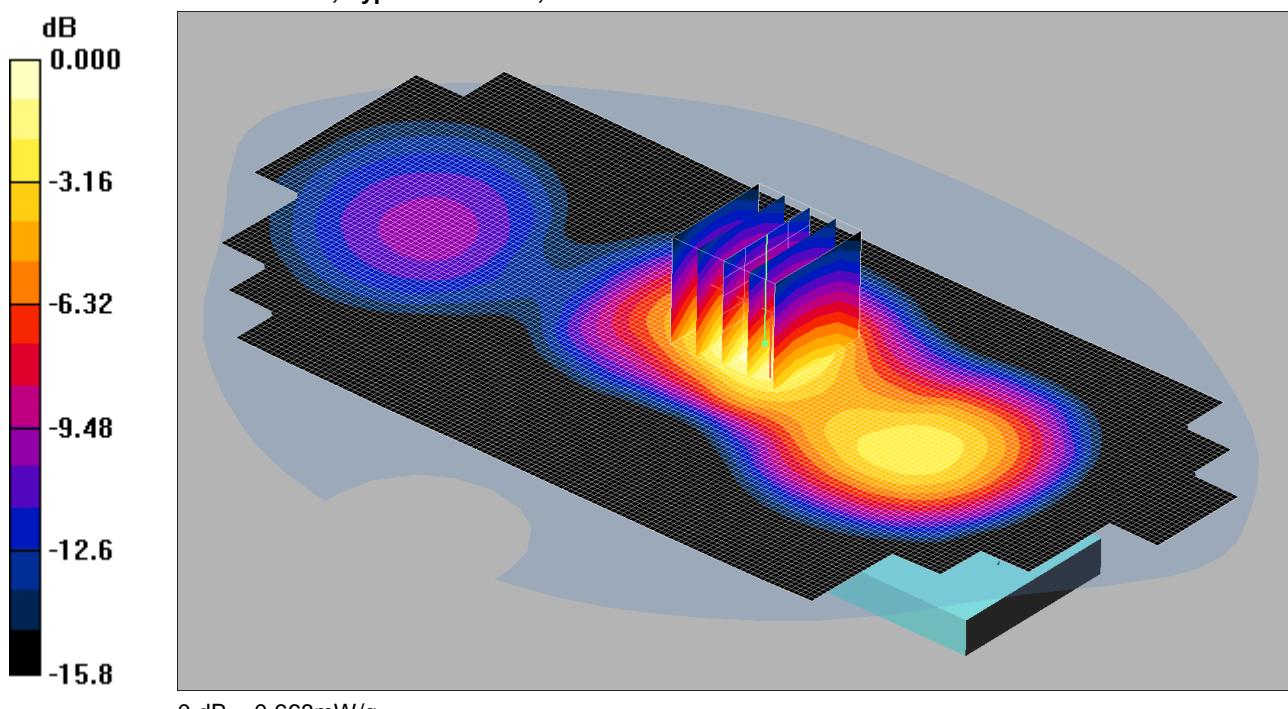
Maximum value of SAR (measured) = 0.635 mW/g

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011: Back of EUT Open Facing Phantom GPRS 1900 2Tx CH512

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: GPRS 1900 2Tx; Frequency: 1850.2 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 53.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Back of EUT Facing Phantom - Middle/Area Scan (91x181x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.693 mW/g

**Back of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.2 V/m; Power Drift = -0.054 dB

Peak SAR (extrapolated) = 1.00 W/kg

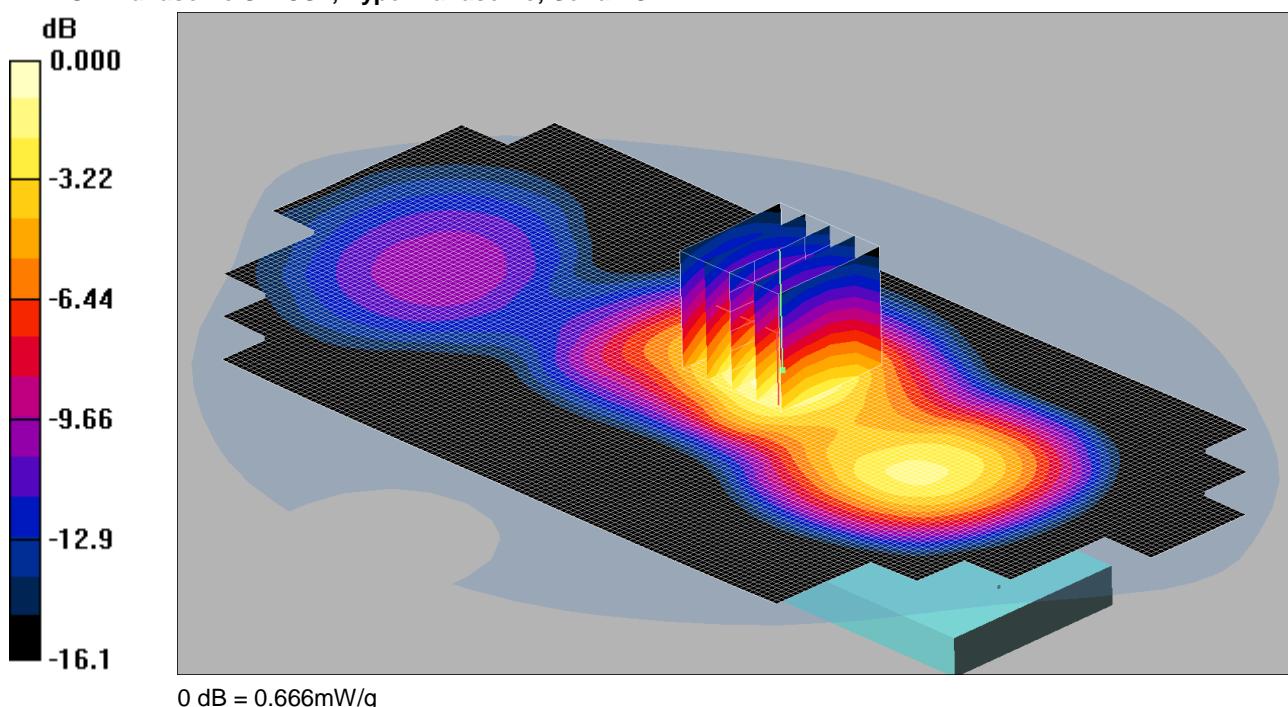
**SAR(1 g) = 0.604 mW/g; SAR(10 g) = 0.348 mW/g**

Maximum value of SAR (measured) = 0.668 mW/g

012: Back of EUT Open Facing Phantom GPRS 1900 2Tx CH810

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: GPRS 1900 2Tx; Frequency: 1909.8 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 53.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Back of EUT Facing Phantom - Middle/Area Scan (91x181x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.679 mW/g

**Back of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.2 V/m; Power Drift = 0.029 dB

Peak SAR (extrapolated) = 1.02 W/kg

**SAR(1 g) = 0.603 mW/g; SAR(10 g) = 0.343 mW/g**

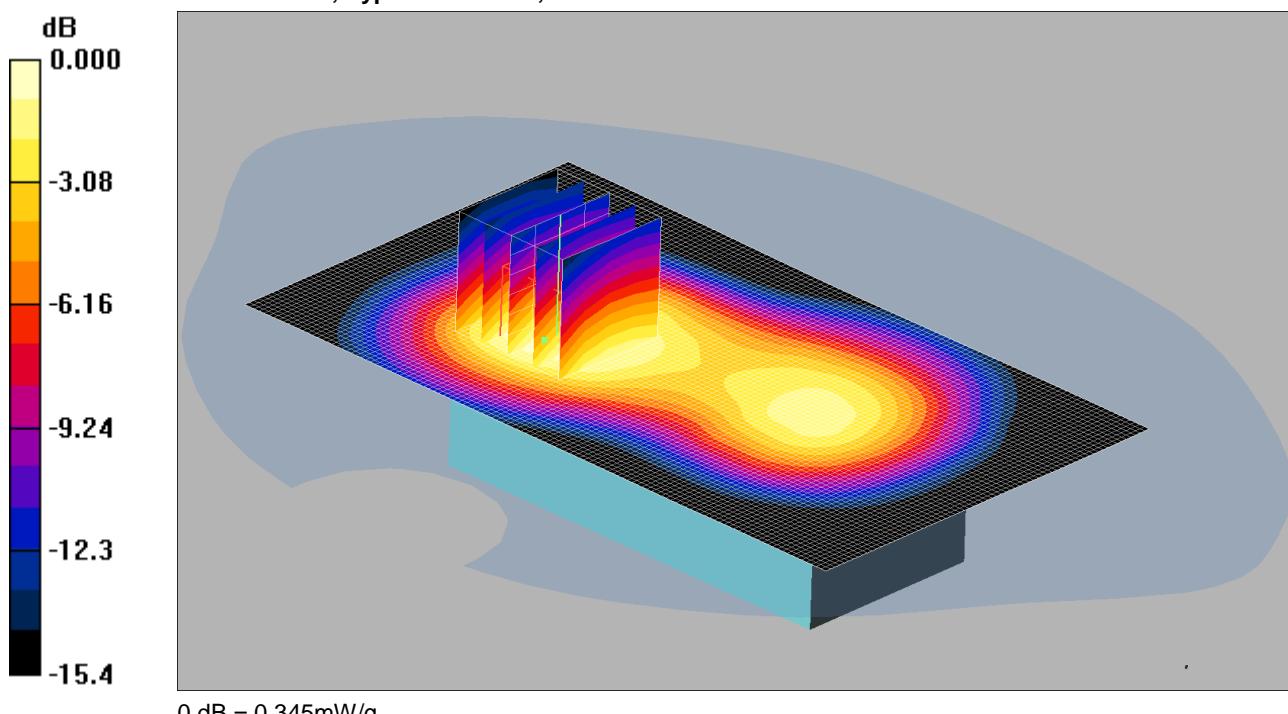
Maximum value of SAR (measured) = 0.666 mW/g

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013: Front of EUT Closed Facing Phantom GPRS 1900 2Tx CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



0 dB = 0.345mW/g

Communication System: GPRS 1900 2Tx; Frequency: 1880 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12b (Site 56); Type: SAM 4.0; Serial: TP:1192
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Front of EUT Closed Facing Phantom - Middle/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.337 mW/g

**Front of EUT Closed Facing Phantom - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.8 V/m; Power Drift = 0.054 dB

Peak SAR (extrapolated) = 0.503 W/kg

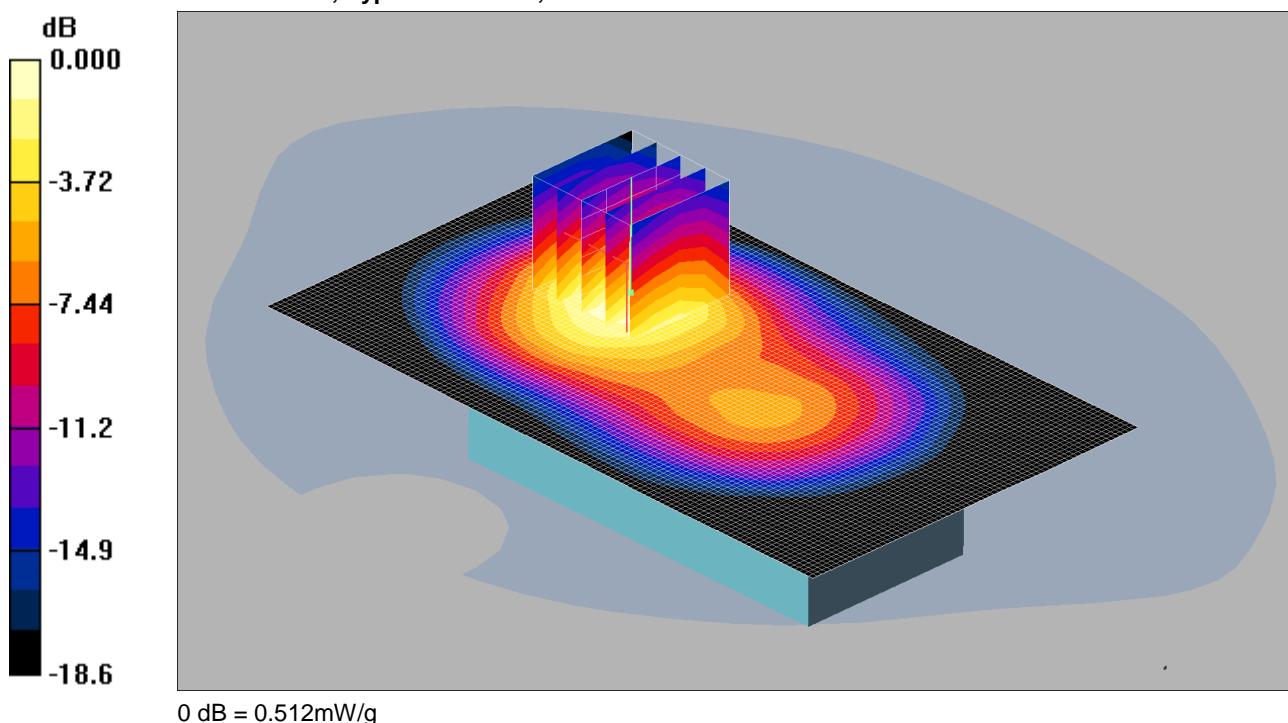
**SAR(1 g) = 0.318 mW/g; SAR(10 g) = 0.197 mW/g**

Maximum value of SAR (measured) = 0.345 mW/g

014: Back of EUT Closed Facing Phantom GPRS 1900 2Tx CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: GPRS 1900 2Tx; Frequency: 1880 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12b (Site 56); Type: SAM 4.0; Serial: TP:1192
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Back of EUT Closed Facing Phantom - Middle/Area Scan (71x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.518 mW/g

**Back of EUT Closed Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.21 V/m; Power Drift = 0.194 dB

Peak SAR (extrapolated) = 0.807 W/kg

**SAR(1 g) = 0.463 mW/g; SAR(10 g) = 0.259 mW/g**

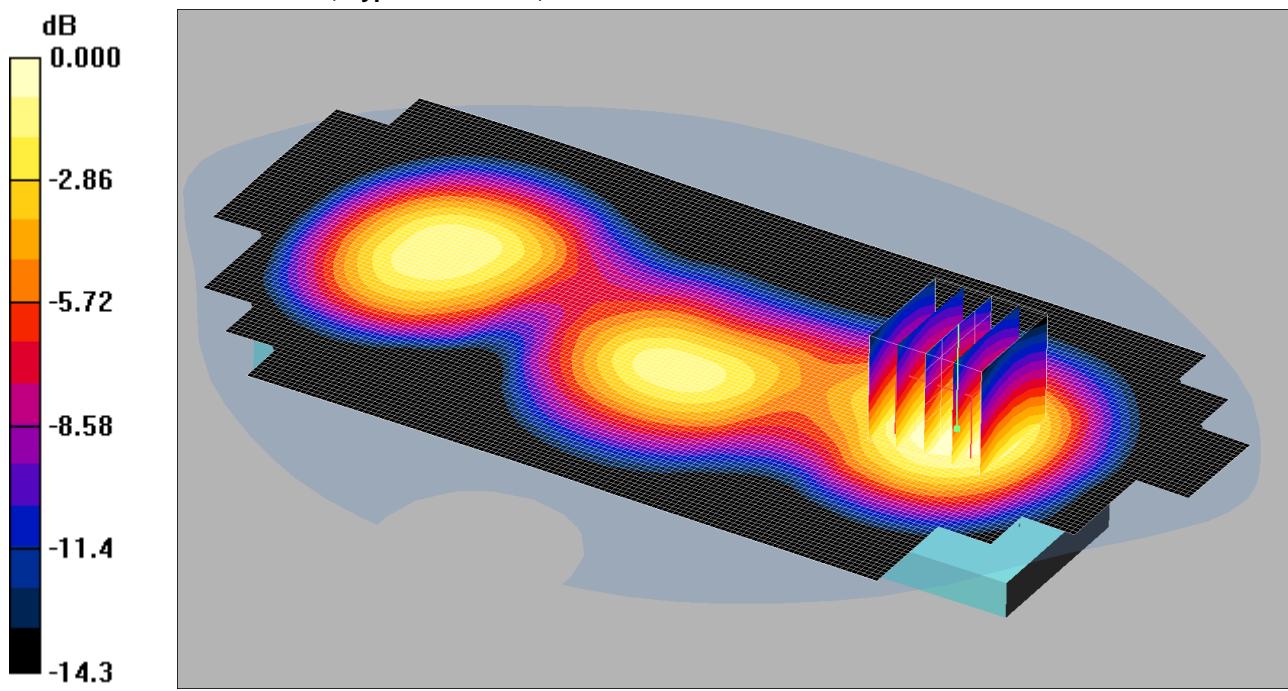
Maximum value of SAR (measured) = 0.512 mW/g

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015: Front of EUT Open Facing Phantom PCS 1900 CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



0 dB = 0.388mW/g

Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12b (Site 56); Type: SAM 4.0; Serial: TP:1192
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Front of EUT Facing Phantom - Middle/Area Scan (91x181x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.399 mW/g

**Front of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.5 V/m; Power Drift = -0.033 dB

Peak SAR (extrapolated) = 0.546 W/kg

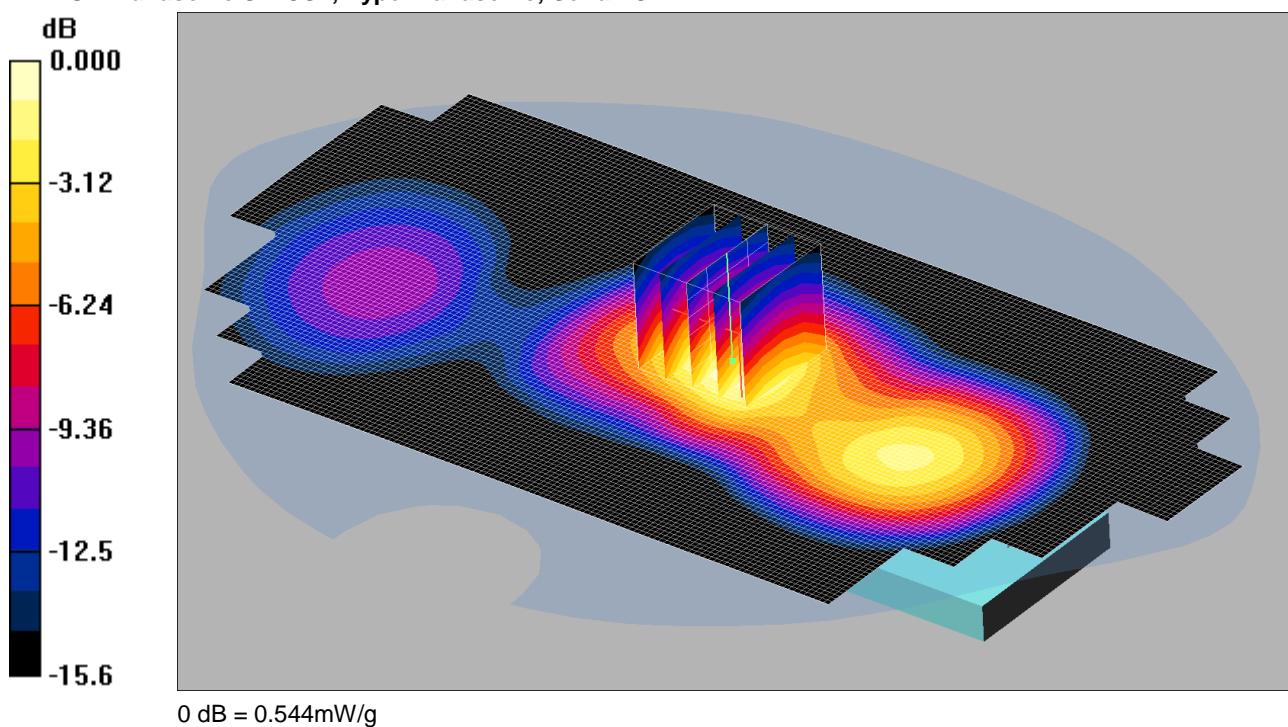
**SAR(1 g) = 0.365 mW/g; SAR(10 g) = 0.233 mW/g**

Maximum value of SAR (measured) = 0.388 mW/g

016: Back of EUT Open Facing Phantom PCS 1900 CH661

Date: 14/11/2013

DUT: Panasonic S41CS1; Type: Panasonic; Serial: C24



Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12b (Site 56); Type: SAM 4.0; Serial: TP:1192
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Back of EUT Facing Phantom - Middle/Area Scan (91x181x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.542 mW/g

**Back of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.3 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 0.839 W/kg

**SAR(1 g) = 0.493 mW/g; SAR(10 g) = 0.282 mW/g**

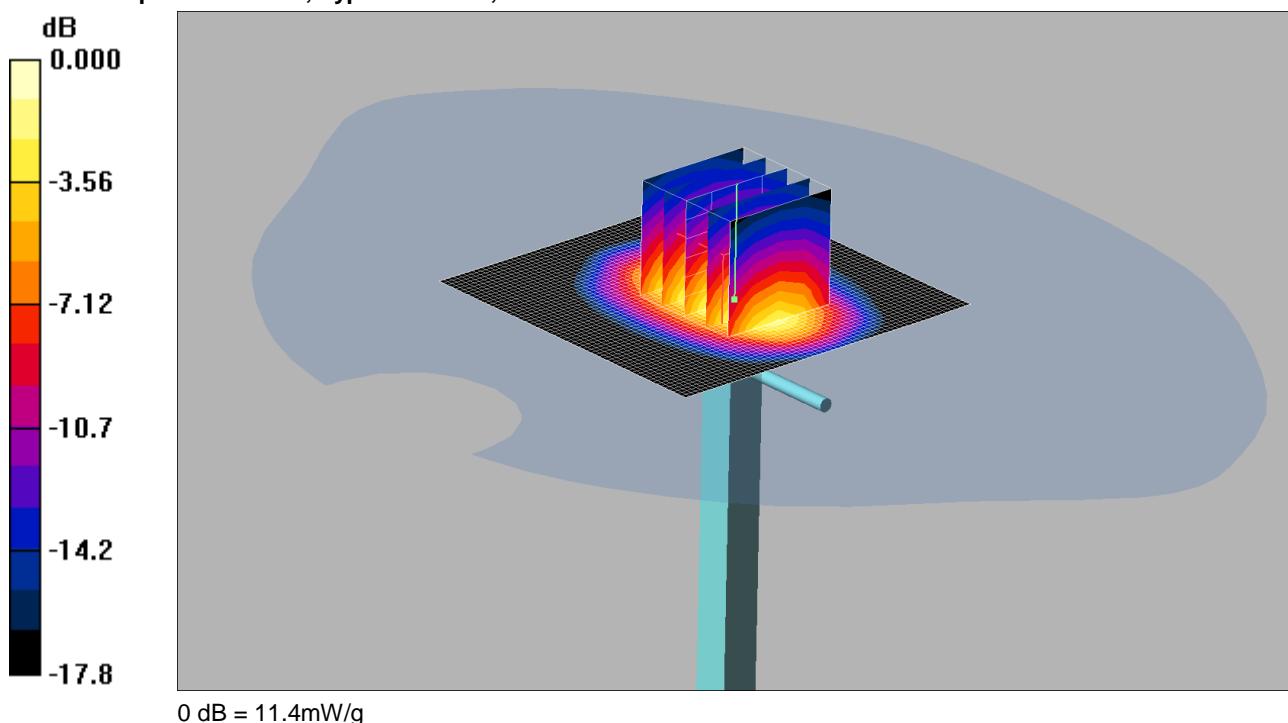
Maximum value of SAR (measured) = 0.544 mW/g

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017: System Performance Check 1900MHz Head 14 11 13

Date: 14/11/2013

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: SN540



0 dB = 11.4mW/g

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

Medium: 1900 MHz HSL Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 39.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(5.12, 5.12, 5.12);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12a (Site 56); Type: SAM 4.0; Serial: TP:1020
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW 2/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 12.8 mW/g

d=10mm, Pin=250mW 2/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 88.9 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 19.0 W/kg

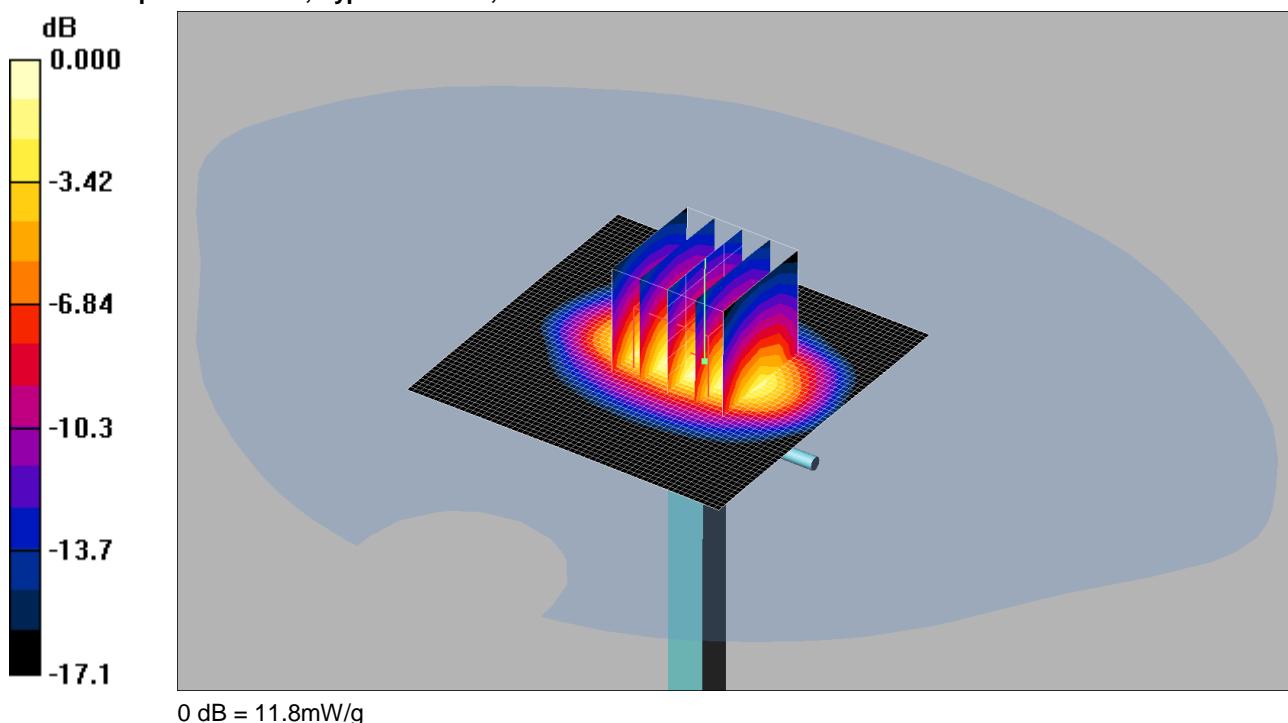
SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.33 mW/g

Maximum value of SAR (measured) = 11.4 mW/g

018: System Performance Check 1900MHz Body 14 11 13

Date: 14/11/2013

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: SN540



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

Medium: 1900 MHz MSL Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 53.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3304; ConvF(4.67, 4.67, 4.67);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn417; Calibrated: 17/04/2013
- Phantom: SAM 12b (Site 56); Type: SAM 4.0; Serial: TP:1192
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**d=10mm, Pin=250mW 2/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 13.6 mW/g

**d=10mm, Pin=250mW 2/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 88.3 V/m; Power Drift = -0.017 dB

Peak SAR (extrapolated) = 18.9 W/kg

**SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.5 mW/g**

Maximum value of SAR (measured) = 11.8 mW/g