# TEST REPORT

Your Ref:

Date: 1 Nov 2003

Our Ref: 56S030690/02



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COMPLIANCE REPORT ON TESTING IN ACCORDANCE WITH
SAR (SPECIFIC ABSORPTION RATE) REQUIREMENTS

**Supplement C (Edition 01-01)**
**FCC OET Bulletin 65 (Edition 97-01)**

OF A

**PORTABLE PC WITH BUILT IN 2.4GHz WIRELESS LAN**
**[ MODEL : W988A ]**
**[ FCC ID : RGV0309W988A ]**

**TEST FACILITY** Telecoms & EMC, Testing Group, PSB Corporation
1 Science Park Drive, Singapore 118221

**PREPARED FOR** Mr Yang Hong
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**JOB NUMBER** 56S030690

**TEST PERIOD** 20 Oct 2003

**PREPARED BY**

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ACCREDITED LABORATORY
SAC-SINGLAS

LA-2001-0212-A
LA-2001-0213-F
LA-2001-0214-E
LA-2001-0215-B
LA-2001-0216-G
LA-2001-0217-G

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme

**TABLE OF CONTENTS**

The product was tested in accordance with the following standards.

**Test Results Summary**

| Test Standards | Description | Pass / Fail |
|---|---|---|
| • Supplement C (Edition 01-01) to FCC OET Bulletin 65 (Edition 97-01)<br>• ANSI/IEEE Standard C95.1-1993 | SAR Measurement<br>Device at head phantom | Pass * |

Note:

1. The worst-case SAR value was found to be **0.0626W/kg** which is lower than the maximum limit of 1.60 W/kg, over 1g of tissue.

* Based on spatial peak uncontrolled exposure / general population level:
  Head: 1.60 W/kg, over 1g of tissue.
  Body: 1.60 W/kg, over 1g of tissue.

Modifications

No modifications were made.

**DEVICE DESCRIPTION**

| | |
|---|---|
| Description | The Equipment Under Test (EUT) is a **Portable PC with Built In 2.4GHz Wireless LAN.** |
| | |
| Device Category | Portable Device |
| | |
| Exposure Environment | General Population/Uncontrolled exposure |
| | |
| Manufacturer | InfoWave Pte Ltd |
| | |
| Model Number | W988A |
| | |
| FCC ID | RGV0309W988A |
| | |
| Serial Number | Nil |
| | |
| Operating Temperature Tolerance | (0 ~ +50) Degree Celsius |
| | |
| Operating / Transmitting Frequency | 1) Channel 1 (2.412GHz)<br>2) Channel 7 (2.442GHz)<br>3) Channel 13 (2.472GHz) |
| | |
| Rated Output Power | 19dBm, Maximum. |
| | |
| EUT Crest Factor | 1.0 |
| | |
| Input Power | 19VDC, 60W via 100 - 240VAC Power Adapter |
| | |
| Accessories | 1) Charger Only |

## DEVICE OPERATING CONDITION

The test software "Prism Test Appliance, Version 3.0.24" was provided by Infowave's client. The EUT was put into operation by continuous transmitting at maximum transmitting power. For each channel tested, the EUT was configured to modulate at CCK (11Mbps).

For every SAR measurement, the Portable PC internal battery was fully charged and EUT was set to maximum output power level.

## TEMPERATURE AND HUMIDITY

| | |
|---|---|
| Ambient Temperature: | $27 \pm 1^0$ C |
| Tissue Temperature: | $26 \pm 1^0$ C |
| Humidity: | 55% to 60% |

The measurement results were obtained with the EUT tested in the conditions described in this report (Annex A).

**Table 1 - SAR Test Results – Device at Flat Phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | SAR (W/kg), over 1g Tissue Device Test Channel & Frequency | | |
|---|---|---|---|---|---|
| | | | Channel: 1 2412MHz | Channel: 7 2442MHz | Channel: 13 2472MHz |
| Flat Phantom | Section A | Fixed | 0.0626 | 0.0294 | 0.0323 |
| | Section B | Fixed | 0.0430 | 0.0550 | 0.0575 |
| | Section C | Fixed | 0.0561 | 0.0351 | 0.0508 |
| | Section D | Fixed | 0.0513 | 0.0353 | 0.0513 |
| | Section E | Fixed | 0.0531 | 0.0541 | 0.0363 |
| Output Power (dBm) Before Test | | | 18.5 | 18.9 | 18.1 |
| Output Power (dBm) After Test | | | 18.3 | 18.8 | 17.9 |

Remarks:

1. All modes of operations were investigated and the worst-case SAR levels are reported.

2. For each mode of operation, the Portable PC internal battery was fully charged.

3. The worst-case SAR value was found to be **0.0626W/Kg** (over a 1g tissue) at **Channel 1** which is lower than the maximum limit of 1.60 W/Kg, please refer to the above table.

4. For more details of the Device Test Position at Section A to E, see Test Setup Photographs at Annex B.

5. The SAR limit of 1.60W/Kg (Spatial Peak level for Uncontrolled Exposure / General Population) is based on the Test Standards:
   a) Supplement C (Edition 01-01) to FCC OET Bulletin 65 (Edition 97-01)
   b) ANSI/IEEE Standard C95.1-1993

**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 1: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section A | Fixed | Channel: 1 2412MHz | 0.0626 |

Date: 10/20/03

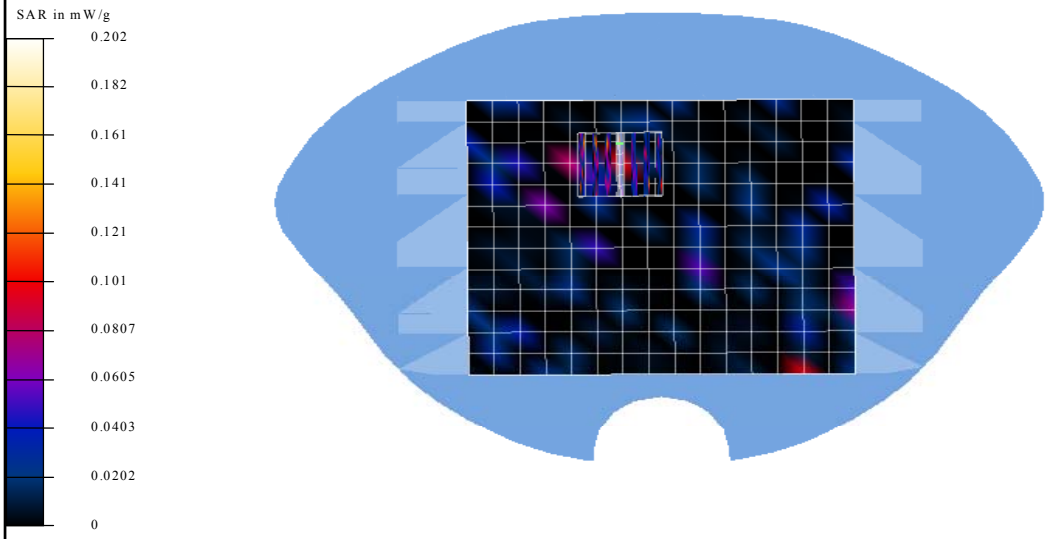
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 1_Section A_Data 6.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 1_Section A_Data 6**

Communication System: 2450 Mhz_PC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 2.22 V/m
Peak SAR = 0.712 mW/g
SAR(1 g) = 0.0626 mW/g; SAR(10 g) = 0.0363 mW/g
Power Drift = 0.04dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 2: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section A | Fixed | Channel: 7 2442MHz | 0.0294 |

Date: 10/20/03

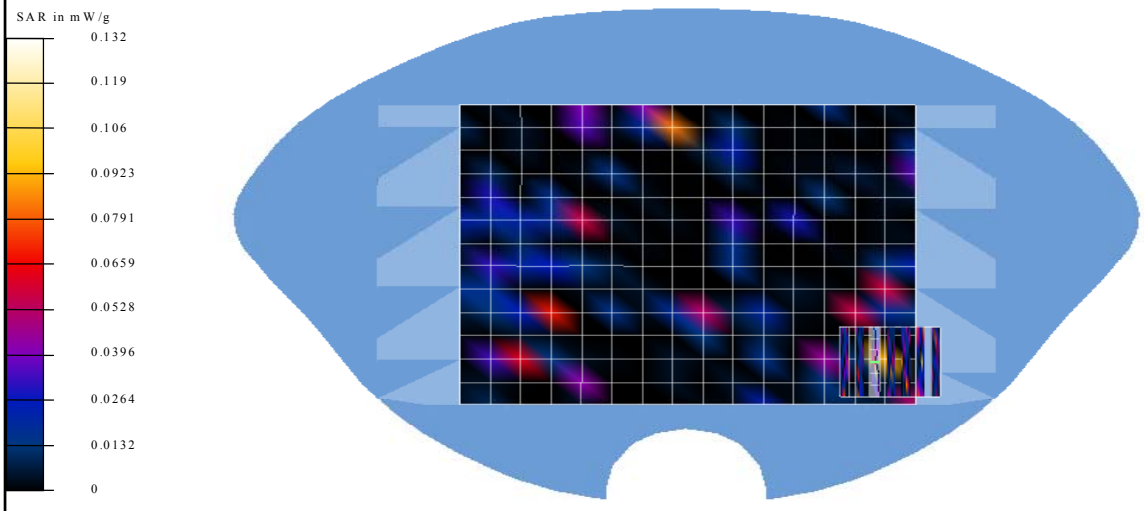
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 7_Section A_Data 11.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 7_Section A_Data 11**

Communication System: 2450 Mhz_PC; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0.972 V/m
Peak SAR = 0.129 mW/g
SAR(1 g) = 0.0294 mW/g; SAR(10 g) = 0.0174 mW/g
Power Drift = 0.03dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 3: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section A | Fixed | Channel: 13 2472MHz | 0.0323 |

Date: 10/20/03

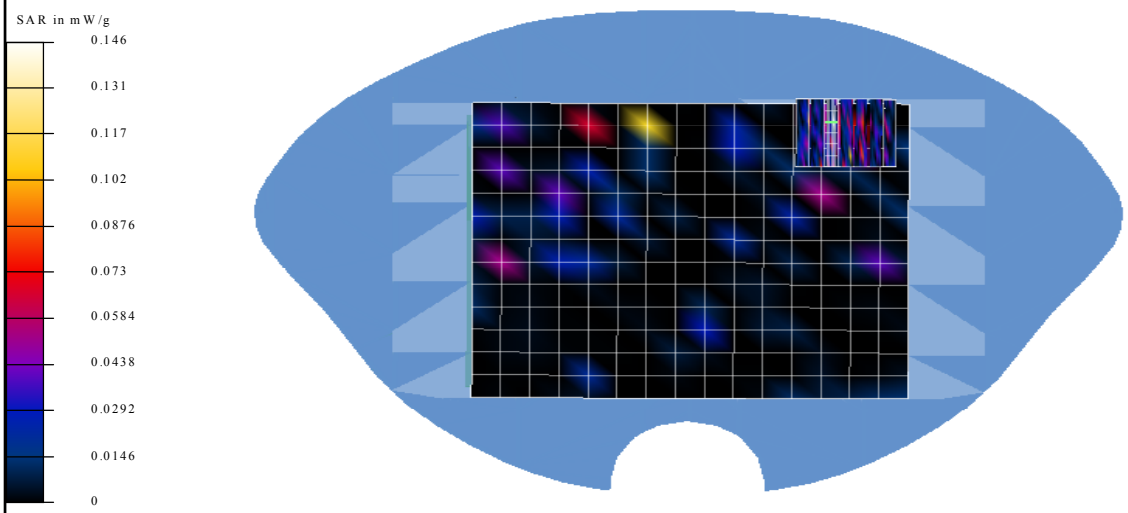
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 13_Section A_Data 12.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 13_Section A_Data 12**

Communication System: 2450 Mhz_PC; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0.663 V/m
Peak SAR = 0.144 mW/g
SAR(1 g) = 0.0323 mW/g; SAR(10 g) = 0.0201 mW/g
Power Drift = -0.05dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 4: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section B | Fixed | Channel: 1 2412MHz | 0.0430 |

Date: 10/20/03

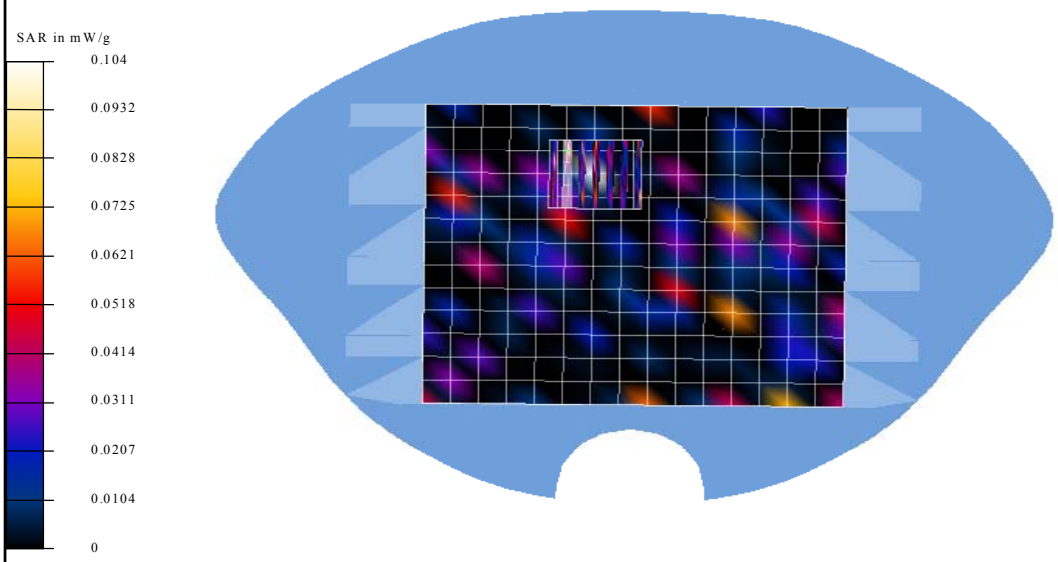
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 1_Section B_Data 5.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 1_Section B_Data 5**

Communication System: 2450 Mhz_PC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0.422 V/m
Peak SAR = 0.103 mW/g
SAR(1 g) = 0.043 mW/g; SAR(10 g) = 0.023 mW/g
Power Drift = 0.06dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 5: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section B | Fixed | Channel: 7 2442MHz | 0.055 |

Date: 10/20/03

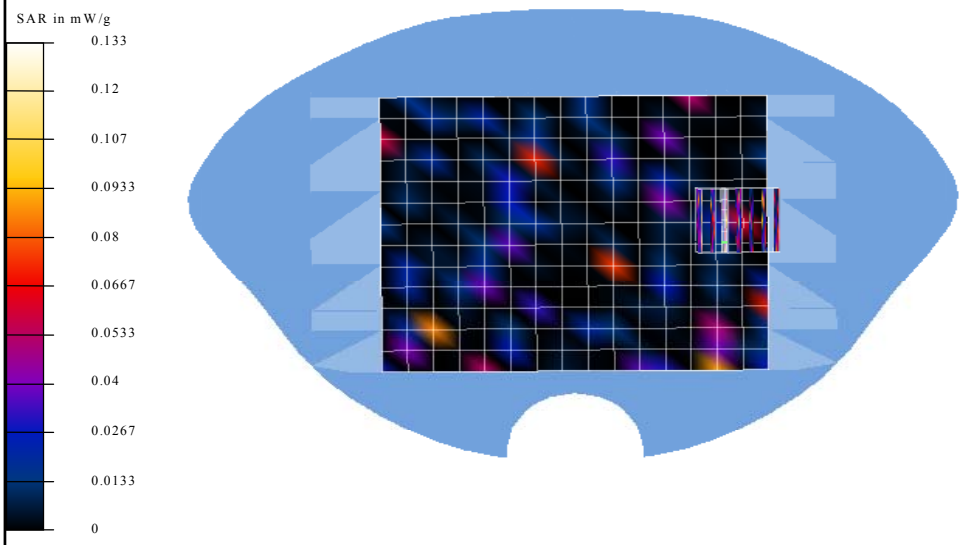
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 7_Section B_Data 9.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 7_Section B_Data 9**

Communication System: 2450 Mhz_PC; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 1.72 V/m
Peak SAR = 0.141 mW/g
SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.0288 mW/g
Power Drift = -0.05dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 6: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section B | Fixed | Channel: 13 2472MHz | 0.0575 |

Date: 10/20/03

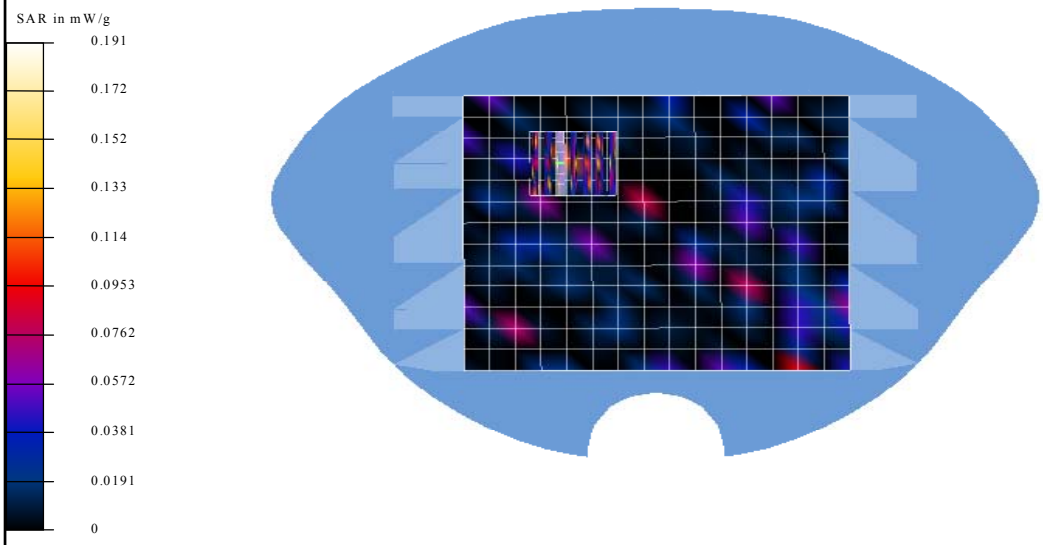
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 13_Section B_Data 10.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 13_Section B_Data 10**

Communication System: 2450 Mhz_PC; Frequency: 2472 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 1.42 V/m
Peak SAR = 0.267 mW/g
SAR(1 g) = 0.0575 mW/g; SAR(10 g) = 0.0411 mW/g
Power Drift = 0.06dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 7: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section C | Fixed | Channel: 1 2412MHz | 0.0561 |

Date: 10/20/03

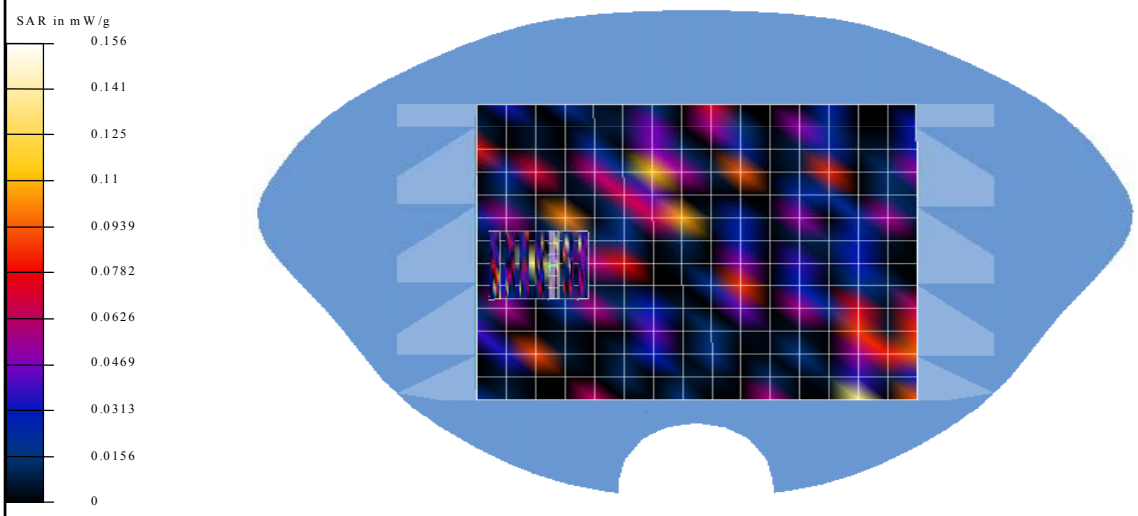
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 1_Section C_Data 4.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 1_Section C_Data 4**

Communication System: 2450 Mhz_PC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 1.25 V/m
Peak SAR = 0.256 mW/g
SAR(1 g) = 0.0561 mW/g; SAR(10 g) = 0.0298 mW/g
Power Drift = 0.01dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 8: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section C | Fixed | Channel: 7 2442MHz | 0.0351 |

Date: 10/20/03

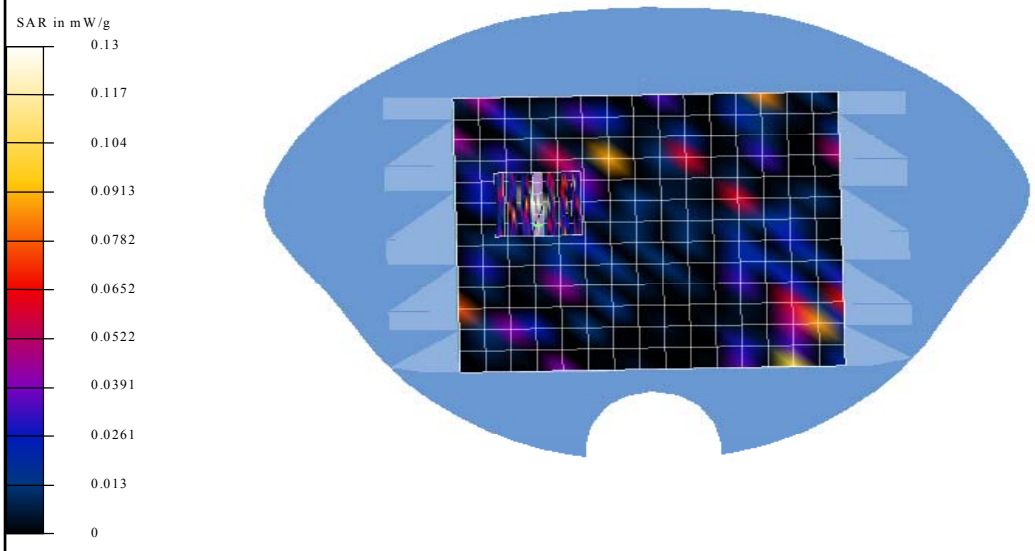
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 7_Section C_Data 7.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 7_Section C_Data 7**

Communication System: 2450 Mhz_PC; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 2.84 V/m
Peak SAR = 0.367 mW/g
SAR(1 g) = 0.0351 mW/g; SAR(10 g) = 0.023 mW/g
Power Drift = 0.01dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 9: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section C | Fixed | Channel: 13 2472MHz | 0.0508 |

Date: 10/20/03

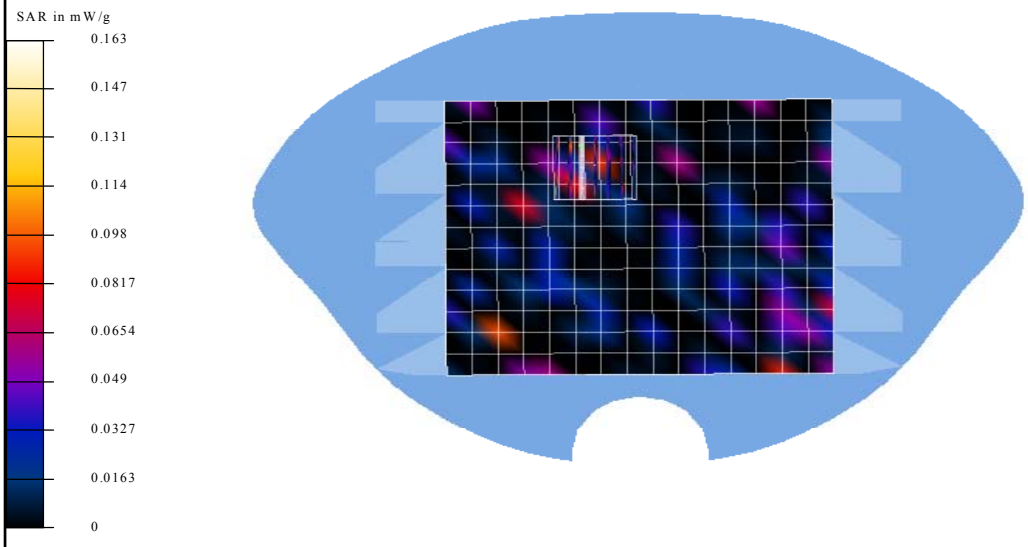
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 13_Section C_Data 8.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 13_Section C_Data 8**

Communication System: 2450 Mhz_PC; Frequency: 2472 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 2.17 V/m
Peak SAR = 0.158 mW/g
SAR(1 g) = 0.0508 mW/g; SAR(10 g) = 0.0318 mW/g
Power Drift = 0.08dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 10: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section D | Fixed | Channel: 1 2412MHz | 0.0513 |

Date: 10/20/03

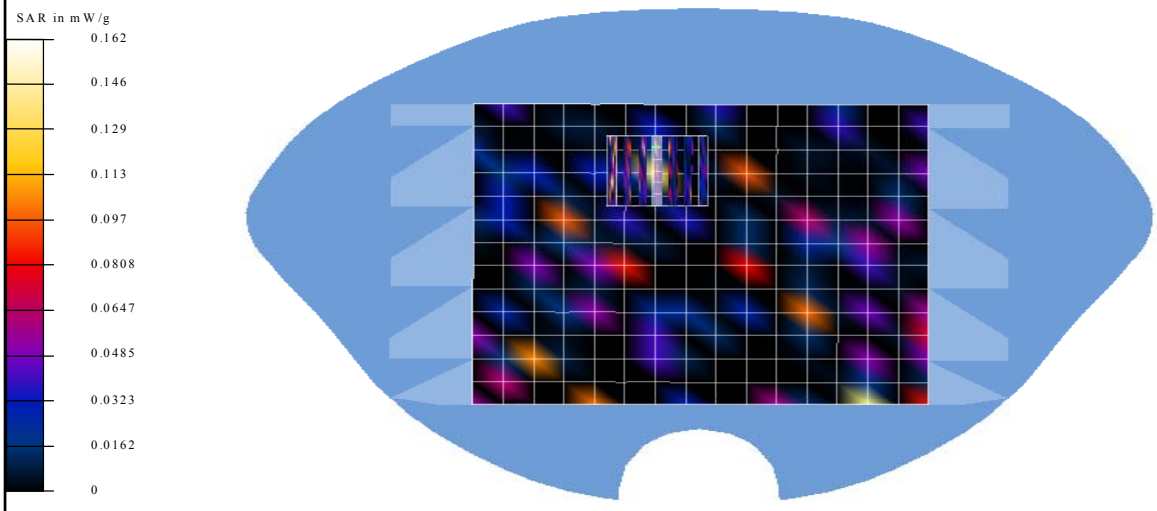
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 1_Section D_Data 1.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 1_Section D_Data 1**

Communication System: 2450 Mhz_PC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0 V/m
Peak SAR = 0.158 mW/g
SAR(1 g) = 0.0513 mW/g; SAR(10 g) = 0.0319 mW/g
Power Drift = 0.02dB
**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 11: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section D | Fixed | Channel: 7 2442MHz | 0.0353 |

Date: 10/20/03

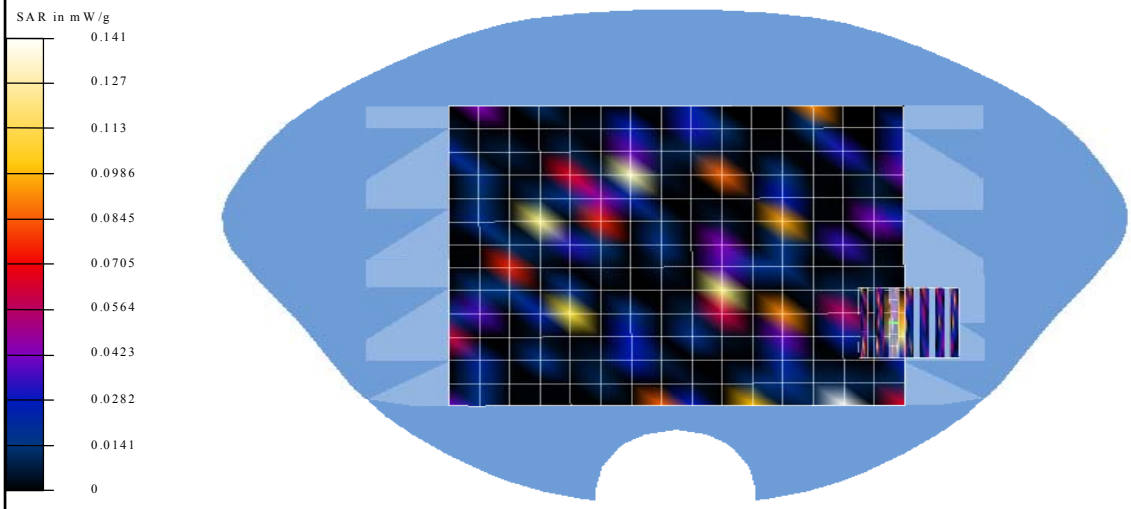
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 7_Section D_Data 2.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 7_Section D_Data 2**

Communication System: 2450 Mhz_PC; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0.428 V/m
Peak SAR = 0.388 mW/g
SAR(1 g) = 0.0353 mW/g; SAR(10 g) = 0.0234 mW/g
Power Drift = -0.08dB
**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 12: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section D | Fixed | Channel: 13 2472MHz | 0.0513 |

Date: 10/20/03

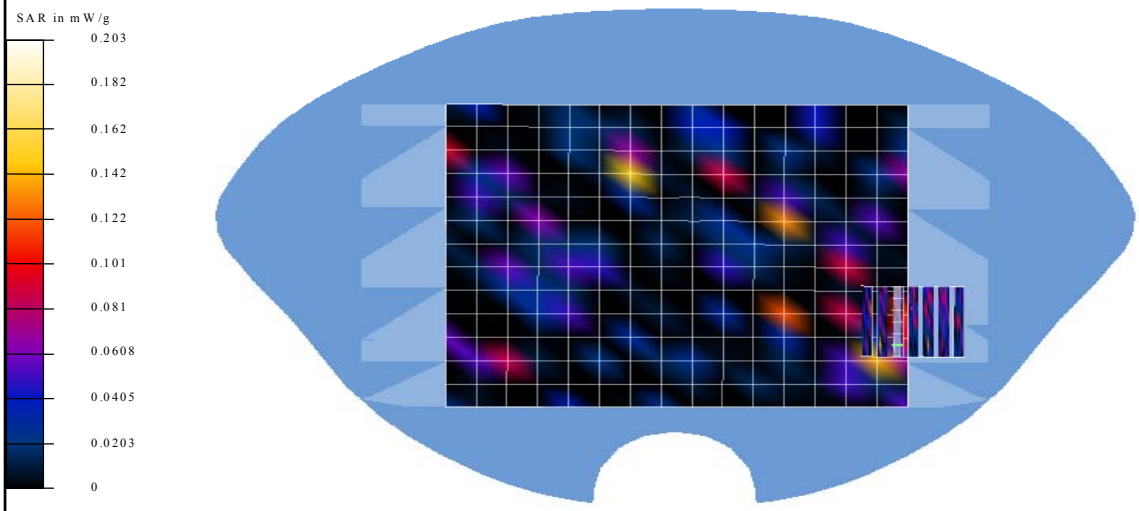
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT Rear Touch_CH 13_Section D_Data 3.da4

**DUT: waveon 988 PC Type & Serial Number:**
**Program: 56S030690; EUT Rear Touch_CH 13_Section D_Data 3**

Communication System: 2450 Mhz_PC; Frequency: 2472 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0.298 V/m
Peak SAR = 0.192 mW/g
SAR(1 g) = 0.0513 mW/g; SAR(10 g) = 0.0333 mW/g
Power Drift = 0.01dB
**Area Scan (14x16x1):** Measurement grid: dx=10mm, dy=10mm



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 13: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section E | Fixed | Channel: 1 2412MHz | 0.0531 |

Date: 10/20/03

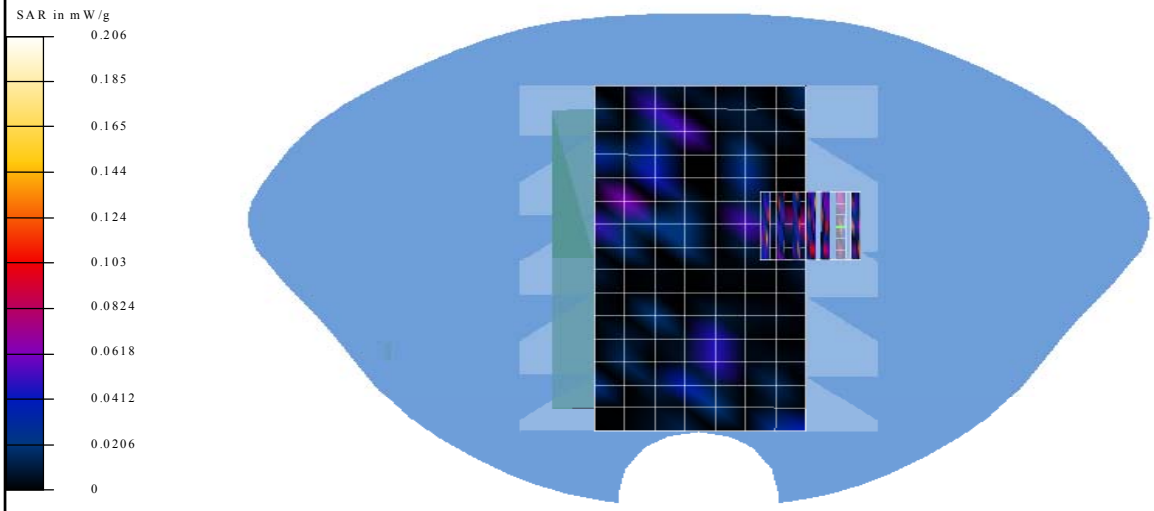
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT_Vertical Positioning_CH 1_Data 13.da4

**DUT: waveon 988 PC_Vertical Position Type & Serial Number:**
**Program: 56S030690; EUT_Vertical Positioning_CH 1_Data 13**

Communication System: 2450 Mhz_PC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (16x8x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 2.15 V/m
Peak SAR = 0.155 mW/g
SAR(1 g) = 0.0531 mW/g; SAR(10 g) = 0.032 mW/g
Power Drift = -0.03dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 14: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section E | Fixed | Channel: 7 2442MHz | 0.0541 |

Date: 10/20/03

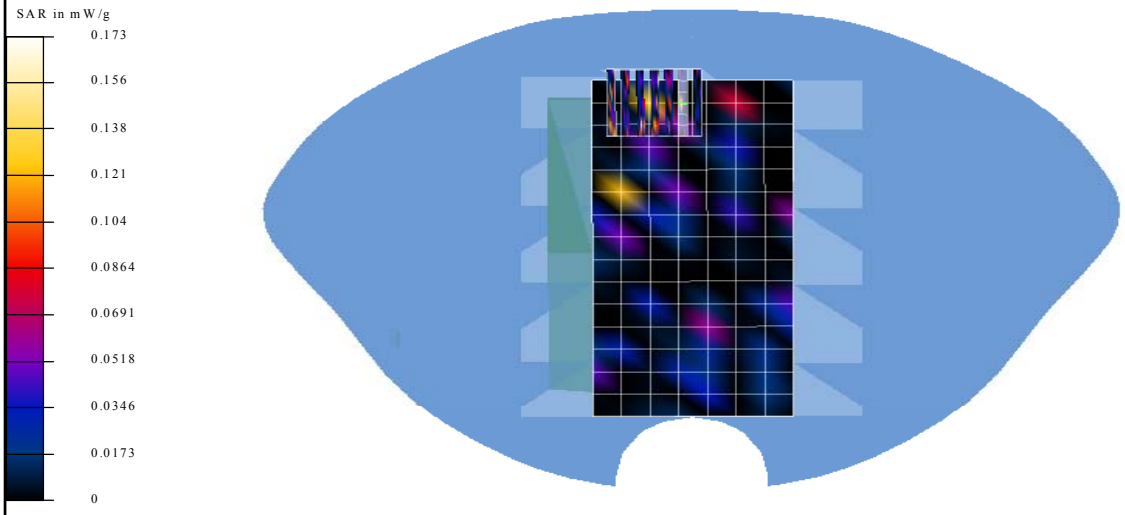
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT_Vertical Positioning_CH 7_Data 14.da4

**DUT: waveon 988 PC_Vertical Position Type & Serial Number:**
**Program: 56S030690; EUT_Vertical Positioning_CH 7_Data 14**

Communication System: 2450 Mhz_PC; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (16x8x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0 V/m
Peak SAR = 0.169 mW/g
SAR(1 g) = 0.0541 mW/g; SAR(10 g) = 0.0241 mW/g
Power Drift = 0.03dB



**Ambient Temperature:** $27 \pm 1^0$ C
**Tissue Temperature:** $26 \pm 1^0$ C
**Humidity:** 55% to 60%

**Figure 15: SAR Test Distribution Plot – Device at flat phantom**

| Phantom Configuration | Device Test Positions | Antenna Position | Channel | SAR (W/kg), over 1g Tissue |
|---|---|---|---|---|
| Flat Phantom | Section E | Fixed | Channel: 13 2472MHz | 0.0363 |

Date: 10/20/03

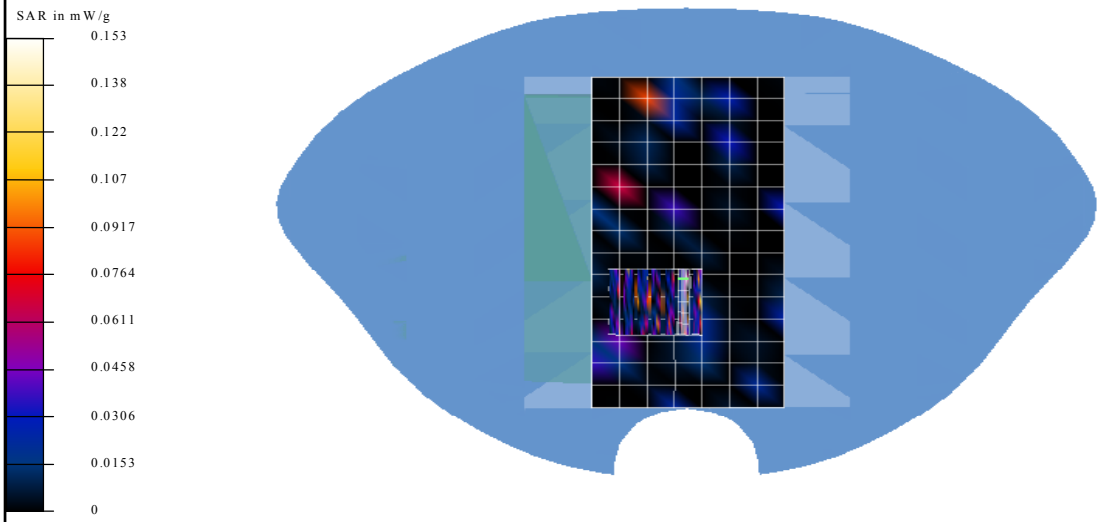
Test Laboratory: Telecom & EMC Testing Group
File Name: EUT_Vertical Positioning_CH 13_Data 15.da4

**DUT: waveon 988 PC_Vertical Position Type & Serial Number:**
**Program: 56S030690; EUT_Vertical Positioning_CH 13_Data 15**

Communication System: 2450 Mhz_PC; Frequency: 2442 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (16x8x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 0.396 V/m
Peak SAR = 0.152 mW/g
SAR(1 g) = 0.0363 mW/g; SAR(10 g) = 0.0191 mW/g
Power Drift = 0.09dB



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August 2003

# ANNEX A

# TEST INSTRUMENTATION
# &
# GENERAL PROCEDURE

## A.1 General Test Procedure

In the SAR measurement, the positioning of the probes must be performed with sufficient accuracy to obtain repeatable measurements in the presence of rapid spatial attenuation phenomena. The accurate positioning of the E-field probe is accomplished by using a high precision robot. The robot can be taught to position the probe sensor following a specific pattern of points. In a first sweep, the sensor is positioned as close as possible to the interface, with the sensor enclosure touching the inside of the fiberglass shell. The SAR is measured on a grid of points, which covers the curved surface of the phantom in an area larger than the size of the EUT. After the initial scan, a high- resolution grid is used to locate the absolute maximum measured energy point. At this location, attenuation versus depth scan will be accomplished by the measurement system to calculate the SAR value.

## A.2 SAR Test Instrumentation

### SAR Measurement System

- **Positioning Equipment**
  Type: High Precision Industrial Robot, RX90.
  Precision: High precision (repeatability 0.02mm)
  Reliability: High reliability (industrial design)

- **Compaq Computer**
  Type: 2.4GHz Pentium
  Memory: 512MB SDRAM
  Operating System: Windows 2000
  Dell Monitor: 17” LCD

- **Dosimetric E-Field Probe**
  Type: ET3DV6
  Isotropy Error (∅): ±0.25dB
  Dynamic Range: 0.01 – 100 W/kg

- **Phantom & Tissue**
  Phantom: “SAM v4.0 Phantom”, manufactured by SPEAG
  Tissue: Simulated Tissue with electrical characteristics similar to those of the human at normal body temperature (23 ± 1°C)
  Shell: Fiberglass shell phantom with 2mm thickness
  Dimension: A100cm x 50cm x 85cm (L x W x H)

## A.3 Test Setup

### Phantom

The "SAM v4.0 Phantom", manufactured by SPEAG is a fiberglass shell phantom with 2 mm shell thickness. It has three measurement areas:

- Left hand
- Right hand
- Flat phantom

The phantom table comes in the sizes: A 100x50x85 cm (LxWxH) table for use with free standing robots.
The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different solutions).

### Simulated tissue

**Simulated Tissue: Suggested in a paper by George Hartsgrove and colleagues in University of Ottawa Ref.: Bioelectromagnetics 8:29-36 (1987)**

This simulated tissue is mainly composed of water, sugar and salt. At higher frequencies, in order to achieve the proper conductivity, the solution does not contain salt. Also, at these frequencies, D.I. water and alcohol is preferred.
Tissue Density : Approximately 1.25 g/cm$^3$

- **Preparation**
  The ingredients (i.e. water, sugar, salt, etc) required to prepare the simulated tissue are carefully weighed and poured into a clean container for mixing. A stirring paddle, that is attached to a hand drill is used to stir the solution for a duration of about 30 minutes or more. When the ingredients are completely dissolved, the solution is left in the container for the air bubbles to disappear.

- **Measurement of Electrical Characteristics of Simulated Tissue**
  1) S-PARAMETER Network Analyzer, Agilent 8753ES (30kHz – 6GHz)
  2) Agilent 85070D Dielectric Probe Kit

# ELECTRICAL CHARACTERISTIC MEASUREMENT SETUP

- **Description of the Agilent 85070D Dielectric Probe Kit**

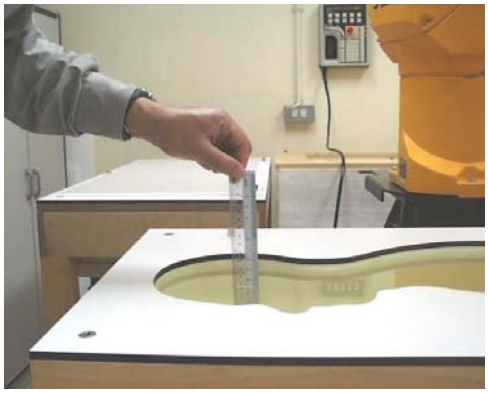
  The 85070D is a dielectric probe that is used to measure the intrinsic electrical properties of materials in the RF and microwave frequency bands. The 85070D software allows you to measure the complex dielectric constant (also called permittivity) of liquids and semi-solids, incuding the dielectric loss factor of loss tangent.

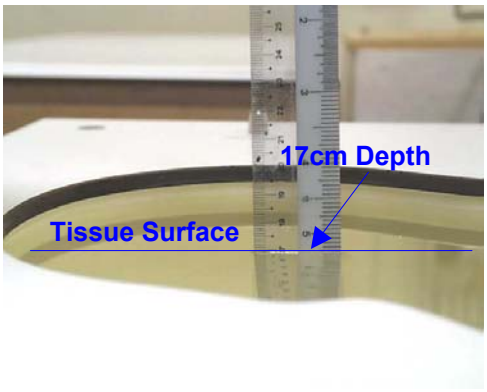
  To obtain data at hundreds of frequencies in seconds, simply immerse the probe into liquids or semi-solids - no special fixtures or containers are required. The 85070D must be used in conjunction with an Agilent network analyzer. The network analyzer provides the high frequency stimulus, and measures the reflected response.

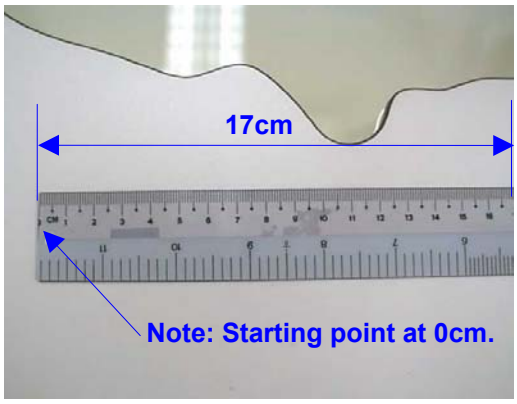
  The probe transmits a signal into the material under test (MUT). The measured reflected response from the materials is then related to its dielectric properties. A computer controls the system, and runs software that guides the user through a measurement sequence. An effort is made to keep the results dielectric constant and conductivity within 5 % of published data.

**Liquid Depth**

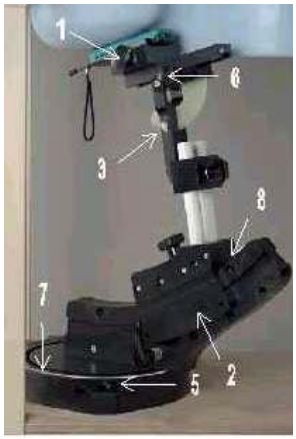
The liquid depth at the head of the SAM v4.0 Phantom is approximately 17cm.





**Positioning of EUT**




**The DASY4 holder** is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65º. The intended use position in the CENELEC document is has a rotation angle of 65º and an inclination angle of 80º. The rotation centers for both scales is the ear opening. Thus the device needs no repositioning when changing the angles. The device rotation around the device axis is not changed in the holder. In the CENELEC standard it is always 0º. If the standard changes, a support will be provided with the new angle.

1. **"Cheek/Touch Position"** – the device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom. This test position is established:

i) When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.

ii) (Or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivotingpoint, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

2. **"Ear/Tilt Position"** – With the handset aligned in the "Cheek/Touch Position":

i) If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

ii) (Otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the handset is tilted away from the mouth with respect to the "test device reference point" by 15°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

3. **Body Worn Configuration**

All body worn accessories are tested for the FCC RF exposure compliance. The phone is positioned into carrying case (if available) and placed below of the flat phantom. Headset or ear piece (if available) is connected during measurements.

## TEST INSTRUMENTATION & GENERAL PROCEDURES ANNEX A

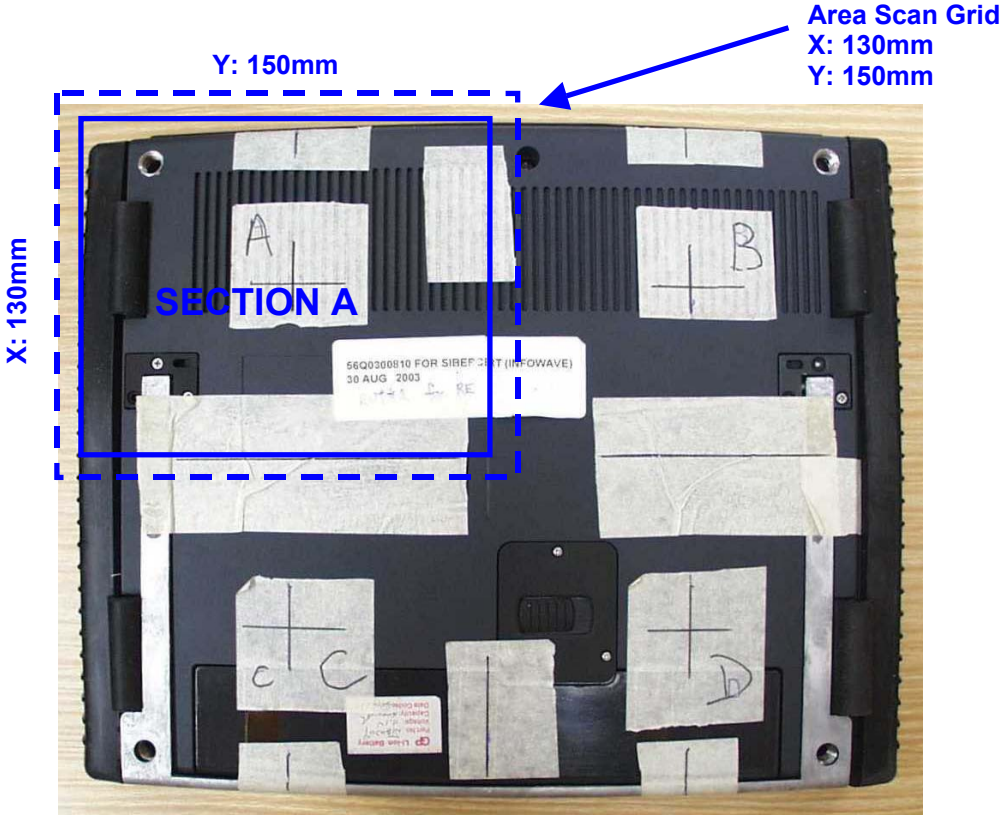
| Instrument | Model | S/No | Cal Due Date | |
|---|---|---|---|---|
| Boonton RF Power Meter (Dual Channel) | 4532 | 97701 | 25 June 2004 | ✓ |
| Boonton Peak Power Sensor | 56218-S/1 | 1417 | 31 Aug 2003 | |
| Boonton Power Sensor | 51075 | 31534 | - | ✓ |
| Boonton Power Sensor | 51075 | 32002 | 25 June 2004 | ✓ |
| S-Parameter Network Analyzer (30kHz – 3GHz) | HP8753ES | US37390533 | 17 Sept 2004 | ✓ |
| Agilent 85070D Dielectric Probe Kit | 85075D | 21356 | - | ✓ |
| Agilient Signal Generator (10MHz – 20GHz) | 83620B | 3844A01337 | - | ✓ |
| Amplifier Research Power Amplifier (1MHz – 1000MHz) | 25W1000B | 27225 | - | |
| Amplifier Research Power Amplifier (800MHz – 4.2GHz) | 25S1G4A | 29346 | - | ✓ |
| Agilent Dual Directional Coupler | HP778D | 18289 | - | ✓ |
| Radio Test Set | 2967 | 296501/331 | - | |
| R&S Universal Radio Communication Tester | CMU-200 | 837587/068 | 3 Apr 2004 | ✓ |
| 450MHz System Validation Dipole | D450V2 | 1004 | 4 Apr 2003 | |
| 835MHz System Validation Dipole | D835V2 | 447 | 12 Nov 2003 | |
| 900MHz System Validation Dipole | D900V2 | 134 | 11 Nov 2003 | |
| 1800MHz System Validation Dipole | D1800V2 | 2d019 | 11 Nov 2003 | |
| 1900MHz System Validation Dipole | D1900V2 | 546 | 25 Nov 2003 | |
| 2450MHz System Validation Dipole | D2450V2 | 715 | 25 Sep 2004 | ✓ |
| Data Acquisition Electronics (DAE) | DAE3V1 | 475 | 11 Nov 2003 | ✓ |
| Dosimetric E-field Probe | ET3DV6 | 1645 | 25 Nov 2002 | ✓ |
| Dosimetric E-field Probe | ET3DV6 | 1646 | 25 Nov 2002 | |
| Dosimetric E-field Probe | ET3DV6 | 1647 | 20 Nov 2003 | |

# ANNEX B

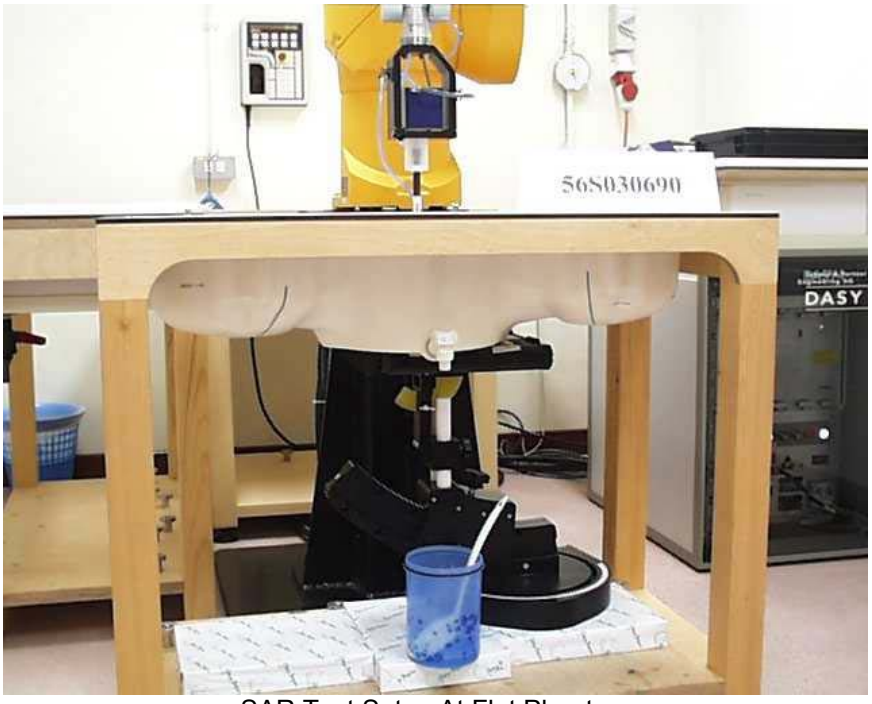
# TEST SETUP PHOTOGRAPHS

## TEST SETUP PHOTOGRAPHS ANNEX B

Note:
1. Due to the large size of the Portable PC, the area scan grid dimension shown below was used to encompass each section during SAR Measurement.
2. For the test setup photographs, see next two pages.

**SAR Test Setup Photographs**




SAR Test Setup At Flat Phantom

## TEST SETUP PHOTOGRAPHS ANNEX B

**SAR Test Setup Photographs**

SAR Test Setup At Flat Phantom – Closer Front View (EUT **Section A** Touched Phantom)

SAR Test Setup At Flat Phantom – Closer Side View (EUT **Section A** Touched Phantom)

## TEST SETUP PHOTOGRAPHS ANNEX B

Note:
1. The area scan grid dimension shown below was used to encompass Section E during SAR Measurement.
2. For the test setup photographs, see next page.

## TEST SETUP PHOTOGRAPHS ANNEX B

**SAR Test Setup Photographs**

SAR Test Setup At Flat Phantom – Closer Front View (EUT **Section E** Touched Phantom)


SAR Test Setup At Flat Phantom – Closer Side View (EUT **Section E** Touched Phantom)

## TEST SETUP PHOTOGRAPHS ANNEX B

**Conducted Power Measurement Setup**


Conducted Power Measurement Setup

## EUT PHOTOGRAPHS


**Front of EUT**


**Rear of EUT**

# ANNEX C

# TISSUE SIMULANT DATA SHEETS

## TISSUE SIMULANT DATA SHEETS ANNEX C

| Type of Tissue | Head | Body |
|---|---|---|
| **Target Frequency (MHz)** | 2450 | 2450 |
| **Target Dielectric Constant** | 39.20 | 52.70 |
| **Target Conductivity (S/m)** | 1.80 | 1.95 |
| **Composition (by weight)** | Ultra Pure Water (55.67%)<br>Glyco (42.52%)<br>Sugar (0%)<br>Salt (0%)<br>HEC (0%)<br>Bactericide (1.81%) | Ultra Pure Water (72.55%)<br>Glyco (27.34%)<br>Sugar (0%)<br>Salt (0.11%)<br>HEC (0%)<br>Bactericide (0%) |
| **Measured Dielectric Constant** | 40.24 | 54.57 |
| **Measured Conductivity (S/m)** | 1.8566 | 1.9987 |

| **Probe Name** | Dosimetric E-field Probe ET3DV6 | Dosimetric E-field Probe ET3DV6 |
|---|---|---|
| **Probe Serial Number** | 1645 | 1645 |
| **Sensor Offset (mm)** | 2.7 | 2.7 |
| **Conversion Factor** | 5.1 ± 9.5% | 4.7 ± 9.5% |
| **Probe Calibration Due Date (DD/MM/YY)** | 9 Oct 2004 | 9 Oct 2004 |

## TISSUE SIMULANT DATA SHEETS ANNEX C

**Head Tissue at 2450MHz**

| Frequency | e' | e'' | Conductivity |
|---|---|---|---|
| 2440000000 | 40.28 | 13.62 | 1.8460 |
| 2441000000 | 40.26 | 13.61 | 1.8457 |
| 2442000000 | 40.27 | 13.61 | 1.8461 |
| 2443000000 | 40.26 | 13.61 | 1.8478 |
| 2444000000 | 40.26 | 13.62 | 1.8499 |
| 2445000000 | 40.26 | 13.64 | 1.8525 |
| 2446000000 | 40.25 | 13.63 | 1.8521 |
| 2447000000 | 40.26 | 13.63 | 1.8535 |
| 2448000000 | 40.24 | 13.64 | 1.8551 |
| 2449000000 | 40.24 | 13.64 | 1.8556 |
| **2450000000** | **40.24** | **13.64** | **1.8566** |
| 2451000000 | 40.22 | 13.65 | 1.8586 |
| 2452000000 | 40.22 | 13.64 | 1.8587 |
| 2453000000 | 40.22 | 13.66 | 1.8613 |
| 2454000000 | 40.23 | 13.65 | 1.8606 |
| 2455000000 | 40.22 | 13.65 | 1.8619 |
| 2456000000 | 40.21 | 13.66 | 1.8644 |
| 2457000000 | 40.21 | 13.66 | 1.8645 |
| 2458000000 | 40.22 | 13.66 | 1.8655 |
| 2459000000 | 40.20 | 13.66 | 1.8662 |
| 2460000000 | 40.20 | 13.65 | 1.8661 |
| 2461000000 | 40.18 | 13.66 | 1.8671 |
| 2462000000 | 40.18 | 13.66 | 1.8680 |
| 2463000000 | 40.18 | 13.67 | 1.8706 |
| 2464000000 | 40.18 | 13.67 | 1.8715 |
| 2465000000 | 40.17 | 13.69 | 1.8745 |
| 2466000000 | 40.18 | 13.68 | 1.8742 |
| 2467000000 | 40.16 | 13.68 | 1.8743 |
| 2468000000 | 40.17 | 13.68 | 1.8753 |
| 2469000000 | 40.16 | 13.69 | 1.8776 |
| 2470000000 | 40.15 | 13.69 | 1.8781 |
| 2471000000 | 40.15 | 13.69 | 1.8796 |
| 2472000000 | 40.14 | 13.70 | 1.8817 |
| 2473000000 | 40.14 | 13.69 | 1.8814 |
| 2474000000 | 40.14 | 13.70 | 1.8835 |
| 2475000000 | 40.12 | 13.70 | 1.8839 |
| 2476000000 | 40.14 | 13.70 | 1.8852 |
| 2477000000 | 40.12 | 13.71 | 1.8868 |
| 2478000000 | 40.13 | 13.71 | 1.8875 |
| 2479000000 | 40.10 | 13.72 | 1.8889 |
| 2480000000 | 40.12 | 13.74 | 1.8928 |

**(e' = Dielectric Constant)**
**(e'' = Loss Factor)**

**Tested by:** NAC
**Date :** 20th Oct 2003
**Frequency:** 2450MHz
**Mixture:** Head Tissue
**Tissue temp:** 26°C

| Composition | | |
|---|---|---|
| Tap Water | 0.0g | 0.00% |
| Ultra Pure Water | 20000.0g | 55.67% |
| Sugar | 0.0g | 0.00% |
| Glyco | 15278.0g | 42.52% |
| Salt | 0.0g | 0.00% |
| Preventol D7 | 650.0g | 1.81% |
| Total Weight | 35928.0g | 100.0% |

| Result (FCC) | Dielectric Constant | Conductivity |
|---|---|---|
| Measured | 40.24 | 1.8566 |
| Target (FCC) | 39.2 | 1.8 |
| Low Limit | 37.24 | 1.71 |
| High Limit | 41.16 | 1.89 |
| % Off Target | 2.65 | 3.14 |

**Body Tissue at 2450MHz**

| Frequency | e' | e'' | Conductivity |
|---|---|---|---|
| 2440000000 | 54.63 | 14.85 | 2.0134 |
| 2441000000 | 54.62 | 14.85 | 2.0137 |
| 2442000000 | 54.65 | 14.82 | 2.0101 |
| 2443000000 | 54.64 | 14.80 | 2.0092 |
| 2444000000 | 54.64 | 14.79 | 2.0087 |
| 2445000000 | 54.64 | 14.77 | 2.0063 |
| 2446000000 | 54.63 | 14.76 | 2.0052 |
| 2447000000 | 54.62 | 14.74 | 2.0034 |
| 2448000000 | 54.61 | 14.72 | 2.0022 |
| 2449000000 | 54.58 | 14.69 | 1.9990 |
| **2450000000** | **54.57** | **14.68** | **1.9987** |
| 2451000000 | 54.56 | 14.66 | 1.9961 |
| 2452000000 | 54.55 | 14.64 | 1.9943 |
| 2453000000 | 54.51 | 14.61 | 1.9909 |
| 2454000000 | 54.50 | 14.61 | 1.9915 |
| 2455000000 | 54.46 | 14.57 | 1.9868 |
| 2456000000 | 54.43 | 14.54 | 1.9844 |
| 2457000000 | 54.39 | 14.54 | 1.9848 |
| 2458000000 | 54.37 | 14.50 | 1.9800 |
| 2459000000 | 54.34 | 14.49 | 1.9788 |
| 2460000000 | 54.30 | 14.46 | 1.9768 |
| 2461000000 | 54.27 | 14.44 | 1.9749 |
| 2462000000 | 54.23 | 14.42 | 1.9730 |
| 2463000000 | 54.18 | 14.41 | 1.9713 |
| 2464000000 | 54.15 | 14.39 | 1.9695 |
| 2465000000 | 54.11 | 14.35 | 1.9656 |
| 2466000000 | 54.05 | 14.34 | 1.9641 |
| 2467000000 | 54.03 | 14.31 | 1.9617 |
| 2468000000 | 53.99 | 14.31 | 1.9618 |
| 2469000000 | 53.95 | 14.27 | 1.9577 |
| 2470000000 | 53.90 | 14.27 | 1.9582 |
| 2471000000 | 53.84 | 14.26 | 1.9574 |
| 2472000000 | 53.80 | 14.23 | 1.9544 |
| 2473000000 | 53.77 | 14.23 | 1.9552 |
| 2474000000 | 53.72 | 14.22 | 1.9541 |
| 2475000000 | 53.67 | 14.20 | 1.9519 |
| 2476000000 | 53.63 | 14.18 | 1.9506 |
| 2477000000 | 53.59 | 14.16 | 1.9486 |
| 2478000000 | 53.54 | 14.17 | 1.9510 |
| 2479000000 | 53.51 | 14.16 | 1.9502 |
| 2480000000 | 53.48 | 14.17 | 1.9518 |

**(e' = Dielectric Constant)**
**(e'' = Loss Factor)**

| | |
|---|---|
| **Tested by:** | OIC |
| **Date :** | 20th Oct 2003 |
| **Frequency:** | 2450MHz |
| **Mixture:** | Body Tissue |
| **Tissue temp:** | 26°C |

| Composition | | |
|---|---|---|
| **Tap Water** | 0.0g | 0.00% |
| **Ultra Pure Water** | 25500.0g | 72.55% |
| **Sugar** | 0.0g | 0.00% |
| **Glyco** | 9610.0g | 27.34% |
| **Salt** | 38.4g | 0.11% |
| **Preventol D7** | 0.0g | 0.00% |
| **Total Weight** | 35148.4g | 100.0% |

| Result (FCC) | Dielectric Constant | Conductivity |
|---|---|---|
| **Measured** | 54.57 | 1.9987 |
| **Target (FCC)** | 52.7 | 1.95 |
| **Low Limit** | 50.065 | 1.8525 |
| **High Limit** | 55.335 | 2.0475 |
| **% Off Target** | 3.55 | 2.50 |

# ANNEX D

# SAR VALIDATION RESULTS

## SAR Validation – Head Tissue at 2450MHz (Dipole forward power = 250mW)

Date: 10/20/03

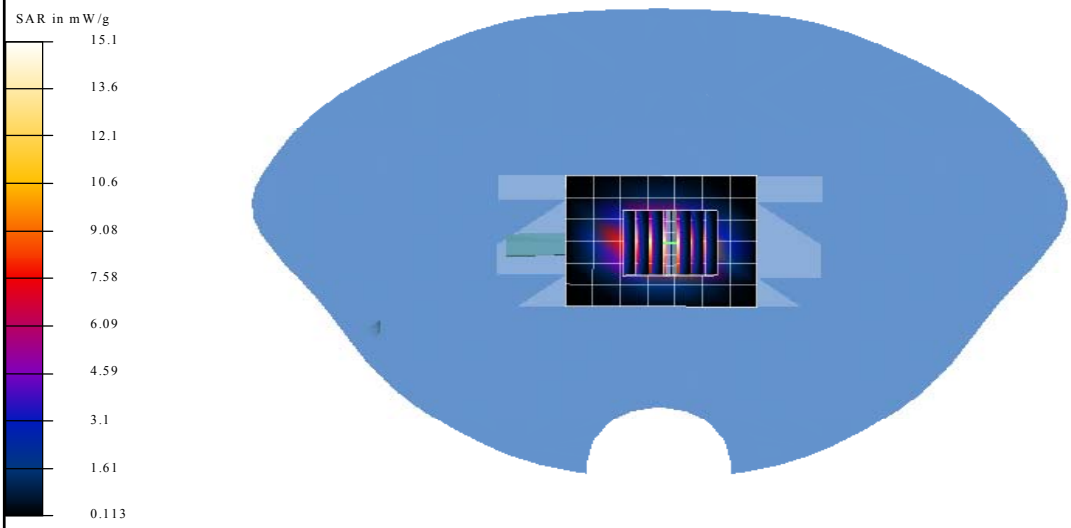
Test Laboratory: Telecom & EMC Testing Group
File Name: 2450MHz Head Dipole Validation.da4

**DUT: Dipole 2450MHz Type & Serial Number: 715**
**Program: Dipole Validation; 2450MHz Head Dipole Validation**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Head 2450 MHz ( $\sigma$ = 1.8566 mho/m, $\varepsilon$ = 40.24, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(5.1, 5.1, 5.1); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (7x8x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 95.4 V/m
Peak SAR = 27.5 mW/g
SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.01 mW/g
Power Drift = 0.005 dB



## SAR Validation – Body Tissue at 2450MHz (Dipole forward power = 250mW)

Date: 10/20/03

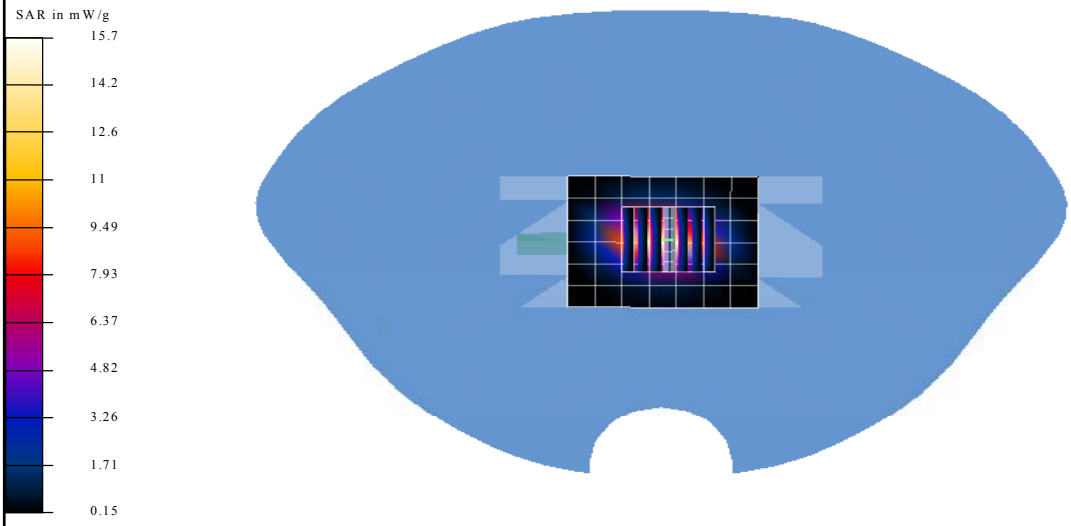
Test Laboratory: Telecom & EMC Testing Group
File Name: 56S030690_2450MHz Body_System Validation.da4

**DUT: Dipole 2450MHz Type & Serial Number: 715**
**Program: Dipole Validation; 2450Mhz dipole validation**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Body 2450 MHz ( $\sigma$ = 1.9987 mho/m, $\varepsilon$ = 54.57, $\rho$ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1645; ConvF(4.7, 4.7, 4.7); Calibrated: 10/9/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn475; Calibrated: 11/14/2002
- Phantom: - TP:
- Software: DASY4, V4.0 Build 51

**Area Scan (7x8x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm
Reference Value = 94 V/m
Peak SAR = 30.3 mW/g
SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.23 mW/g
Power Drift = -0.02 dB



## SAR VALIDATION RESULTS ANNEX D

**SUMMARY**

**SAR System Validation Target & Measured:**

| System Validation 2450MHz: S/Nos.: 447 | Target SAR W/kg (1g) | 2450MHz Head | 2450MHz Body |
|---|---|---|---|
| | | Measured Target W/kg (1g) (Deviation %) | Measured Target W/kg (1g) (Deviation %) |
| | 13.1[Note 1] | 13.3[Note 1] (+1.50%) | 13.9[Note 1] (+6.10%) |

**Note 1 - Dipole forward power = 250mW**

# ANNEX E

# MEASUREMENT UNCERTAINTY

**Measurement Uncertainty**

All test measurement carried out are traceable to national standards. The uncertainty of measurement at a confidence level of 95%, with a coverage of 2, is ± 20.8%.

| Error Description | Uncertainty Value ± % | Probability Distribution | Divisor | ci 1g | Standard Unc.(1g) | Vi or Veff |
|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | |
| Probe Calibration | ± 4.8 | normal | 1 | 1 | ± 4.8 | ∞ |
| Axial isotropy | ± 4.7 | rectangular | √3 | (1-cp)^1/2 | ± 1.9 | ∞ |
| Hemispherical Isotropy | ± 9.6 | rectangular | √3 | (cp)^1/2 | ± 3.9 | ∞ |
| Spatial resolution | ± 0.0 | rectangular | √3 | 1 | ± 0.0 | ∞ |
| Boundary effects | ± 1.0 | rectangular | √3 | 1 | ± 0.6 | ∞ |
| Linearity | ± 4.7 | rectangular | √3 | 1 | ± 2.7 | ∞ |
| System Detection limit | ± 1.0 | rectangular | √3 | 1 | ± 0.6 | ∞ |
| Readout electronics | ± 1.0 | normal | 1 | 1 | ± 1.0 | ∞ |
| Response time | ± 0.8 | rectangular | √3 | 1 | ± 0.5 | ∞ |
| Integration time | ± 2.6 | rectangular | √3 | 1 | ± 1.5 | ∞ |
| RF ambient conditions | ± 3.0 | rectangular | √3 | 1 | ± 1.7 | ∞ |
| Probe Positioning Mechanical Tolerance | ± 0.4 | rectangular | √3 | 1 | ± 0.2 | ∞ |
| Probe Positioning with respect to Phantom Shell | ± 2.9 | rectangular | √3 | 1 | ± 1.7 | ∞ |
| Extrapolation, Interpolation and Integration Algorithms for Max. SAR Evaluation | ± 1.0 | rectangular | √3 | 1 | ± 0.6 | ∞ |
| | | | | | | |
| **Test Sample Related** | | | | | | |
| Device positioning | ± 2.9 | normal | 1 | 1 | ± 2.9 | 145 |
| Device holder uncertainty | ± 3.6 | normal | 1 | 1 | ± 3.6 | 5 |
| Power drift | ± 5.0 | rectangular | √3 | 1 | ± 2.9 | ∞ |
| | | | | | | |
| **Phantom and Tissue Parameters** | | | | | | |
| Phantom uncertainty | ± 4.0 | rectangular | √3 | 1 | ± 2.3 | ∞ |
| Liquid conductivity (target) | ± 5.0 | rectangular | √3 | 0.64 | ± 1.8 | ∞ |
| Liquid conductivity (meas) | ± 2.5 | normal | 1 | 0.64 | ± 1.6 | ∞ |
| Liquid permittivity (target) | ± 5.0 | rectangular | √3 | 0.6 | ± 1.7 | ∞ |
| Liquid permittivity (meas) | ± 3.6 | normal | 1 | 0.6 | ± 2.1 | ∞ |
| | | | | | | |
| **Combined Standard Uncertainty** | | | | | ± 10.4 | 330 |
| **Coverage Factor for 95%** | | **k=2** | | | | |
| **Extended Standard Uncertainty** | | | | | ± 20.8 | |

# ANNEX F

# SAR PROBE CALIBRATION CERTIFICATES

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

**Client** **PSB**

# CALIBRATION CERTIFICATE

Object(s) ET3DV6 - SN:1645

Calibration procedure(s) QA CAL-01.v2
Calibration procedure for dosimetric E-field probes

Calibration date: October 9, 2003

Condition of the calibrated item In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

| Model Type | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM E4419B | GB41293874 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Power sensor E4412A | MY41495277 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Reference 20 dB Attenuator | SN: 5086 (20b) | 3-Apr-03 (METAS No. 251-0340 | Apr-04 |
| Fluke Process Calibrator Type 702 | SN: 6295803 | 8-Sep-03 (Sintrel SCS No. E-030020) | Sep-04 |
| Power sensor HP 8481A | MY41092180 | 18-Sep-02 (Agilent, No. 20020918) | In house check: Oct 03 |
| RF generator HP 8684C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Aug-02) | In house check: Aug-05 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (Agilent, No. 24BR1033101) | In house check: Oct 03 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Nico Vetterli | Technician | |
| Approved by: | Katja Pokovic | Laboratory Director | |

Date issued: October 9, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Schmid & Partner Engineering AG
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info@speag.com, http://www.speag.com

# Probe ET3DV6

## SN:1645

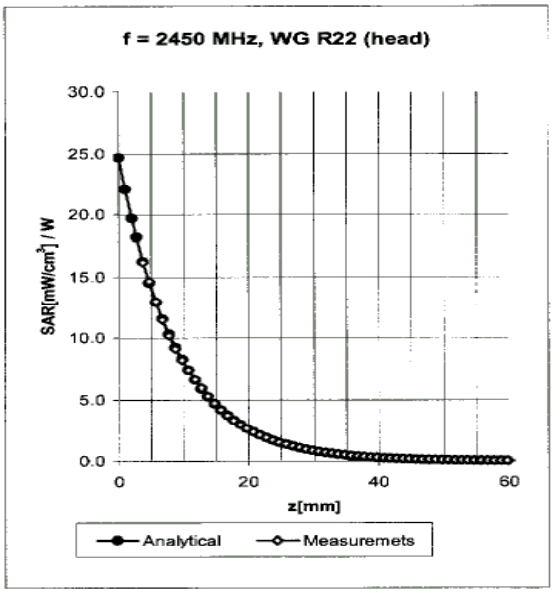
Manufactured: November 7, 2001
Last calibration: November 20, 2002
Recalibrated: October 9, 2003

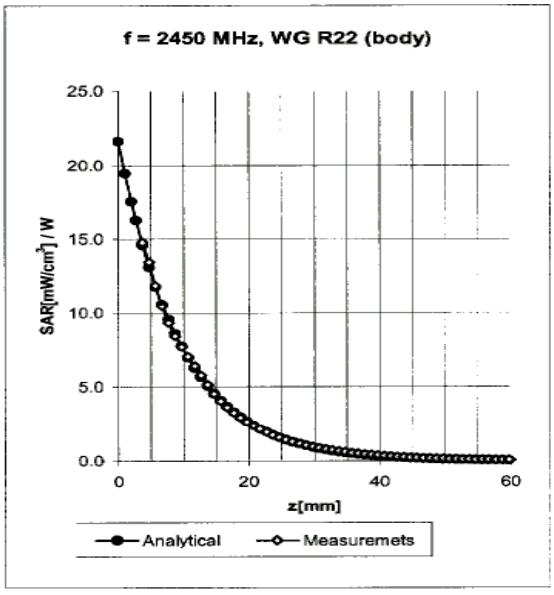
Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1645 October 9, 2003

## Conversion Factor Assessment




| | | | | |
|---|---|---|---|---|
| Head | 2450 | MHz | $\varepsilon_r$ = 39.2 ± 5% | $\sigma$ = 1.80 ± 5% mho/m |

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

| | | | | |
|---|---|---|---|---|
| ConvF X | 5.1 | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | 5.1 | ± 9.5% (k=2) | Alpha | **0.97** |
| ConvF Z | 5.1 | ± 9.5% (k=2) | Depth | **1.91** |

| | | | | |
|---|---|---|---|---|
| Body | 2450 | MHz | $\varepsilon_r$ = 52.7 ± 5% | $\sigma$ = 1.95 ± 5% mho/m |

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

| | | | | |
|---|---|---|---|---|
| ConvF X | 4.7 | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | 4.7 | ± 9.5% (k=2) | Alpha | **1.25** |
| ConvF Z | 4.7 | ± 9.5% (k=2) | Depth | **1.65** |

# ANNEX G

# REFERENCES

The methods and procedures used for the measurements contained in this report are details in the following reference standards:

| Publications | Year | Title |
|---|---|---|
| Supplement C (Edition 01-01) to FCC OET Bulletin 65 (Edition 97-01) | 2001 | "Evaluating Compliance with FCC Guidelines for Human Exposure to radio Frequency Fields" |
| IEEE Standard 1528-200X | 2000 | "Product Performance Standards Relative to the safe Use of Electromagnetic Energy" |
| ANSI/IEEE C95.3 | 1992 | "Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave" |
| ANSI/IEEE C95.1 | 1992 | "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz" |
| ACA, Radio Communications (EMR Human Exposure) | 2000 (No.2) | “Radiocommunication (Electromagnetic Radiation – Human Exposure)” |
| EN50360 | 2001 | Product Standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300MHz – 3GHz) |
| EN50361 | 2001 | Basic Standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phone (300MHz – 3GHz) |