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## SAR Test Report

Report Number: **M060761\_CERT\_AR5BXB6\_SAR\_2.4**

Test Sample: Portable Tablet Computer Wireless LAN  
Model Number: AR5BXB6  
Tested For: Fujitsu Australia Pty Ltd  
FCC ID: EJE-WB0043  
IC: 337J-WB0043  
Date of Issue: 31<sup>st</sup> August 2006

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**SAR TEST REPORT**  
**Portable Tablet Computer Wireless LAN**  
**Model: AR5BXB6**  
**Report Number: M060761\_CERT\_AR5BXB6\_SAR\_2.4**  
**FCC ID: EJE-WB0043**  
**IC: 337J-WB0043**

**1.0 GENERAL INFORMATION**

**Test Sample:** Portable Tablet Computer Wireless LAN and Bluetooth Module  
**Interface Type:** Mini-PCI Module  
**Device Category:** Portable Transmitter  
**Test Device:** Production Unit  
**Model Number:** AR5BXB6  
**FCC ID:** EJE-WB0043  
**IC:** 337J-WB0043  
**RF exposure Category:** General Population/Uncontrolled  
  
**Manufacturer:** Fujitsu Limited

**Test Standard/s:**

1. Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)
2. Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields. RSS-102 Issue 1 (Provisional) September 25, 1999

**Statement Of Compliance:** The Fujitsu Portable Tablet Computer Wireless LAN model AR5BXB6 complied\* with the FCC General public/uncontrolled RF exposure limits of 1.6mW/g per requirements of 47CFR2.1093(d). It also complied with IC RSS-102 requirements.  
\*. Refer to compliance statement section 9.

**Test Date:** 9<sup>th</sup> August – 18<sup>th</sup> August 2006

**Tested for:** Fujitsu Australia Pty Ltd  
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**Authorised Signature:**



**Aaron Sargent B.Eng**  
**EMR Engineer**

**SAR TEST REPORT**  
**Portable Tablet Computer Wireless LAN**  
**Model: AR5BxB6**  
**Report Number: M060761\_CERT\_AR5BxB6\_SAR\_2.4**

## 2.0 DESCRIPTION OF DEVICE

(from customer)

### 2.1 Description of Test Sample

The EUT is a Fujitsu LifeBook incorporating a Mini-PCI wireless LAN (WLAN) module Atheros (AR5BxB6). The Atheros module is an OEM product. The Mini-PCI wireless LAN (WLAN) module was tested in the dedicated host, a Stylistic ST Series "Osian".

The measurement test results mentioned hereon only apply to the 2450MHz frequency band; an additional report titled "M060761\_OSIAN\_XB62\_SAR\_5.6" applies to the 5200/5600MHz range.

#### 2.1.1 Summary of EUT Details

**Table 1: EUT Details**

|                                |   |
|--------------------------------|---|
| WLAN Module                    | : Atheros 11abg (AR5BxB6)   |
| Antenna type                   | : Monopole Ceramic chip YCE-5008                                      |
| Applicable Head Configurations | : None  |
| Applicable Body Configurations | 1. Tablet Position<br>2. Lap-Arm Held Position<br>3. Edge On Position |
| Battery Options                | : Standard  |

**Table 2: Modulation Schemes and Frequency Ranges**

| Frequency Range | Modulation   | Rated Power Output (dBm) | TURBO Mode Rated Power Output (dBm) |
|-----------------|--|--------------------------|-------------------------------------|
| 2.402-2.480     | Bluetooth (BT)<br>Frequency Hopping Spread Spectrum (FHSS) | 12                       | NO Turbo Mode                       |
| 2.412-2.462 GHz | 802.11b - DSSS   | 18                       | NO Turbo Mode                       |
|                 | 802.11g - OFDM   |                          | 14.5 max                            |
| 5.150-5.250 GHz | 802.11a – OFDM   | 14                       | 13.5 max                            |
| 5.250-5.350 GHz |  | 17                       |                                     |
| 5.725-5.825 GHz |  | 16                       |                                     |

NOTE: For 5200/5600MHz SAR results refer to report titled "M060761\_OSIAN\_XB62\_SAR\_5.6".

**Table 3: 802.11a**

| Modulation Scheme | Date Rate      |
|-------------------|----------------|
| BPSK              | 6Mbps, 9Mbps   |
| QPSK              | 12Mbps, 18Mbps |
| 16QAM             | 24Mbps, 36Mbps |
| 64QAM             | 48Mbps, 54Mbps |

NOTE: For 5200/5600MHz SAR results refer to report titled "M060761\_OSIAN\_XB62\_SAR\_5.6".

**Table 4: 802.11b**

| Modulation Scheme | Date Rate       |
|-------------------|-----------------|
| DBPSK             | <b>1Mbps</b>    |
| DQPSK             | 2Mbps           |
| CCK               | 5.5Mbps, 11Mbps |

**Table 5: 802.11g**

| Modulation Scheme | Date Rate            |
|-------------------|----------------------|
| BPSK              | <b>6Mbps</b> , 9Mbps |
| QPSK              | 12Mbps, 18Mbps       |
| 16QAM             | 24Mbps, 36Mbps       |
| 64QAM             | 48Mbps, 54Mbps       |

## 2.1.2 EUT Host Details

**Table 6: Host Details**

|               |                     |
|---------------|---------------------|
| Test Sample:  | LIFEBOOK SST Series |
| Model:        | ST5110              |
| Codename:     | Osian               |
| CPU Speed:    | 1.2GHz              |
| Manufacturer: | Fujitsu Ltd.        |
| LAN:          | Intel               |
| Modem:        | AR5BXB62            |
| SDRAM:        | 504 MB              |
| LCD Screen:   | SXGA+               |

## 2.2 Test sample Accessories

### 2.2.1 Battery Types

One type of Fujitsu Lithium Ion Batteries is used to power the Portable Tablet Computer Wireless LAN Mode. SAR measurements were performed with the battery as shown below.

#### Standard Battery

|            |               |               |
|------------|---------------|---------------|
| Model      | FPCBP77       | FPCBP77       |
| V/mAh      | 10.8V/4400mAh | 10.8V/4400mAh |
| Serial No. | W01A-I03A     | W01A-H44A     |

### 2.3 Test Signal, Frequency and Output Power

The Portable Tablet Computer Wireless LAN uses a total of 11 channels (USA model) within the 2412 to 2462 MHz frequency band and 13 channels within the frequency range 5180 – 5825 MHz. The frequency range is 2412 MHz to 2462 MHz and the device operates in 2 modes, OFDM and DSSS. Within the 5180 – 5825 MHz frequency range the device operates in OFDM mode only. For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu. The fixed frequency channels used in the testing are shown in Table 7.

The Bluetooth module operates over 79 channels within the frequency range 2402 to 2480 MHz. It is possible for the Bluetooth module to operate simultaneously with the WLAN module (co-transmission). For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu. The tests were conducted with only the WLAN operating and also with the WLAN and Bluetooth module operating in co-transmission. The fixed frequency channels used in the testing are shown in Table 7. The Bluetooth interface utilizes dedicated antenna, for the purpose of this report labelled antenna "D".

The test results mentioned in this report only apply to the 2450MHz and 5800MHz frequency range. An additional report titled "M060761\_OSIAV\_XB62\_SAR\_5.6" is specific to the 5200/5600MHz range.

The WLAN modules can be configured in a number of different data rates. It was found that the highest source based time averaged power was measured when using the lowest data rates available in each mode. This lowest data rate corresponds to 6Mbps in OFDM mode and 1Mbps in DSSS mode. Table 7 shows the data rates used in the SAR tests.

The frequency span of the 2450 MHz range and 5200/5600/5800MHz Bands was more than 10MHz consequently; the SAR levels of the test sample were measured for lowest, centre and highest channels in the applicable modes. There were no wires or other connections to the Portable Tablet Computer during the SAR measurements.

At the beginning and at the completion of the SAR tests, the conducted power of the device was measured after temporary modification of antenna connector inside the device's TX RX compartment. Measurements were performed with a calibrated Power Meter. The results of this measurement are listed in table 7.

**Table 7: 2450MHz Frequency and Conducted Power Results**

| Channel    | Channel Frequency MHz | Modulation | Antenna Port | *Data Rate (Mbps) | Maximum Conducted Output Power Measured |
|------------|-----------------------|------------|--------------|-------------------|---|
| Channel 01 | 2412                  | DSSS       | A            | 1                 | 17.5                                    |
| Channel 06 | 2437                  | DSSS       | A            | 1                 | 18.0                                    |
| Channel 11 | 2462                  | DSSS       | A            | 1                 | 17.5                                    |
| Channel 01 | 2412                  | DSSS       | B            | 1                 | 17.0                                    |
| Channel 06 | 2437                  | DSSS       | B            | 1                 | 17.5                                    |
| Channel 11 | 2462                  | DSSS       | B            | 1                 | 17.0                                    |
| Channel 01 | 2412                  | OFDM       | A            | 6                 | 17.5                                    |
| Channel 06 | 2437                  | OFDM       | A            | 6                 | 18.0                                    |
| Channel 11 | 2462                  | OFDM       | A            | 6                 | 17.5                                    |
| Channel 01 | 2412                  | OFDM       | B            | 6                 | 17.0                                    |
| Channel 06 | 2437                  | OFDM       | B            | 6                 | 17.5                                    |
| Channel 11 | 2462                  | OFDM       | B            | 6                 | 17.0                                    |
| Bluetooth  |                       |            |              |                   |   |
| Channel 1  | 2402                  | FHSS       | D            | N/A               | 3.5                                     |
| Channel 40 | 2441                  | FHSS       | D            | N/A               | 3.7                                     |
| Channel 79 | 2480                  | FHSS       | D            | N/A               | 3.9                                     |

\*NOTE: The highest conducted power was measured in these data rates for each respective mode. i.e. DSSS & OFDM.

**Table 8: 5800MHz Frequency and Conducted Power Results**

| Channel          | Channel Frequency MHz | Modulation | Antenna Port | *Data Rate (Mbps) | Maximum Conducted Output Power Measured |
|------------------|-----------------------|------------|--------------|-------------------|---|
| OFDM Channel 149 | 5745                  | OFDM       | A            | 6                 | 14.5                                    |
| OFDM Channel 157 | 5785                  | OFDM       | A            | 6                 | 14.5                                    |
| OFDM Channel 165 | 58025                 | OFDM       | A            | 6                 | 14.5                                    |
| OFDM Channel 149 | 5745                  | OFDM       | B            | 6                 | 15.0                                    |
| OFDM Channel 157 | 5785                  | OFDM       | B            | 6                 | 15.5                                    |
| OFDM Channel 165 | 58025                 | OFDM       | B            | 6                 | 15.5                                    |

\*NOTE: The highest conducted power was measured in these data rates for each respective mode. i.e. DSSS & OFDM.

## 2.4 Battery Status

The device battery was fully charged prior to commencement of measurement. Each SAR test was completed within 30 minutes. The battery condition was monitored by measuring the RF field at a defined position inside the phantom before the commencement of each test and again after the completion of the test. It was not possible to perform conducted power measurements at the output of the device, at the beginning and end of each scan due to lack of a suitable antenna port. The uncertainty associated with the power drift was less than 9.5% and was assessed in the uncertainty budget.

## 2.5 Details of Test Laboratory

### 2.5.1 Location

EMC Technologies Pty Ltd - ACN/ABN: 82057105549  
57 Assembly Drive  
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Australia 3043

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**website:** [www.emctech.com.au](http://www.emctech.com.au)

### 2.5.2 Accreditations

EMC Technologies Pty. Ltd. is accredited by the National Association of Testing Authorities, Australia (NATA).  
**NATA Accredited Laboratory Number: 5292**

EMC Technologies Pty Ltd is NATA accredited for the following standards:

|                        |  |
|------------------------|--|
| <b>AS/NZS 2772.1:</b>  | RF and microwave radiation hazard measurement  |
| <b>ACA:</b>            | Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003  |
| <b>FCC:</b>            | Guidelines for Human Exposure to RF Electromagnetic Field OET65C 01/01   |
| <b>CENELEC:</b>        | ES59005: 1998  |
| <b>EN 50360: 2001</b>  | Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)              |
| <b>EN 50361: 2001</b>  | Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz – 3GHz)                          |
| <b>IEEE 1528: 2003</b> | Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques. |

Refer to NATA website [www.nata.asn.au](http://www.nata.asn.au) for the full scope of accreditation.

### 2.5.3 Environmental Factors

The measurements were performed in a shielded room with no background RF signals. The temperature in the laboratory was controlled to within  $21\pm1^{\circ}\text{C}$  and the humidity was 35%. The liquid parameters are measured daily prior to the commencement of each test. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN1377 and the SN3563 probe was less than  $5\mu\text{V}$  in both air and liquid mediums.



### 3.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

#### 3.1 Probe Positioning System

The measurements were performed with the state-of-the-art automated near-field scanning system **DASY4 V4.6 Build 23.7** from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision 6-axis robot (working range greater than 1.1m), which positions the SAR measurement probes with a positional repeatability of better than  $\pm 0.02$  mm. The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN50361 SAR measurement requirements.

#### 3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with SPEAG dosimetric probe ET3DV6 Serial: 1377 (2.45 GHz) and SPEAG dosimetric probe ES3DV3 Serial: 3029 (5.2-5.8 GHz) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probes have been calibrated and found to be accurate to better than  $\pm 0.25$  dB. The probe is suitable for measurements close to material discontinuity at the surface of the phantom. The sensors of the probe are directly loaded with Schottky diodes and connected via highly resistive lines (length = 300 mm) to the data acquisition unit.

#### 3.3 Data Acquisition Electronics

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. The input impedance of the DAE3 box is 200 M $\Omega$ ; the inputs are symmetrical and floating. Common mode rejection is above 80dB. Transmission to the PC-card is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The mechanical probe-mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

#### 3.4 Calibration and Validation Procedures and Data

Prior to the SAR assessment, the system validation kit was used to verify that the DASY4 was operating within its specifications. The validation was performed at 2450 MHz with the SPEAG 2450V2 calibrated dipole and at 5800 MHz with the SPEAG D5GHzV2 calibrated dipole.

The validation dipoles are highly symmetric and matched at the centre frequency for the specified liquid and distance to the phantom. The accurate distance between the liquid surface and the dipole centre is achieved with a distance holder that snaps onto the dipole.

System validation is performed by feeding a known power level into a reference dipole, set at a known distance from the phantom. The measured SAR is compared to the theoretically derived level.

##### 3.4.1 Validation Results @ 2450MHz & 5800MHz

The following tables list the dielectric properties of the tissue simulating liquid measured prior to SAR validation. The results of the validation are listed in columns 4 and 5. The forward power into the reference dipole for SAR validation was adjusted to 250 mW.

**Table 9: Validation Results (Dipole: SPEAG D2450V2 SN: 724)**

| 1. Validation Date           | Frequency | 2. $\epsilon_r$ (measured) | 3. $\sigma$ (mho/m) (measured) | 4. Measured SAR 1g (mW/g) | 5. Measured SAR 10g (mW/g) |
|------------------------------|-----------|----------------------------|--------------------------------|---------------------------|----------------------------|
| 9 <sup>th</sup> August 2006  | 2450MHz   | 50.7                       | 1.98                           | 13.7                      | 6.50                       |
| 10 <sup>th</sup> August 2006 | 2450MHz   | 40.4                       | 1.79                           | 13.7                      | 6.48                       |
| 11 <sup>th</sup> August 2006 | 5800MHz   | 33.7                       | 5.38                           | 19.4                      | 5.47                       |
| 14 <sup>th</sup> August 2006 | 5800MHz   | 34.1                       | 5.24                           | 19.4                      | 5.50                       |
| 15 <sup>th</sup> August 2006 | 5800MHz   | 33.7                       | 5.37                           | 19.7                      | 5.51                       |

### 3.4.2 Deviation from reference validation values

The reference SAR values are derived using a reference dipole and flat section of the SAM phantom suitable for a centre frequency of 2450MHz. These reference SAR values are obtained from the IEEE Std 1528-2003 and are normalized to 1W.

The SPEAG calibration reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole (D2450V2) during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in the tables below.

**Table 10: Deviation from reference validation values @ 2450MHz**

| Frequency and Date                    | Measured SAR 1g (mW/g) | Measured SAR 1g (Normalized to 1W) | SPEAG Calibration reference SAR Value 1g (mW/g) | Deviation From SPEAG Reference (1g) | IEEE Std 1528 reference SAR value 1g (mW/g) | Deviation From IEEE (1g) |
|---------------------------------------|------------------------|------------------------------------|---|-------------------------------------|---|--------------------------|
| 2450MHz<br>9 <sup>th</sup> August 06  | 13.7                   | 54.8                               | 55.6  | -1.44                               | 52.4  | 4.58                     |
| 2450MHz<br>10 <sup>th</sup> August 06 | 13.7                   | 54.8                               | 55.6  | -1.44                               | 52.4  | 4.58                     |

NOTE: All reference validation values are referenced to 1W input power.

**Table 11: Deviation from reference validation values @ 5200MHz and 5800MHz**

| Frequency and Date                      | Measured SAR 1g (mW/g) | Measured SAR 1g (Normalized to 1W) | SPEAG Calibration reference SAR Value 1g (mW/g) | Deviation From SPEAG Reference (1g) |
|---|------------------------|------------------------------------|---|-------------------------------------|
| 5800MHz<br>11 <sup>th</sup> August 2006 | 19.4                   | 77.6                               | 80.8  | -3.96                               |
| 5800MHz<br>14 <sup>th</sup> August 2006 | 19.4                   | 77.6                               | 80.8  | -3.96                               |
| 5800MHz<br>15 <sup>th</sup> August 2006 | 19.7                   | 77.7                               | 80.8  | -2.47                               |

NOTE: All reference validation values are referenced to 1W input power.

### 3.4.3 Liquid Depth 15cm

During the SAR measurement process the liquid level was maintained to a level of 15cm with a tolerance of 0.5cm.

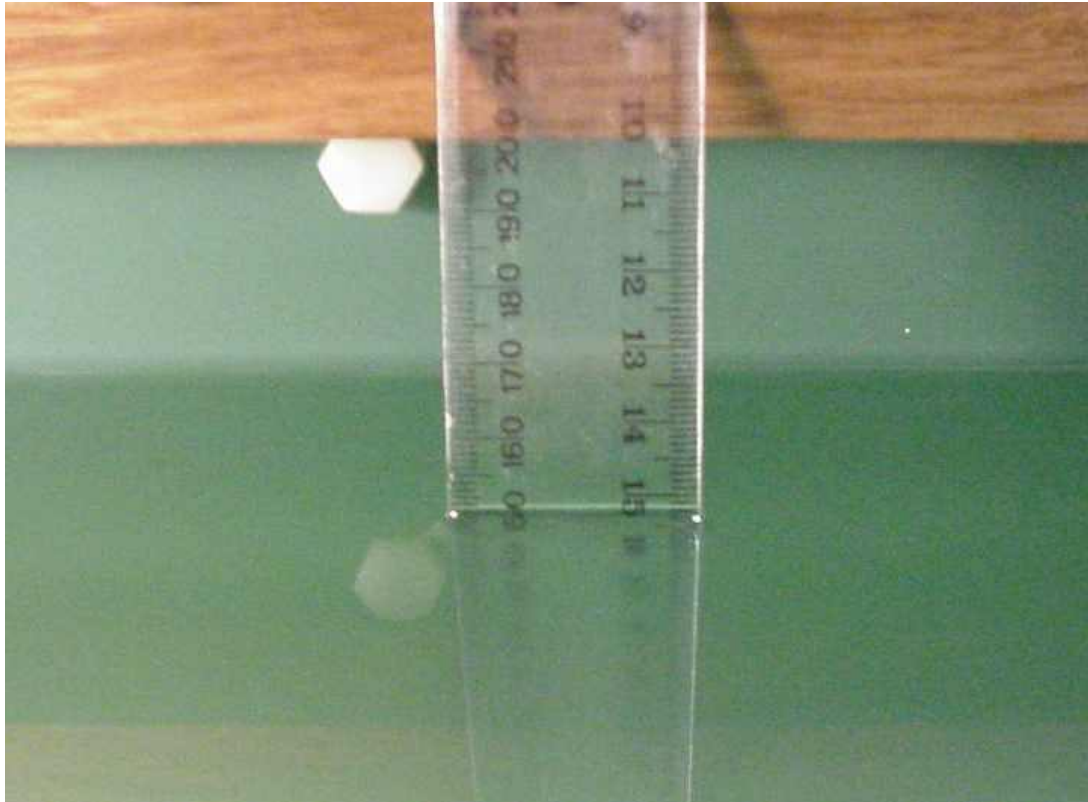


Photo of liquid Depth in Flat Phantom

### 3.5 Phantom Properties (Size, Shape, Shell Thickness)

The phantom used during the validations was the SAM Phantom model: TP - 1260 from SPEAG. It is a phantom with a single thickness of 2 mm and was filled with the required tissue simulating liquid. The SAM phantom support structures were all non-metallic and spaced more than one device width away in transverse directions.

For SAR testing in the body worn positions an AndreT Flat phantom P 10.1 was used. The phantom thickness is 2.0mm+/-0.2 mm and was filled with the required tissue simulating liquid. Table 10 provides a summary of the measured phantom properties.

**Table 12: Phantom Properties (300MHz-2500MHz)**

| Phantom Properties        | Required                           | Measured                                |
|---------------------------|------------------------------------|---|
| Thickness of flat section | 2.0mm $\pm$ 0.2mm (bottom section) | 2.12-2.20mm                             |
| Dielectric Constant       | <5.0                               | 4.603 @ 300MHz (worst-case frequency)   |
| Loss Tangent              | <0.05                              | 0.0379 @ 2500MHz (worst-case frequency) |

Depth of Phantom 200mm  
 Length of Flat Section 620mm  
 Width of Flat Section 540mm

**Table 13: Phantom Properties (300MHz-2500MHz)**

| Phantom Properties        | Required                           | Measured                                |
|---------------------------|------------------------------------|---|
| Thickness of flat section | 2.0mm $\pm$ 0.2mm (bottom section) | 2.12-2.20mm                             |
| Dielectric Constant       | <5.0                               | 4.603 @ 300MHz (worst-case frequency)   |
| Loss Tangent              | <0.05                              | 0.0379 @ 2500MHz (worst-case frequency) |

Depth of Phantom 200mm  
 Length of Flat Section 620mm  
 Width of Flat Section 540mm

**P 10.1 Flat Phantom**



**P 10.1 Flat Phantom**



### 3.6 Tissue Material Properties

The dielectric parameters of the brain simulating liquid were measured prior to SAR assessment using the HP85070A dielectric probe kit and HP8753ES Network Analyser. The actual dielectric parameters are shown in the following table.

**Table 14: Measured Brain Simulating Liquid Dielectric Values for Validations**

| Frequency Band | $\epsilon_r$ (measured range) | $\epsilon_r$ (target)           | $\sigma$ (mho/m) (measured range) | $\sigma$ (target)               | $\rho$ kg/m <sup>3</sup> |
|----------------|-------------------------------|---------------------------------|-----------------------------------|---------------------------------|--------------------------|
| 2450 MHz Brain | 40.0 – 40.4                   | 39.2 $\pm$ 5%<br>(37.2 to 41.2) | 1.78 - 1.84                       | 1.80 $\pm$ 5%<br>(1.71 to 1.89) | 1000                     |
| 5800 MHz Brain | 33.7 - 35.6                   | 35.3 $\pm$ 5%<br>(33.5 to 37.1) | 5.30 - 5.42                       | 5.27 $\pm$ 5%<br>(5.01 to 5.53) | 1000                     |

NOTE: The brain liquid parameters were within the required tolerances of  $\pm$ 5%.

**Table 15: Measured Body Simulating Liquid Dielectric Values**

| Frequency Band  | $\epsilon_r$ (measured range) | $\epsilon_r$ (target)           | $\sigma$ (mho/m) (measured range) | $\sigma$ (target)               | $\rho$ kg/m <sup>3</sup> |
|-----------------|-------------------------------|---------------------------------|-----------------------------------|---------------------------------|--------------------------|
| 2412 MHz Muscle | 50.9 – 51.4                   | 52.7 $\pm$ 5%<br>(50.1 to 55.3) | 1.87 - 1.94                       | 1.95 $\pm$ 5%<br>(1.85 to 2.05) | 1000                     |
| 2437 MHz Muscle | 50.7 – 51.3                   | 52.7 $\pm$ 5%<br>(50.1 to 55.3) | 1.92 - 1.98                       | 1.95 $\pm$ 5%<br>(1.85 to 2.05) | 1000                     |
| 2462 MHz Muscle | 50.6 – 51.1                   | 52.7 $\pm$ 5%<br>(50.1 to 55.3) | 1.96 - 2.02                       | 1.95 $\pm$ 5%<br>(1.85 to 2.05) | 1000                     |

NOTE: The brain and muscle liquid parameters were within the required tolerances of  $\pm$ 5%.

#### 3.6.1 Liquid Temperature and Humidity

The humidity and dielectric/ambient temperatures were recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than  $|2|^\circ\text{C}$ .

**Table 16: Temperature and Humidity recorded for each day**

| Date                         | Ambient Temperature ( $^\circ\text{C}$ ) | Liquid Temperature ( $^\circ\text{C}$ ) | Humidity (%) |
|------------------------------|--|---|--------------|
| 9 <sup>th</sup> August 2006  | 20.4                                     | 19.9                                    | 36.0         |
| 10 <sup>th</sup> August 2006 | 21.4                                     | 20.1                                    | 36.0         |
| 11 <sup>th</sup> August 2006 | 21.4                                     | 20.5                                    | 37.0         |
| 14 <sup>th</sup> August 2006 | 20.4                                     | 20.0                                    | 35.0         |
| 15 <sup>th</sup> August 2006 | 20.4                                     | 19.9                                    | 41.0         |

### 3.7 Simulated Tissue Composition Used for SAR Test

The tissue simulating liquids are created prior to the SAR evaluation and often require slight modification each day to obtain the correct dielectric parameters.

**Table 17: Tissue Type: Brain @ 2450MHz**

Volume of Liquid: 30 Litres

| Approximate Composition | % By Weight |
|-------------------------|-------------|
| Distilled Water         | 62.7        |
| Salt                    | 0.5         |
| Triton X-100            | 36.8        |

\*Refer "OET Bulletin 65 97/01 P38"

**Table 18: Tissue Type: Muscle @ 2450MHz**

Volume of Liquid: 60 Litres

| Approximate Composition | % By Weight |
|-------------------------|-------------|
| Distilled Water         | 73.2        |
| Salt                    | 0.04        |
| DGBE                    | 26.7        |

**Table 19: Tissue Type: Muscle @ 5600MHz**

Volume of Liquid: 60 Litres

EMCT Liquid

| Composition     |
|-----------------|
| Distilled Water |
| Salt            |
| Triton X-100    |

SPEAG liquid (validation)

| Composition |
|-------------|
| Proprietary |
|             |
|             |

### 3.8 Device Holder for Laptops and P 10.1 Phantom

A low loss clamp was used to position the Laptop underneath the phantom surface. Small pieces of foam were then used to press the laptop flush against the phantom surface.

*Refer to Appendix A for photographs of device positioning*

## 4.0 SAR MEASUREMENT PROCEDURE USING DASY4

The SAR evaluation was performed with the SPEAG DASY4 system. A summary of the procedure follows:

- a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the EUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.
- b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 3.9 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 15 mm x 15 mm. The actual Area Scan has dimensions of 101 mm x 81 mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first “pre-scans” covered an area of 151 mm x 201 mm to ensure that the hotspot was correctly identified.
- c) Around this point, a volume of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:
  - (i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.
  - (ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.
  - (iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.
  - (iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.



## 5.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both Handset SAR tests and Validation uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95% confidence level) must be less than 30%.

**Table 20: Uncertainty Budget for DASY4 Version V4.6 Build 23.7 – EUT SAR test @ 2450MHz**

| a   | b     | c           | d              | e=<br>f(d,k) | f                   | g                    | h=cxf/e               | i=cxg/e                | k              |
|---|-------|-------------|----------------|--------------|---------------------|----------------------|-----------------------|------------------------|----------------|
| Uncertainty Component   | Sec.  | Tol.<br>(%) | Prob.<br>Dist. | Div.         | C <sub>i</sub> (1g) | C <sub>i</sub> (10g) | 1g u <sub>i</sub> (%) | 10g u <sub>i</sub> (%) | v <sub>i</sub> |
| <b>Measurement System</b>   |       |             |                |              |                     |                      |                       |                        |                |
| Probe Calibration (k=1) (numerical calibration)                                 | 7.2.1 | 4.8         | N              | 1            | 1                   | 1                    | 4.8                   | 4.8                    | ∞              |
| Axial Isotropy  | 7.2.1 | 4.7         | R              | 1.73         | 0.707               | 0.707                | 1.9                   | 1.9                    | ∞              |
| Hemispherical Isotropy  | 7.2.1 | 9.6         | R              | 1.73         | 0.707               | 0.707                | 3.9                   | 3.9                    | ∞              |
| Boundary Effect   | 7.2.1 | 1           | R              | 1.73         | 1                   | 1                    | 0.6                   | 0.6                    | ∞              |
| Linearity   | 7.2.1 | 4.7         | R              | 1.73         | 1                   | 1                    | 2.7                   | 2.7                    | ∞              |
| System Detection Limits   | 7.2.1 | 1           | R              | 1.73         | 1                   | 1                    | 0.6                   | 0.6                    | ∞              |
| Readout Electronics   | 7.2.1 | 1           | N              | 1            | 1                   | 1                    | 1.0                   | 1.0                    | ∞              |
| Response Time   | 7.2.1 | 0.8         | R              | 1.73         | 1                   | 1                    | 0.5                   | 0.5                    | ∞              |
| Integration Time  | 7.2.1 | 2.6         | R              | 1.73         | 1                   | 1                    | 1.5                   | 1.5                    | ∞              |
| RF Ambient Conditions   | 7.2.3 | 0.05        | R              | 1.73         | 1                   | 1                    | 0.0                   | 0.0                    | ∞              |
| Probe Positioner Mechanical Tolerance   | 7.2.2 | 0.4         | R              | 1.73         | 1                   | 1                    | 0.2                   | 0.2                    | ∞              |
| Probe Positioning with respect to Phantom Shell                                 | 7.2.2 | 2.9         | R              | 1.73         | 1                   | 1                    | 1.7                   | 1.7                    | ∞              |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | 7.2.4 | 1           | R              | 1.73         | 1                   | 1                    | 0.6                   | 0.6                    | ∞              |
| <b>Test Sample Related</b>  |       |             |                |              |                     |                      |                       |                        |                |
| Test Sample Positioning   | 7.2.2 | 1.61        | N              | 1            | 1                   | 1                    | 1.6                   | 1.6                    | 11             |
| Device Holder Uncertainty   |       |             |                |              |                     |                      |                       |                        |                |
| Output Power Variation – SAR Drift Measurement                                  | 7.2.3 | 11.7        | R              | 1.73         | 1                   | 1                    | 6.8                   | 6.8                    | ∞              |
| <b>Phantom and Tissue Parameters</b>  |       |             |                |              |                     |                      |                       |                        |                |
| Phantom Uncertainty (shape and thickness tolerances)                            | 7.2.2 | 4           | R              | 1.73         | 1                   | 1                    | 2.3                   | 2.3                    | ∞              |
| Liquid Conductivity – Deviation from target values                              | 7.2.3 | 5           | R              | 1.73         | 0.64                | 0.43                 | 1.8                   | 1.2                    | ∞              |
| Liquid Conductivity – Measurement uncertainty                                   | 7.2.3 | 4.3         | N              | 1            | 0.64                | 0.43                 | 2.8                   | 1.8                    | 5              |
| Liquid Permittivity – Deviation from target values                              | 7.2.3 | 5           | R              | 1.73         | 0.6                 | 0.49                 | 1.7                   | 1.4                    | ∞              |
| Liquid Permittivity – Measurement uncertainty                                   | 7.2.3 | 4.3         | N              | 1            | 0.6                 | 0.49                 | 2.6                   | 2.1                    | 5              |
| Combined standard Uncertainty   |       |             | RSS            |              |                     |                      | 11.4                  | 11.0                   | 154            |
| Expanded Uncertainty (95% CONFIDENCE LEVEL)                                     |       |             | k=2            |              |                     |                      | 22.9                  | 22.07                  |                |

Estimated total measurement uncertainty for the DASY4 measurement system was  $\pm 11.4\%$ . The extended uncertainty ( $K = 2$ ) was assessed to be  $\pm 22.9\%$  based on 95% confidence level. The uncertainty is not added to the measurement result.



**Table 21: Uncertainty Budget for DASY4 Version V4.6 Build 23.7 – Validation 2450MHz**

| a   | b     | c            | D              | e=<br>f(d,k) | f                   | g                    | h=cxf/e                   | i=cxg/e                    | k              |
|---|-------|--------------|----------------|--------------|---------------------|----------------------|---------------------------|----------------------------|----------------|
| Uncertainty Component   | Sec.  | Tol.<br>(6%) | Prob.<br>Dist. | Div.         | C <sub>i</sub> (1g) | C <sub>i</sub> (10g) | 1g u <sub>i</sub><br>(6%) | 10g u <sub>i</sub><br>(6%) | V <sub>i</sub> |
| <b>Measurement System</b>   |       |              |                |              |                     |                      |                           |                            |                |
| Probe Calibration (k=1) (standard calibration)                                  | E.2.1 | 4.8          | N              | 1            | 1                   | 1                    | 4.8                       | 4.8                        | ∞              |
| Axial Isotropy  | E.2.2 | 4.7          | R              | 1.73         | 1                   | 1                    | 2.7                       | 2.7                        | ∞              |
| Hemispherical Isotropy  | E.2.2 | 0            | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| Boundary Effect   | E.2.3 | 1            | R              | 1.73         | 1                   | 1                    | 0.6                       | 0.6                        | ∞              |
| Linearity   | E.2.4 | 4.7          | R              | 1.73         | 1                   | 1                    | 2.7                       | 2.7                        | ∞              |
| System Detection Limits   | E.2.5 | 1            | R              | 1.73         | 1                   | 1                    | 0.6                       | 0.6                        | ∞              |
| Readout Electronics   | E.2.6 | 1            | N              | 1            | 1                   | 1                    | 1.0                       | 1.0                        | ∞              |
| Response Time   | E.2.7 | 0            | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| Integration Time  | E.2.8 | 0            | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| RF Ambient Conditions   | E.6.1 | 0.05         | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| Probe Positioner Mechanical Tolerance   | E.6.2 | 0.4          | R              | 1.73         | 1                   | 1                    | 0.2                       | 0.2                        | ∞              |
| Probe Positioning with respect to Phantom Shell                                 | E.6.3 | 2.9          | R              | 1.73         | 1                   | 1                    | 1.7                       | 1.7                        | ∞              |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E.5   | 1            | R              | 1.73         | 1                   | 1                    | 0.6                       | 0.6                        | ∞              |
| <b>Test Sample Related</b>  |       |              |                | □            |                     |                      |                           |                            |                |
| Dipole Axis to Liquid Surface   |       | 2            | R              | 1.73         | 1                   | 1                    | 1.2                       | 1.2                        | ∞              |
| Power Drift   |       | 4.7          | R              | 1.73         | 1                   | 1                    | 2.7                       | 2.7                        | ∞              |
|   |       |              |                | □            |                     |                      |                           |                            | □              |
| <b>Phantom and Tissue Parameters</b>  |       |              |                |              |                     |                      |                           |                            |                |
| Phantom Uncertainty (shape and thickness tolerances)                            | E.3.1 | 4            | R              | 1.73         | 1                   | 1                    | 2.3                       | 2.3                        | ∞              |
| Liquid Conductivity – Deviation from target values                              | E.3.2 | 5            | R              | 1.73         | 0.6                 | 0.43                 | 1.7                       | 1.2                        | ∞              |
| Liquid Conductivity – Measurement uncertainty                                   | E.3.3 | 2.5          | N              | 1.73         | 0.6                 | 0.43                 | 0.9                       | 0.6                        | 5              |
| Liquid Permittivity – Deviation from target values                              | E.3.2 | 5            | R              | 1.73         | 0.6                 | 0.49                 | 1.7                       | 1.4                        | ∞              |
| Liquid Permittivity – Measurement uncertainty                                   | E.3.3 | 2.5          | N              | 1.73         | 0.6                 | 0.49                 | 0.9                       | 0.7                        | 5              |
| Combined standard Uncertainty   |       |              | RSS            |              |                     |                      | <b>8.0</b>                | <b>7.8</b>                 | 154            |
| Expanded Uncertainty (95% CONFIDENCE LEVEL)                                     |       |              | k=2            |              |                     |                      | 16.0                      | 15.63                      |                |

Estimated total measurement uncertainty for the DASY4 measurement system was  $\pm 8.0\%$ . The extended uncertainty ( $K = 2$ ) was assessed to be  $\pm 16.0\%$  based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

**Table 22: Uncertainty Budget for DASY4 Version V4.6 Build 23.7 – EUT SAR test @ 5200/5600 MHz**

| a   | b     | c            | d              | e=<br>f(d,k) | f                   | g                    | h=cxf/e                   | i=cxg/e                    | k              |
|---|-------|--------------|----------------|--------------|---------------------|----------------------|---------------------------|----------------------------|----------------|
| Uncertainty Component   | Sec.  | Tol.<br>(6%) | Prob.<br>Dist. | Div.         | C <sub>i</sub> (1g) | C <sub>i</sub> (10g) | 1g u <sub>i</sub><br>(6%) | 10g u <sub>i</sub><br>(6%) | v <sub>i</sub> |
| <b>Measurement System</b>   |       |              |                |              |                     |                      |                           |                            |                |
| Probe Calibration (k=1) (standard calibration)                                  | E.2.1 | 6.6          | N              | 1            | 1                   | 1                    | 6.6                       | 6.6                        | ∞              |
| Axial Isotropy  | E.2.2 | 4.7          | R              | 1.73         | 1                   | 1                    | 2.7                       | 2.7                        | ∞              |
| Hemispherical Isotropy  | E.2.2 | 0            | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| Boundary Effect   | E.2.3 | 2            | R              | 1.73         | 1                   | 1                    | 1.2                       | 1.2                        | ∞              |
| Linearity   | E.2.4 | 4.7          | R              | 1.73         | 1                   | 1                    | 2.7                       | 2.7                        | ∞              |
| System Detection Limits   | E.2.5 | 1            | R              | 1.73         | 1                   | 1                    | 0.6                       | 0.6                        | ∞              |
| Readout Electronics   | E.2.6 | 1            | N              | 1            | 1                   | 1                    | 1.0                       | 1.0                        | ∞              |
| Response Time   | E.2.7 | 0            | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| Integration Time  | E.2.8 | 0            | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| RF Ambient Conditions   | E.6.1 | 0.075        | R              | 1.73         | 1                   | 1                    | 0.0                       | 0.0                        | ∞              |
| Probe Positioner Mechanical Tolerance   | E.6.2 | 0.8          | R              | 1.73         | 1                   | 1                    | 0.5                       | 0.5                        | ∞              |
| Probe Positioning with respect to Phantom Shell                                 | E.6.3 | 5.7          | R              | 1.73         | 1                   | 1                    | 3.3                       | 3.3                        | ∞              |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E.5   | 4            | R              | 1.73         | 1                   | 1                    | 2.3                       | 2.3                        | ∞              |
| <b>Test Sample Related</b>  |       |              |                |              |                     |                      |                           |                            |                |
| Dipole Axis to Liquid distance  | E.4.2 | 2            | N              | 1            | 1                   | 1                    | 2.0                       | 2.0                        | 11             |
| Output Power Variation – SAR Drift Measurement                                  | 6.6.2 | 11.7         | R              | 1.73         | 1                   | 1                    | 6.8                       | 6.8                        | ∞              |
| <b>Phantom and Tissue Parameters</b>  |       |              |                |              |                     |                      |                           |                            |                |
| Phantom Uncertainty (shape and thickness tolerances)                            | E.3.1 | 4            | R              | 1.73         | 1                   | 1                    | 2.3                       | 2.3                        | ∞              |
| Liquid Conductivity – Deviation from target values                              | E.3.2 | 5            | R              | 1.73         | 0.64                | 0.43                 | 1.8                       | 1.2                        | ∞              |
| Liquid Conductivity – Measurement uncertainty                                   | E.3.3 | 2.5          | N              | 1            | 0.64                | 0.43                 | 1.6                       | 1.1                        | 5              |
| Liquid Permittivity – Deviation from target values                              | E.3.2 | 5            | R              | 1.73         | 0.6                 | 0.49                 | 1.7                       | 1.4                        | ∞              |
| Liquid Permittivity – Measurement uncertainty                                   | E.3.3 | 2.5          | N              | 1            | 0.6                 | 0.49                 | 1.5                       | 1.2                        | 5              |
| Combined standard Uncertainty   |       |              | RSS            |              |                     |                      | 12.0                      | 11.8                       | 154            |
| Expanded Uncertainty (95% CONFIDENCE LEVEL)                                     |       |              | k=2            |              |                     |                      | 24.0                      | 23.54                      |                |

Estimated total measurement uncertainty for the DASY4 measurement system was  $\pm 12\%$ . The extended uncertainty ( $K = 2$ ) was assessed to be  $\pm 24.0\%$  based on 95% confidence level. The uncertainty is not added to the measurement result.

**Table 23: Uncertainty Budget for DASY4 Version V4.6 Build 23.7 – Validation 5200/5600 MHz**

| a   | b     | c           | d              | e=<br>f(d,k) | f                   | g                    | h=cxf/e               | i=cxg/e                | k              |
|---|-------|-------------|----------------|--------------|---------------------|----------------------|-----------------------|------------------------|----------------|
| Uncertainty Component   | Sec.  | Tol.<br>(%) | Prob.<br>Dist. | Div.         | C <sub>i</sub> (1g) | C <sub>i</sub> (10g) | 1g u <sub>i</sub> (%) | 10g u <sub>i</sub> (%) | v <sub>i</sub> |
| <b>Measurement System</b>   |       |             |                |              |                     |                      |                       |                        |                |
| Probe Calibration (k=1) (standard calibration)                                  | E.2.1 | 8.3         | N              | 1            | 1                   | 1                    | 8.3                   | 8.3                    | ∞              |
| Axial Isotropy  | E.2.2 | 4.7         | R              | 1.73         | 1                   | 1                    | 2.7                   | 2.7                    | ∞              |
| Hemispherical Isotropy  | E.2.2 | 0           | R              | 1.73         | 1                   | 1                    | 0.0                   | 0.0                    | ∞              |
| Boundary Effect   | E.2.3 | 2           | R              | 1.73         | 1                   | 1                    | 1.2                   | 1.2                    | ∞              |
| Linearity   | E.2.4 | 4.7         | R              | 1.73         | 1                   | 1                    | 2.7                   | 2.7                    | ∞              |
| System Detection Limits   | E.2.5 | 1           | R              | 1.73         | 1                   | 1                    | 0.6                   | 0.6                    | ∞              |
| Readout Electronics   | E.2.6 | 1           | N              | 1            | 1                   | 1                    | 1.0                   | 1.0                    | ∞              |
| Response Time   | E.2.7 | 0           | R              | 1.73         | 1                   | 1                    | 0.0                   | 0.0                    | ∞              |
| Integration Time  | E.2.8 | 0           | R              | 1.73         | 1                   | 1                    | 0.0                   | 0.0                    | ∞              |
| RF Ambient Conditions   | E.6.1 | 0.075       | R              | 1.73         | 1                   | 1                    | 0.0                   | 0.0                    | ∞              |
| Probe Positioner Mechanical Tolerance   | E.6.2 | 0.8         | R              | 1.73         | 1                   | 1                    | 0.5                   | 0.5                    | ∞              |
| Probe Positioning with respect to Phantom Shell                                 | E.6.3 | 5.7         | R              | 1.73         | 1                   | 1                    | 3.3                   | 3.3                    | ∞              |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E.5   | 4           | R              | 1.73         | 1                   | 1                    | 2.3                   | 2.3                    | ∞              |
| <b>Test Sample Related</b>  |       |             |                |              |                     |                      |                       |                        |                |
| Dipole Axis to Liquid distance  | E.4.2 | 2           | N              | 1            | 1                   | 1                    | 2.0                   | 2.0                    | 11             |
| Output Power Variation – SAR Drift Measurement                                  | 6.6.2 | 4.7         | R              | 1.73         | 1                   | 1                    | 2.7                   | 2.7                    | ∞              |
| <b>Phantom and Tissue Parameters</b>  |       |             |                |              |                     |                      |                       |                        |                |
| Phantom Uncertainty (shape and thickness tolerances)                            | E.3.1 | 4           | R              | 1.73         | 1                   | 1                    | 2.3                   | 2.3                    | ∞              |
| Liquid Conductivity – Deviation from target values                              | E.3.2 | 10          | R              | 1.73         | 0.64                | 0.43                 | 3.7                   | 2.5                    | ∞              |
| Liquid Conductivity – Measurement uncertainty                                   | E.3.3 | 2.5         | N              | 1            | 0.64                | 0.43                 | 1.6                   | 1.1                    | 5              |
| Liquid Permittivity – Deviation from target values                              | E.3.2 | 10          | R              | 1.73         | 0.6                 | 0.49                 | 3.5                   | 2.8                    | ∞              |
| Liquid Permittivity – Measurement uncertainty                                   | E.3.3 | 2.5         | N              | 1            | 0.6                 | 0.49                 | 1.5                   | 1.2                    | 5              |
| Combined standard Uncertainty   |       |             | RSS            |              |                     |                      | 12.2                  | 11.7                   | 154            |
| Expanded Uncertainty (95% CONFIDENCE LEVEL)                                     |       |             | k=2            |              |                     |                      | 24.5                  | 23.34                  |                |

Estimated total measurement uncertainty for the DASY4 measurement system was  $\pm 12.2\%$ . The extended uncertainty ( $K = 2$ ) was assessed to be  $\pm 24.5\%$  based on 95% confidence level. The uncertainty is not added to the measurement result.

## 6.0 EQUIPMENT LIST AND CALIBRATION DETAILS

**Table 24: SPEAG DASY4 V4.6 Build 23.7**

| Equipment Type                   | Manufacturer    | Model Number | Serial Number | Calibration Due | Used For this Test? |
|----------------------------------|-----------------|--------------|---------------|-----------------|---------------------|
| Robot - Six Axes                 | Staubli         | RX90BL       | N/A           | Not applicable  | YES                 |
| Robot Remote Control             | SPEAG           | CS7MB        | RX90B         | Not applicable  | YES                 |
| SAM Phantom                      | SPEAG           | N/A          | 1260          | Not applicable  | YES                 |
| SAM Phantom                      | SPEAG           | N/A          | 1060          | Not applicable  | NO                  |
| Flat Phantom                     | AndreT          | 10.1         | P 10.1        | Not Applicable  | YES                 |
| Flat Phantom                     | AndreT          | 9.1          | P 9.1         | Not Applicable  | NO                  |
| Flat Phantom                     | SPEAG           | PO1A 6mm     | 1003          | Not Applicable  | NO                  |
| Data Acquisition Electronics     | SPEAG           | DAE3 V1      | 359           | 07-July-2006    | NO                  |
| Data Acquisition Electronics     | SPEAG           | DAE3 V1      | 442           | 08-Dec-2006     | YES                 |
| Probe E-Field - Dummy            | SPEAG           | DP1          | N/A           | Not applicable  | NO                  |
| Probe E-Field                    | SPEAG           | ET3DV6       | 1380          | 14-Dec-2006     | NO                  |
| Probe E-Field                    | SPEAG           | ET3DV6       | 1377          | 14-July-2006    | YES                 |
| Probe E-Field                    | SPEAG           | ES3DV6       | 3029          | 1-Nov-2005      | NO                  |
| Probe E-Field                    | SPEAG           | EX3DV4       | 3563          | 14-July-2007    | YES                 |
| Antenna Dipole 300 MHz           | SPEAG           | D300V2       | 1005          | 26-Oct-2007     | NO                  |
| Antenna Dipole 450 MHz           | SPEAG           | D450V2       | 1009          | 15-Dec-2006     | NO                  |
| Antenna Dipole 900 MHz           | SPEAG           | D900V2       | 047           | 12-July-2006    | NO                  |
| Antenna Dipole 1640 MHz          | SPEAG           | D1640V2      | 314           | 25-May-2006     | NO                  |
| Antenna Dipole 1800 MHz          | SPEAG           | D1800V2      | 242           | 13-July-2006    | NO                  |
| Antenna Dipole 2450 MHz          | SPEAG           | D2450V2      | 724           | 2-Nov-2006      | YES                 |
| Antenna Dipole 3500 MHz          | SPEAG           | D3500V2      | 1002          | 1-July-2007     | NO                  |
| Antenna Dipole 5600 MHz          | SPEAG           | D5GHzV2      | 1008          | 27-Oct-2007     | YES                 |
| RF Amplifier                     | EIN             | 603L         | N/A           | In test         | YES                 |
| RF Amplifier                     | Mini-Circuits   | ZHL-42       | N/A           | In test         | YES                 |
| RF Amplifier                     | Mini-Circuits   | ZVE-8G       | N/A           | In test         | YES                 |
| Synthesized signal generator     | Hewlett Packard | ESG-D3000A   | GB37420238    | *Not Required   | YES                 |
| RF Power Meter Dual              | Hewlett Packard | 437B         | 3125012786    | 30-May-2007     | YES                 |
| RF Power Sensor<br>0.01 - 18 GHz | Hewlett Packard | 8481H        | 1545A01634    | 30-May-2007     | YES                 |
| RF Power Meter Dual              | Gigatronics     | 8542B        | 1830125       | 18-April-2007   | YES                 |
| RF Power Sensor                  | Gigatronics     | 80301A       | 1828805       | 18-April-2007   | YES                 |
| RF Power Meter Dual              | Hewlett Packard | 435A         | 1733A05847    | *Not Required   | YES                 |
| RF Power Sensor                  | Hewlett Packard | 8482A        | 2349A10114    | *Not Required   | YES                 |
| Network Analyser                 | Hewlett Packard | 8714B        | GB3510035     | 31-Aug-2006     | NO                  |
| Network Analyser                 | Hewlett Packard | 8753ES       | JP39240130    | 11-Aug-2006     | YES                 |
| Dual Directional Coupler         | Hewlett Packard | 778D         | 1144 04700    | In test         | NO                  |
| Dual Directional Coupler         | NARDA           | 3022         | 75453         | In test         | YES                 |

## 7.0 OET BULLETIN 65 – SUPPLEMENT C TEST METHOD

Notebooks should be evaluated in normal use positions, typical for lap-held bottom-face only. However the number of positions will depend on the number of configurations the laptop can be operated in. The ST Series laptop “Osian” can only be used in the Tablet configuration. The antenna location in the “Osian” is closest to the top of the screen and due to the separation distances involved between the phantom and the laptop antenna, testing is not required in this position.

In the tablet position the antenna location is closest to the screen of the laptop. The ST Series tablets use interactive screen modes that allow the user to place their arms/hands on the tablet screen. To account for occasional exposure to the arms, SAR tests were performed with the tablet screen facing the phantom.

Therefore SAR measurements were performed with the front and back of the laptop facing the flat section of the AndreT Flat phantom (P 10.1). See Appendix A for photos of test positions.

### 7.1.1 “Tablet” Position Definition (0mm spacing)

The device was tested in the 2.00 mm flat section of the AndreT Flat phantom P 10.1 for the “Tablet” position. The Transceiver was placed at the bottom of the phantom and suspended in such way that the back of the device was touching the phantom. This device orientation simulates the tablet’s normal use – being held on the lap of the user whilst in the tablet configuration. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

### 7.1.2 “Lap Arm Held” Position (0mm spacing)

The device was tested with the screen of the Tablet touching the flat phantom<sup>1</sup>. This orientation simulates use of the device in interactive or arm-held modes where the arm may be rested against the screen during normal use.

For this position, the Transceiver was placed at the bottom of the P 10.1 phantom and suspended in such way that the screen of the device was touching the phantom. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case assessment (with regards to SAR).

### 7.1.3 “Edge On Side” Position Definition (0mm spacing)

The device was tested in the 2.00 mm flat section of the AndreT Flat phantom P 10.1 for the “Edge” position. The Transceiver was placed at the bottom of the phantom and suspended in such way that the edge of the device was touching the phantom.

The edge of the tablet chosen corresponded to the locations of the antennas. This device orientation simulates the tablet’s normal use – being held on the lap of the user with exposure occurring on the stomach or torso. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case configuration.

<sup>1</sup> TCB Workshop Notes 2003, Session 6 “Portable Transmitters”

## 7.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)

The device has a fixed antenna. Depending on the measured SAR level up to three test channels with the test sample operating at maximum power, as specified in section 2.3 were recorded. The following table represents the matrix used to determine what testing was required.

**Table 25: Testing configurations for 2450MHz**

| Phantom Configuration         | *Device Mode | Antenna | Test Configurations |                  |                |
|-------------------------------|--------------|---------|---------------------|------------------|----------------|
|                               |              |         | Channel (Low)       | Channel (Middle) | Channel (High) |
| Lap-Arm Held (No Bluetooth)   | OFDM         | A       |                     | X                |                |
|                               |              | B       |                     | X                |                |
|                               | DSSS         | A       | X                   | X                | X              |
|                               |              | B       | X                   | X                | X              |
| Tablet                        | OFDM         | A       |                     | X                |                |
|                               |              | B       |                     | X                |                |
|                               | DSSS         | A       | X                   | X                | X              |
|                               |              | B       |                     | X                |                |
| Edge On                       | DSSS         | A       | X                   | X                | X              |
|                               |              | B       | X                   | X                | X              |
| Lap-Arm Held (With Bluetooth) | DSSS         | A       | If Worst case       |                  |                |
|                               |              | B       | If Worst case       |                  |                |
| Tablet (With Bluetooth)       | DSSS         | A       | If Worst case       |                  |                |
|                               |              | B       | If Worst case       |                  |                |
| Edge On (With Bluetooth)      | DSSS         | A       | If Worst case       |                  |                |
|                               |              | B       | If Worst case       |                  |                |

**Table 26: Testing configurations for 5800 MHz**

| Phantom Configuration | *Device Mode  | Antenna | Test Configurations |                  |                |
|-----------------------|---------------|---------|---------------------|------------------|----------------|
|                       |               |         | Channel (Low)       | Channel (Middle) | Channel (High) |
| Lap-Arm Held          | OFDM 5GHz HR  | B       | X                   | X                | X              |
| Tablet                | OFDM 5GHz HR  | A       | X                   | X                | X              |
| Edge On               | OFDM 5 GHz HR | A       | X                   | X                | X              |
|                       |               | B       | X                   | X                | X              |
| Lap-Arm Held          | OFDM 5 GHz HR | B       | If Worst Case       |                  |                |
| Tablet                | OFDM 5GHz LR  | A       | If Worst Case       |                  |                |
| Edge On               | OFDM 5 GHz HR | A       | If Worst Case       |                  |                |
|                       |               | B       | If Worst Case       |                  |                |

### Legend

|   |  |
|---|--|
| X | Testing Required in this configuration   |
|   | Testing not required in this configuration because SAR of middle channel is more than 3dB below the SAR limit. |

**7.3 FCC RF Exposure Limits for Occupational/ Controlled Exposure**

| Spatial Peak SAR Limits For:    |  |
|---------------------------------|--|
| Partial-Body:                   | 8.0 mW/g (averaged over any 1g cube of tissue) |
| Hands, Wrists, Feet and Ankles: | 20.0 mW/g (averaged over 10g cube of tissue)   |

**7.4 FCC RF Exposure Limits for Un-controlled/Non-occupational**

| Spatial Peak SAR Limits For:    |  |
|---------------------------------|--|
| Partial-Body:                   | 1.6 mW/g (averaged over any 1g cube of tissue) |
| Hands, Wrists, Feet and Ankles: | 4.0 mW/g (averaged over 10g cube of tissue)    |

## 8.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1g tissue masses were determined for the sample device for all test configurations listed in section 7.2.

### 8.1 2450MHz SAR Results

There are two modes of operation within the 2450MHz band, they include OFDM and DSSS modulations. Refer to section 7.2 for selection of all device test configurations. Table 20 below displays the SAR results for the DSSS mode. Table 21 displays the SAR results for the OFDM mode.

**Table 27: SAR MEASUREMENT RESULTS – DSSS Mode**

| 1. Test Position       | 2. Plot No. | 3. Antenna | 4. Test Channel      | 5. Test Freq (MHz)           | 6. Measured 1g SAR Results (mW/g) | 7. Measured Drift (dB) |
|------------------------|-------------|------------|----------------------|------------------------------|-----------------------------------|------------------------|
| *Lap Arm Held          | 1           | A          | 6                    | 2437                         | Pre-scan Only                     | -                      |
| *Lap Arm Held          | 2           | B          | 6                    | 2437                         | Pre-scan Only                     | -                      |
| Lap Arm Held           | 3           | B          | 1                    | 2412                         | 0.52                              | 0.20                   |
|                        | 4           | B          | 6                    | 2437                         | 0.64                              | -0.04                  |
|                        | 5           | B          | 11                   | 2462                         | 1.00                              | -0.04                  |
| Tablet                 | 6           | B          | 6                    | 2437                         | Pre-scan Only                     | -                      |
|                        | 7           | A          | 1                    | 2412                         | 0.99                              | -0.26                  |
|                        | 8           | A          | 6                    | 2437                         | 1.11                              | 0.15                   |
|                        | 9           | A          | 11                   | 2462                         | 1.01                              | -0.09                  |
| Edge On                | 10          | A          | 1                    | 2412                         | 1.57                              | 0.22                   |
|                        | 11          | A          | 6                    | 2437                         | 1.51                              | 0.17                   |
|                        | 12          | A          | 11                   | 2462                         | 1.40                              | 0.12                   |
|                        | 13          | B          | 1                    | 2412                         | 0.25                              | 0.31                   |
|                        | 14          | B          | 6                    | 2437                         | 0.27                              | 0.08                   |
|                        | 15          | B          | 11                   | 2462                         | 0.25                              | 0.27                   |
| WLAN with Bluetooth On |             |            |                      |                              |                                   |                        |
| 1. Test Position       | 2. Plot No. | 3. Antenna | 4. WLAN Test Channel | 5. Bluetooth Frequency (MHz) | 6. Measured 1g SAR Results (mW/g) | 7. Measured Drift (dB) |
| Lap Arm Held           | 16          | B          | 2462                 | 2441                         | 0.93                              | -0.19                  |
| Tablet                 | 17          | A          | 2437                 | 2441                         | 1.09                              | -0.04                  |
| Edge On                | 18          | A          | 2412                 | 2441                         | 1.56                              | 0.15                   |
|                        | 19          | B          | 2437                 | 2441                         | 0.26                              | 0.42                   |

\*This plot was used for identifying the "hotspot" only.

\*\*SAR results are within the noise floor of the DASY4 system and were not included.

NOTE: The measurement uncertainty of 22.9% for 2.45GHz was not added to the result.



**Table 28: SAR MEASUREMENT RESULTS – OFDM Mode**

| 1. Test Position | 2. Plot No. | 3. Antenna | 4. Test Channel | 5. Test Freq (MHz) | 6. Measured 1g SAR Results (mW/g) | 7. Measured Drift (dB) |
|------------------|-------------|------------|-----------------|--------------------|-----------------------------------|------------------------|
| Tablet           | 20          | A          | 6               | 2437               | 1.07                              | -0.16                  |
| Lap Arm Held     | 21          | B          | 6               | 2437               | 0.60                              | 0.08                   |

NOTE: The measurement uncertainty of 22.9% for 2.45GHz testing is not added to the result.

The highest SAR level recorded in the 2450MHz band was 1.57 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in edge on position in DSSS mode, utilizing channel 1 (2412 MHz), at the antenna A. The Bluetooth was ON at the Frequency of 2441 MHz.

## 8.2 5800MHz SAR Results

**Table 29: 5800MHz SAR MEASUREMENT RESULTS – OFDM Mode**

| 1. Test Position       | 2. Plot No. | 3. Antenna | 4. Test Channel      | 5. Test Freq (MHz)           | 6. Measured 1g SAR Results (mW/g) | 7. Measured Drift (dB) |
|------------------------|-------------|------------|----------------------|------------------------------|-----------------------------------|------------------------|
| Lap Arm Held           | 24          | B          | 149                  | 5745                         | 1.53                              | -0.13                  |
|                        | 25          | B          | 157                  | 5785                         | 0.65                              | 0.37                   |
|                        | 26          | B          | 165                  | 58025                        | 1.28                              | 0.20                   |
| Tablet                 | 27          | A          | 149                  | 5745                         | 0.58                              | -0.31                  |
|                        | 28          | A          | 157                  | 5785                         | 0.64                              | 0.15                   |
|                        | 29          | A          | 165                  | 5825                         | 0.77                              | -0.26                  |
| Edge On                | 30          | A          | 149                  | 5745                         | 1.05                              | -0.09                  |
|                        | 31          | A          | 157                  | 5785                         | 1.27                              | 0.09                   |
|                        | 32          | A          | 165                  | 5825                         | 1.37                              | 0.13                   |
|                        | 33          | B          | 149                  | 5745                         | 0.92                              | -0.38                  |
|                        | 34          | B          | 157                  | 5785                         | 0.78                              | -0.20                  |
|                        | 35          | B          | 165                  | 5825                         | 0.66                              | -0.03                  |
| WLAN with Bluetooth On |             |            |                      |                              |                                   |                        |
| 1. Test Position       | 2. Plot No. | 3. Antenna | 4. WLAN Test Channel | 5. Bluetooth Frequency (MHz) | 6. Measured 1g SAR Results (mW/g) | 7. Measured Drift (dB) |
| Lap Arm Held           | 36          | B          | 5745                 | 2441                         | 0.95                              | -0.26                  |
| Tablet                 | 37          | A          | 5825                 | 2441                         | 0.80                              | 0.03                   |
| Edge On                | 38          | A          | 5825                 | 2441                         | 1.33                              | 0.30                   |
|                        | 39          | B          | 5725                 | 2441                         | 0.94                              | -0.30                  |

NOTE: The measurement uncertainty of 24.0% for 5GHz testing is not added to the result.

\*This plot was used for identifying the "hotspot" only.

The highest SAR level recorded in the 5.8GHz band was 1.53g as evaluated in a 1g cube of averaging mass. This value was obtained in Lap Arm Held Position in OFDM mode, utilizing channel 34 (5745MHz) and antenna B. The Bluetooth was ON at the Frequency of 2441 MHz.

## 9.0 COMPLIANCE STATEMENT

The model AR5BXB6, FCC ID: EJE-WB0043, IC: 337J-WB0043 Portable Tablet Computer Wireless LAN was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded in the 2450MHz band was 1.57 mW/g for a 1g cube. This value was measured at 2412 MHz (channel 1) in the “Edge On” position in DSSS modulation mode at the antenna A. This was below the limit of 1.6 mW/g for uncontrolled exposure.

The highest SAR level recorded in the 5800MHz band was 1.53 mW/g for a 1g cube. This value was measured at 5745 MHz (channel 34) in the “Lap Arm Held” position in OFDM modulation mode at the antenna B. The Bluetooth was ON at the Frequency of 2441 MHz. This was below the limit of 1.6 mW/g for uncontrolled exposure.

## APPENDIX A1 TEST SAMPLE PHOTOGRAPHS

AR5BxB6- Front



AR5BxB6- Back



## APPENDIX A2 TEST SAMPLE PHOTOGRAPHS

Battery 1



Battery 2



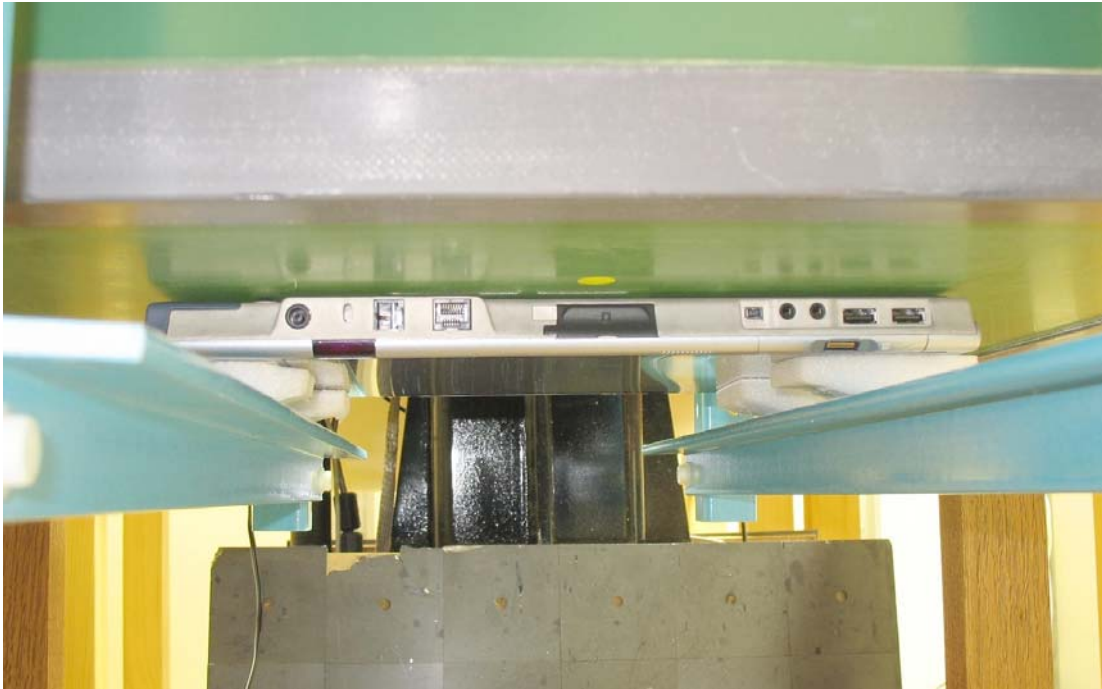
AR5BXB6 Inside the Fujitsu Tablet Computer





## APPENDIX A3 TEST SETUP PHOTOGRAPHS

Tablet Position



## APPENDIX A4 TEST SAMPLE PHOTOGRAPHS

Arm Held Position



## APPENDIX A5 TEST SAMPLE PHOTOGRAPHS

Edge On Position

