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# SAR Test Report

Report Number: M100216_FCC_AR5B97_SAR_2.4

| | |
|---|---|
| Test Sample: | Portable TABLET Computer |
| Radio Modules: | ATHEROS AR5B97 WLAN & CSR BSMAN3 Bluetooth Modules |
| Host PC Model Number: | T730 / TH700 |
| WLAN FCC ID: | PPD-AR5B97-F |
| WLAN IC: | 4104A-AR5B97 |
| Date of Issue: | 19th March, 2010 |

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## 1.0 GENERAL INFORMATION

| | |
|---|---|
| **Test Sample:** | Portable TABLET Computer |
| **Model Name:** | T730 / TH700 |
| **Radio Modules:** | WLAN Atheros AR5B97 & Bluetooth CSR BSMAN3 |
| **Interface Type:** | Half Mini-PCI Module |
| **Device Category:** | Portable Transmitter |
| **Test Device:** | Pre-Production Unit |
| **WLAN FCC ID:** | PPD-AR5B97-F |
| **WLAN IC:** | 4104A-AR5B97 |
| **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)<br>**2.** Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) RSS-102 Issue 2 November 2005 |
| **Statement Of Compliance:** | The Fujitsu TABLET Computer T730/TH700 with Wireless LAN model AR5B97 and Bluetooth module CSR BSMAN3 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. |
| **Test Dates:** | 26th Feb. 2010 |

**Test Officer:**

Peter Jakubiec

**Authorised Signature:**

Peter Jakubiec

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**SAR TEST REPORT**
**Portable TABLET Computer**
**Model: T730 / TH700**
**Report Number: M100216_FCC_AR5B97_SAR_2.4**

## 2.0 INTRODUCTION

SAR testing was performed on the Fujitsu TABLET PC, Model: T730/TH700 with ATHEROS Half Mini-PCI Wireless LAN Module (ATHEROS HB97 802.11 b/g/n), Model: AR5B97 & CSR Bluetooth Module, Model: BSMAN3. The ATHEROS 802.11 b/g/n module is an OEM product. The Half Mini-PCI Wireless LAN (WLAN) was tested in the dedicated host – LIFEBOOK T SERIES, Model T730/TH700.

## 3.0 TEST SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

## 3.1 EUT (WLAN) Details

| | |
|---|---|
| **Transmitter:** | Half Mini-Card Wireless LAN Module |
| **Wireless Module:** | Atheros (HB97) |
| **Model Number:** | AR5B97 |
| **Manufacturer:** | Atheros Communication Inc, |
| **Modulation Type:** | DSSS for 802.11b<br>OFDM for 802.11g<br>OFDM for 802.11n |
| **5GHz (802.11a/n)** | - |
| **2.4GHz (802.11b/g/n)** | CCK, DQPSK, DBPSK, BPSK, QPSK, 16QAM, 64QAM |
| **Maximum Data Rate:** | 802.11b = 11 Mbps, 802.11g = 54 Mbps<br>802.11n = 300 Mbps |
| **Frequency Range:** | 2.412–2.462 GHz for 11b/g/n |
| **Number of Channels:** | 11 channels for 11b/g/n with 20MHz Bandwidth<br>7 channels for 11n with 40MHz Bandwidth |
| **Antenna Types:** | Nissei Inverted F ($1^{st}$, $2^{nd}$)<br>Model: CP313598 and CP313592<br>Location: Left Top edge of LCD screen($1^{st}$), Right Top edge of LCD screen($2^{nd}$) |
| **Power Supply:** | 3.3 VDC from PCI Express bus |

**Channels and Output power setting:**

**2.4 GHz (2.412 to 2.462 GHz)**

| Mode | Channel | Frequency (MHz) | Data Rate (Mbps) | Tx BW (MHz) | Average Power (dBm) |
|---|---|---|---|---|---|
| **802.11b 2.4 GHz** | 1 | 2412 | 1 | - | 17.02 |
| | 6 | 2437 | | | 17.25 |
| | 11 | 2462 | | | 16.21 |
| | | | | | |
| **802.11g 2.4 GHz** | 1 | 2412 | 6 | - | 14.80 |
| | 6 | 2437 | | | 17.60 |
| | 11 | 2462 | | | 11.94 |
| | | | | | |
| **802.11n 2.4 GHz** | 1 | 2412 | HT0 | 20 | 13.88 |
| | 6 | 2437 | | | 17.37 |
| | 11 | 2462 | | | 11.32 |
| | | | | | |
| | 3 | 2422 | | 40 Wide | 12.15 |
| | 6 | 2437 | | | 15.13 |
| | 9 | 2452 | | | 10.10 |

## 3.2 EUT (Bluetooth) Details

**Transmitter:** Bluetooth
**Model Number:** BSMAN3
**Manufacturer:** CSR
**Network Standard:** BluetoothTM RF Test Specification
**Modulation Type:** Frequency Hopping Spread Spectrum (FHSS)
**Frequency Range:** 2402 MHz to 2480 MHz
**Number of Channels:** 79
**Carrier Spacing:** 1.0 MHz
**Antenna Types:** Monopole Antenna included in module
Module location: Left side of hinge
**Max. Output Power:** 4 dBm
**Reference Oscillator:** 16 MHz (Built-in)
**Power Supply:** 3.3 VDC from host.

**Frequency allocation:**

| Channel Number | Frequency (MHz) | Bluetooth Utility power setting |
|---|---|---|
| 1* | 2402 | Power (Ext, Int) = 0, 56 |
| 2 | 2403 | |
| 3 | 2404 | |
| . | . | |
| . | . | |
| 39 | 2440 | |
| 40* | 2441 | |
| 41 | 2442 | |
| . | . | |
| . | . | |
| 77 | 2478 | |
| 78 | 2479 | |
| 79* | 2480 | |

*Channels tested

## 3.3 EUT (Notebook PC) Details

| | |
|---|---|
| **Host notebook :** | LifeBook T series |
| ***Model Name:** | T730 / TH700 |
| **Serial Number:** | Pre-production Sample |
| **Manufacturer:** | FUJITSU LIMITED |
| | |
| **CPU Type and Speed:** | Core i7-620M 2.66GHz |
| **LCD** | 12.1"WXGA |
| **Wired LAN:** | Intel 82577LM/82577LC: 10 Base-T/100 Base-TX/1000Base-T |
| **Modem:** | Non |
| **Port Replicator Model:** | FPCPR94 |
| | |
| **AC Adapter Model:** | 80W: SEE100P2-19.0(Sanken), ADP-80NB A(Delta) |
| **Voltage:** | 19V |
| **Current Specs:** | 4.22A |
| **Watts:** | 80W |

*The model numbers shown T730 and TH700 are for the same product.
The T730 is for commercial market (there is Port-Replicator as option).
The TH700 is for consumer market (there is no Port-Replicator).

## 3.4 Test sample Accessories

### 3.4.1 Battery Types

One type of Fujitsu Lithium Ion Battery is used to power the Portable TABLET Computer with Wireless LAN Model: AR5B97. SAR measurements were performed with the battery as shown below.

**Standard Battery**

| **Battery #1** | | **Battery #2** | |
|---|---|---|---|
| Product No. | FPCBP215 | Product No. | FPCBP215 |
| V/mAh | 10.8V/5800mAh | V/mAh | 10.8V/5800mAh |
| Serial No. | 01A-Z091109000178Z | Serial No. | 01A-Z091109000279Z |

# 4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

ATHEROS's ART test tool was used to configure the WLAN for testing. The Portable Tablet Computer Wireless LAN had a total of 11 channels (USA model) within the 2412 to 2462 MHz frequency band. In the frequency range 2412 MHz to 2462 MHz the device operates in 2 modes, OFDM and DSSS. For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu.

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). However, the standalone SAR measurement for Bluetooth module was not required (See Section 13 Multiband Evaluation Considerations).

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.

The frequency span of the 2450 MHz range Band was more than 10MHz consequently; the SAR levels of the test sample were measured for lowest, centre and highest channels in the applicable modes. The EUT is capable of using two antennas transmitting simultaneously (HT8 DATA mode) the power level is 3dB lower (50%) than if a single antenna was transmitting. There were no wires or other connections to the Portable TABLET Computer during the SAR measurements.

The transmitter power was set to be equal or higher than power specified by the manufacturer.

## 4.1 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 12% and was assessed in the uncertainty budget.

# 5.0 DETAILS OF TEST LABORATORY

## 5.1 Location

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## 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:

| | |
|---|---|
| **AS/NZS 2772.1:** | RF and microwave radiation hazard measurement |
| **ACA:** | Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003 |
| **FCC:** | Guidelines for Human Exposure to RF Electromagnetic Field OET65C 01/01 |
| **EN 50360: 2001** | Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz) |
| **EN 62209-1:2006** | Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures. **Part 1:** Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (300 MHz to 3 GHz) |
| **IEEE 1528: 2003** | 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 for the full scope of accreditation.

## 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±1°C, the humidity was 61%. 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 SN1380 probe was less than 5μV in both air and liquid mediums.

# 6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

| | |
|---|---|
| Applicable Head Configurations<br>Applicable Body Configurations | : None<br>: Tablet Position<br>: Edge On Position |

## 6.1 Probe Positioning System

The measurements were performed with the state-of-the-art automated near-field scanning system **DASY4 V4.7 Build 53** from Schmid & Partner Engineering AG (SPEAG). The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN62209-1 SAR measurement requirements.

## 6.2 E-Field Probe Type and Performance

The SAR measurements were conducted with SPEAG dosimetric probe ET3DV6 Serial: 1380 (2.45 GHz). Please refer to appendix C for detailed information.

## 6.4 Validation

### 6.4.1 Validation Results @ 2450MHz

The following tables lists 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: Validation Results (Dipole: SPEAG D2450V2 SN: 724)**

| 1. Validation Date | 2. $\epsilon$r (measured) | 3. $\sigma$ (mho/m) (measured) | 4. Measured SAR 1g (mW/g) | 5. Measured SAR 10g (mW/g) |
|---|---|---|---|---|
| 26th Feb 2010 | 39.5 | 1.88 | 13.9 | 6.44 |

### 6.4.2 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 table below (2450MHz) below.

**Table: 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 | 13.9 | 55.60 | 52 | 6.92 | 52.4 | 6.11 |

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

### 6.4.3 Liquid Depth 15cm

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

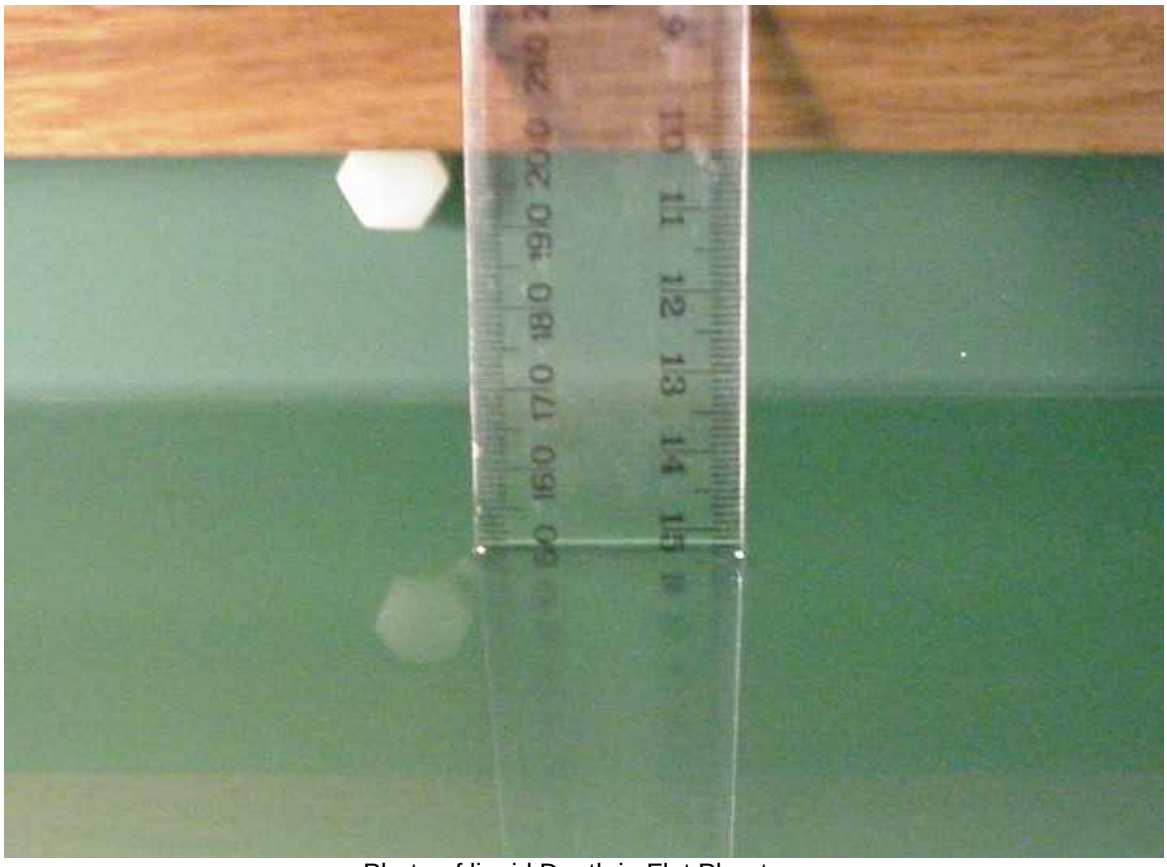

Photo of liquid Depth in Flat Phantom

## 6.5 Phantom Properties

The phantoms used during the testing comply with the OET65 C (01-01), IEEE 1528 and EN62209-1 SAR measurement requirements.

## 6.6 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: Measured Brain Simulating Liquid Dielectric Values for Validations**

| Frequency Band | ∈r (measured range) | ∈r (target) | σ (mho/m) (measured range) | σ (target) | ρ kg/m$^3$ |
|---|---|---|---|---|---|
| 2450 MHz Brain | 39.5 | 39.2 ±5% (37.2 to 41.2) | 1.88 | 1.80 ±5% (1.71 to 1.89) | 1000 |

NOTE: The brain liquid parameters were within the required tolerances of ±5%.

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

| Frequency Band | ∈r (measured range) | ∈r (target) | σ (mho/m) (measured range) | σ (target) | ρ kg/m$^3$ |
|---|---|---|---|---|---|
| 2412 MHz Muscle | 50.9 | 52.7 ±5% (50.1 to 55.3) | 1.94 | 1.95 ±5% (1.85 to 2.05) | 1000 |
| 2437 MHz Muscle | 50.7 | 52.7 ±5% (50.1 to 55.3) | 1.98 | 1.95 ±5% (1.85 to 2.05) | 1000 |
| 2462 MHz Muscle | 50.6 | 52.7 ±5% (50.1 to 55.3) | 2.02 | 1.95 ±5% (1.85 to 2.05) | 1000 |

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

### 6.6.1 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|°C.

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

| Date | Ambient Temperature (°C) | Liquid Temperature (°C) | Humidity (%) |
|---|---|---|---|
| 26th Feb. 2010 | 20.1 | 19.8 | 61.0 |

## 6.7 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: 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 |

**Table: Tissue Type: Muscle @ 2450MHz**
Volume of Liquid: 60 Litres

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

*Refer "OET Bulletin 65 97/01 P38"

## 6.8 Device Holder for Laptops and P 10.1 Phantom

A low loss clamp was used to position the TABLET underneath the phantom surface.
*Refer to Appendix A for photographs of device positioning*

# 7.0 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 75mm x 120mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

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.

# 8.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both device 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: Uncertainty Budget for DASY4 V4.7 Build 53 – EUT SAR test 2450MHz**

| Uncertainty Component | Tol. (6%) | Prob. Dist. | Div. | $C_i$ (1g) | $C_i$ (10g) | 1g $u_i$ (6%) | 10g $u_i$ (6%) | $v_i$ |
|---|---|---|---|---|---|---|---|---|
| Measurement System | | | | | | | | |
| Probe Calibration | 5.5 | N | 1 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Axial Isotropy | 4.7 | R | 1.73 | 0.707 | 0.707 | 1.9 | 1.9 | ∞ |
| Hemispherical Isotropy | 9.6 | R | 1.73 | 0.707 | 0.707 | 3.9 | 3.9 | ∞ |
| Boundary Effects | 1 | R | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Linearity | 4.7 | R | 1.73 | 1 | 1 | 2.7 | 2.7 | ∞ |
| System Detection Limits | 1 | R | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Readout Electronics | 0.3 | N | 1 | 1 | 1 | 0.3 | 0.3 | ∞ |
| Response Time | 0.8 | R | 1.73 | 1 | 1 | 0.5 | 0.5 | ∞ |
| Integration Time | 2.6 | R | 1.73 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Noise | 3 | R | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Reflections | 3 | R | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | R | 1.73 | 1 | 1 | 0.2 | 0.2 | ∞ |
| Probe Positioning | 2.9 | R | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Max. SAR Eval. | 1 | R | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Test Sample Related | | | | | | | | |
| Test Sample Positioning | 1.61 | N | 1 | 1 | 1 | 1.6 | 1.6 | 11 |
| Device Holder Uncertainty | 3.6 | N | 1 | 1 | 1 | 3.6 | 3.6 | 7 |
| Output Power Variation – SAR Drift Measurement | 9.67 | R | 1.73 | 1 | 1 | 5.6 | 5.6 | ∞ |
| Phantom and Setup | | | | | | | | |
| Phantom Uncertainty | 4 | R | 1.73 | 1 | 1 | 2.3 | 2.3 | ∞ |
| Liquid Conductivity – Deviation from target values | 5 | R | 1.73 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid Conductivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.64 | 0.43 | 1.6 | 1.1 | 5 |
| Liquid Permittivity – Deviation from target values | 5 | R | 1.73 | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid Permittivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.6 | 0.49 | 1.5 | 1.2 | 5 |
| Combined standard Uncertainty | | RSS | | | | 11.4 | 11.2 | 154 |
| Expanded Uncertainty (95% CONFIDENCE LEVEL) | | k=2 | | | | 22.8 | 22.44 | |

Estimated total measurement uncertainty for the DASY4 measurement system was ±11.4%. The extended uncertainty (K = 2) was assessed to be ±22.8% based on 95% confidence level. The uncertainty is not added to the measurement result.

**Table: Uncertainty Budget for DASY4 V4.7 Build 53 – Validation 2450MHz**

| Uncertainty Component | Tol. (6%) | Prob. Dist. | Div. | $C_i$ (1g) | $C_i$ (10g) | 1g $u_i$ (6%) | 10g $u_i$ (6%) | $v_i$ |
|---|---|---|---|---|---|---|---|---|
| Measurement System | | | | | | | | |
| Probe Calibration | 5.5 | N | 1 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Axial Isotropy | 4.7 | R | 1.73 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Hemispherical Isotropy | 9.6 | R | 1.73 | 0 | 0 | 0.0 | 0.0 | ∞ |
| Boundary Effects | 1 | R | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Linearity | 4.7 | R | 1.73 | 1 | 1 | 2.7 | 2.7 | ∞ |
| System Detection Limits | 1 | R | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Readout Electronics | 0.3 | N | 1 | 1 | 1 | 0.3 | 0.3 | ∞ |
| Response Time | 0 | R | 1.73 | 1 | 1 | 0.0 | 0.0 | ∞ |
| Integration Time | 0 | R | 1.73 | 1 | 1 | 0.0 | 0.0 | ∞ |
| RF Ambient Noise | 3 | R | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Reflections | 3 | R | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | R | 1.73 | 1 | 1 | 0.2 | 0.2 | ∞ |
| Probe Positioning | 2.9 | R | 1.73 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Max. SAR Eval. | 1 | R | 1.73 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Dipole | | | | | | | | |
| Dipole Axis to Liquid Distance | 2 | N | 1.73 | 1 | 1 | 1.2 | 1.2 | 11 |
| Input Power and SAR drift meas. | 4.7 | R | 1.73 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Phantom and Tissue Param. | | | | | | | | |
| Phantom Uncertainty | 4 | R | 1.73 | 1 | 1 | 2.3 | 2.3 | ∞ |
| Liquid Conductivity – Deviation from target values | 5 | R | 1.73 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid Conductivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.64 | 0.43 | 1.6 | 1.1 | 5 |
| Liquid Permittivity – Deviation from target values | 5 | R | 1.73 | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid Permittivity – Measurement uncertainty | 2.5 | N | 1.00 | 0.6 | 0.49 | 1.5 | 1.2 | 5 |
| Combined standard Uncertainty | | RSS | | | | 9.0 | 8.7 | 154 |
| Expanded Uncertainty (95% CONFIDENCE LEVEL) | | k=2 | | | | 17.9 | 17.34 | |

Estimated total measurement uncertainty for the DASY4 measurement system was ±9.0%. The extended uncertainty (K = 2) was assessed to be ±17.9% based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

# 9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

**Table: SPEAG DASY4 V4.7 Build 53**

| Equipment Type | Manufacturer | Model Number | Serial Number | Calibration Due | Used For this Test? |
|---|---|---|---|---|---|
| Robot - Six Axes | Staubli | RX90BL | N/A | Not applicable | ✓ |
| Robot Remote Control | SPEAG | CS7MB | RX90B | Not applicable | ✓ |
| SAM Phantom | SPEAG | N/A | 1260 | Not applicable | ✓ |
| SAM Phantom | SPEAG | N/A | 1060 | Not applicable | |
| Flat Phantom | AndreT | 10.1 | P 10.1 | Not Applicable | ✓ |
| Flat Phantom | AndreT | 9.1 | P 9.1 | Not Applicable | |
| Flat Phantom | SPEAG | PO1A 6mm | 1003 | Not Applicable | |
| Data Acquisition Electronics | SPEAG | DAE3 V1 | 359 | 08-July-2010 | |
| Data Acquisition Electronics | SPEAG | DAE3 V1 | 442 | 08-Dec-2010 | ✓ |
| Probe E-Field - Dummy | SPEAG | DP1 | N/A | Not applicable | |
| Probe E-Field | SPEAG | ET3DV6 | 1380 | 11-Dec-2010 | ✓ |
| Probe E-Field | SPEAG | ET3DV6 | 1377 | 14-July-2010 | |
| Probe E-Field | SPEAG | ES3DV6 | 3029 | Not Used | |
| Probe E-Field | SPEAG | EX3DV4 | 3563 | 16-July-2010 | |
| Probe E-Field | SPEAG | EX3DV4 | 3557 | 16-Dec-2010 | |
| Antenna Dipole 300 MHz | SPEAG | D300V2 | 1005 | 15-Dec-2011 | |
| Antenna Dipole 450 MHz | SPEAG | D450V2 | 1009 | 17-Dec-2010 | |
| Antenna Dipole 900 MHz | SPEAG | D900V2 | 047 | 7-July-2010 | |
| Antenna Dipole 1640 MHz | SPEAG | D1640V2 | 314 | 16-July-2010 | |
| Antenna Dipole 1800 MHz | SPEAG | D1800V2 | 242 | 8-July-2010 | |
| Antenna Dipole 1950 MHz | SPEAG | D1950V3 | 1113 | 12-Dec -2010 | |
| Antenna Dipole 3500 MHz | SPEAG | D3500V2 | 1002 | 17-July-2010 | |
| Antenna Dipole 2450 MHz | SPEAG | D2450V2 | 724 | 10-Dec-2010 | ✓ |
| Antenna Dipole 5600 MHz | SPEAG | D5GHzV2 | 1008 | 16-Dec-2011 | |
| RF Amplifier | EIN | 603L | N/A | *In test | |
| RF Amplifier | Mini-Circuits | ZHL-42 | N/A | *In test | ✓ |
| RF Amplifier | Mini-Circuits | ZVE-8G | N/A | *In test | |
| Synthesized signal generator | Hewlett Packard | ESG-D3000A | GB37420238 | *In test | ✓ |
| RF Power Meter Dual | Hewlett Packard | 437B | 3125012786 | 29-June-2010 | ✓ |
| RF Power Sensor 0.01 - 18 GHz | Hewlett Packard | 8481H | 1545A01634 | 01-July-2010 | ✓ |
| RF Power Meter Dual | Gigatronics | 8542B | 1830125 | 26-Mar-2010 | |
| RF Power Sensor | Gigatronics | 80301A | 1828805 | 26-Mar-2010 | |
| RF Power Meter Dual | Hewlett Packard | 435A | 1733A05847 | *In test | ✓ |
| RF Power Sensor | Hewlett Packard | 8482A | 2349A10114 | *In test | ✓ |
| Network Analyser | Hewlett Packard | 8714B | GB3510035 | 30-Sept-2010 | |
| Network Analyser | Hewlett Packard | 8753ES | JP39240130 | 24-Nov-2010 | ✓ |
| Dual Directional Coupler | Hewlett Packard | 778D | 1144 04700 | *In test | |
| Dual Directional Coupler | NARDA | 3022 | 75453 | *In test | ✓ |

* Calibrated during the test for the relevant parameters.

# 10.0 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 "LIFEBOOK T SERIES" can be used in either a conventional laptop position (see Appendix A1) or a Tablet configuration. The antenna location in the "LIFEBOOK T SERIES" is closest to the top of the screen when used in a conventional laptop configuration and due to the separation distances involved between the phantom and the laptop antenna, testing is not required in this position.

## 10.1 Positions

### 10.1.1 "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 PC's normal use – being held on the lap of the user. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

### 10.1.2 "Edge On" Position (Portrait or Landscape)

The device was tested in the (2.00 mm) flat section of the AndreT phantom for the "Edge On" position. The Antenna edge of the Transceiver was placed underneath the flat section of the phantom and suspended until the edge touched the phantom. *Refer to Appendix A for photos of measurement positions.*

## 10.2 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 were recorded. The following table represents the matrix used to determine what testing was required. All relevant provisions of KDB 447498 (v03r02 Dec 2008) are applied for SAR measurements of the host system. KDB 616217 was used in the SAR evaluation.

**Table: Testing configurations**

| Phantom Configuration | *Device Mode | Antenna | Test Configurations | | |
|---|---|---|---|---|---|
| | | | Channel (Low) | Channel (Middle) | Channel (High) |
| Tablet | OFDM 2.4GHz | A | | X | |
| | | B | | X | |
| Edge On | OFDM 2.4GHz | A | | X | |
| | | B | | X | |
| | DSSS 2.4GHz | A | | X | |
| | | B | | X | |

Legend

| | |
|---|---|
| X | Testing Required in this configuration |
| | Testing required in this configuration only if SAR of middle channel is more than 3dB below the SAR limit or it is the worst case. |

*NOTE: Throughout this report, Antenna A and B refer to Tx1 and Tx2 in the host respectively.*

# 11.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1g tissue masses were determined for the sample device for all test configurations listed in section 10.2.

## 11.1 2450MHz SAR Results

There are two modes of operation within the 2450MHz band, they include OFDM and DSSS modulations. Refer to section 10.2 for selection of all device test configurations. Table below displays the SAR results.

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

| Test Position | Plot No. | Antenna | Bit rate Mode (Mbps) | Channel Bandwidth (MHz) | Test Channel | Test Freq (MHz) | Measured 1g SAR Results (mW/g) | Measured Drift (dB) |
|---|---|---|---|---|---|---|---|---|
| Primary Portrait | 1 | A | 1 | - | 06 | 2437 | 0.291 | -0.130 |

NOTE: The measurement uncertainty of 22.8% for 2.45GHz was not added to the result.

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

| Test Position | Plot No. | Antenna | Bit rate Mode (Mbps) | Channel Bandwidth (MHz) | Test Channel | Test Freq (MHz) | Measured 1g SAR Results (mW/g) | Measured Drift (dB) |
|---|---|---|---|---|---|---|---|---|
| Primary Portrait | 2 | A | MCS0 | 20 | 06 | 2437 | 0.305 | -0.245 |
| | 3 | | MCS0 | 40 | | | 0.192 | -0.401 |
| | 4 | | 6 | - | | | 0.301 | 0.064 |
| | | | | | | | | |
| Secondary Portrait | 5 | B | MCS0 | 20 | 01 | 2412 | 0.589 | -0.140 |
| | 6 | | | | 06 | 2437 | **1.290** | -0.072 |
| | 7 | | | | 11 | 2462 | 0.315 | -0.120 |
| Secondary Landscape | 8 | A | | | 06 | 2437 | 0.220 | -0.146 |
| | 9 | B | | | 06 | 2437 | 0.196 | 0.139 |
| | | | | | | | | |
| Tablet | 10 | A | MCS0 | 20 | 06 | 2437 | 0.157 | 0.115 |
| | - | B | | | | | N/F | N/A |

NOTE: The measurement uncertainty of 22.8% for 2.45GHz was not added to the result.

The highest SAR level recorded in the 2450MHz band was 1.29 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Secondary Portrait position in OFDM MCS0 20 MHz mode, utilizing channel 06 (2437 MHz) and antenna B.

## 12.0 COMPLIANCE STATEMENT

The Fujitsu TABLET PC, Model: T730/TH700 with ATHEROS Half Mini-PCI Wireless LAN Module (HB97 802.11 /b/g/n), Model: AR5B97 & CSR Bluetooth Module, Model: BSMAN3 was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 1.29 mW/g for a 1g cube. This value was measured at 2437 MHz (channel 06) in the “Secondary Portrait” position in OFDM MCS0 20 MHz modulation mode at the antenna B. This was below the limit of 1.6 mW/g for uncontrolled exposure, but was within the band of measurement uncertainty 22.8 % around the limit.

## 13.0 MULTIBAND EVALUATION CONSIDERATIONS

According to the SAR standards, when the sum of SAR results (simultaneously transmitting antennas WLAN and WWAN) is > 1.6mW/g and the distance between the antennas is 5cm or less, or the ratio of above sum to the distance between peak SAR locations > 0.3, simultaneous transmission SAR evaluation is required.

The Bluetooth module operates in the 2.4GHz range. According to the FCC rules, applying 60/f gives an output power threshold of 25mW (60/2.4 = 25). The Bluetooth module has a maximum output power <5mW and therefore stand-alone SAR was not required. The distance between the BT module and the closest transmitting antenna was 191cm. Because the distance to the closest WLAN antenna (191cm) > 5cm, and 5mW < 25mW, the Bluetooth module was not considered for SAR evaluation.

Since the sum of the highest SAR results for the standalone WLAN antennas A and B is less than 1.6mW/g (refer to Tables of SAR Measurement Results), and the RF power is reduced by 3dB during simultaneous transmission (antenna A and B) multi-band evaluation was not required.

This is in accordance with the test reduction methods detailed in KDB 616217 and KDB 447498.

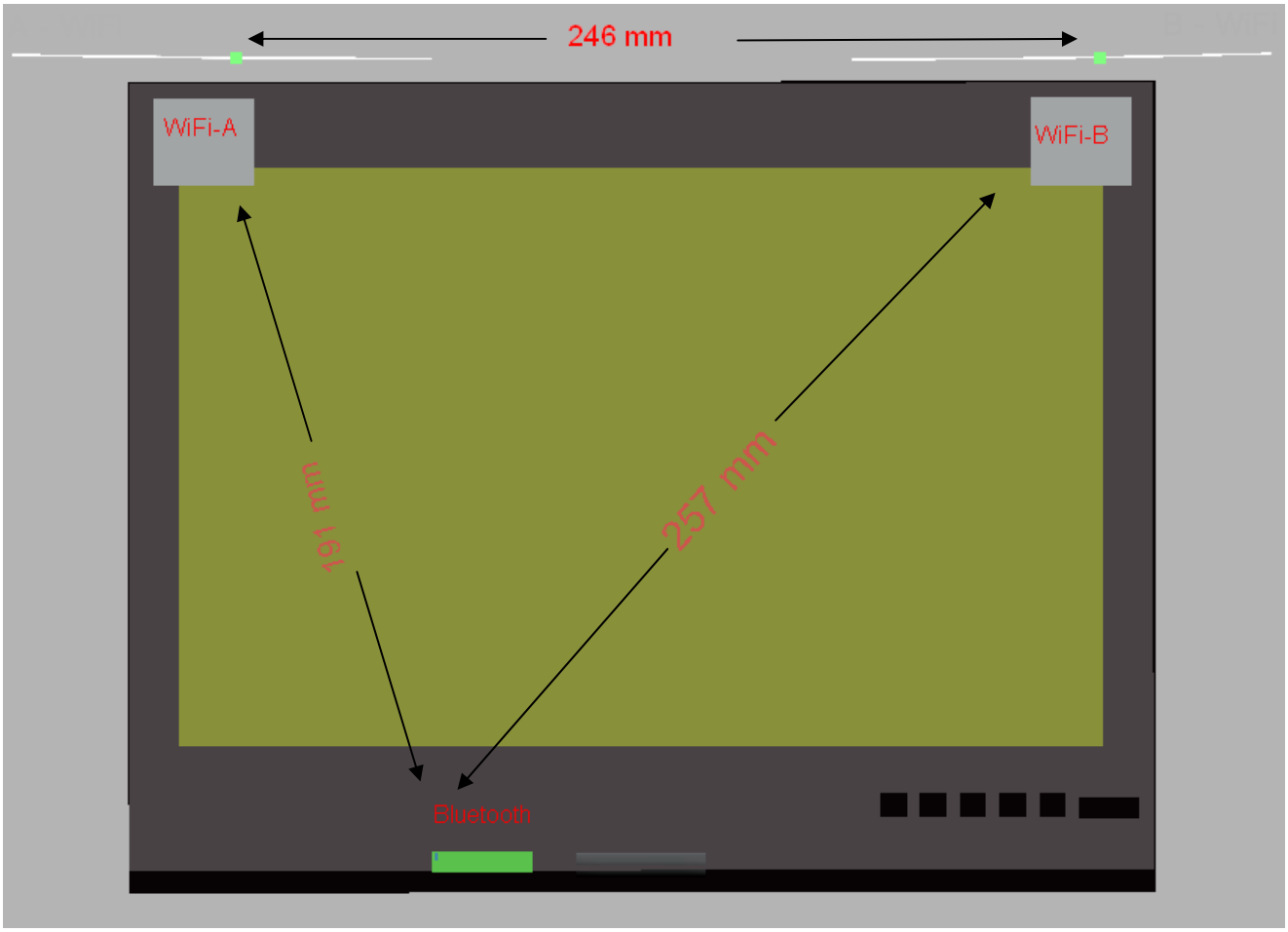


**Diagram Showing Antenna Positions**

*NOTE: Throughout this report, Antenna A and B refer to Tx1 and Tx2 in the host.*