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SAR Test Report

Report Number: M080752_CERT_AR5BHB92_SAR_2.4

Test Sample: Portable TABLET Computer
Radio Modules: WLAN AR5BHB92 & Bluetooth
EYTF3CS FS
Host PC Model Number: P1630
HOST PC FCC ID: EJE-WB0068
HOST PC IC: 337J-WB0068
Date of Issue: 13th August 2008

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CONTENTS

1.0 General Information	3
2.0 INTRODUCTION	4
3.0 Sample Technical INFORMATION	4
3.1 EUT (WLAN) Details	4
3.2 EUT (Bluetooth) Details.....	5
3.3 EUT (Notebook PC) Details	6
3.4 Test sample Accessories	6
3.4.1 Battery Types	6
4.0 Test Signal, Frequency and Output Power.....	7
4.1 Battery Status.....	8
5.0 Details of Test Laboratory	8
5.1 Location	8
5.2 Accreditations.....	8
5.3 Environmental Factors	9
6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM.....	9
6.1 Probe Positioning System	9
6.2 E-Field Probe Type and Performance	9
6.3 Data Acquisition Electronics.....	9
6.4 Validation	10
6.4.1 Validation Results @ 2450MHz.....	10
6.4.2 Deviation from reference validation values	10
6.4.3 Liquid Depth 15cm.....	11
6.5 Phantom Properties (Size, Shape, Shell Thickness)	12
6.6 Tissue Material Properties.....	13
6.6.1 Liquid Temperature and Humidity.....	13
6.7 Simulated Tissue Composition Used for SAR Test	13
6.8 Device Holder for Laptops and P 10.1 Phantom	14
7.0 SAR Measurement Procedure Using DASY4	14
8.0 MEASUREMENT UNCERTAINTY.....	15
9.0 Equipment List and Calibration Details.....	17
10.0 OET Bulletin 65 – Supplement C Test Method	18
10.1 Positions	18
10.1.1 “Tablet” Position Definition (0mm spacing)	18
10.1.2 “Edge On” Position	18
10.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)	19
10.3 FCC RF Exposure Limits for Occupational/ Controlled Exposure.....	19
10.4 FCC RF Exposure Limits for Un-controlled/Non-occupational	19
11.0 SAR measurement RESULTS.....	20
11.1 2450MHz SAR Results.....	20
12.0 Compliance statement	21
APPENDIX A1 Test Sample Photographs	22
APPENDIX A2 test setup Photographs	23
APPENDIX A3 test setup Photographs	24
APPENDIX A4 Test Sample Photographs	25
APPENDIX B Plots of the SAR Measurements	26
APPENDIX C Calibration Documents.....	39



SAR TEST REPORT**Report Number: M080752 _CERT_AR5BHB92 _SAR_2.4****HOST PC FCC ID: EJE-WB0068****HOST PC IC: 337J-WB0068****1.0 GENERAL INFORMATION**

Test Sample: Portable TABLET Computer
Model Name: P1630
Radio Modules: WLAN AR5BHB92 & Bluetooth EYTF3CS FS
Interface Type: Mini-PCI Module
Device Category: Portable Transmitter
Test Device: Pre-Production Unit
HOST PC FCC ID: EJE-WB0068
HOST PC IC: 337J-WB0068
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. Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) RSS-102 Issue 2 November 2005

Statement Of Compliance: The Fujitsu TABLET Computer P1630 with Wireless LAN model AR5BHB92 and Bluetooth module EYTF3CS FS 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 Date: 30th July 2008

Test Officer:



Jason Cameron

Authorised Signature:



Peter Jakubiec
EMC Technologies Pty Ltd



SAR TEST REPORT
Portable TABLET Computer
Model: P1630
Report Number: M080752 _CERT_AR5BHB92 _SAR_2.4

2.0 INTRODUCTION

Testing was performed on the Fujitsu TABLET PC, Model: P1630 with Atheros Mini-PCI Wireless LAN Module (HB92 802.11a/b/g/n), Model: AR5BHB92 & TAIYO YUDEN Bluetooth Module, Model: EYTF3CS FS. The HB92 module is an OEM product. The Mini-PCI Wireless LAN (WLAN) was tested in the dedicated host – LIFEBOOK P SERIES, Model P1630.

The measurement test results mentioned hereon only apply to the 2450MHz frequency band; an additional report titled "M080752 _CERT_AR5BHB92 _SAR_5.6" applies to the 5GHz range.

3.0 SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 EUT (WLAN) Details

Transmitter:	Half Mini-Card Wireless LAN Module
Wireless Module:	HB92 (11a/b/g/n)
Model Number:	AR5BHB92
Manufacturer:	Atheros Communication Inc,
Modulation Type:	DSSS for 802.11b OFDM for 802.11g OFDM for 802.11a OFDM for 802.11n
5GHz (802.11a/n)	BPSK, QPSK, 16QAM, 64QAM
2.4GHz (802.11b/g/n)	CCK, DQPSK, DBPSK, 16QAM, 64QAM
Maximum Data Rate:	802.11b = 11 Mbps, 802.11g and 802.11a = 54 Mbps 802.11n = 300 Mbps
Frequency Range:	2.412–2.462 GHz for 11b/g/n 5.18-5.32 GHz, 5.5-5.6 GHz and 5.745-5.825 GHz for 11a/n
Number of Channels:	11 channels for 11b/g/n with 20MHz Bandwidth 24 channels for 11a/n with 20MHz Bandwidth 18 channels for 11n with 40MHz Bandwidth
Antenna Types:	Nissei Electric Inverted F Antenna(1 st , 2 nd) Location: Left Top edge of LCD screen(1 st), Right lower edge of LCD screen(2 nd)
Model:	Tx1 Antenna:CP313576 Tx2 Antenna:CP338045
Power Supply:	3.3 VDC from PCI Express bus



Channels and Output power setting:

Mode	Channel	Frequency, MHz	Data Rate, Mbps	Tx BW, MHz	Average Output Power dBm
802.11b 2.4 GHz	1	2412	1	-	14.0
	6	2437			
	11	2462			
802.11g 2.4 GHz	1	2412	6	-	14.0
	6	2437			
	11	2462			
802.11n 2.4 GHz	1	2412	MCS0	20	14.0
	6	2437			12.5
	11	2462		40 Wide	12.0
	3	2422			14.0
	6	2437			10.5
	9	2452			

NOTE: For 5GHz SAR results refer to report titled "M080752 _CERT_AR5BHB92 _SAR_5.6".

3.2 EUT (Bluetooth) Details

Transmitter: Bluetooth
Model Number: EYTF3CS FS
Manufacturer: TAIYO YUDEN
Network Standard: Bluetooth™ 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: Antenna : YCE-5250
Location: Right palm rest area
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, 96
2	2403	
3	2404	
.	.	
.	.	
39	2440	
40	2441	
41	2442	
.	.	
.	.	
77	2478	
78	2479	
79	2480	



3.3 EUT (Notebook PC) Details

Host notebook :	LifeBook P series
Model Name:	P1630
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core2 Duo SU9400 1.4GHz
LCD	8.9"WXGA
Wired LAN:	Marvell 88E8057 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	<i>FPCPR56</i>
AC Adapter Model:	60W: SED80N2-16.0(Sanken) 40W: SEB55N2-16.0(Sanken)
Voltage:	16 V
Current Specs:	3.75A / 2.5A
Watts:	60W / 40W

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 Wireless LAN Model: AR5BHB92. SAR measurements were performed with the battery as shown below.

Battery #1

Product Number FPCBP101
V/mAh 10.8V/2600mAh

Battery #2

Product Number FMVNB144
V/mAh 10.8V/2600mAh



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 and 28 channels within the frequency range 5180 – 5825 MHz. In The frequency range 2412 MHz to 2462 MHz 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 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 only the Bluetooth module operating for the purpose of determining co-transmission requirements.

The test results mentioned in this report only apply to the 2450MHz frequency range. An additional report titled "M080752 _CERT_AR5BHB92 _SAR_5.6" is specific to the 5GHz 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.

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 (MCS8 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.

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 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

EMC Technologies Pty Ltd
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Facsimile: +61 3 9331 7455
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website: www.emctech.com.au

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 50361: 2001	Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz – 3GHz)
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 $20 \pm 1^\circ\text{C}$, the humidity was 48%. 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 $5\mu\text{V}$ in both air and liquid mediums.

6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

Applicable Head Configurations	: None
Applicable Body Configurations	: Tablet Position
	: 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 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 $\pm 0.02\text{ mm}$. The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN50361 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) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probes have been calibrated and found to be accurate to better than $\pm 0.25\text{ dB}$. 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.

6.3 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 $200\text{ M}\Omega$; 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.



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. ϵ_r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
30 th July 2008	39.7	1.80	14.0	6.54

6.4.2 Deviation from reference validation values

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: 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)
30 th July 2008 2450MHz	14.0	56.0	53.3	5.07	52.4	6.87

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.

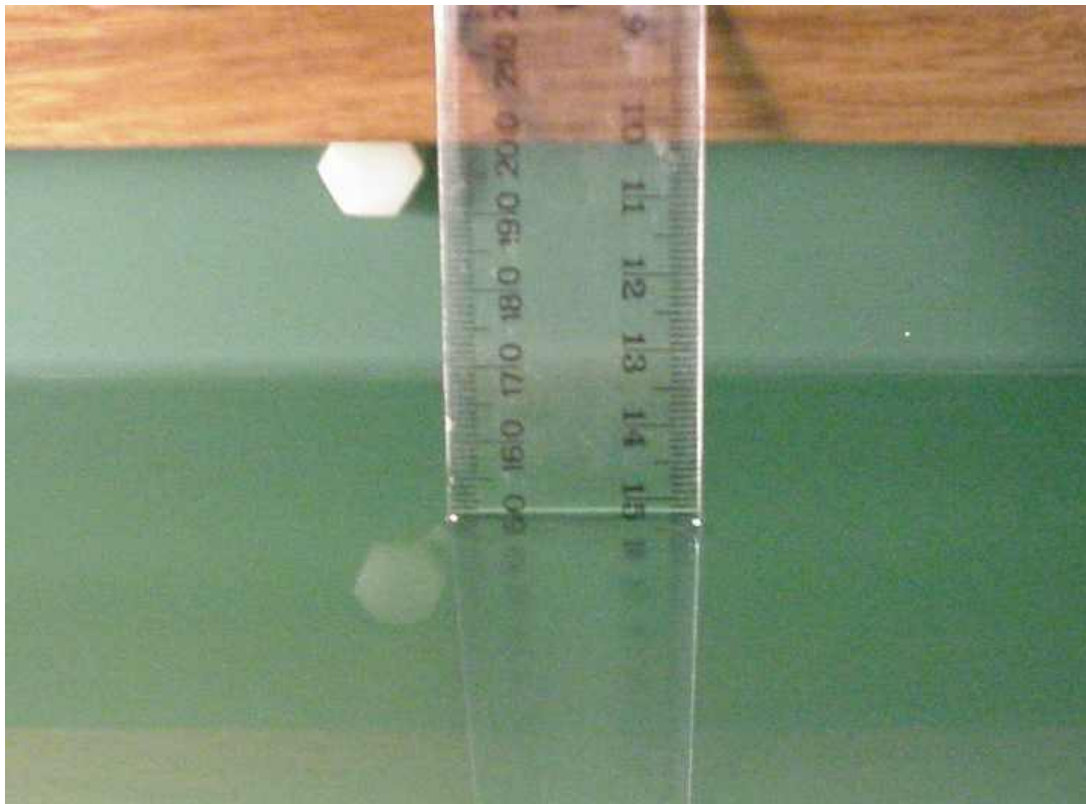


Photo of liquid Depth in Flat Phantom

6.5 Phantom Properties (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 \pm 0.2 mm and was filled with the required tissue simulating liquid. Below table provides a summary of the measured phantom properties.

Table: 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



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	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
2450 MHz Brain	39.7	39.2 \pm 5% (37.2 to 41.2)	1.80	1.80 \pm 5% (1.71 to 1.89)	1000

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

Table: Measured Body Simulating Liquid Dielectric Values

Frequency Band	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
2412 MHz Muscle	52.0	52.7 \pm 5% (50.1 to 55.3)	1.88	1.95 \pm 5% (1.85 to 2.05)	1000
2437 MHz Muscle	51.9	52.7 \pm 5% (50.1 to 55.3)	1.93	1.95 \pm 5% (1.85 to 2.05)	1000
2462 MHz Muscle	51.7	52.7 \pm 5% (50.1 to 55.3)	1.98	1.95 \pm 5% (1.85 to 2.05)	1000

NOTE: The brain and muscle liquid parameters were within the required tolerances of \pm 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 $|2|^\circ\text{C}$.

Table: Temperature and Humidity recorded for each day

Date	Ambient Temperature ($^\circ\text{C}$)	Liquid Temperature ($^\circ\text{C}$)	Humidity (%)
30 th July 2008	19.5	19.4	48

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. Small pieces of foam were then used to press the TABLET flush against 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 105mm 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 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: Uncertainty Budget for DASY4 V4.7 Build 53 – EUT SAR test 2450MHz

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (%)	Prob. Dist.	Div.	C _i (1g)	C _i (10g)	1g u _i (%)	10g u _i (%)	v _i
Measurement System									
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	∞
Test Sample Related									
Test Sample Positioning	7.2.2	1.61	N	1	1	1	1.6	1.6	11
Device Holder Uncertainty	E.4.1	3.34	N	1	1	1	3.3	3.3	7
Output Power Variation – SAR Drift Measurement	7.2.3	11.38	R	1.73	1	1	6.6	6.6	∞
Phantom and Tissue Parameters									
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				11.8	11.4	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				23.6	22.84	

Estimated total measurement uncertainty for the DASY4 measurement system was $\pm 11.8\%$. The extended uncertainty ($K = 2$) was assessed to be $\pm 23.6\%$ 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

a	b	c	D	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	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 (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	∞
Test Sample Related				□					
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	∞
				□					□
Phantom and Tissue Parameters									
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				8.0	7.8	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.



9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table: SPEAG DASY4 Version 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	11-July-2009	
Data Acquisition Electronics	SPEAG	DAE3 V1	442	24-July-2009	✓
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	
Probe E-Field	SPEAG	ET3DV6	1380	18-Dec-2008	✓
Probe E-Field	SPEAG	ET3DV6	1377	14-July-2009	
Probe E-Field	SPEAG	ES3DV6	3029	Not Used	
Probe E-Field	SPEAG	EX3DV4	3563	14-July-2009	
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	14-Dec-2009	
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	14-Dec-2008	
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	5-March-2009	
Antenna Dipole 3500 MHz	SPEAG	D3500V2	1002	06-July-2009	
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	13-Dec-2008	✓
Antenna Dipole 5600 MHz	SPEAG	D5GHzV2	1008	07-Dec-2009	
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	07-July-2009	✓
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	09-July-2009	✓
RF Power Meter Dual	Gigatronics	8542B	1830125	24-June-2009	
RF Power Sensor	Gigatronics	80301A	1828805	24-June-2009	
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	06-Sept-2008	
Network Analyser	Hewlett Packard	8753ES	JP39240130	02 Oct-2008	✓
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 P SERIES” can be used in either a conventional laptop position (see Appendix A1) or a Tablet configuration. The antenna location in the “LIFEBOOK P 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

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.*



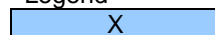
10.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)

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, as specified in section 4.0 were recorded. The following table represents the matrix used to determine what testing was required.

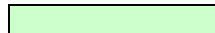
Table: Testing configurations

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

Legend



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.

10.3 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)

10.4 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)



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 – OFDM Mode

Test Position	Plot No.	Ant	Bit rate Mode (Mbps)	Channel Bandwidth (MHz)	Test Channel	Test Freq (MHz)	Measured 10g SAR Results (mW/g)	Measured Drift (dB)
Edge on Right	1	B	6	-	06	2437	0.351	-0.337

NOTE: The measurement uncertainty of 22.84% for 2.45GHz was not added to the result.

Table: SAR MEASUREMENT RESULTS – DSSS Mode

Test Position	Plot No.	Ant A or B	Bit rate Mode (Mbps)	Channel Bandwidth (MHz)	Test Channel	Test Freq (MHz)	Measured 10g SAR Results (mW/g)	Measured Drift (dB)
Edge On Right	2	B	1	-	01	2412	0.329	-0.315
	3		1	-	06	2437	0.358	-0.230
	4		1	-	11	2462	0.413	-0.136
Edge On Left	5	A	1	-	06	2437	0.076	-0.085
Tablet	6	A	1	-	06	2437	0.211	-0.251
	7	B	1	-	06	2437	0.013	-0.041

NOTE: The measurement uncertainty of 22.84% for 2.45GHz was not added to the result.

Table: SAR MEASUREMENT RESULTS – Bluetooth (FHSS Mode)

Test Position	Plot No.	Ant	Bit rate Mode (Mbps)	Channel Bandwidth (MHz)	Test Channel	Test Freq (MHz)	Measured 1g SAR Results (mW/g)	Measured Drift (dB)
Edge On Left	-	-	-	-	40	2441	0.02	-0.429
Tablet	-	-	-	-	40	2441	Noise Floor	N/A

NOTE: The measurement uncertainty of 23.8% for 2.45GHz was not added to the result.

The highest SAR level recorded in the 2450MHz band was 0.413 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Edge On Right position in DSSS mode, utilizing channel 11 (2462 MHz) and antenna B.



12.0 COMPLIANCE STATEMENT

The Fujitsu TABLET PC, Model: P1630 with ATHEROS Mini-PCI Wireless LAN Module (HB92 802.11a/b/g/n), Model: AR5BHB92 & TAIYO YUDEN Bluetooth Module, Model: EYTF3CS FS was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 0.413 mW/g for a 1g cube. This value was measured at 2462 MHz (channel 11) in the “Edge On Right” position in DSSS modulation mode at the antenna B. This was below the limit of 1.6 mW/g for uncontrolled exposure, even taking into account the measurement uncertainty of 23.6 %.



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APPENDIX A1 TEST SAMPLE PHOTOGRAPHS

Battery 1



Battery 2



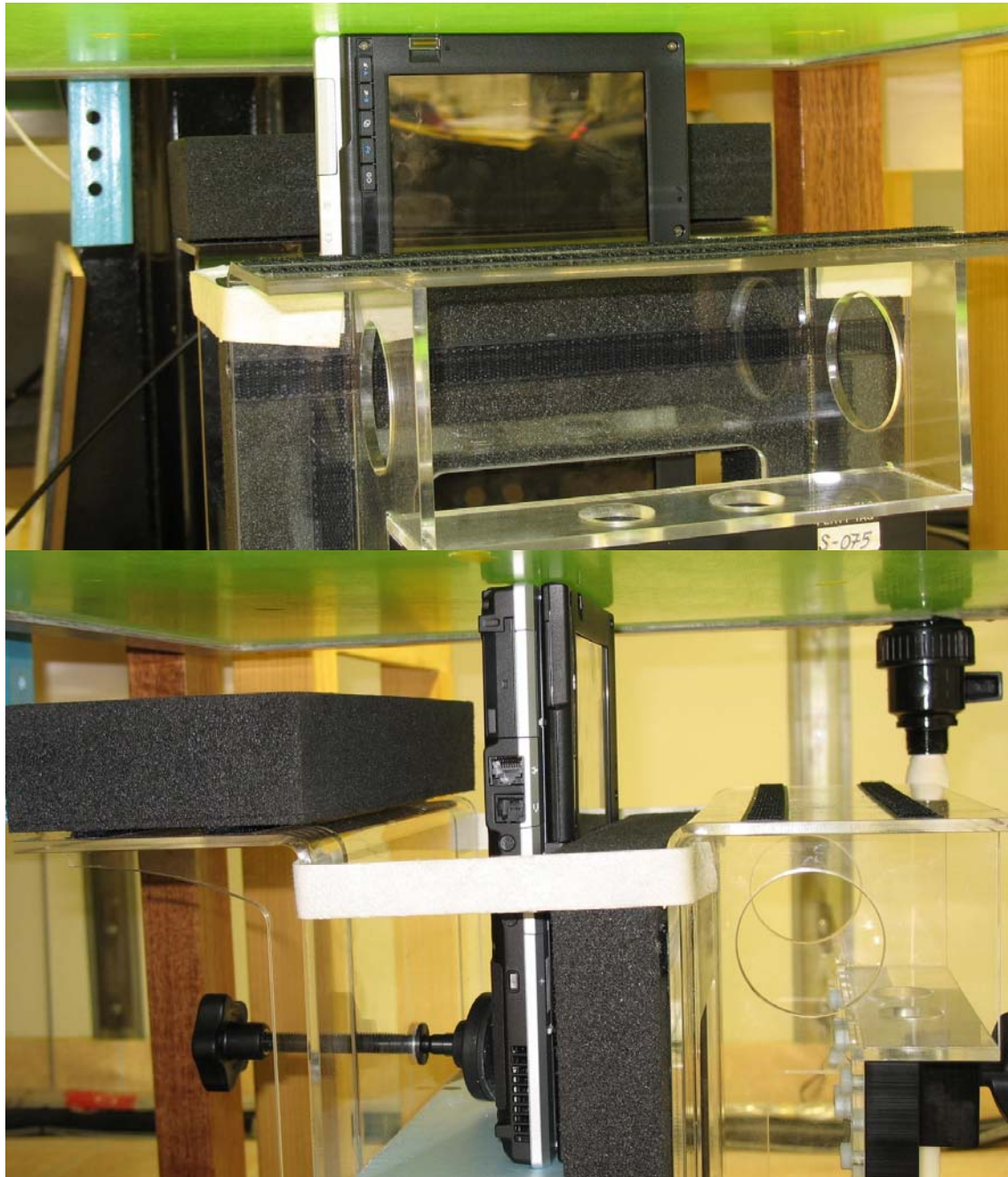
APPENDIX A2 TEST SETUP PHOTOGRAPHS

Tablet Position



APPENDIX A3 TEST SETUP PHOTOGRAPHS

Edge On Left Position



APPENDIX A4 TEST SAMPLE PHOTOGRAPHS

Edge On Right Position

