



EMC Technologies Pty Ltd

ABN 82 057 105 549
176 Harrick Road
Keilor Park
Victoria Australia 3042

Ph: + 613 9365 1000
Fax: + 613 9331 7455
email: melb@emctech.com.au

SAR Test Report

Report Number: M091069_CERT_622ANHMW_SAR_5.6_BT

Test Sample: Portable TABLET Computer
Host PC Model Number: T900 / TH900
Radio Modules: WLAN 622ANHMW & Bluetooth
EYSMJCS

PC System FCC ID: EJE-WB0080
PC System IC: 337J-WB0080
Date of Issue: 27th November 2006

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.



This document must not be copied or reproduced, except in full without the written permission of the Manager, EMC Technologies Pty Ltd. The certificate on page 3 may be reproduced in full.
www.emctech.com.au

CONTENTS

1.0 GENERAL INFORMATION.....	3
2.0 INTRODUCTION.....	4
3.0 TEST SAMPLE TECHNICAL INFORMATION.....	4
3.1 EUT (WLAN) Details	4
3.2 EUT (Bluetooth) Details.....	6
3.3 EUT (Notebook PC) Details	7
3.4 Test sample Accessories	7
3.4.1 Battery Types	7
4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER.....	8
4.1 Battery Status.....	8
5.0 DETAILS OF TEST LABORATORY	9
5.1 Location	9
5.2 Accreditations.....	9
5.3 Environmental Factors	9
6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM	10
6.1 Probe Positioning System	10
6.2 E-Field Probe Type and Performance	10
6.3 Validation	11
6.3.1 Validation Results @ 5GHz	11
6.3.2 Deviation from reference validation values	11
6.3.3 Liquid Depth 15cm.....	12
6.4 Phantom Properties	13
6.5 Tissue Material Properties.....	13
6.5.1 Liquid Temperature and Humidity.....	14
6.6 Simulated Tissue Composition Used for SAR Test	14
6.7 Device Holder for Laptops and P 10.1 Phantom	14
7.0 SAR MEASUREMENT PROCEDURE USING DASY4	15
8.0 MEASUREMENT UNCERTAINTY	16
9.0 EQUIPMENT LIST AND CALIBRATION DETAILS.....	18
10.0 OET BULLETIN 65 – SUPPLEMENT C TEST METHOD	19
10.1 Position	19
10.1.1 “Tablet” Position Definition (0mm spacing)	19
10.1.2 “Edge On” Position (Portrait or Landscape).....	19
10.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)	19
11.0 SAR MEASUREMENT RESULTS	20
11.1 5GHz Band SAR Results	20
12.0 COMPLIANCE STATEMENT	22
13.0 MULTIBAND EVALUATION CONSIDERATIONS.....	23
APPENDIX A1 TEST SAMPLE PHOTOGRAPHS	24
APPENDIX A2 TEST SAMPLE PHOTOGRAPHS	25
APPENDIX A3 TEST SAMPLE PHOTOGRAPHS	26
APPENDIX A4 TEST SETUP PHOTOGRAPHS	27
APPENDIX A5 TEST SETUP PHOTOGRAPHS	28
APPENDIX A6 TEST SETUP PHOTOGRAPHS	29
APPENDIX B PLOTS OF THE SAR MEASUREMENTS	30
APPENDIX C CALIBRATION DOCUMENTS	55



SAR TEST REPORT

Report Number: M091069_CERT_622ANHMW_SAR_5.6_BT
PC System FCC ID: EJE-WB0080 PC System IC: 337J-WB0080

1.0 GENERAL INFORMATION

Test Sample: Portable TABLET Computer
Model Name: T900 / TH900
Radio Modules: WLAN 622ANHMW & Bluetooth EYSMJCS
Interface Type: Half Mini-PCI Module
Device Category: Portable Transmitter
Test Device: Pre-Production Unit
FCC System ID: EJE-WB0080
PC System IC: 337J-WB0080
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 T900 / TH900 with Wireless LAN model 622ANHMW and Bluetooth module EYSMJCS 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: 4th – 6th November 2009

Test Officer:



Peter Jakubiec



Jason Cameron

Authorised Signature:



Peter Jakubiec

This document is issued in accordance with NATA's accreditation requirements. The results of tests, calibration and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing and calibration reports.



This document must not be copied or reproduced, except in full without the written permission of the Manager, EMC Technologies Pty Ltd. The certificate on page 3 may be reproduced in full.
www.emctech.com.au

SAR TEST REPORT
Portable TABLET Computer
Model: T900 / TH900
Report Number: M091069_CERT_622ANHMW_SAR_5.6_BT

2.0 INTRODUCTION

Testing was performed on the Fujitsu TABLET PC, Model: T900 / TH900 with INTEL Mini-PCI Wireless LAN Module (INTEL CENTRINO ADVANCED-N 6200(PUMA PEAK) 802.11a/b/g/n), Model: 622ANHMW & TAIYO YUDEN Bluetooth Module, Model: EYSMJCS. The INTEL CENTRINO ADVANCED-N 6200(PUMA PEAK) module is an OEM product. The Half Mini-PCI Wireless LAN (WLAN) was tested in the dedicated host – LIFEBOOK T SERIES, Model T900 / TH900.

The measurement test results mentioned here on only apply to the 5GHz frequency band; an additional report titled "M091069_CERT_622ANHMW_SAR_2.4_BT" applies to the 2450MHz frequency range.

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:	Intel Centrino Advanced-N 6200(Puma Peak) (11a/b/g/n)
Model Number:	622ANHMW
Manufacturer:	Intel Corporation
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 5.18-5.24 GHz, 5.26-5.32 GHz, 5.50-5.70 GHz, 5.745-5.825 GHz for 11a/n
Number of Channels:	11 channels for 11b/g/n 24 channels for 11a/n with 20MHz Bandwidth 18 channels for 11n with 40MHz Bandwidth
Antenna Types:	Nissei Electric Inverted F Antenna(TX1, TX2), Model: Tx1 Antenna: CP405102 Tx2 Antenna: CP405101
Antenna gain:	Location: Top edge of LCD screen(TX1, TX2), Tx1 Antenna: CP405102: 1.05 dBi Tx2 Antenna: CP405101: -0.01 dBi
Power Supply:	3.3 VDC from PCIe 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	-	16.5
	6	2437			16.5
	11	2462			16.5
802.11g 2.4 GHz	1	2412	6	-	15.5
	6	2437			16.5
	11	2462			15.5
802.11n 2.4 GHz	1	2412	HT0	20	15.5
	6	2437			16.5
	11	2462			15.5
	3	2422		40 Wide	12
	6	2437			16.5
	9	2452			12

5 GHz (5.180 to 5.825 GHz)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power (dBm)
802.11a 5.2 GHz	1	2412	6	-	16.5
	6	2437			16.5
	11	2462			16.5
802.11n 5.2 GHz	1	2412	HT0	20	16.5
	6	2437			16.5
	11	2462			16.5
	3	2422		40 Wide	16.5
	6	2437			16.5
	9	2452			16.5
802.11a 5.6 GHz	1	2412	6	-	16.5
	6	2437			16.5
	11	2462			16.5
802.11n 5.6 GHz	1	2412	HT0	20	16.5
	6	2437			16.5
	11	2462			16.5
	3	2422		40 Wide	16.5
	6	2437			16.5
	9	2452			16.5
802.11a 5.8 GHz	1	2412	6	-	16.5
	6	2437			16.5
	11	2462			16.5
802.11n 5.8 GHz	1	2412	HT0	20	16.5
	6	2437			16.5
	11	2462			16.5
	3	2422		40 Wide	16.5
	6	2437			16.5
	9	2452			16.5

NOTE: For 2450 MHz SAR results refer to report titled "M091069_CERT_622ANHWMW_SAR_2.4_BT"



3.2 EUT (Bluetooth) Details

Transmitter: Bluetooth
Model Number: EYSMJCS
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: Included BT module
 Location: left side of hinge
Antenna gain: Please refer antenna data provided separately
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 T series
Model Name(Reg No.):	T900 / TH900
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core i7 M620 2.67GHz
LCD	13.3" WXGA
Wired LAN:	Intel 82577LM : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	ZPR0030
AC Adapter Model:	80W: SEE100P2-19.0 (Sanken), SEC100P3-19.0 (Sanken), ADP-80NB A (Delta) 100W: SEE120P2-19.0 (Sanken)
Voltage:	19V
Current Specs:	4.22A / 5.27A
Watts:	80W / 100W
Radio Modules:	WLAN (Puma Peak IEEE802.11a/b/g/n, 2x2)
WLAN Model Number:	622ANHMW
WLAN Manufacturer:	Intel Corp.
Interface Type:	Half Mini-Card Wireless LAN Module
Radio Modules:	Bluetooth module
Model Number:	EYSMJCS
Manufacturer:	Taiyo Yuden
Interface Type:	USB

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: 622ANHMW. SAR measurements were performed with the battery as shown below.

Standard Battery

Battery #1

Product No. FPCBP215
V/mAh 10.8V/5800mAh
Serial No. 01A-Z090511000293Z

Battery #2

Product No. FPCBP215
V/mAh 10.8V/5800mAh
Serial No. 01A-Z090429000610Z



4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

INTEL's CRTU 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 24 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.

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). Due to the output power of the Bluetooth module being <60/f, and a separation of the Bluetooth antenna from all other simultaneous transmitting antennas >5cm, the Bluetooth module was not assessed in the SAR measurements. See section 13 for further details.

The test results mentioned in this report only apply to the 5200/5800MHz frequency range. An additional report titled "M091069_CERT_622ANHMW_SAR_2.4_BT" is specific to the 2450MHz 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 and 5600MHz 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. 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

EMC Technologies Pty Ltd
176 Harrick Road
Keilor Park, (Melbourne) Victoria
Australia 3042

Telephone: +61 3 9365 1000
Facsimile: +61 3 9331 7455
email: melb@emctech.com.au
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 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 $21 \pm 1^\circ\text{C}$, the humidity was in the range 41% to 47%. 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 SN3563 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 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 EX3DV4 Serial: 3563. Please refer to appendix C for detailed information.



6.3 Validation

6.3.1 Validation Results @ 5GHz

The following table 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 D5GHzV2 SN: 1008)

1. Validation Date	2. ϵ_r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
4 th November 2009	35.5	5.14	21.1	5.99
5 th November 2009	36.5	5.17	22.1	6.24
6 th November 2009	37.0	4.80	21.9	6.26

6.3.2 Deviation from reference validation values

The reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole (D5GHzV2) after system component calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table below.

Table: Deviation from reference validation values in 5.6 GHz band.

Frequency and Date	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	EMCT Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG Reference 1g (%)
4 th November 2009 5800MHz	21.1	84.40	89.2	-5.38
5 th November 2009 5500MHz	22.1	88.40	85.2	3.76
6 th November 2009 5200MHz	21.9	87.60	89.6	-2.23

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



6.3.3 Liquid Depth 15cm

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



Photo of liquid Depth in Flat Phantom

6.4 Phantom Properties

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

6.5 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
5200 MHz Brain	37.0	36.0 $\pm$ 5% (34.2 to 37.8)	4.80	4.76 $\pm$ 5% (4.43 to 4.90)	1000
5500 MHz Brain	36.5	35.6 $\pm$ 5% (33.8 to 37.4)	5.17	4.96 $\pm$ 5% (4.71 to 5.21)	1000
5800 MHz Brain	35.5	35.3 $\pm$ 5% (33.5 to 37.1)	5.14	5.27 $\pm$ 5% (5.01 to 5.53)	1000

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

Table: Measured Body Simulating Liquid Dielectric Values for 5200MHz range

Frequency Band	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
5260 MHz Muscle	47.6	48.9 $\pm$ 10% (44.0 to 53.8)	5.37	5.40 $\pm$ 10% (4.86 to 5.94)	1000

Table: Measured Body Simulating Liquid Dielectric Values for 5600MHz range

Frequency Band	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
5600 MHz Muscle	45.9	48.5 $\pm$ 10% (43.8 to 53.5)	5.89	5.77 $\pm$ 10% (5.20 to 6.34)	1000

Table: Measured Body Simulating Liquid Dielectric Values for 5800MHz range

Frequency Band	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
5785 MHz Muscle	44.9	48.2 $\pm$ 10% (43.4 to 53.0)	6.38	6.0 $\pm$ 10% (5.40 to 6.60)	1000

NOTE: The muscle liquid parameters were within the required tolerances of $\pm$ 10%.



6.5.1 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 (%)
4 th November 2009	21.1	20.8	47
5 th November 2009	21.0	20.8	43
6 th November 2009	21.9	21.5	41

6.6 Simulated Tissue Composition Used for SAR Test

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.

Table: Tissue Type: Muscle @ 5600MHz

Volume of Liquid: 60 Litres

EMCT Liquid

Composition
Distilled Water
Salt
Triton X-100

6.7 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 2.0 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 100mm x 140mm 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 24 mm x 24 mm x 20 mm is assessed by measuring 7 x 7 x 9 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 1.0 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 2.0 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.

Table: Uncertainty Budget for DASY4 Version V4.7 Build 53 – EUT SAR test 5GHz

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	6.55	N	1	1	1	6.6	6.6	∞
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	2	R	1.73	1	1	1.2	1.2	∞
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	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning	9.9	R	1.73	1	1	5.7	5.7	∞
Max. SAR Eval.	4	R	1.73	1	1	2.3	2.3	∞
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	12.00	R	1.73	1	1	6.9	6.9	∞
Phantom and Setup								
Phantom Uncertainty	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	10	R	1.73	0.64	0.43	3.7	2.5	∞
Liquid Conductivity – Measurement uncertainty	5	N	1.00	0.64	0.43	3.2	2.2	5
Liquid Permittivity – Deviation from target values	10	R	1.73	0.6	0.49	3.5	2.8	∞
Liquid Permittivity – Measurement uncertainty	5	N	1.00	0.6	0.49	3.0	2.5	5
Combined standard Uncertainty		RSS				14.9	14.3	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				29.8	28.66	

Estimated total measurement uncertainty for the DASY4 measurement system was $\pm 14.9\%$. The extended uncertainty ($K = 2$) was assessed to be $\pm 29.8\%$ based on 95% confidence level. The uncertainty is not added to the measurement result.



Table: Uncertainty Budget for DASY4 Version V4.7 Build 53 – Validation 5GHz

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	6.55	N	1	1	1	6.6	6.6	∞
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	2	R	1.73	1	1	1.2	1.2	∞
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	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning	9.9	R	1.73	1	1	5.7	5.7	∞
Max. SAR Eval.	4	R	1.73	1	1	2.3	2.3	∞
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				11.4	11.1	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				22.7	22.26	

Estimated total measurement uncertainty for the DASY4 measurement system was $\pm 11.4\%$. The extended uncertainty ($K = 2$) was assessed to be $\pm 22.7\%$ based on 95% confidence level. The uncertainty is not added to the 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	08-July-2010	
Data Acquisition Electronics	SPEAG	DAE3 V1	442	10-Dec-2009	✓
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	
Probe E-Field	SPEAG	ET3DV6	1380	18-Dec-2009	
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	✓
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	14-Dec-2009	
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	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	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	11-Nov-2009	✓
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 Position

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) and KDB 616217 (v01r01 Nov 2009) are applied for SAR measurements of the host system.

Table: Testing configurations

Phantom Configuration	*Device Mode	Antenna	Test Configurations		
			Channel (Low)	Channel (Middle)	Channel (High)
Tablet	OFDM 5GHz	A		X	
	All Bands	B		X	
Edge On	OFDM 5GHz	A		X	
	All Bands	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 5GHz Band SAR Results

Table: SAR MEASUREMENT RESULTS Lower Band – OFDM 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)
Primary Portrait	-	A	6	-	52	5260	Noise Floor	N/A
	1	B	6	-	52	5260	0.044	0.261
Secondary Portrait	-	A	6	-	52	5260	Noise Floor	N/A
Tablet	-	A	6	-	52	5260	Noise Floor	N/A
	-	B	6	-	52	5260	Noise Floor	N/A

NOTE: The measurement uncertainty of 29.8% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.2 GHz band was 0.044 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Primary Portrait position in OFDM mode, utilizing channel 52 (5260MHz) and antenna B.

Table: SAR MEASUREMENT RESULTS Middle Band – OFDM 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)
Primary Portrait	2	A	6	-	120	5600	0.017	0.378
	3	B	6	-	120	5600	0.068	0.028
Secondary Portrait	-	A	6	-	120	5600	Noise Floor	N/A
Tablet	-	A	6	-	120	5600	Noise Floor	N/A
	4	B	6	-	120	5600	0.026	-0.492

NOTE: The measurement uncertainty of 29.8% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.6 GHz band was 0.068 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Primary Portrait position in OFDM mode, utilizing channel 120 (5600MHz) and antenna B.



Table: SAR MEASUREMENT RESULTS Upper Band – OFDM 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)
Primary Portrait	5	A	6	-	157	5785	0.037	0.080
	6	B	6	-	157	5785	0.113	0.306
	7	B	HT0	20	157	5785	0.111	-0.233
	8	B	HT0	40	159	5795	0.094	-0.457
Secondary Portrait	-	A	6	-	157	5785	Noise Floor	N/A
Tablet	-	A	6	-	157	5785	Noise Floor	N/A
	9	B	6	-	157	5785	0.043	0.153

NOTE: The measurement uncertainty of 29.8% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.8 GHz band was 0.113 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Primary Portrait position in OFDM mode, utilizing channel 157 (5785MHz) and antenna B.



12.0 COMPLIANCE STATEMENT

The Fujitsu TABLET PC, Model: T900 / TH900 with INTEL Half Mini-PCI Wireless LAN Module (INTEL CENTRINO ADVANCED-N 6200(PUMA PEAK) 802.11a/b/g/n), Model: 622ANHMW & TAIYO YUDEN Bluetooth Module, Model: EYSMJCS was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 0.113 mW/g for a 1g cube. This value was measured at 5785 MHz (channel 157) in the "Primary Portrait" position in OFDM modulation mode at the antenna B. This was below the limit of 1.6mW/g for uncontrolled exposure, even taking into account the measurement uncertainty of 29.8%.

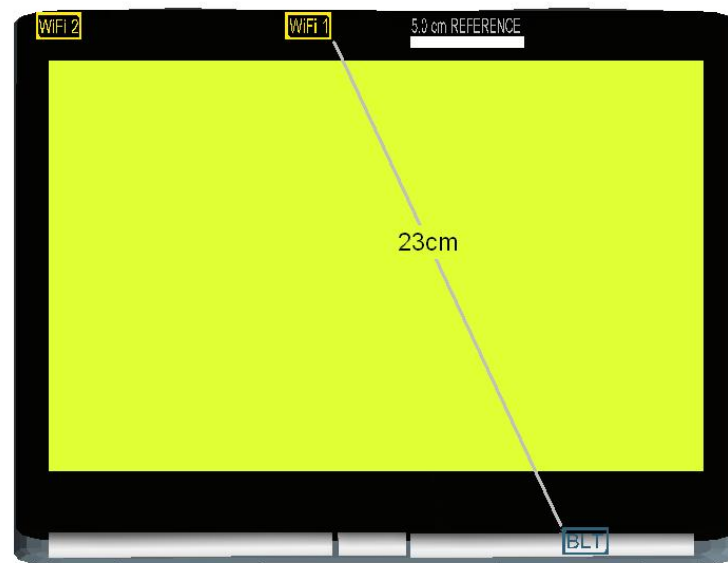
This document is issued in accordance with NATA's accreditation requirements. The results of tests, calibration and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing and calibration reports.



This document must not be copied or reproduced, except in full without the written permission of the Manager, EMC Technologies Pty Ltd. The certificate on page 3 may be reproduced in full.
www.emctech.com.au

13.0 MULTIBAND EVALUATION CONSIDERATIONS

The Fujitsu Tablet PC has multiple antennas that are capable of simultaneous transmission. 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 shortest distance between the BT module and any other transmitting antenna was 23cm.

Because $23\text{cm} > 5\text{cm}$, and $5\text{mW} < 25\text{mW}$, the Bluetooth module was not considered for SAR evaluation. This is in accordance with the test reduction methods detailed in KDB 616217 and KDB 447498.