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SAR Test Report

Report Number: M071143_CERT_4965AG _SAR_2.4

Test Sample:	Portable Tablet Computer
Radio Modules:	WLAN 4965AG & Bluetooth EYTF3CS FT
Model Number:	P1620
Tested For:	Fujitsu Australia Pty Ltd
FCC ID:	EJE-WB0055
IC:	337J-WB0055
Date of Issue:	14th January 2008

Nata Accredited Laboratory
Number: 5292

CONTENTS

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1.0 GENERAL INFORMATION

Test Sample:	Portable Tablet Computer
Model Name:	P1620
Radio Modules:	WLAN 4965AG & Bluetooth EYTF3CS FT
Interface Type:	Mini-PCI Module
Device Category:	Portable Transmitter
Test Device:	Pre-Production Unit
FCC ID:	EJE-WB0055
IC:	337J-WB0055
RF exposure Category:	General Population/Uncontrolled
Manufacturer:	Fujitsu Limited
Test Standard/s:	**1.** Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) **2.** Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields. RSS-102 Issue 1 (Provisional) September 25, 1999
Statement Of Compliance:	The Fujitsu Tablet Computer P1620 with Wireless LAN model 4965AG and Bluetooth module EYTF3CS FT complied***** with the FCC General public/uncontrolled RF exposure limits of 1.6mW/g per requirements of 47CFR2.1093(d). It also complied with IC RSS-102 requirements. *. Refer to compliance statement section 9.
Test Date:	7th & 10th December 2007
Tested for:	Fujitsu Australia Pty Ltd
Address:	1230 Nepean Highway, Cheltenham VIC 3192
Contact:	Praveen Rao
Phone:	+61 3 9265 0210
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Test Officer:

Kim H Long
Test Engineer

Authorised Signature:

Chris Zombolas
Technical Director

SAR TEST REPORT
Portable Tablet Computer
Model: P1620
Report Number: M071143_CERT_4965AG _SAR_2.4

2.0 INTRODUCTION

Testing was performed on the Fujitsu Tablet PC, Model: P1620 with INTEL Mini-PCI Wireless LAN Module (KEDRON 802.11a/b/g), Model: 4965AG & TAIYO YUDEN Bluetooth Module, Model: EYTF3CS FT. The KEDRON module is an OEM product. The Mini-PCI Wireless LAN (WLAN) was tested in the dedicated host – RYUGA, Model P1620.

The measurement test results mentioned hereon only apply to the 2450MHz frequency band; an additional report titled "M071143_CERT_4965AG_SAR_5.6" applies to the 5GHz range.

3.0 SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 EUT (WLAN) Details

Transmitter:	Mini-Card Wireless LAN Module
Wireless Module:	Kedron (11a/b/g)
Model Number:	4965AG
Manufacturer:	Intel Corporation
Modulation Type:	DSSS for 802.11b OFDM for 802.11g OFDM for 802.11a
5GHz (802.11a)	BPSK, QPSK, 16QAM, 64QAM
2.4GHz (802.11b/g)	CCK, DQPSK, DBPSK, 16QAM, 64QAM
Maximum Data Rate:	802.11b = 11 Mbps, 802.11g and 802.11a = 54 Mbps
Frequency Range:	2.412–2.462 GHz for 802.11b/g 5.18-5.32 GHz and 5.745-5.825 GHz for 802.11a
Number of Channels:	11 channels for 802.11b/g 13 channels for 802.11a
Antenna Types:	Nissei Electric Inverted F Antenna - Model: CP313544(Main:Rihgt), CP313545(Aux:Left) Location: Top edge of LCD screen
Antenna gain:	Please refer antenna data provided separately
Power Supply:	3.3 VDC from PCI bus

Channels Tested and Output power setting:

Channel and Mode	Frequency MHz	Average Output Power dBm
802.11b/g mode		
Channels 1, 6 and 11	2412, 2437 and 2462	15.5
802.11a mode		
Channels 36	5180	16.5
Channels 48	5240	16.5
Channels 52	5260	16.5
Channels 64	5320	16.5
Channels 149	5745	17.5
Channels 157	5785	17.5
Channels 165	5825	17.5

NOTE: For 5GHz SAR results refer to report titled “M071143_CERT_4965AG_SAR_5.6”.

3.2 EUT (Bluetooth) Details

Transmitter: Bluetooth
Model Number: EYTF3CS FT
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: Nissei Electric Inverted F Antenna, Model: CP115428
Location: Right palm rest corner
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	

*Channels Tested

3.3 EUT (Notebook PC) Details

EUT:	RYUGA
Model Name:	P1620
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core2 Duo T7700 2.4GHz
LCD	12”SXGA+ / 12”XGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	FPCPR65
AC Adapter Model:	SEC100P2-19.0(Sanken) / SEC100P3-19.0(Sanken, 3pin) / ADP-80NB A(Delta)
Voltage:	19 V
Current Specs:	4.22A
Watts:	80W

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: 4965ABG. SAR measurements were performed with the battery as shown below.

Standard Battery

Model	Standard Battery	Extended Battery
Type:	Li-ion	Li-ion
V/mAh	10.8V/2600mAh	10.8V/5200mAh
Cell No.	6	6

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 17 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 fixed frequency channels used in the testing are shown in the table below.

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

The test results mentioned in this report only apply to the 2450MHz frequency range. An additional report titled *"M071143_CERT_4965ABG_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.

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

Table: Frequency and Conducted Power Results

Channel	Channel Frequency MHz	Data Rates	Maximum Conducted Output Power - Peak Measured (dBm)
Channel 01	2412	1 (DSSS)	15.3
Channel 06	2437	1 (DSSS)	15.0
Channel 11	2462	1 (DSSS)	15.4
Channel 01	2412	6	15.5
Channel 06	2437	6	15.3
Channel 11	2462	6	15.7

Frequency and Conducted Power Results Bluetooth

Channel	Channel Frequency MHz	*Data Rate (Mbps)	Maximum Conducted Output Power Measured (dBm)
Channel 40	2441	N/A	3.7

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 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 21±1°C, the humidity was in the range 44% to 62%. The liquid parameters are measured daily prior to the commencement of each test. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN1377 probe was less than 5μV in both air and liquid mediums.

6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

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 that 1.1m), which positions the SAR measurement probes with a positional repeatability of better than ±0.02 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: 1377 (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 ±0.25 dB. The probe is suitable for measurements close to material discontinuity at the surface of the phantom. The sensors of the probe are directly loaded with Schottky diodes and connected via highly resistive lines (length = 300 mm) to the data acquisition unit.

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 MΩ; 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. ∈r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
7th Dec 07	39.7	1.81	13.8	6.53
10th Dec 07	40.0	1.80	13.8	6.47

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	13.8	55.2	55.6	-0.72	52.4	5.34
2450MHz	13.8	55.2	55.6	-0.72	52.4	5.34

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.

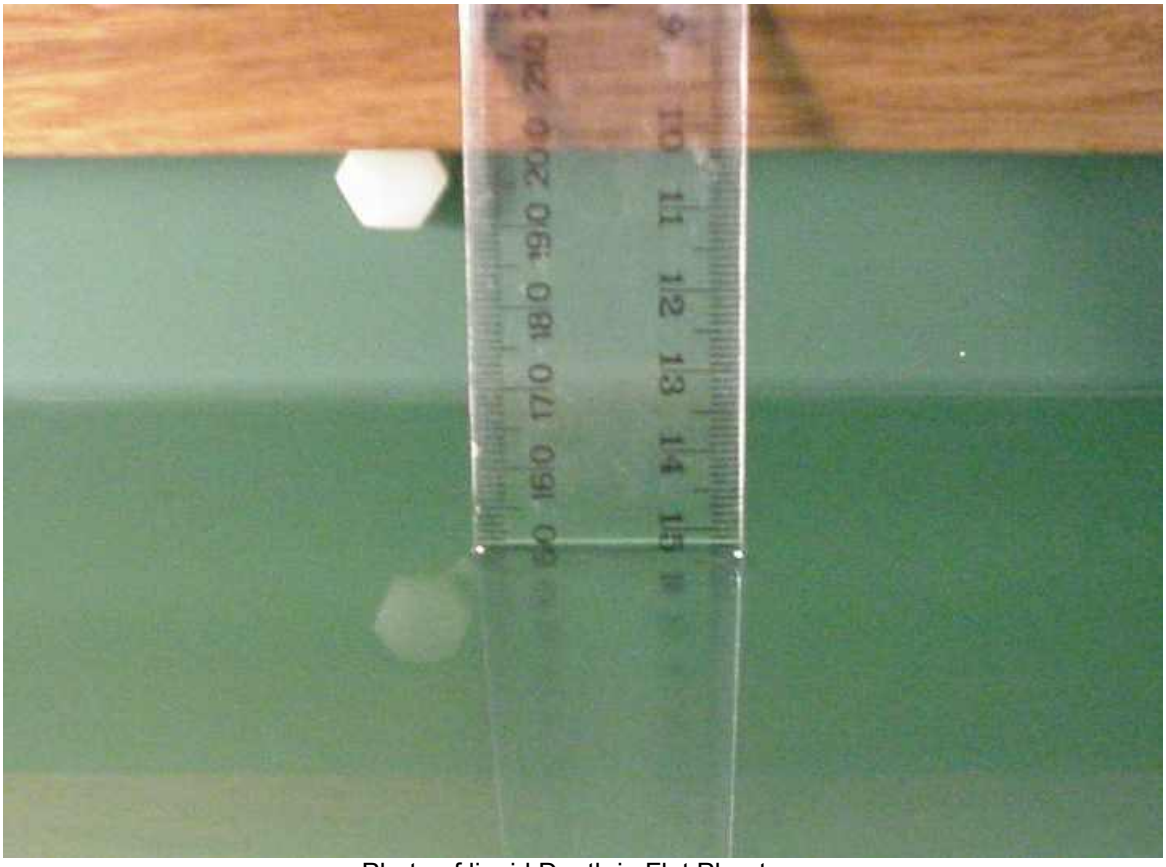


Photo of liquid Depth in Flat Phantom

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+/-0.2 mm and was filled with the required tissue simulating liquid. Below table provides a summary of the measured phantom properties. *Refer to Appendix C Part 4, for details of P 10.1 phantom dielectric properties and loss tangent*.

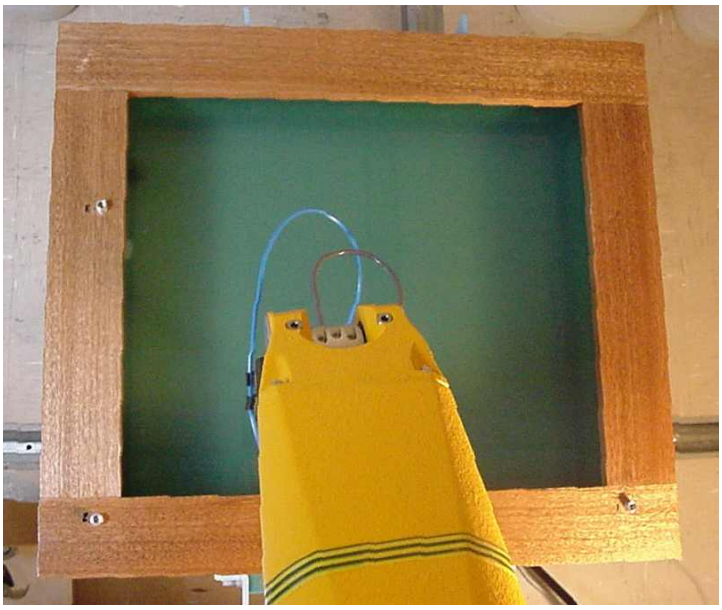
Table: Phantom Properties (300MHz-2500MHz)

Phantom Properties	Required	Measured
Thickness of flat section	2.0mm ± 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	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
2450 MHz Brain	40.0	39.2 ±5% (37.2 to 41.2)	1.80	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	52.3	52.7 ±5% (50.1 to 55.3)	1.91	1.95 ±5% (1.85 to 2.05)	1000
2437 MHz Muscle	52.2	52.7 ±5% (50.1 to 55.3)	1.95	1.95 ±5% (1.85 to 2.05)	1000
2462 MHz Muscle	52.0	52.7 ±5% (50.1 to 55.3)	1.98	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 (%)
7th November 2007	21.1	20.9	62
10th November 2007	21.9	21.4	44

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"