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SAR Test Report

Report Number: M071144 _CERT_AR5BXB6 _SAR_5.6**Test Sample:** Portable Tablet Computer**Radio Modules:** WLAN AR5BXB6 & Bluetooth EYTF3CS FT**Tested For:** Fujitsu Australia Pty Ltd**FCC ID:** EJE-WB0041**IC:** 337J- WB0041**Date of Issue:** 9th January 2008

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SAR TEST REPORT**Report Number: M071144 _CERT_AR5BxB6 _SAR_5.6****FCC ID: EJE-WB0041****IC: 337J- WB0041****1.0 GENERAL INFORMATION**

Test Sample: Portable Tablet Computer
Model Name: P1620
Radio Modules: WLAN AR5BxB6 & Bluetooth EYTF3CS FT
Interface Type: Mini-PCI Module
Device Category: Portable Transmitter
Test Device: Pre-Production Unit
FCC ID: EJE-WB0041
IC: 337J- WB0041
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 AR5BxB6 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: 5th – 6th December 2007

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SAR TEST REPORT
Portable TABLET Computer Wireless LAN
Model: P1620
Report Number: M071144 _CERT_AR5BxB6 _SAR_5.6

2.0 INTRODUCTION

Testing was performed on the Fujitsu Tablet PC, Model: P1620 with INTEL Mini-PCI Wireless LAN Module (ATHEROS 802.11a/b/g/n), Model: AR5BxB6 & TAIYO YUDEN Bluetooth Module, Model: EYTF3CS FT. The ATHEROS 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 5GHz frequency band; an additional report titled "M071144_ CERT_AR5BxB6 _SAR_2.4" applies to the 2450MHz frequency range.

3.0 SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 EUT (WLAN) Details

Transmitter:	Mini-Card Wireless LAN Module
Wireless Module:	XB62 (11a+b/g)
Model Number:	AR5BxB6
Manufacturer:	ATHEROS
Modulation Type:	Direct Sequence Spread Spectrum (DSSS for 802.11b) Orthogonal Frequency Division Multiplexing (OFDM for 802.11g) Orthogonal Frequency Division Multiplexing (OFDM for 802.11a)
802.11a	BPSK – 6Mbps, 9Mbps QPSK – 12Mbps, 18Mbps 16QAM – 24Mbps, 36Mbps 64QAM – 48Mbps, 54Mbps
802.11g	BPSK – 6Mbps, 9Mbps QPSK – 12Mbps, 18Mbps 16QAM – 24Mbps, 36Mbps 64QAM – 48Mbps, 54Mbps
802.11b	DBPSK – 1Mbps DQPSK – 2Mbps CCK – 5.5Mbps, 11Mbps
Maximum Data Rate:	802.11b = 11Mbps, 802.11g and 802.11a = 54Mbps
Frequency Range:	2.4 –2483.5 GHz for 11b/g 5.15 - 5.35 GHz and 5.725 - 5.850 GHz for 11a
Number of Channels:	11 channels for 802.11b or 802.11g 24 channels for 802.11a
Antenna Types:	Nissei Electric Inverted F Antenna - Model: CP313544(Main:Rihgt), CP313545(Aux:Left)
Antenna gain:	Location: Top edge of LCD screen Please refer antenna data provided separately
Power Supply:	3.3 VDC from PCI bus



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Frequency allocation and maximum output power for 802.11b/g and 802.11a:

Operation Frequency [GHz]	Rated output power (conducted) [dBm] average power										
	1/2M bps	5.5M bps	11M bps	6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
Ch. 1-11	+17	+17	+17	+16	+16	+16	+16	+16	+16	+16	+15
Ch. 36-140	-	-	-	+16	+16	+16	+16	+16	+16	+14	+13
Ch.149-165	-	-	-	+16	+16	+16	+16	+16	+16	+14	+11

NOTE: For 2450 MHz SAR results refer to report titled "M071144 _CERT_AR5BxB6 _SAR_2.4".

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	



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3.3 EUT (Notebook PC) Details

EUT:	Ryuga
Host notebook :	LifeBook P series
Model Name:	P1620
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core2 Duo U7700 1.3GHz
LCD	8.9"WXGA
Wired LAN:	Marvell 88E8055 : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	FPCPR56
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

Two type of Fujitsu Lithium Ion Battery was used to power the Portable Tablet Computer Wireless LAN Model: AR5BxB6. SAR measurements were performed with the battery as shown below.

Standard Battery

Model	CP240502-01 X02A7723
Type	Li-ion
V/mAh	10.8V/2600mAh

Extended Battery

Model	CP2297-01 X01A-6518
Type	Li-ion
V/mAh	10.8V/5200mAh



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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 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 5200/5800MHz frequency range. An additional report titled "M071144_ CERT_AR5BxB6 _SAR_2.4" 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.

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 the following table.



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Table: Frequency and Conducted Power Results WLAN

Channel	Channel Frequency MHz	Data Rates	Maximum Conducted Output Power – Peak Measured (dBm)
Channel 36	5180	6	14.5
Channel 52	5260	6	14.0
Channel 64	5320	6	14.0
Channel 149	5745	6	13.0
Channel 157	5785	6	13.0
Channel 165	5825	6	12.5

Frequency and Conducted Power Results Bluetooth

Channel	Channel Frequency MHz	*Data Rate (Mbps)	Maximum Conducted Output Power Measured (dBm)
Channel 40	2441	N/A	3.9

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.



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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 59% to 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 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	: 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 EX3DV4 Serial: 3563 (5.6 GHz) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probe has 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 @ 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)
5 th Dec 07	36.8	4.75	21.0	6.07
6 th Dec 07	35.4	5.31	19.4	5.47

6.4.2 Deviation from reference validation values

Currently no IEEE Std 1528-2003 SAR reference values are available in 5.6 GHz band, as a consequence all validation results were compared against the SPEAG calibration reference SAR values.

The SPEAG calibration reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole (D5GHzV2) during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in 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)	SPEAG Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG Reference (1g) %
5200MHz	21.0	84.0	78.1	7.55
5800MHz	19.4	77.6	78.2	-0.67

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



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6.4.3 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.

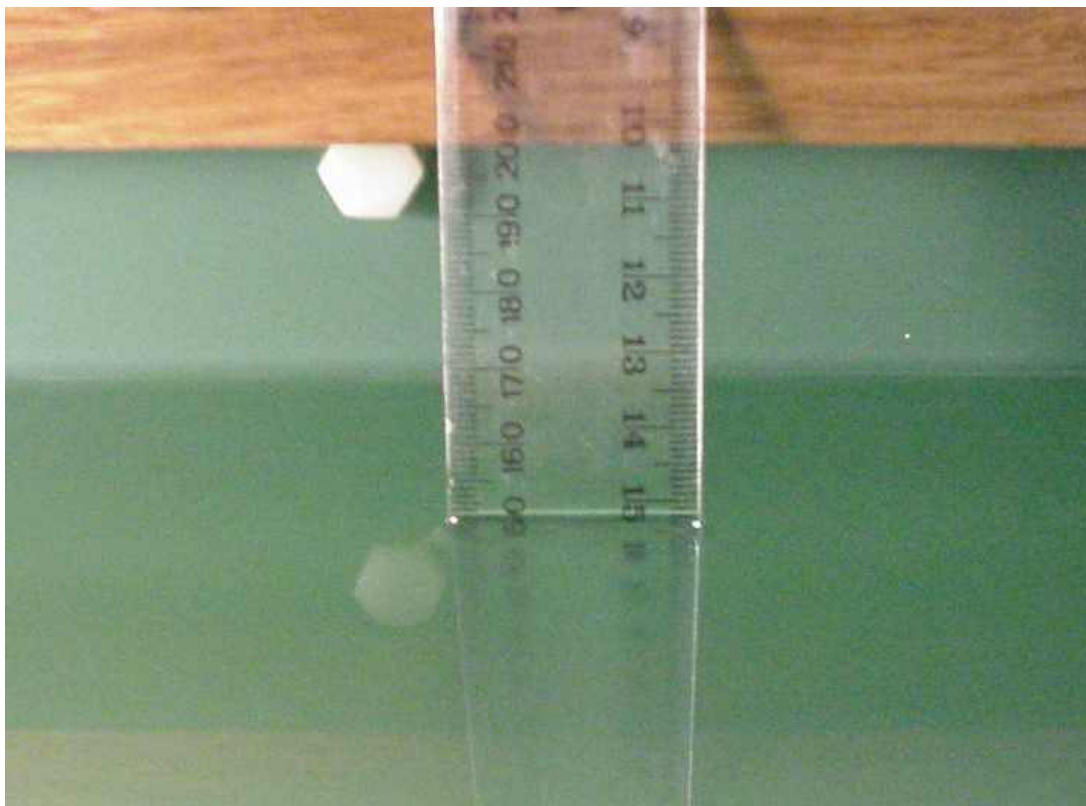


Photo of liquid Depth in Flat Phantom