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SAR Test Report

Report Number: M091006 _CERT_AR5B95 _SAR_2.4

Test Sample:	Portable Notebook Computer
Radio Modules:	WLAN AR5B95 & Bluetooth BCM92070MD_REF
Host PC Model Number:	MH380/M380
WLAN FCC ID:	PPD-AR5B95-F
WLAN IC:	4104A-AR5B95F
Date of Issue:	28th October 2009

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1.0 GENERAL INFORMATION

Test Sample:	Portable Notebook Computer
Model Name:	MH380/M380
Radio Modules:	WLAN AR5B95 & Bluetooth BCM92070MD_REF
Interface Type:	Half Mini-PCI Module
Device Category:	Portable Transmitter
Test Device:	Pre-Production Unit
WLAN FCC ID:	PPD-AR5B95-F
WLAN IC:	4104A-AR5B95F
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 Notebook Computer MH380/M380 with Wireless LAN model AR5B95 and Bluetooth module BCM92070MD_REF 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:	13th October 2009

Test Officer:

Peter Jakubiec

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.

SAR TEST REPORT
Portable Notebook Computer
Model: MH380/M380
Report Number: M091006_CERT_AR5B95_SAR_2.4

2.0 INTRODUCTION

Testing was performed on the Fujitsu Notebook PC, Model: MH380/M380 with ATHEROS Half Mini-PCI Wireless LAN Module (HB95 802.11 b/g/n), Model: AR5B95 & Broadcom Bluetooth Module, Model: BCM92070MD_REF. The HB95 module is an OEM product. The Half Mini -PCI Wireless LAN (WLAN) was tested in the dedicated host – LifeBook M series, Model MH380/M380.

3.0 SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 EUT (WLAN) Details

Transmitter:	Half Mini-Card Wireless LAN Module
FCC ID:	PPD-AR5B95-F
IC:	4104A-AR5B95F
Wireless Module:	HB95 (11b/g/n) 1x1
Model Number:	AR5B95
Manufacturer:	Atheros Communication Inc,
Modulation Type:	DSSS for 802.11b OFDM for 802.11g OFDM for 802.11n
2.4 GHz (802.11b/g/n):	CCK, DQPSK, DBPSK, BPSK, QPSK, 16QAM, 64QAM
5 GHz (802.11a/n):	-
Maximum Data Rate:	802.11b = 11 Mbps, 802.11g = 54 Mbps 802.11n = 300 Mbps
Frequency Ranges:	2.412–2.462 GHz for 11b/g/n
Number of Channels:	11 channels for 11b/g/n with 20MHz Bandwidth 7 channels for 11n with 40MHz Bandwidth
Antenna Types:	Nissei Inverted F (1st, 2nd) Model: refer to WLAN antenna data Location: Left Top edge of LCD screen(1st), Right Top edge of LCD screen(2nd)
Power Supply:	3.3 VDC from PCI Express bus

Channels and Output power setting:

Mode	Channel	Frequency, MHz	Data Rate, Mbps	Tx BW, MHz	Power Control PCDAC Tx A	Average Output Power dBm
802.11b 2.4 GHz	1	2412	1	-	41	17.22
	6	2437			41	17.80
	13	2462			41	18.02
802.11g 2.4 GHz	1	2412	6	-	58	13.82
	6	2437			64	17.08
	13	2462			59	14.70
802.11n 2.4 GHz	1	2412	MCS0	20	56	12.84
	6	2437			65	17.09
	13	2462			58	13.76
	3	2422		40 Wide	49	9.66
	6	2437			57	13.50
	9	2452			48	9.24

3.2 EUT (Bluetooth) Details

Transmitter: Bluetooth
FCC ID: QDS-BRCM1043
IC: 4324A-BRCM1043
Model Number: BCM92070MD_REF
Manufacturer: Broadcom
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: Monopole Antenna included in module
Module location: Mid-Left side under the Keyboard
Max. Output Power: 4 dBm
Reference Oscillator: 16 MHz (Built-in)
Power Supply: 3.3 VDC from host.

Frequency allocation:

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

3.3 EUT (Notebook PC) Details

EUT:	LifeBook M series
Model Number:	MH380/M380
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Intel Atom N450 1.66GHz
LCD	10.1" FWXGA(Full Wide XGA: 1366 x 768)
Wired LAN:	Realtek RTL8103EL-GR : 10 Base-T/100 Base-TX
Modem:	Non
Port Replicator Model:	Non
AC Adapter Model:	40W: SEE55N2-19.0 (Sanken)
Voltage:	19V
Current Specs:	2.1A
Watts:	40W

3.4 Test sample Accessories

3.4.1 Battery Types

One type of Lithium Ion Battery is used to power the Portable Notebook Computer MH380/M380. SAR measurements were performed with the battery as shown below.

Standard Battery

Model	CP455627-xx
V/mAh	10.8V 2900mAh

4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

ATHEROS'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. In The frequency range 2412 MHz to 2462 MHz the device operates in 2 modes, OFDM and DSSS. For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu. The 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), however due to very low Bluetooth RF output power, and more than 5cm spacing between the Bluetooth and WiFi transmitting antennas the SAR measurements for Bluetooth were not conducted. 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 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. There were no wires or other connections to the Portable Notebook 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

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5.2 Accreditations

EMC Technologies Pty. Ltd. is accredited by the National Association of Testing Authorities, Australia (NATA).
NATA Accredited Laboratory Number: 5292

EMC Technologies Pty Ltd is NATA accredited for the following standards:

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

Refer to NATA website www.nata.asn.au for the full scope of accreditation.

5.3 Environmental Factors

The measurements were performed in a shielded room with no background RF signals. The temperature in the laboratory was controlled to within 21±1°C, the humidity was 42%. The liquid parameters are measured daily prior to the commencement of each test. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN1380 probe was less than 5μV in both air and liquid mediums.

6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

Applicable Head Configurations	: None
Applicable Body Configurations	: Notebook Position

6.1 Probe Positioning System

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

6.2 E-Field Probe Type and Performance

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

6.3 Validation

6.3.1 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)
13th October 2009	39.4	1.86	13.5	6.21

6.3.2 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 13th Oct. 2009	13.5	54.00	52	3.85	52.4	3.05

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 15cm with a tolerance of 0.5cm.

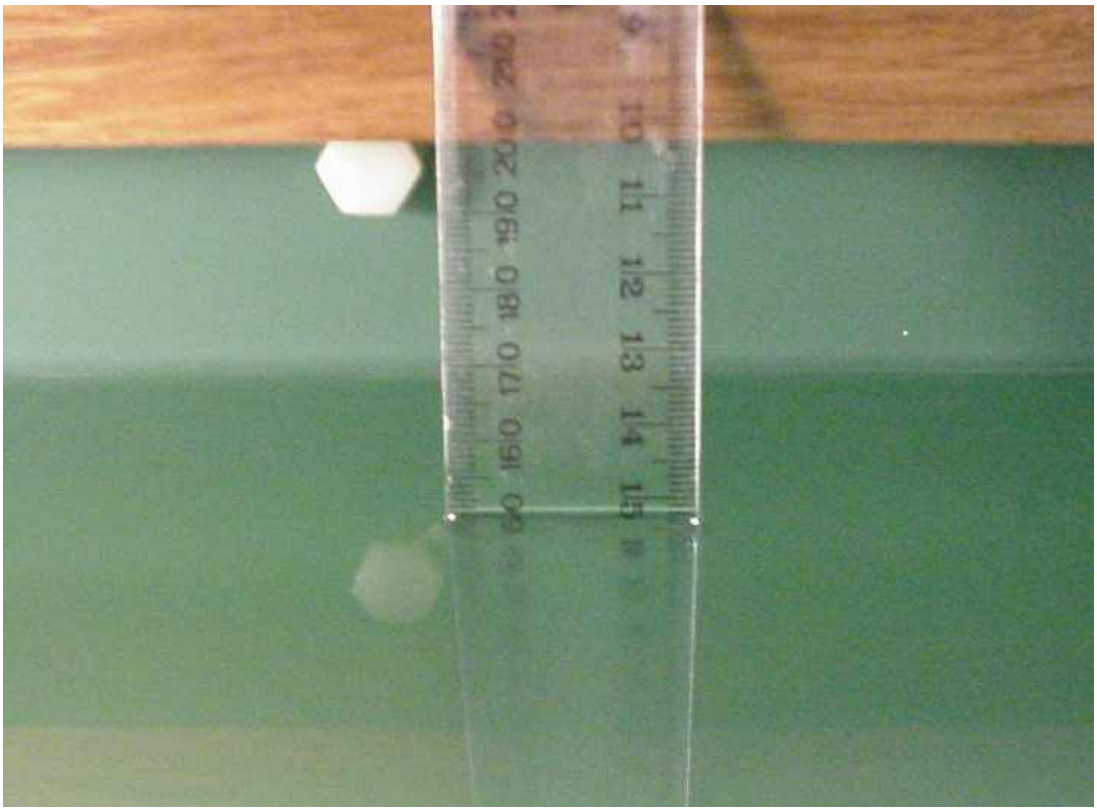

Photo of liquid Depth in Flat Phantom

6.4 Phantom Properties (Size, Shape, Shell Thickness)

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	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
2450 MHz Brain	39.4	39.2 ±5% (37.2 to 41.2)	1.86	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
2437 MHz Muscle	51.2	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%.

6.5.1 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|°C.

Table: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
13th October 2009	20.5	20.3	42

6.6 Device Holder for Laptops and P 10.1 Phantom

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

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"

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 105mm x 120mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

c) Around this point, a volume of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

   (i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

   (ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

   (iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

   (iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

All relevant FCC rules and KDB 447498: v03r02 Dec 2008 was applied for testing this product. Since the screen size of this notebook is <12 inches, KDB 616217 is not applicable.

8.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both device SAR tests and Validation uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95% confidence level) must be less than 30%.

Table: Uncertainty Budget for DASY4 V4.7 Build 53 – EUT SAR test 2450MHz

Uncertainty Component	Tol. (6%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i (6%)	10g u_i (6%)	v_i
Measurement System								
Probe Calibration	5.5	N	1	1	1	5.5	5.5	∞
Axial Isotropy	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effects	1	R	1.73	1	1	0.6	0.6	∞
Linearity	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	0.3	N	1	1	1	0.3	0.3	∞
Response Time	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	2.6	R	1.73	1	1	1.5	1.5	∞
RF Ambient Noise	3	R	1.73	1	1	1.7	1.7	∞
RF Ambient Reflections	3	R	1.73	1	1	1.7	1.7	∞
Probe Positioner	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning	2.9	R	1.73	1	1	1.7	1.7	∞
Max. SAR Eval.	1	R	1.73	1	1	0.6	0.6	∞
Test Sample Related								
Test Sample Positioning	1.61	N	1	1	1	1.6	1.6	11
Device Holder Uncertainty	3.6	N	1	1	1	3.6	3.6	7
Output Power Variation – SAR Drift Measurement	6.19	R	1.73	1	1	3.6	3.6	∞
Phantom and Setup								
Phantom Uncertainty	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	5	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – Measurement uncertainty	2.5	N	1.00	0.64	0.43	1.6	1.1	5
Liquid Permittivity – Deviation from target values	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	2.5	N	1.00	0.6	0.49	1.5	1.2	5
Combined standard Uncertainty		RSS				10.6	10.4	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				21.1	20.73	

Estimated total measurement uncertainty for the DASY4 measurement system was ±10.6%. The extended uncertainty (K = 2) was assessed to be ±21.1% based on 95% confidence level. The uncertainty is not added to the measurement result.

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

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

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

9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table: SPEAG DASY4 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	18-Sept-2009	
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 M series" can be used only in a conventional laptop position (see Appendix A1). The antenna location in the "LifeBook M series" is closest to the mid of the screen.

10.1 Positions

10.1.1 "Notebook" 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 "Notebook" 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.

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

The device has a fixed antenna. Depending on the measured SAR level up to three test channels with the test sample operating at maximum power were recorded. The following table represents the matrix used to determine what testing was required. All relevant provisions of KDB 447498 (v03r02 Dec 2008) are applied for SAR measurements of the host system. Due to the screen size <12 inches, KDB 616217 was not used in the SAR evaluation.

Table: Testing configurations

Phantom Configuration	*Device Mode	Antenna	Test Configurations		
			CHANNEL (LOW)	Channel (Middle)	Channel (High)
Notebook	DSSS 2.4GHz	A		X	
Notebook	OFDM 2.4GHz	A		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 Rx1 in the host respectively.

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 – DSSS 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)
Notebook Position	1	A	1	-	06	2437	**0.011**	-0.261

NOTE: The measurement uncertainty of 21.1% for 2.45GHz was not added to the result.

The highest SAR level recorded in the 2450MHz band was 0.011 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Notebook position in DSSS mode, utilizing channel 6 (2437 MHz) and antenna A.

12.0 COMPLIANCE STATEMENT

The Fujitsu Notebook PC, Model: MH380/M380 with ATHEROS Mini-PCI Wireless LAN Module (HB95 802.11 b/g/n), Model: AR5B95 & Broadcom Bluetooth Module, Model: BCM92070MD_REF was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 0.011 mW/g for a 1g cube. This value was measured at 2437 MHz (channel 6) in the “Notebook” position in DSSS modulation mode at the antenna A. This was below the limit of 1.6 mW/g for uncontrolled exposure, even taking into account the measurement uncertainty of 21.1 %.

13.0 MULTIBAND EVALUATION CONSIDERATIONS

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

Above did not apply due to very low Bluetooth RF output power (4 mW), and more than 5cm spacing between the Bluetooth and WiFi transmitting antennas. The SAR measurements for Bluetooth were not conducted.