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SAR Test Report

Report Number: M100860 _FCC_AR5BHB92_SAR_2.4

Test Sample:	Portable Tablet Computer
Radio Modules:	WLAN HB92 AR5BHB92 & Bluetooth BSMAN3
Host PC Model Number:	T580 / TH550
PC System FCC ID:	PPD-AR5BHB92-F
PC System IC:	IC ID: 4104A-ARBHB92F
Date of Issue:	28th September 2010

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CONTENTS

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PC System FCC ID: PPD-AR5BHB92-F
PC System IC: IC ID: 4104A-ARBHB92F

1.0 GENERAL INFORMATION

Table 1

Test Sample:	Portable Tablet Computer
Model Name:	T580 / TH550
Radio Modules:	WLAN AR5BHB92 & Bluetooth BSMAN3
Interface Type:	Half Mini-PCI Module
Device Category:	Portable Transmitter
Test Device:	Pre-Production Unit
PC System FCC ID:	PPD-AR5BHB92-F
PC System IC:	IC ID: 4104A-ARBHB92F
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
Statement Of Compliance:	The Fujitsu Tablet Computer T580 / TH550 with Wireless LAN model AR5BHB92 and Bluetooth module BSMAN3 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:	15th September 2010
Test Officer:	Peter Jakubiec
Authorised Signature:	Peter Jakubiec

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SAR TEST REPORT
Portable Tablet Computer
Model: T580 / TH550
Report Number: M100860 _FCC_AR5BHB92_SAR_2.4

2.0 INTRODUCTION

Testing was performed on the Fujitsu Tablet PC, Model: T580 / TH550 with Atheros Communication Inc. Half Mini-PCI Wireless LAN Module (HB92 802.11a/b/g/n), Model: AR5BHB92 & CSR Bluetooth Module, Model: BSMAN3. The HB92 module is an OEM product. The Half Mini-PCI Wireless LAN (WLAN) was tested in the dedicated host – LifeBook T series, Model T580 / TH550. The system tested will be referred to as the DUT throughout this report.
There are two variants of the Fujitsu Tablet PC, Model: T580 / TH550 one that is equipped with the Bluetooth transmitter and Bluetooth antenna, and one variant that does not contain Bluetooth transmitter or Bluetooth antenna.
SAR testing was conducted on the sample that is equipped with the Bluetooth transmitter and Bluetooth antenna.

The measurement test results mentioned hereon only apply to the 2450MHz frequency band; an additional report titled “M100860_FCC_AR5BHB92_SAR_5.6” applies to the 5GHz range.

3.0 TEST SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 EUT (WLAN) Details

Table 2

Transmitter:	Mini-Card Wireless LAN Module
Wireless Module:	HB92 (802.11a/b/g/n)
Model Number:	AR5BHB92
Manufacturer:	Atheros Communication Inc,
Modulation Type:	DSSS for 802.11b OFDM for 802.11g OFDM for 802.11a OFDM for 802.11n
2.4 GHz (802.11b/g/n):	CCK, DQPSK, DBPSK, 16QAM, 64QAM
5 GHz (802.11a/n):	BPSK, QPSK, 16QAM, 64QAM
Maximum Data Rate:	802.11b = 11 Mbps, 802.11g and 802.11a = 54 Mbps 802.11n = 300 Mbps
Frequency Ranges:	2.412–2.462 GHz for 11b/g/n 5.18-5.32 GHz, 5.5-5.6 GHz and 5.745-5.825 GHz for 11a/n
Number of Channels:	11 channels for 11b/g/n with 20MHz Bandwidth 24 channels for 11a/n with 20MHz Bandwidth 18 channels for 11n with 40MHz Bandwidth
Antenna Types:	Nissei Electric Inverted F Antenna Model: Tx1 Antenna: CP492575 Tx2 (or Rx2) Antenna: CP492575 Location: Top edge of LCD screen
Power Supply:	3.3 VDC from PCI Express bus

Table 3 Channels and Output power setting

2.4 GHz (802.11b, 802.11g and 802.11n)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)	Power Control - PCDAC Setting		Average Power Measured (dBm)	
						Gain Control Tx A	Gain Control Tx B	Tx A	Tx B
802.11b 2.4 GHz	1	2412	1	-	15.0	28.0	23.0	15.15	15.23
	2	2417				-	-	-	-
	3	2422				-	-	-	-
	4	2427				-	-	-	-
	5	2432				-	-	-	-
	6	2437				26.0	22.0	15.10	15.16
	7	2442				-	-	-	-
	8	2447				-	-	-	-
	9	2452				-	-	-	-
	10	2457				-	-	-	-
	11	2462				25.0	21.0	15.17	15.23
	13	2472				-	-	-	-
802.11g 2.4 GHz	1	2412	6	-	15.0	-	-	-	-
	2	2417				-	-	-	-
	3	2422				-	-	-	-
	4	2427				-	-	-	-
	5	2432				-	-	-	-
	6	2437				-	-	-	-
	7	2442				-	-	-	-
	8	2447				-	-	-	-
	9	2452				-	-	-	-
	10	2457				-	-	-	-
	11	2462				-	-	-	-
	13	2472				-	-	-	-
802.11n 2.4 GHz	1	2412	HT0	20	15.0	-	-	-	-
	2	2417				-	-	-	-
	3	2422				-	-	-	-
	4	2427				-	-	-	-
	5	2432				-	-	-	-
	6	2437				-	-	-	-
	7	2442				-	-	-	-
	8	2447				-	-	-	-
	9	2452				-	-	-	-
	10	2457				-	-	-	-
	11	2462				-	-	-	-
	13	2472				-	-	-	-
	3	2422		40 Wide	12.5	-	-	-	-
	4	2427			15.0	-	-	-	-
	6	2437				-	-	-	-
	8	2447				-	-	-	-
	9	2452			12.8	-	-	-	-

5 GHz (802.11a)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)	Power Control - PCDAC Setting		Average Power Measured (dBm)	
						Gain Control Tx A	Gain Control Tx B	Tx A	Tx B
802.11a	**5.2 GHz**		6	-					
	36	5180			**12.0**	-	-	-	-
	40	5200				-	-	-	-
	44	5220				-	-	-	-
	48	5240				-	-	-	-
	5.3 GHz								
	52	5260			**15.0**	32.0	29.0	15.05	15.28
	56	5280				-	-	-	-
	60	5300				-	-	-	-
	64	5320				32.0	28.0	15.32	15.26
	5.6 GHz								
	100	5500				-	-	-	-
	104	5520			**15.0**	35.0	28.0	15.08	15.19
	108	5540				-	-	-	-
	112	5560				-	-	-	-
	116	5580				36.0	29.0	15.31	15.26
	120	5600				-	-	-	-
	124	5620				36.0	30.0	15.28	15.36
	128	5640				-	-	-	-
	132	5660				-	-	-	-
	136	5680				36.0	34.0	15.00	15.20
	140	5700				-	-	-	-
	5.8 GHz								
	149	5745			**15.0**	37.0	36.0	15.23	15.07
	153	5765				-	-	-	-
	157	5785				39.0	38.0	15.32	15.40
	161	5805				-	-	-	-
	165	5825				43.0	39.0	15.43	15.09

5 GHz (802.11n)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)	Power Control - PCDAC Setting		Average Power Measured (dBm)	
						Gain Control Tx A	Gain Control Tx B	Tx A	Tx B
802.11n	**5.2 GHz**		HT0	20					
	36	5180			13.5	31.0	29.0	13.73	13.96
	40	5200				-	-	-	-
	44	5220				-	-	-	-
	48	5240				30.0	27.0	13.74	13.83
	5.3 GHz								
	52	5260			15.0	-	-	-	-
	56	5280				-	-	-	-
	60	5300				-	-	-	-
	64	5320				-	-	-	-
	5.6 GHz								
	100	5500				-	-	-	-
	104	5520			15.0	-	-	-	-
	108	5540				-	-	-	-
	112	5560				-	-	-	-
	116	5580				-	-	-	-
	120	5600				-	-	-	-
	124	5620				-	-	-	-
	128	5640				-	-	-	-
	132	5660				-	-	-	-
	136	5680				-	-	-	-
	140	5700				-	-	-	-
	5.8 GHz								
	149	5745			15.0	-	-	-	-
	153	5765				-	-	-	-
	157	5785				-	-	-	-
	161	5805				-	-	-	-
	165	5825				-	-	-	-
	5.2 GHz								
	38	5190		40 Wide	12.5	-	-	-	-
	46	5230				-	-	-	-
	5.3 GHz								
	54	5270			14.0	-	-	-	-
	62	5310				-	-	-	-
	5.6 GHz								
	102	5510			15.0	-	-	-	-
	110	5550				-	-	-	-
	118	5590				-	-	-	-
	126	5630				-	-	-	-
	134	5670				-	-	-	-
	5.8 GHz								
	151	5755			15.0	-	-	-	-
	159	5795				-	-	-	-

NOTE: For 5GHz SAR results refer to report titled “M100860_FCC_AR5BHB92_SAR_5.6”.

3.2 EUT (Bluetooth) Details

Table 4

Transmitter:	Bluetooth
Model Number:	BSMAN3
Manufacturer:	CSR
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: Left side of hinge
Max. Output Power:	4 dBm
Reference Oscillator:	16 MHz (Built-in)
Power Supply:	3.3 VDC from host.

Table 5 Frequency allocation

Channel Number	Frequency (MHz)	Bluetooth Utility power setting
1	2402	Power (Ext, Int) = 0, 56
2	2403	
3	2404	
.	.	
.	.	
39	2440	
40	2441	
41	2442	
.	.	
.	.	
77	2478	
78	2479	
79	2480	

3.3 EUT (Notebook PC) Details

Table 6

Host notebook :	LifeBook T series
Model Name:	T580 / TH550
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core i7-620M 1.47GHz
LCD	**10.1"HD**
Wired LAN:	Realteck RTL8111E: 10 Base-T/100 Base-TX/1000Base-T
Modem:	No
Port Replicator Model:	**No**
AC Adapter Model:	PXW1931N(Tamura), ADP-60ZH A (Delta)
Voltage:	19V
Current Specs:	3.16A
Watts:	60W

3.4 Test sample Accessories

3.4.1 Battery Types

One type of Fujitsu Lithium Ion battery is used to power the DUT.

Table 7 Battery Details

Battery S/N	01A-Z100702001792Z	01A-Z091026000648Z
Model	FPCB219	FPCB219
V/mAh	10.8V/5800mAh	10.8V/5800mAh

4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

Atheros Communication Inc.'s ART test tool was used to configure the WLAN for testing. The DUT Wireless LAN had a total of 11 channels (USA model) within the 2412 to 2462 MHz frequency band and 12 channels within the frequency range 5180 to 5825 MHz. In The frequency range 2412 MHz to 2462 MHz the DUT operates in 2 modes, OFDM and DSSS. Within the 5180 to 5825 MHz frequency range the DUT operates in OFDM mode only. For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu.

The Bluetooth module operates over 79 channels within the frequency range 2402 to 2480 MHz. It is possible for the Bluetooth module to operate simultaneously with the WLAN module (co-transmission). However, due to low output power of Bluetooth module (less than 5mW), standalone SAR measurement for Bluetooth module was not conducted (as per **"Supplement to the KDB 616217"**). 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 *"*M100860_FCC_AR5BHB92_SAR_5.6*"* is specific to the 5GHz range.

The WLAN modules can be configured in a number of different data rates. It was found that the highest source based time averaged power was measured when using the lowest data rates available in each mode. This lowest data rate corresponds to 6Mbps in OFDM mode and 1Mbps in DSSS mode.

The frequency span of the 2450 MHz range Band was more than 10MHz consequently; the SAR levels of the test sample were measured for lowest, centre and highest channels in the applicable modes. The EUT is capable of using two antennas transmitting simultaneously (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 DUT during the SAR measurements.

At the beginning 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.

Table 8 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:

Table 9

AS/NZS 2772.1:	RF and microwave radiation hazard measurement
ACMA:	Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003 + Amdt (No. 1):2007
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)
***EN62209-2:2010**	Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures **Part 2**: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 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.

*NATA accreditation pending
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 34%. 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

Table 10

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 80** from Schmid & Partner Engineering AG (SPEAG). The DASY4 fully complies with the OET65 C (01-01), IEEE 1528, EN62209-1 and EN62209-2 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.

6.4 System verification

6.4.1 System verification Results @ 2450MHz

The following tables lists the dielectric properties of the tissue simulating liquid measured prior to SAR system verification. The results of the system verification are listed in columns 4 and 5. The forward power into the reference dipole for SAR system verification was adjusted to 250 mW.

Table 11 System verification Results (Dipole: SPEAG D2450V2 SN: 724)

1. System Frequency and verification Date	2. ϵr (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
2450 MHz 15th Sept 2010	39.6	1.80	13.6	6.38

6.4.2 Deviation from reference system verification 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 system verification 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 12 Deviation from reference system verification 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 (%)
2450 MHz 15th Sept 2010	13.6	54.40	52	4.62	52.4	3.82

NOTE: All reference system verification 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.

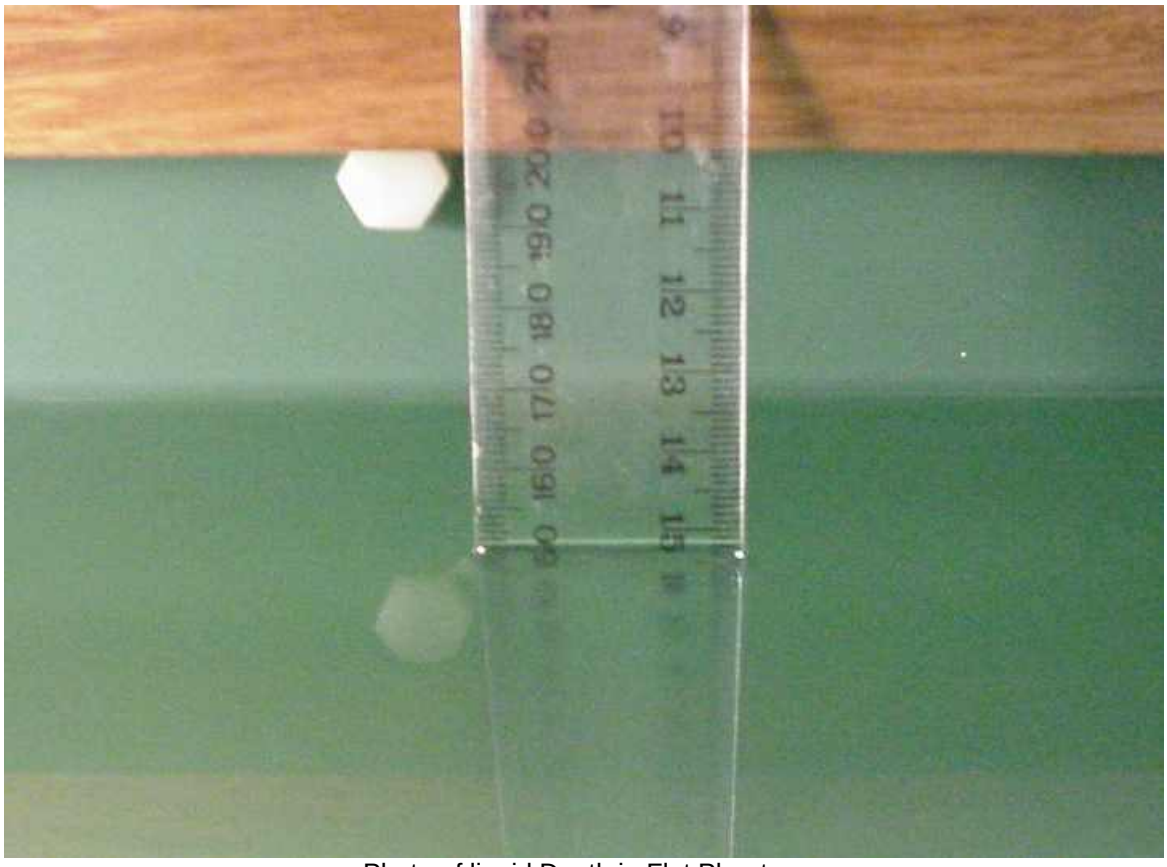


Photo of liquid Depth in Flat Phantom

6.5 Phantom Properties

The phantoms used during the testing comply with the OET65 C (01-01), IEEE 1528, EN62209-1 and EN62209-2 SAR measurement requirements.

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 13 Measured Brain Simulating Liquid Dielectric Values for System verifications

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
2450 MHz Brain	39.6	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 14 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	52.2	52.7 ±5% (50.1 to 55.3)	1.85	1.95 ±5% (1.85 to 2.05)	1000
2437 MHz Muscle	52.0	52.7 ±5% (50.1 to 55.3)	1.90	1.95 ±5% (1.85 to 2.05)	1000
2462 MHz Muscle	51.9	52.7 ±5% (50.1 to 55.3)	1.94	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 15 Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
15th Sept 2010	21.6	21.2	34.0

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 16 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

*Refer "OET Bulletin 65 97/01 P38"

Table 17 Tissue Type: Muscle @ 2450MHz

Volume of Liquid: 60 Litres

Approximate Composition	% By Weight
Distilled Water	73.2
Salt	0.04
DGBE	26.7

6.8 Device Holder for Laptops and P 10.1 Phantom

A low loss clamp was used to position the DUT 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 4 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 120mm x 75mm 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 4 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 System verification 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 18 Uncertainty Budget for DASY4 V4.7 Build 80 – DUT 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	11.66	R	1.73	1	1	6.7	6.7	∞
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				12.0	11.8	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				24.0	23.66	

Estimated total measurement uncertainty for the DASY4 measurement system was ±12.0%. The extended uncertainty (K = 2) was assessed to be ±24.0% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 19 Uncertainty Budget for DASY4 V4.7 Build 80 – System verification 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 System verification measurement result.

9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table 20 SPEAG DASY4 Version V4.7 Build 80

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	07-July-2011	
Data Acquisition Electronics	SPEAG	DAE3 V1	442	08-Dec-2010	✓
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	
Probe E-Field	SPEAG	ET3DV6	1380	11-Dec-2010	✓
Probe E-Field	SPEAG	ET3DV6	1377	7-July-2011	
Probe E-Field	SPEAG	ES3DV6	3029	Not Used	
Probe E-Field	SPEAG	EX3DV4	3563	16-July-2011	
Probe E-Field	SPEAG	EX3DV4	3657	15-July-2011	
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	15-Dec-2011	
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	17-Dec-2010	
Antenna Dipole 900 MHz	SPEAG	D900V2	047	5-July-2012	
Antenna Dipole 1640 MHz	SPEAG	D1640V2	314	9-July-2012	
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	13-July-2012	
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	16-Dec-2011	
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	Hewlett Packard	437B	3125012786	9-Aug-2011	
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	13-Aug-2011	
RF Power Meter	Rohde & Schwarz	NRP	101415	5-May-2011	✓
RF Power Sensor	Rohde & Schwarz	NRP - Z81	100174	16-July-2011	✓
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	24-Nov-2010	✓
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 TEST METHODOLOGY

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.

10.0 Position

10.1.1 "Tablet" Position Definition (0mm spacing)

The DUT 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 DUT 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.*

10.1.3 "Lap Held" Position (0mm spacing)

The DUT was tested in the 2.00 mm flat section of the AndreT Flat phantom P 10.1 for the "Lap Held" position. The DUT was placed at the bottom of the phantom and suspended in such way that the back of the device was touching the phantom. The LCD screen was angled at 90 degrees to the base of the Tablet. 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 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 instead "Supplement to the KDB 616217" was followed.

Table 21 Testing configurations

Phantom Configuration	*Device Mode	Antenna	Test Configurations		
			Channel (Low)	Channel (Middle)	Channel (High)
Lap Held	DSSS 2.4GHz	A		X	
		B		X	
Tablet	DSSS 2.4GHz	A		X	
		B		X	
Edge On	DSSS 2.4GHz	A		X	
		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 DUT 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 22 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)
Tablet	1	A	1	-	06	2437	0.125	-0.019
Tablet	2	B	1	-	06	2437	0.058	0.031
Lap Held	-	A	1	-	06	2437	Noise Floor	-
Lap Held	-	B	1	-	06	2437	Noise Floor	-
Edge On Secondary Portrait	3	B	1	-	06	2437	0.017	-0.103
Edge On Secondary Landscape	4	A	1	-	06	2437	0.126	-0.073
Edge On Secondary Landscape	5	B	1	-	06	2437	0.240	-0.107
Edge On Primary Portrait	6	A	1	-	1	2412	0.464	0.117
	7	A	1	-	06	2437	0.465	0.479
	8	A	1	-	11	2462	0.413	0.111

NOTE: The measurement uncertainty of 24.0% for 2.45GHz was not added to the result.

The highest SAR level recorded in the 2450MHz band was 0.465 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Edge On Primary Portrait position in DSSS mode, utilizing channel 6 (2437 MHz) and antenna A.

12.0 COMPLIANCE STATEMENT

The Fujitsu Tablet PC, Model: T580 / TH550 with Atheros Communication Inc. Mini-PCI Wireless LAN Module (HB92 802.11a/b/g/n), Model: AR5BHB92 & CSR Bluetooth Module, Model: BSMAN3 was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 0.465 mW/g for a 1g cube. This value was measured at 2437 MHz (channel 6) in the “Edge On Primary Portrait ” 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 24.0 %.

13.0 MULTIBAND EVALUATION CONSIDERATIONS

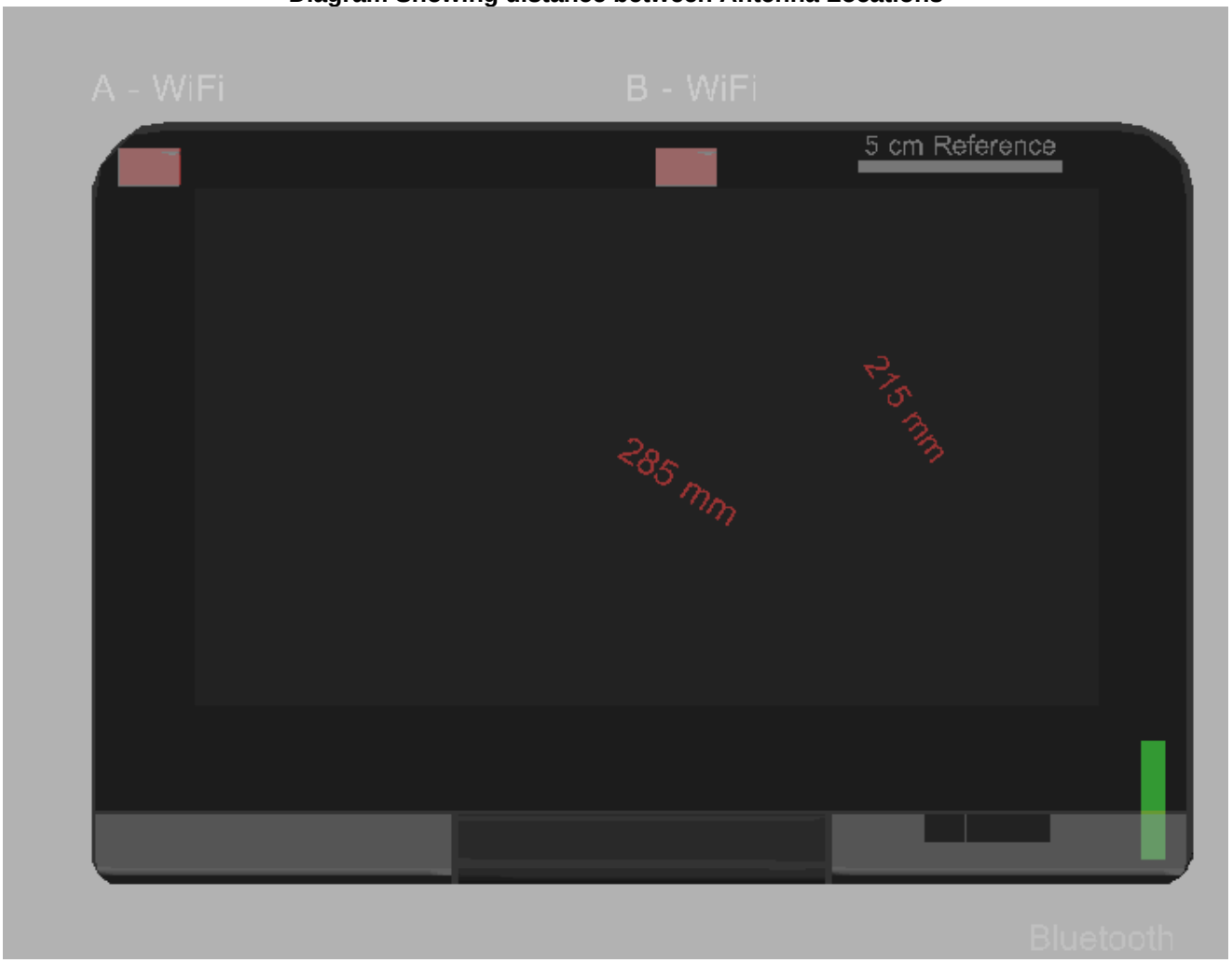
Fujitsu **TABLET** PC, Model: **T580/TH550** is equipped with WLAN (AR5BHB92) and Bluetooth (BSMAN3).

According to the FCC SAR evaluation procedures mentioned in **"Supplement to the KDB 616217" (for Tablet PC with the LCD size < 12)**, stand-alone SAR evaluation is NOT required when the maximum transmitter and antenna output power is less than or equal to $60/f_{(GHz)}$ (P_{ref}) The Bluetooth module in the EUT operates in the 2.4GHz range. It has a maximum output power of 2.5mW (4dBm) which is less than P_{ref} (=60/2.4=25mW).

The shortest distance between the BT module and any other transmitting antenna was 21.5cm.

Because 21.5cm > 5cm, and 2.5mW < 25mW, the Bluetooth module was not considered for SAR evaluation. This is in accordance with the test reduction methods detailed in **"Supplement to the KDB 616217"** and KDB 447498.

Diagram Showing distance between Antenna Locations



NOTE: Throughout this report, Antenna A, and B refer to Tx1, and Tx2 in the host respectively.