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SAR Test Report

Report Number: M030726_MACE_CALEXICO_SAR

Test Sample: Portable Tablet Computer Wireless LAN
Model Number: WM3B2100-MACE
Tested For: Fujitsu Australia Pty Ltd
FCC ID: EJE-WL0001
IC: 337J-WL0001
Date of Issue: 4th August 2003

CONTENTS

1.0 GENERAL INFORMATION 3
2.0 DESCRIPTION OF DEVICE 4
2.1 Description of Test Sample 4
2.1.1 Summary of EUT Details 4
2.1.2 EUT Host Details 5
2.2 Test sample Accessories 5
2.2.1 Battery Types 5
2.3 Test Signal, Frequency and Output Power 5
2.4 Battery Status 5
2.5 Details of Test Laboratory 6
2.5.1 Location 6
2.5.2 Accreditations 6
2.5.3 Environmental Factors 6
3.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM 7
3.1 Probe Positioning System 7
3.2 E-Field Probe Type and Performance 7
3.3 Data Acquisition Electronics 7
3.4 Calibration and Validation Procedures and Data 7
3.4.1 Validation Results @ 2450MHz 7
3.4.2 Deviation from reference validation values 8
3.4.3 Liquid Depth 15cm 8
3.5 Phantom Properties (Size, Shape, Shell Thickness) 9
3.6 Tissue Material Properties 10
3.6.1 Liquid Temperature and Humidity 11
3.7 Simulated Tissue Composition Used for SAR Test 11
3.8 Device Holder for Laptops and PL550 Phantom 11
4.0 SAR MEASUREMENT PROCEDURE USING DASY4 12
5.0 MEASUREMENT UNCERTAINTY 13
6.0 EQUIPMENT LIST AND CALIBRATION DETAILS 15
7.0 OET BULLETIN 65 – SUPPLEMENT C TEST METHOD 16
7.1 Description of the Test Positions (Lap Top) 16
7.1.1 "Tablet" Position Definition (0mm spacing) 16
7.1.2 "Laptop no spacer" Position (0mm spacing) 16
7.1.3 "Lap Arm Held" Position (0mm spacing) 16
7.1.4 "Back of Lid" Position (0mm spacing) 16
7.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes) 17
7.3 FCC RF Exposure Limits for Occupational/ Controlled Exposure 17
7.4 FCC RF Exposure Limits for Un-controlled/Non–occupational 17
8.0 SAR MEASUREMENT RESULTS 18
9.0 COMPLIANCE STATEMENT 18
APPENDIX A1 TEST HOST PHOTOGRAPHS 19
APPENDIX A2 TEST SAMPLE PHOTOGRAPHS 20
APPENDIX A3 TEST SAMPLE PHOTOGRAPHS 21
APPENDIX A4 TEST SETUP PHOTOGRAPHS 22
APPENDIX A5 TEST SETUP PHOTOGRAPHS 23
APPENDIX A6 TEST SETUP PHOTOGRAPHS 24
APPENDIX A7 TEST SETUP PHOTOGRAPHS 25
APPENDIX B PLOTS OF THE SAR MEASUREMENTS 26
APPENDIX C SAR TESTING EQUIPMENT CALIBRATION CERTIFICATE ATTACHMENTS 39

SAR EVALUATION

Portable Tablet Computer Wireless LAN
Model: WM3B2100-MACE
Report Number: M030726_MACE_CALEXICO_SAR
FCC ID: EJE-WL0001
IC: 337J-WL0001

1.0 GENERAL INFORMATION

Test Sample: Portable Tablet Computer Wireless LAN
Model Name: Calexico
Interface Type: Mini-PCI Module
Device Category: Portable Transmitter
Test Device: Production Unit
Model Number: WM3B2100-MACE
FCC ID: EJE-WL0001
IC: 337J-WL0001
RF exposure Category: General Population/Uncontrolled

Manufacturer: Intel Corp

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 Portable Tablet Computer Wireless LAN model WM3B2100-MACE 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 Date: 6th and 7th August 2003

Tested for: Fujitsu Australia Pty Ltd
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Contact: Praveen Rao
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Test Officer:

Peter Jakubiec
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Authorised Signature:

Aaron Sargent B.Eng
EMR Engineer

SAR EVALUATION
Portable Tablet Computer Wireless LAN
Model: WM3B2100-MACE
Report Number: M030726_MACE_CALEXICO_SAR

2.0 DESCRIPTION OF DEVICE

2.1 Description of Test Sample

The EUT is a Fujitsu LifeBook incorporating a Mini-PCI wireless LAN (WLAN) module (Calexico WM3B2100-Mace). The Calexico module is an OEM product. The Mini-PCI wireless LAN (WLAN) module was tested in the dedicated host, a LifeBook ST Series “Mace”.

2.1.1 Summary of EUT Details

Operating Mode during Testing	: Crest Factor - DSSS = 1.0
Modulation Scheme	: Direct Sequence Spread Spectrum (DSSS)
Device Power Rating for test sample and identical production unit	: 15.2dBm (33 mW) for DSSS Modulation Sourced-Based AVR : Peak Power is 16 dBm
Device Dimensions (LxWxH)	: 238x295x38mm
Antenna type	: Monopole located in the laptop lid
Applicable Head Configurations	: None
Applicable Body Configurations	1. Tablet Position 2. Lap Top Position 3. Lap Arm Held Position 4. Back of Lid Position
Battery Options	: Standard Battery

2.1.2 EUT Host Details

Test Sample:	LifeBook T Series
Models:	T3010
Codename:	Mace
CPU Speed:	Pentium-M4 – 1.4 GHz
Manufacturer:	Fujitsu Ltd.
LAN:	Rialtek Onboard 10/100MB Base-T
Tablet Dock Kit:	FPCPR33AP

2.2 Test sample Accessories

2.2.1 Battery Types

A Fujitsu Lithium Ion Battery is used to power the Portable Tablet Computer Wireless LAN Model: WM3B2100-MACE. SAR measurements were performed with a standard Fujitsu battery.

2.3 Test Signal, Frequency and Output Power

The Portable Tablet Computer Wireless LAN had a total of 11 channels (USA model) within the 2412 to 2462 MHz frequency band. The frequency range is 2412 MHz to 2462 MHz and the device operates in 1 mode, DSSS. For the SAR measurements the device was operating in continuous wave mode using programming codes supplied by Fujitsu. The fixed frequency channels used in the testing are shown in Table 1. The frequency span of the 2450 MHz Band was more than 10MHz consequently; the SAR levels of the test sample were measured for lowest, centre and highest channels in DSSS mode. There were no wires or other connections to the Portable Tablet Computer during the SAR measurements.

At the beginning and completion of the SAR tests, conducted power of the device was measured after temporary modification of antenna connector inside the device's TX RX compartment. Measurements were conducted with a calibrated Power Meter. The results of this measurement are listed in table 1.

Table 1: Frequency and Output Power

Channel	Channel Frequency MHz	Battery Type	Maximum Conducted Output Power Measured
DSSS Channel 01	2412	Standard	15.18dBm
DSSS Channel 06	2437	Standard	15.20dBm
DSSS Channel 11	2462	Standard	14.61dBm

2.4 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 10% and was assessed in the uncertainty budget.

2.5 Details of Test Laboratory

2.5.1 Location

EMC Technologies Pty Ltd - ACN/ABN: 82057105549
57 Assembly Drive
Tullamarine, (Melbourne) Victoria
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Telephone: +61 3 9335 3333
Facsimile: +61 3 9338 9260
email: melb@emctech.com.au
website: www.emctech.com.au

2.5.2 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
CENELEC:	ES59005: 1998
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.

2.5.3 Environmental Factors

The measurements were performed in a shielded room with no background network signals. The temperature in the laboratory was controlled to within 20±1.0 °C, the humidity was in the range 38% to 41%. 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 is less than 5μV in both air and liquid mediums.

3.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

3.1 Probe Positioning System

The measurements were performed with the state of the art automated near-field scanning system **DASY4 V4.1 Build 33** 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.

3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with the dosimetric probe ET3DV6 Serial: 1380 (manufactured by SPEAG) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probe has 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.

3.3 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.

3.4 Calibration and Validation Procedures and Data

Prior to the SAR assessment, the system validation kit was used to verify that the DASY4 was operating within its specifications. The validation was performed at 2450 MHz with the SPEAG 2450V2 calibrated dipole.

The validation dipoles are highly symmetric and matched at the centre frequency for the specified liquid and distance to the phantom. The accurate distance between the liquid surface and the dipole centre is achieved with a distance holder that snaps onto the dipole.

System validation is performed by feeding a known power level into a reference dipole, set at a know distance from the phantom. The measured SAR is compared to the theoretically derived level.

3.4.1 Validation Results @ 2450MHz

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 2: Validation Results (Dipole: SPEAG D2450V2 SN: 724)

1. Validation Date	2. ϵ_r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
6th August 2003	38.9	1.87	13.9	6.48
7th August 2003	38.9	1.86	14.2	6.56

3.4.2 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 3 below.

Table 3: Deviation from reference validation values

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)
6th August 2003	13.9	55.6	55.6	0%	52.4	6.1%
7th August 2003	14.2	56.8	55.6	2.2%	52.4	8.4%

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

3.4.3 Liquid Depth 15cm

During the SAR measurement process the liquid level was maintained to a level of a least 15cm with a tolerance of 0.2cm.

3.5 Phantom Properties (Size, Shape, Shell Thickness)

The phantom used during the validations was the SAM Phantom model: TP - 1060 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 a Flat phantom PL550 was used. The phantom thickness is 2.0mm+/-0.2 mm and the phantom was filled with the required tissue simulating liquid. Table 4 provides a summary of the measured phantom properties. *Refer to Appendix C Part 4, for details of PL550 phantom dielectric properties and loss tangent*.

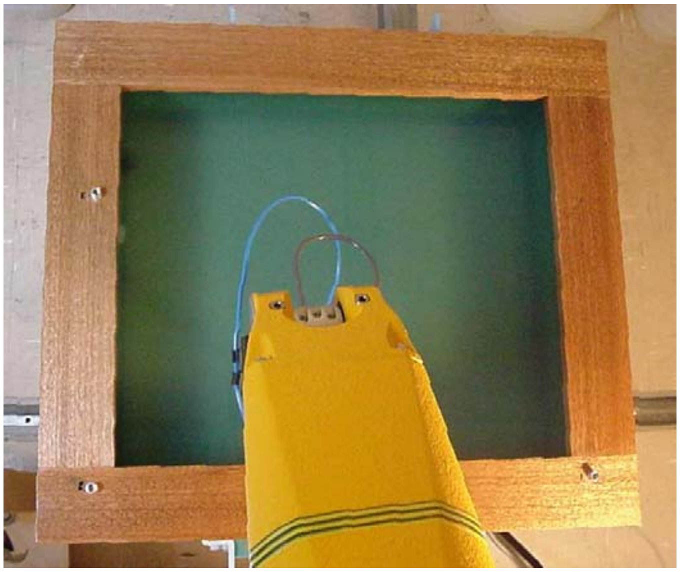
Table 4: Phantom Properties (300MHz-2500MHz)

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

PL550 Flat Phantom

PL550 Flat Phantom



3.6 Tissue Material Properties

The dielectric parameters of the brain simulating liquid were measured prior to SAR assessment using the HP85070A dielectric probe kit and HP8714B Network Analyser. The actual dielectric parameters are shown in the following table.

Table 5: Measured Brain Simulating Liquid Dielectric Values

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
2450 MHz Brain	38.9	39.8 ±5% (37.8 to 41.8)	1.86-1.87	1.88 ±5% (1.79 to 1.97)	1000

Table 6: 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	52.1	52.7 ±5% (50.1 to 55.3)	1.96	1.95 ±5% (1.85 to 2.05)	1000
2437 MHz Muscle	52.0-52.1	52.7 ±5% (50.1 to 55.3)	1.97-1.99	1.95 ±5% (1.85 to 2.05)	1000
2462 MHz Muscle	51.9	52.7 ±5% (50.1 to 55.3)	2.03	1.95 ±5% (1.85 to 2.05)	1000

NOTE: The brain and muscle liquid parameters were within the required tolerances of ±5%.

3.6.1 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 7: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
6th August 2003	20.3	19.7	38
7th August 2003	20.5	19.8	41

3.7 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 8: 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 9: Tissue Type: Muscle @ 2450MHz
Volume of Liquid: 60 Litres

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

3.8 Device Holder for Laptops and PL550 Phantom

A low loss clamp was used to position the Laptop underneath the phantom surface. Small pieces of foam were then used to press the laptop flush against the phantom surface.

Refer to Appendix A4-A7 for photographs of device positioning

4.0 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 head and the horizontal grid spacing is 15 mm x 15 mm. The actual Area Scan has dimensions of 71mm x 71mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first "pre-scans" covered an area of 151 mm x 181 mm to ensure that the hotspot was correctly identified.

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.

5.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both Handset 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 10: Uncertainty Budget for DASY4 Version V4.1 Build 33 – EUT SAR test

a	**b**	**c**	**D**	**e= f(d,k)**	**f**	**g**	**h=cxf/e**	**i=cxg/e**	**k**
Uncertainty Component	Sec.	Tol. (%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i (%)	10g u_i (%)	v_i
Measurement System									
Probe Calibration (k=1) (numerical calibration)	E.2.1	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1	N	1	1	1	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions	E.6.1	0.075	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	2.9	R	1.73	1	1	1.7	1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	1	R	1.73	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6	N	1	1	1	6.0	6.0	11
Device Holder Uncertainty	E.4.1	3.6	N	1	1	1	3.6	3.6	7
Output Power Variation – SAR Drift Measurement	6.6.2	12	R	1.73	1	1	6.9	6.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	E.3.2	5	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – Measurement uncertainty	E.3.3	10	N	1	0.64	0.43	6.4	4.3	5
Liquid Permittivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	E.3.3	5	N	1	0.6	0.49	3.0	2.5	5
Combined standard Uncertainty			RSS				14.6	13.6	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				±29.2	±27.19	

Estimated total measurement uncertainty for the DASY4 measurement system was ±14.6%. The extended uncertainty (K = 2) was assessed to be ±29.2% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 11: Uncertainty Budget for DASY4 Version V4.0 Build 51 - Validation

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	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 (k=1) (standard calibration)	E.2.1	4.4	N	1	1	1	4.4	4.4	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Hemispherical Isotropy	E.2.2	0	R	1.73	1	1	0.0	0.0	∞
Boundary Effect	E.2.3	8.3	R	1.73	1	1	4.8	4.8	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1	N	1	1	1	1.0	1.0	∞
Response Time	E.2.7	0	R	1.73	1	1	0.0	0.0	∞
Integration Time	E.2.8	0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions	E.6.1	0.05	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	2.9	R	1.73	1	1	1.7	1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	3.9	R	1.73	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning		1	R	1.73	1	1	0.6	0.6	∞
Device Holder Uncertainty		4.7	R	1.73	1	1	2.7	2.7	∞
Output Power Variation – SAR Drift Measurement									
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.43	1.7	1.2	∞
Liquid Conductivity – Measurement uncertainty	E.3.3	10	N	1.73	0.6	0.43	3.5	2.5	5
Liquid Permittivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	E.3.3	5	N	1.73	0.6	0.49	1.7	1.4	5
Combined standard Uncertainty			RSS				10.0	9.5	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				±20.0	±19.1	

Estimated total measurement uncertainty for the DASY4 measurement system was ±10.0%. The extended uncertainty (K = 2) was assessed to be ±20.0% based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

6.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table 12: SPEAG DASY4 Version 4.0 Build 51

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX90BL	N/A	Not applicable	Yes
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	Yes
SAM Phantom	SPEAG	N/A	1260	Not applicable	No
SAM Phantom	SPEAG	N/A	1060	Not applicable	Yes
Flat Phantom	AndreT	PL870	011	Not Applicable	No
Flat Phantom	AndreT	PL550	10.1	Not Applicable	Yes
Data Acquisition Electronics	SPEAG	DAE3 V1	359	16-July-2004	No
Data Acquisition Electronics	SPEAG	DAE3 V1	442	Oct – 03	Yes
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	No
Probe E-Field	SPEAG	ET3DV6	1380	18-July-2004	Yes
Probe E-Field	SPEAG	ET3DV6	1377	6–Sept-03	No
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	24-Jan-05	No
Antenna Dipole 900 MHz	SPEAG	D900V2	047	27-Aug-2004	No
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	28-Aug-2004	No
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	9-Nov-2004	Yes
RF Amplifier	Mini-Circuits	ZHL-42	N/A	Not applicable	Yes
Synthesized signal generator	Hewlett Packard	ESG-D3000A	GB37420238	In test	Yes
RF Power Meter Dual	Hewlett Packard	437B	3125012786	25-May-04	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	25-May-04	Yes
RF Power Meter Dual	Gigatronics	8542B	1830125	10-Sept-03	Yes
RF Power Sensor	Gigatronics	80301A	1828805	10-Sept-03	Yes
Network Analyser	Hewlett Packard	8714B	GB3510035	10-Sept-03	Yes
Dual Directional Coupler	NARDA	3022	75453	In test	Yes

7.0 OET BULLETIN 65 – SUPPLEMENT C TEST METHOD

7.1 Description of the Test Positions (Lap Top)

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 "Mace" can be used in a normal laptop configuration and also a tablet configuration so additional test positions were required.

SAR measurements were performed in the "Tablet", "Lap Top no Spacer", "Lap-Arm Held" and "Back of Lid" positions and were measured in the flat section of the ANDRET Flat phantom (PL550). See Appendix A for photos of test positions.

7.1.1 "Tablet" Position Definition (0mm spacing)

The device was tested in the 2.00 mm flat section of the ANDRET Flat phantom PL550 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 is similar to touch position for handsets (to simulate Tablet use a conservative touch position at a flat phantom is requested).

This device orientation simulates the tablet's normal use – being held on the lap of the user whilst in the tablet configuration. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

7.1.2 "Laptop no spacer" Position (0mm spacing)

The SAR evaluation was performed in the flat section of the Flat phantom PL550. With the laptop in "normal-use" laptop configuration, press the bottom of the laptop against the flat phantom.

This device orientation simulates the laptop's normal use – being held on the lap of the user whilst in the laptop configuration. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

7.1.3 "Lap Arm Held" Position (0mm spacing)

If the device can be used in interactive or arm-held modes where the arm may be rested against the screen during normal use it has been suggested that the device should be tested with the screen of the Tablet touching the flat phantom[1].

For this position the Transceiver was placed at the bottom of the PL550 phantom and suspended in such way that the screen of the device was touching the phantom. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

7.1.4 "Back of Lid" Position (0mm spacing)

This position is used to account for the user or bystander being occasionally exposed to RF fields in the arm or torso regions.

For this position the Transceiver was placed at the bottom of the PL550 phantom and suspended in such way that the back of the screen was touching the phantom. While the screen is touching the phantom the keyboard is perpendicular to the phantom surface. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

[1] TCB Workshop Notes 2003, Session 6 "Portable Transmitters"

7.2 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, as specified in section 2.3 were recorded. The following table represents the matrix used to determine what testing was required.

Table 13: Testing configurations

Phantom Configuration	***Device Mode**	**Test Configurations**			
		Channel (Low)	**Channel (Middle)**	**Channel (High)**	**Channel (European)**
Tablet	DSSS		X		
Laptop	DSSS		X		
Lap-Arm Held	DSSS	X	X	X	X
Back of Lid	DSSS	X	X	X	X

Legend

X (yellow) Testing Required in this configuration

(red) Testing not required in this configuration because SAR of middle channel is more than 3dB below the SAR limit.

7.3 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)

7.4 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)

8.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1g tissue masses were determined for the sample device for all test configurations listed in section 7.2.

Table 14: SAR MEASUREMENT RESULTS – DSSS Mode

1. Test Position	2. Plot No.	3. Test Channel	4. Test Freq (MHz)	5. Measured 1g SAR Results (mW/g)	6. Measured Drift (dB)
Tablet	-	06	2437	0.0011	-0.09
Laptop	-	06	2437	0.0016	0.20
Lap Arm Held	1	01	2412	0.120	-0.20
	2	06	2437	0.141	-0.40
	3	11	2462	0.109	-0.09
Back of Lid	4	01	2412	0.329	-0.40
	5	06	2437	0.345	-0.40
	6	11	2462	0.230	-0.30

NOTE: The measurement uncertainty of 29.2% is not added to the result.

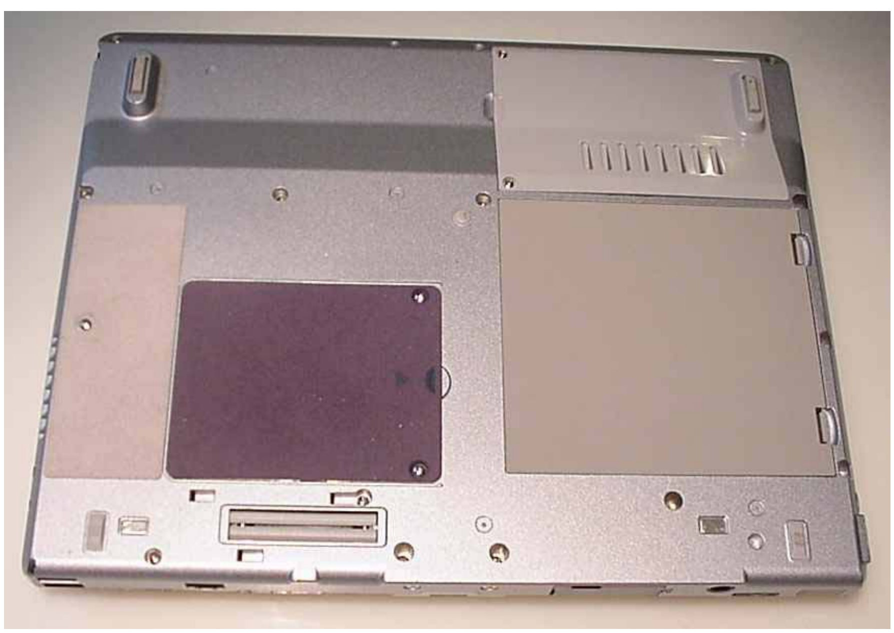
9.0 COMPLIANCE STATEMENT

The model WM3B2100-MACE, FCC ID: EJE-WL0001, IC: 337J-WL0001 Portable Tablet Computer Wireless LAN was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 0.345 mW/g for a 1g cube. This value was measured for channel 06 in the "Back of lid" position in DSSS modulation mode. This was below the limit of 1.6 mW/g for uncontrolled exposure, even taking into account the measurement uncertainty of 29.2%.

APPENDIX A1
TEST HOST PHOTOGRAPHS

Model: EUT Host - External Front View

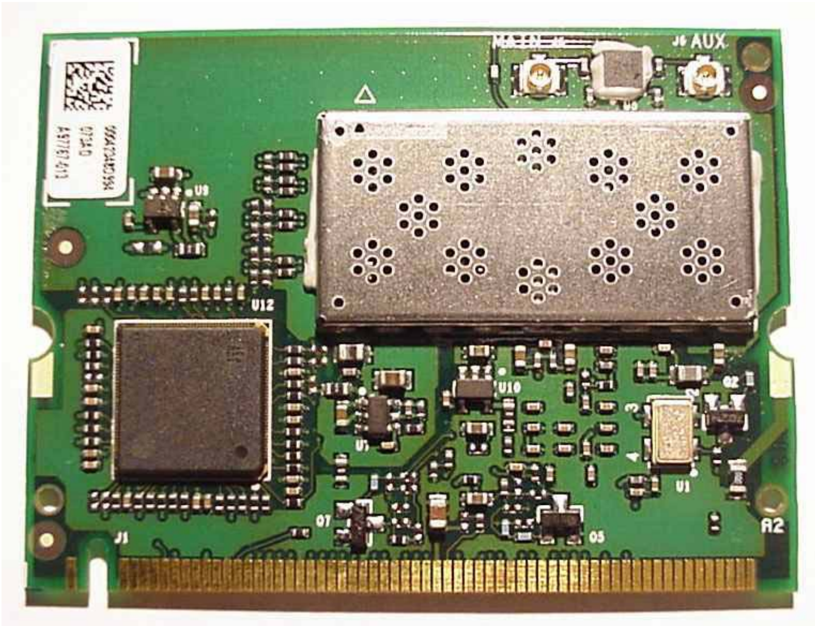


Model: EUT Host - External Rear View

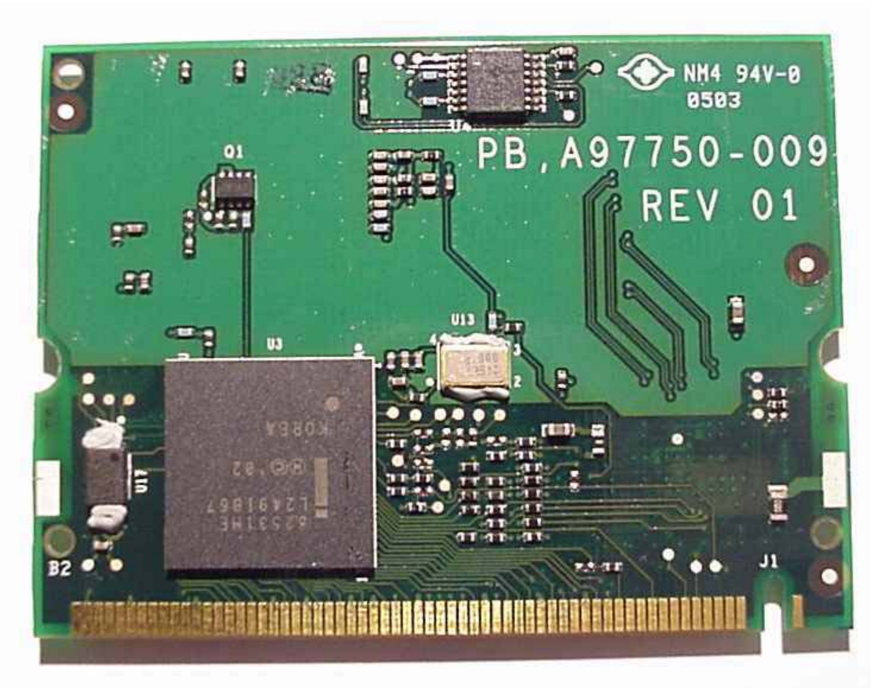
APPENDIX A2
TEST SAMPLE PHOTOGRAPHS

Model: WM3B2100-MACE

Front



Back

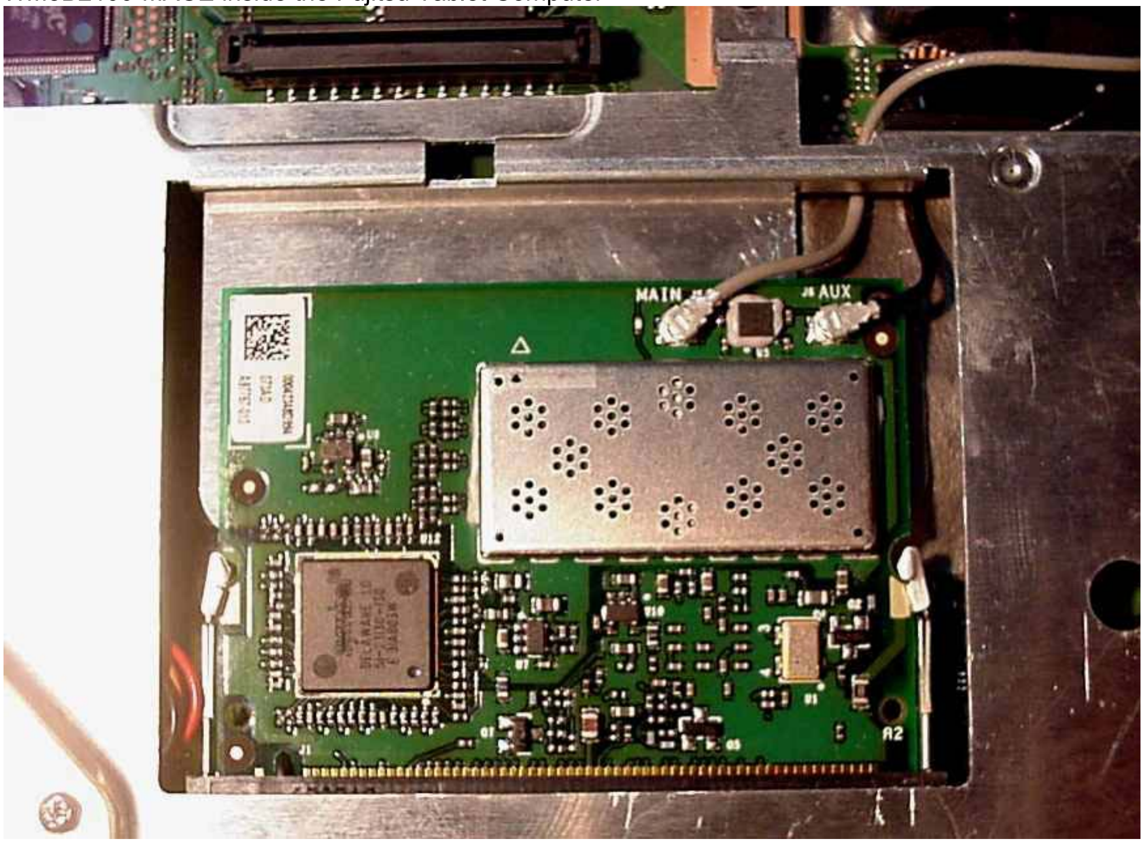


APPENDIX A3
TEST SAMPLE PHOTOGRAPHS

Battery 1

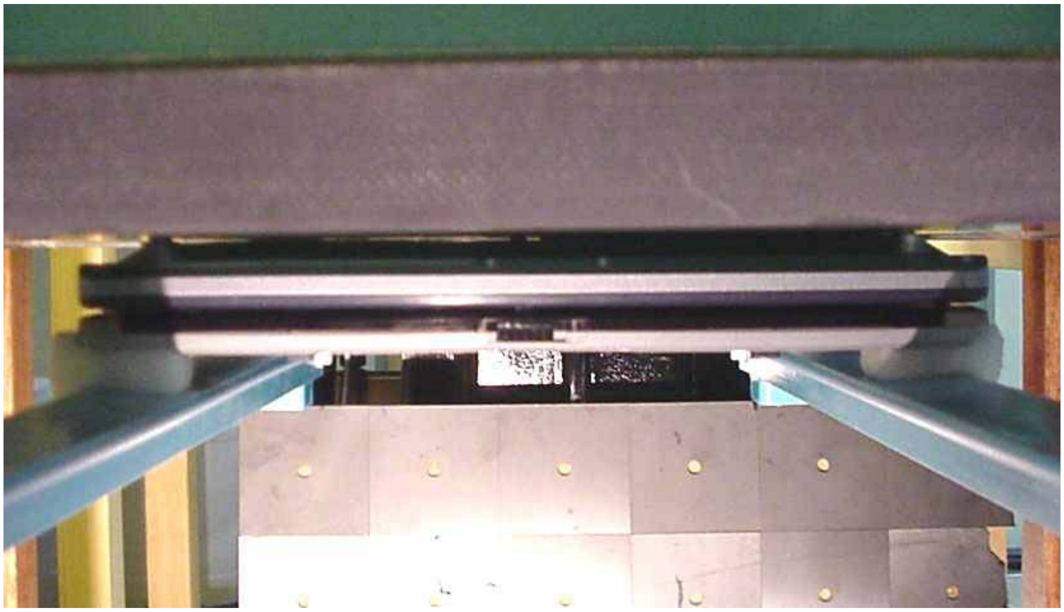
Battery 2

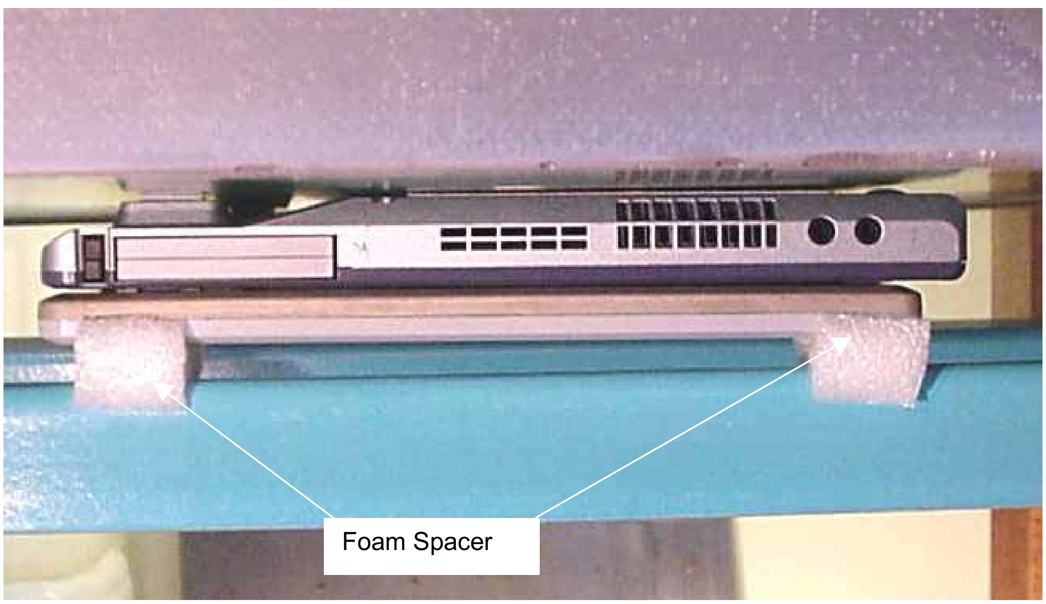
WM3B2100-MACE inside the Fujitsu Tablet Computer



APPENDIX A4
TEST SETUP PHOTOGRAPHS

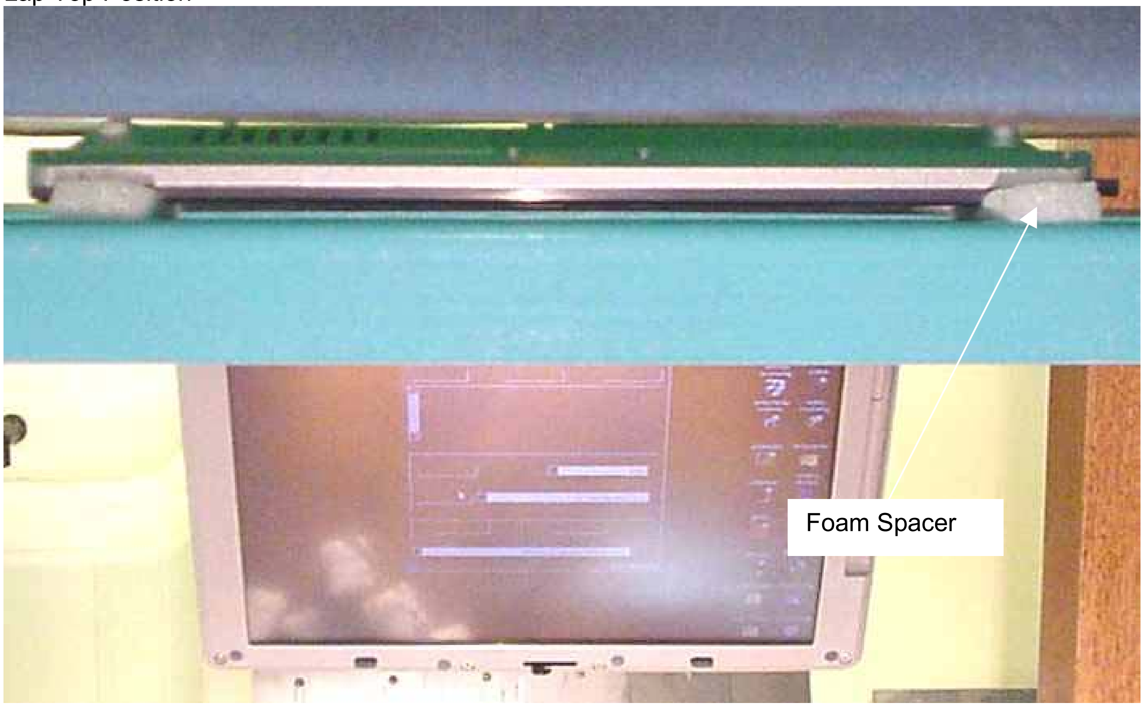
Tablet Position

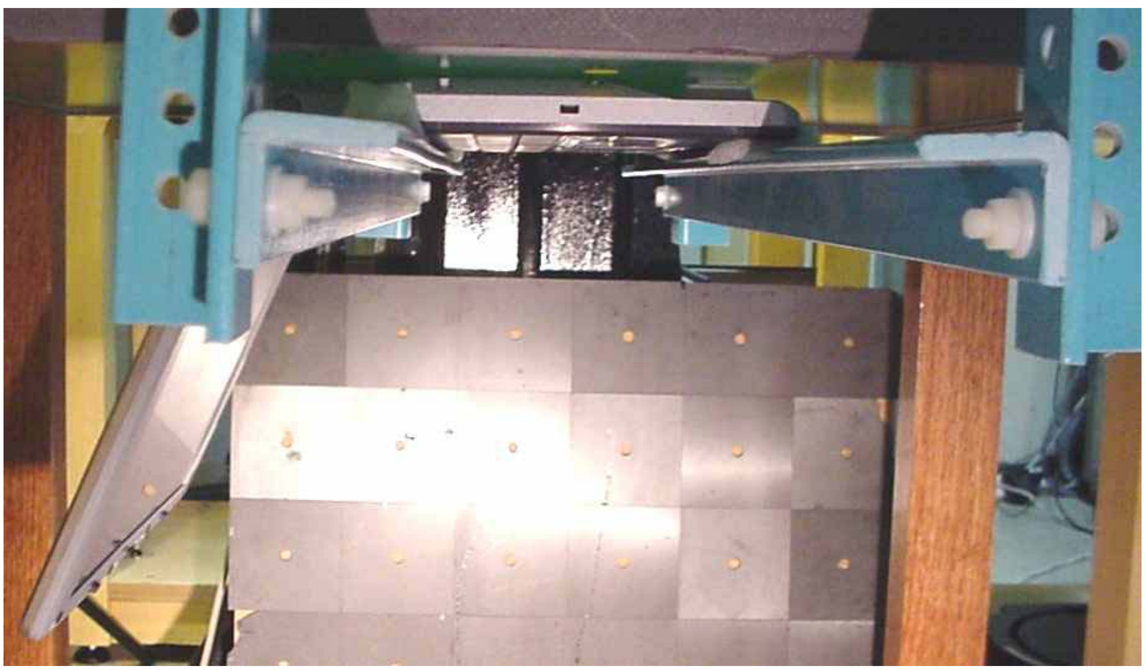




APPENDIX A5
TEST SETUP PHOTOGRAPHS

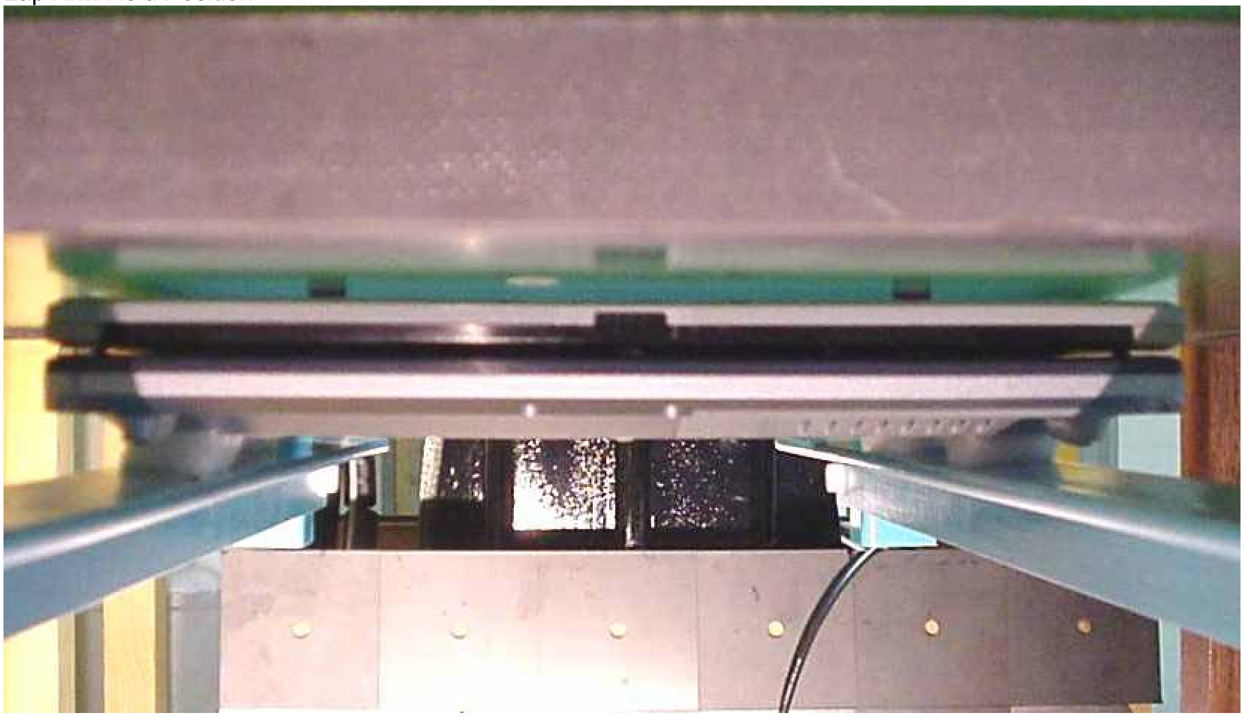
Lap Top Position

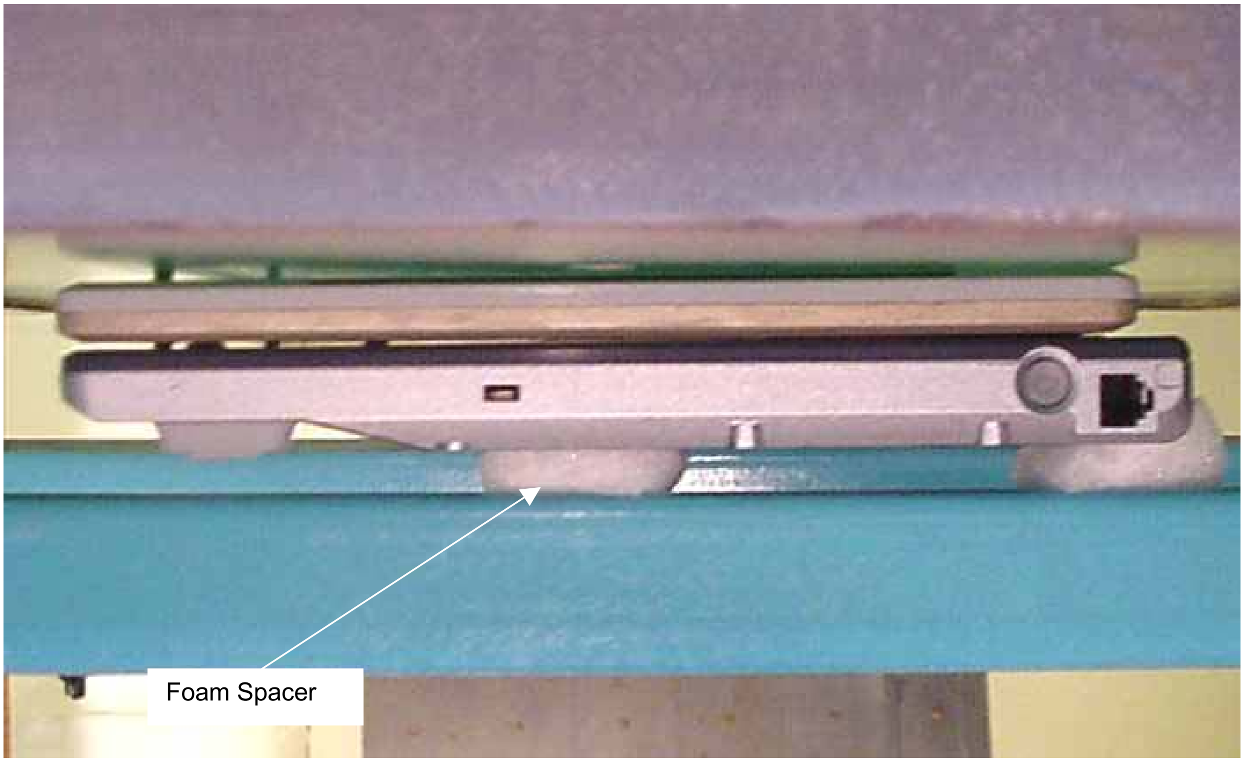




APPENDIX A6
TEST SETUP PHOTOGRAPHS

Lap Arm Held Position





APPENDIX A7
TEST SETUP PHOTOGRAPHS

Back of Lid Position