Global Product Certification
EMC-EMF-Safety Approvals

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SAR Test Report

Report Number: M090734_CERT_512AN_HMW_SAR_5.6_BT

Test Sample: Portable TABLET Computer
Host PC Model Number: T4310
Radio Modules: WLAN 512AN_HMW & Bluetooth BSMAN3

PC System FCC ID: EJE-WB0077
PC System IC: 337J-WB0077
Date of Issue: 18th September 2009

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1.0 GENERAL INFORMATION

Test Sample: Portable TABLET Computer
Model Name: T4310
Radio Modules: WLAN 512AN_HMW & Bluetooth BSMAN3
Interface Type: Mini-PCI Module
Device Category: Portable Transmitter
Test Device: Pre-Production Unit
FCC System ID: EJE-WB0077
PC System IC: 337J-WB0077
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 TABLET Computer T4310 with Wireless LAN model 512AN_HMW 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: 3rd – 19th August 2009

Test Officer:

Peter Jakubiec

Authorised Signature:

Chris Zombolas
Technical Director

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SAR TEST REPORT
Portable TABLET Computer
Model: T4310
Report Number: M090734_CERT_512AN_HMW_SAR_5.6_BT

2.0 INTRODUCTION

Testing was performed on the Fujitsu TABLET PC, Model: T4310 with INTEL Mini-PCI Wireless LAN Module (512AN_HMW 802.11a/b/g/n), Model: 512AN_HMW & CSR Bluetooth Module, Model: BSMAN3. The 512AN_HMW module is an OEM product. The Mini-PCI Wireless LAN (WLAN) was tested in the dedicated host – LIFEBOOK T SERIES, Model T4310.

The measurement test results mentioned hereon only apply to the 5GHz frequency band; an additional report titled "M090734_CERT_512AN_HMW_SAR_2.4_BT" applies to the 2450MHz frequency range.

3.0 TEST SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 EUT (WLAN) Details

Transmitter:	Half Mini-Card Wireless LAN Module
Wireless Module:	WiFi Link 5100(11a/b/g/n)
Model Number:	512AN_HMW
Manufacturer:	Intel Corporation
Modulation Type:	DSSS for 802.11b OFDM for 802.11g OFDM for 802.11a OFDM for 802.11n
5GHz (802.11a/n)	BPSK, QPSK, 16QAM, 64QAM
2.4GHz (802.11b/g/n)	CCK, DQPSK, DBPSK, 16QAM, 64QAM
Maximum Data Rate:	802.11b = 11 Mbps, 802.11g and 802.11a = 54 Mbps 802.11n = Tx 150 Mbps Rx 300 Mbps
Frequency Range:	2.412–2.462 GHz for 11b/g/n 5.18-5.32 GHz ,5.5-5.6GHz and 5.745-5.825 GHz for 11a/n
Number of Channels:	11 channels for 11b/g/n 24 channels for 11a/n with 20MHz Bandwidth 18 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)
Antenna gain:	Antenna A (1): 2.38 dBi (peak) Antenna B (2): 2.17 dBi (peak) Antenna C (3): 2.24 dBi (peak
Power Supply:	3.3 VDC from PCI bus

Channels and Output Power Settings:

Modes	Channels	Frequency MHz	Average Output Power (dBm)
802.11a	36	5180	14.7
	40	5200	17.5
	48	5240	17.4
	52	5260	17.0
	56	5280	17.3
	64	5320	14.6
	100	5500	17.5
	120	5600	17.8
	140	5700	17.2
	149	5745	17.5
	157	5785	17.8
	165	5825	17.3
802.11n 20MHz Bandwidth	36	5180	14.5
	40	5200	17.5
	48	5240	17.4
	52	5260	16.5
	56	5280	17.5
	64	5320	14.5
	100	5500	17.5
	120	5600	16.5
	140	5700	16.5
	149, 157 and 165	5745, 5785 and 5825	16.5
802.11n 40MHz Bandwidth	38	5190	10.1
	54	5270	16.5
	62	5310	10.9
	102	5510	13.5
	118	5590	16.6
	134	5670	16.5
	151	5755	16.5
	159	5795	16.5

NOTE: For 2450 MHz SAR results refer to report titled “M090734_CERT_512AN_HMW _SAR_2.4”.

3.2 EUT (Bluetooth) Details

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: Right side of hinge
Antenna gain: 1.8 dBi
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	
2	2403	
3	2404	
.	.	
.	.	
39	2440	
4	2441	Power (Ext, Int) = 0, 56
41	2442	
.	.	
.	.	
77	2478	
78	2479	
79	2480	

3.3 EUT (Notebook PC) Details

Host notebook : LifeBook T series
Model Name: T4310
Serial Number: Pre-production Sample
Manufacturer: FUJITSU LIMITED

CPU Type and Speed: Core2 Duo T9600 2.8GHz
LCD 12.1"WXGA
Wired LAN: Broadcom BCM57780 : 10 Base-T/100 Base-TX/1000Base-T
Modem: None
Port Replicator Model: FPCPR94

AC Adapter Model: 80W: SEE100P2-19.0(Sanken), ADP-80NB A(Delta)
Voltage: 19V
Current Specs: 4.22A
Watts: 80W

3.4 Test sample Accessories

3.4.1 Battery Types

One type of Fujitsu Lithium Ion Battery is used to power the Portable TABLET Computer Wireless LAN Model: 512AN_HMW. SAR measurements were performed with the battery as shown below.

Standard Battery

Battery #1		**Battery #2**	
P/N	CP422590-02 (Extended Battery)	P/N	CP302296-01 (FPCBP200)
V/mAh	10.8V/5800mAh	V/mAh	10.8V/5200mAh
S/N	01-2090604000159Z	S/N	01A-W090623000736WE

4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

INTEL's CRTU test tool was used to configure the WLAN for testing. The Portable Tablet Computer Wireless LAN had a total of 11 channels (USA model) within the 2412 to 2462 MHz frequency band and 17 channels within the frequency range 5180 – 5825 MHz. In The frequency range 2412 MHz to 2462 MHz the device operates in 2 modes, OFDM and DSSS. Within the 5180 – 5825 MHz frequency range the device operates in OFDM mode only. For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu. The fixed frequency channels used in the testing are shown in Table Below.

The Bluetooth module operates over 79 channels within the frequency range 2402 to 2480 MHz. It is possible for the Bluetooth module to operate simultaneously with the WLAN module (co-transmission). For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu. The tests were conducted with only the WLAN operating. The SAR tests were not required for Bluetooth because the Bluetooth transmit power is very low and Bluetooth antenna is located at more than 5cm away from the other transmitting antennas. The fixed frequency channels used in the testing are shown in the table below.

The test results mentioned in this report only apply to the 5200/5800MHz frequency range. An additional report titled *"*M090734_CERT_512AN_HMW_SAR_2.4*"* is specific to the 2450MHz range.

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

The frequency span of the 2450 MHz range and 5600MHz Bands was more than 10MHz consequently; the SAR levels of the test sample were measured for lowest, centre and highest channels in the applicable modes. There were no wires or other connections to the Portable TABLET Computer during the SAR measurements.

At the beginning and at the completion of the SAR tests, the conducted power of the device was measured after temporary modification of antenna connector inside the device's TX RX compartment. Measurements were performed with a calibrated Power Meter. The 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 in the range 40% to 43%. The liquid parameters are measured daily prior to the commencement of each test. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN3563 probe was less than 5μV in both air and liquid mediums.

6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

Applicable Head Configurations Applicable Body Configurations	: None : 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 53** from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision 6-axis robot (working range greater that 1.1m), which positions the SAR measurement probes with a positional repeatability of better than ±0.02 mm. The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN62209-1 SAR measurement requirements.

6.2 E-Field Probe Type and Performance

The SAR measurements were conducted with SPEAG dosimetric probe EX3DV4 Serial: 3563 (5.6 GHz) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probe has been calibrated and found to be accurate to better than ±0.25 dB. The probe is suitable for measurements close to material discontinuity at the surface of the phantom. The sensors of the probe are directly loaded with Schottky diodes and connected via highly resistive lines (length = 300 mm) to the data acquisition unit.

6.3 Data Acquisition Electronics

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. The input impedance of the DAE3 box is 200 MΩ; the inputs are symmetrical and floating. Common mode rejection is above 80dB.Transmission to the PC-card is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The mechanical probe-mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

6.4 Validation

6.4.1 Validation Results @ 5GHz

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

Table: Validation Results (Dipole: SPEAG D5GHzV2 SN: 1008)

1. Validation Date	2. ϵ_r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
31st July 2009	35.2	5.47	22.8	6.42
1st August 2009	37.4	4.88	21.7	6.19
18th August 2009	37.6	4.66	20.9	5.91
19th August 2009	36.8	5.10	21.9	6.17
19th August 2009	35.4	5.32	22.0	6.21

6.4.2 Deviation from reference validation values

The reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole (D5GHzV2) after system component calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table below.

Table: Deviation from reference validation values in 5.6 GHz band.

Frequency and Date	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	Reference SAR Value 1g (mW/g)	Deviation From Reference (%)
5800 MHz 31st July 2009	22.8	91.20	89.2	2.24
5200 MHz 1st August 2009	21.7	86.80	89.6	-3.13
5200 MHz 18th August 2009	20.9	83.60	89.6	-6.70
5500 MHz 19th August 2009	21.9	87.60	85.2	2.82
5800 MHz 19th August 2009	22.0	88.00	89.2	-1.35

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

6.4.3 Liquid Depth 15cm

During the SAR measurement process the liquid level was maintained to a level of a least 15cm with a tolerance of 0.5cm.

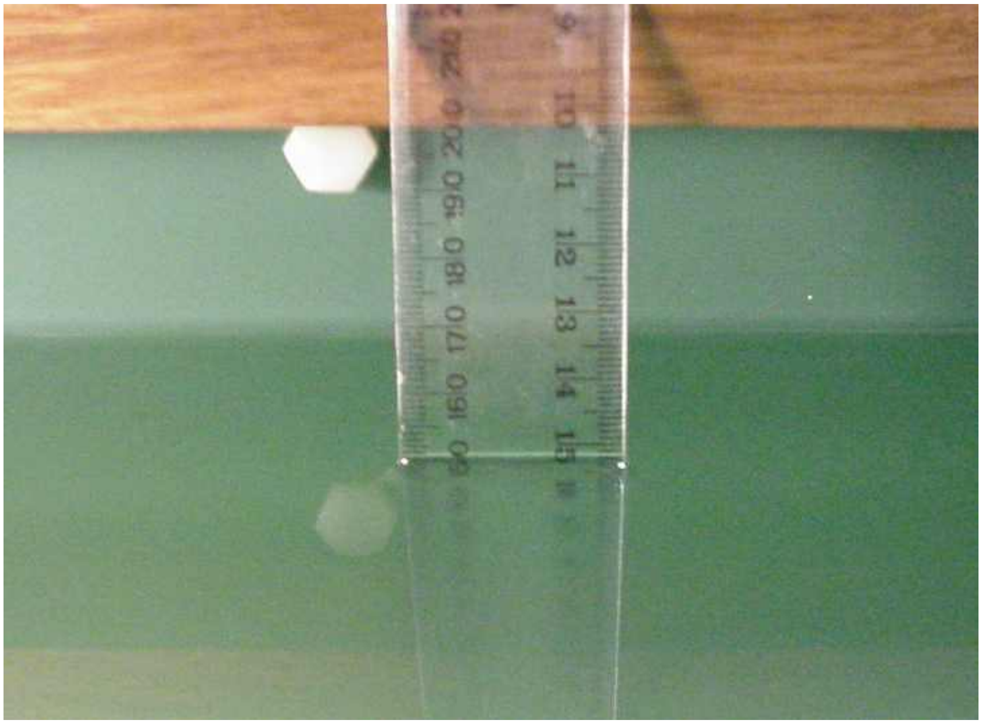


Photo of liquid Depth in Flat Phantom

6.5 Phantom Properties (Size, Shape, Shell Thickness)

The phantom used during the validations was the SAM Phantom model: TP - 1260 from SPEAG. It is a phantom with a single thickness of 2 mm and was filled with the required tissue simulating liquid. The SAM phantom support structures were all non-metallic and spaced more than one device width away in transverse directions.

For SAR testing in the body worn positions an AndreT Flat phantom P 10.1 was used. The phantom thickness is 2.0mm+/-0.2 mm and was filled with the required tissue simulating liquid. Table below provides a summary of the measured phantom properties.

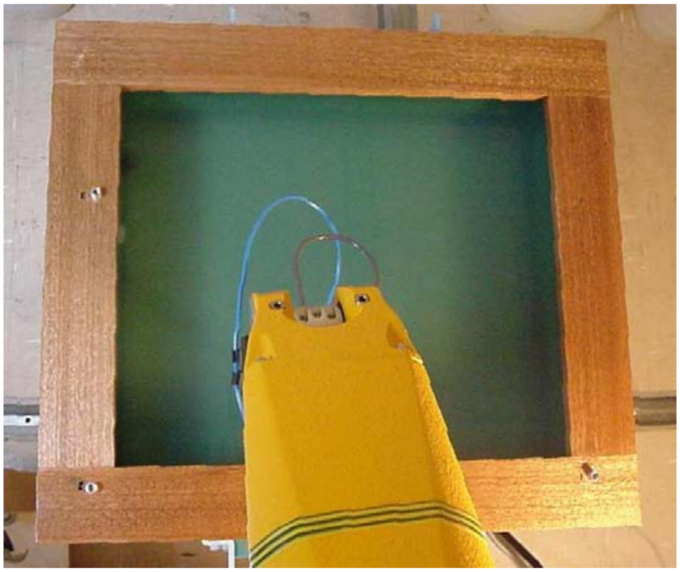
Table: Phantom Properties (300MHz-2500MHz)

Phantom Properties	Required	Measured
Thickness of flat section	2.0mm ± 0.2mm (bottom section)	2.12-2.20mm
Dielectric Constant	<5.0	4.603 @ 300MHz (worst-case frequency)
Loss Tangent	<0.05	0.0379 @ 2500MHz (worst-case frequency)

Depth of Phantom 200mm
Length of Flat Section 620mm
Width of Flat Section 540mm

P 10.1 Flat Phantom

P 10.1 Flat Phantom



6.6 Tissue Material Properties

The dielectric parameters of the brain simulating liquid were measured prior to SAR assessment using the HP85070A dielectric probe kit and HP8753ES Network Analyser. The actual dielectric parameters are shown in the following table.

Table: Measured Brain Simulating Liquid Dielectric Values for Validations

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m³
5200 MHz Brain	37.4 – 37.6	36.0 ±5% (34.2 to 37.8)	4.66 – 4.88	4.76 ±5% (4.43 to 4.90)	1000
5500 MHz Brain	36.8	35.6 ±5% (33.8 to 37.4)	5.10	4.96 ±5% (4.71 to 5.21)	1000
5800 MHz Brain	35.2 – 35.4	35.3 ±5% (33.5 to 37.1)	5.32 – 5.47	5.27 ±5% (5.01 to 5.53)	1000

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

Table: Measured Body Simulating Liquid Dielectric Values for 5200MHz range

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m³
5180 MHz Muscle	48.2	49.0 ±10% (44.1 to 53.9)	5.23	5.3 ±10% (4.77 to 5.83)	1000
5260 MHz Muscle	47.9	48.9 ±10% (44.0 to 53.8)	5.43 – 5.48	5.4 ±10% (4.86 to 5.94)	1000
5320 MHz Muscle	47.8	48.8 ±10% (43.9 to 53.7)	5.54	5.4 ±10% (4.86 to 5.94)	1000

Table: Measured Body Simulating Liquid Dielectric Values for 5600MHz range

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m³
5500 MHz Muscle	47.2	48.6 ±10% (43.7 to 53.4)	5.89	5.6 ±10% (5.04 to 6.16)	1000
5600 MHz Muscle	46.8	48.5 ±10% (43.8 to 53.5)	6.09	5.77 ±10% (5.20 to 6.34)	1000
5700 MHz Muscle	46.4	48.4 ±10% (43.6 to 53.2)	6.26	5.9 ±10% (5.31 to 6.49)	1000

Table: Measured Body Simulating Liquid Dielectric Values for 5800MHz range

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m³
5745 MHz Muscle	46.2	48.3 ±10% (43.47 to 53.13)	6.38	5.9 ±10% (5.31 to 6.49)	1000
5785 MHz Muscle	46.1 – 46.3	48.2 ±10% (43.38 to 53.02)	6.45 – 6.47	6.0 ±10% (5.4 to 6.60)	1000
5825 MHz Muscle	45.9	48.2 ±10% (43.38 to 53.02)	6.51	6.0 ±10% (5.4 to 6.60)	1000

NOTE: The muscle liquid parameters were within the required tolerances of ±10%.

6.6.1 Liquid Temperature and Humidity

The humidity and dielectric/ambient temperatures were recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than |2|°C.

Table: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
31st July 2009	20.3	20.0	43.0
1st August 2009	20.4	20.2	42.0
18th August 2009	20.5	20.3	43.0
19th August 2009	20.3	20.0	42.0

6.7 Simulated Tissue Composition Used for SAR Test

Table: Tissue Type: Muscle @ 5600MHz

Volume of Liquid: 60 Litres

EMCT Liquid

Composition
Distilled Water
Salt
Triton X-100

6.8 Device Holder for Laptops and P 10.1 Phantom

A low loss clamp was used to position the Laptop 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 2.0 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 10 mm x 10 mm. The actual Area Scan has dimensions of 70 mm x 120 mm 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 24 mm x 24 mm x 20 mm is assessed by measuring 7 x 7 x 9 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 1.0 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 2.0 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 Validation uncertainty. The measurement uncertainty of a specific device is evaluated independently.

Table: Uncertainty Budget for DASY4 V4.7 Build 53 – EUT SAR test 5GHz

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	6.55	N	1	1	1	6.6	6.6	∞
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	2	R	1.73	1	1	1.2	1.2	∞
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	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning	9.9	R	1.73	1	1	5.7	5.7	∞
Max. SAR Eval.	4	R	1.73	1	1	2.3	2.3	∞
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	8.49	R	1.73	1	1	4.9	4.9	∞
Phantom and Setup								
Phantom Uncertainty	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	10	R	1.73	0.64	0.43	3.7	2.5	∞
Liquid Conductivity – Measurement uncertainty	5	N	1.00	0.64	0.43	3.2	2.2	5
Liquid Permittivity – Deviation from target values	10	R	1.73	0.6	0.49	3.5	2.8	∞
Liquid Permittivity – Measurement uncertainty	5	N	1.00	0.6	0.49	3.0	2.5	5
Combined standard Uncertainty		RSS				14.1	13.5	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				28.2	26.94	

Estimated total measurement uncertainty for the DASY4 measurement system was ±14.1%. The extended uncertainty (K = 2) was assessed to be ±28.2% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table: Uncertainty Budget for DASY4 V4.7 Build 53 – Validation 5GHz

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	6.55	N	1	1	1	6.6	6.6	∞
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	2	R	1.73	1	1	1.2	1.2	∞
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	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning	9.9	R	1.73	1	1	5.7	5.7	∞
Max. SAR Eval.	4	R	1.73	1	1	2.3	2.3	∞
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				11.4	11.1	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				22.7	22.26	

Estimated total measurement uncertainty for the DASY4 measurement system was ±11.4%. The extended uncertainty (K = 2) was assessed to be ±22.7% based on 95% confidence level. The uncertainty is not added to the measurement result.

9.0 QUIPMENT LIST AND CALIBRATION DETAILS

Table: SPEAG DASY4 Version DASY4 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-2009	✓
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 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 and due to the separation distances involved between the phantom and the laptop antenna, testing is not required in this position.

10.0 Position

10.1.1 "Tablet" 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 "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 device 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.*

10.2 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.

Table: Testing configurations

Phantom Configuration	*Device Mode	Antenna	Test Configurations		
			Channel (Low)	Channel (Middle)	Channel (High)
Tablet	OFDM 5GHz All Bands	A		X	
Edge On	OFDM 5GHz All Bands	A		X	

Legend

X (blue)	Testing Required in this configuration
(green)	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 refers to Tx1 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 5GHz Band SAR Results

Table: SAR MEASUREMENT RESULTS Lower Band – OFDM 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)
Primary Portrait	1	A	6	-	52	5260	0.219	-0.259
Secondary Landscape	2	A	6	-	36	5180	0.629	0.085
	3	A			52	5260	1.45	-0.147
	4	A			64	5320	0.667	-0.354
Tablet	5	A	6	-	52	5260	0.201	-0.029

NOTE: The measurement uncertainty of 28.2% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.2 GHz band was 1.45 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Secondary Landscape position in OFDM mode, utilizing channel 52 (5260MHz) and antenna A.

Table: SAR MEASUREMENT RESULTS Middle Band – OFDM 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)
Primary Portrait	6	A	6	-	120	5600	0.556	-0.196
Secondary Landscape	7	A	6	-	100	5500	1.41	-0.193
	8	A			120	5600	1.49	-0.179
	9	A			140	5700	0.816	-0.083
Secondary Landscape 5.2Ah Battery	10	A	6	-	120	5600	1.36	-0.014
Tablet	11	A	6	-	120	5600	0.217	-0.262

NOTE: The measurement uncertainty of 28.2% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.6 GHz band was 1.49 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Secondary Landscape position in OFDM mode, utilizing channel 120 (5600MHz) and antenna A.

Table: SAR MEASUREMENT RESULTS Upper Band – OFDM 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)
Primary Portrait	12	A	6	-	157	5785	0.411	-0.299
	13	A	-	20	157	5785	0.246	-0.205
	14	A	-	40	157	5785	0.230	-0.135
Secondary Landscape	15	A	6	-	149	5745	1.06	-0.209
	16	A			157	5785	1.05	-0.125
	17	A			165	5825	0.882	0.039
Tablet	18	A	6	-	157	5785	0.204	0.077

NOTE: The measurement uncertainty of 28.2% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.8 GHz band was 1.06 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Secondary Landscape position in OFDM mode, utilizing channel 149 (5745MHz) and antenna A.

12.0 COMPLIANCE STATEMENT

The Fujitsu TABLET PC, Model: T4310 with INTEL Mini-PCI Wireless LAN Module (512AN_HMW 802.11a/b/g/n), Model: 512AN_HMW & CSR Bluetooth Module, Model: BSMAN3 was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 1.49 mW/g for a 1g cube. This value was measured at 5600 MHz (channel 120) in the “Secondary Landscape” position in OFDM modulation mode at the antenna A. This was below the limit of 1.6 mW/g for uncontrolled exposure, but was within the band of measurement uncertainty around the limit.