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SAR Test Report

Report Number: M091071_CERT_GOBI2000_SAR_GSM-UMTS

Test Sample: Portable TABLET Computer with Intel or Atheros WLAN Modules
Radio Modules Under Test: WWAN GOBI2000
Host PC Model: T900 / TH900
WWAN FCC ID: N7NGOBI2
WWAN IC: 2417C-GOBI2
Date of Issue: 1st December 2009

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SAR TEST REPORT

Report Number: M091071_CERT_GOBI2000_SAR_GSM-UMTS
WWAN FCC ID: N7NGOBI2 AN IC: 2417C-GOBI2

1.0 GENERAL INFORMATION

Test Sample: Portable TABLET Computer with Intel or Atheros WLAN Modules
Radio Module Under Test: WWAN GOBI2000
Interface Type: Mini-PCI Module
Device Category: Portable Transmitter
Test Device: Pre-Production Unit
Host PC model: T900 / TH900
WWAN FCC ID: N7NGOBI2
WWAN IC: 2417C-GOBI2
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 T900 / TH900 with Sierra Wireless GSM/UMTS Module GOBI2000 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: 20th and 22nd November 2009

Test Officer:



Jason Cameron

Authorised Signature:



Peter Jakubiec

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SAR TEST REPORT
Portable TABLET Computer
Model: T900 / TH900
Report Number: M091071_CERT_GOBI2000_SAR_GSM-UMTS

2.1 Introduction

Testing was performed on the Fujitsu TABLET PC, Model: T900 / TH900 with SIERRA Mini-PCI Wireless WAN Module, Model: GOBI2000. The SIERRA WIRELESS module is an OEM product. The Mini-PCI Wireless WAN (WWAN) was tested in the dedicated host – LIFEBOOK T SERIES, Model T900 / TH900, with Intel or Atheros WLAN modules.

3.0 TEST SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 WWAN Details

Transmitter:	Mini-Card UMTS Module
Wireless Module:	UMTS
Model Number:	Gobi2000
Manufacturer:	Sierra Wireless
GSM Frequency Bands:	850 / 900 / 1800 / 1900 MHz
UMTS Frequency Bands:	Band I(2100MHz) / Band II(1900MHz) / Band V(850MHz) / Band VII(900 MHz)
Features:	EGPRS, GPRS, UMTS and HSDPA, and HSUPA
Output Power:	GPRS: 850 MHz = 33 dBm and 1900 MHz = 30 dBm EGPRS: 850 MHz = 27 dBm and 1900 MHz = 26 dBm UMTS: 850 MHz and 1900 MHz bands = 24 dBm
Antenna Type:	Nissei Electric
Antenna Gain:	Max peak gain 0.89 dBi

3.1.1 Test Signal, Frequency and Output Power

The EUT was provided by Fujitsu Australia Pty Ltd. It was put into operation using a Rhodes & Schwarz Radio Communication Tester CMU200. The channels utilised in the measurements were the traffic channels shown in the table below. The power level was set to Class 4 for 850 MHz GPRS, Class 1 for 1900 MHz GPRS and class 3 for 850 and 1900 MHz UMTS bands.

Channels and Output power:

Channel and Mode	Frequency MHz	Average Output Power dBm
GPRS Mode		
Channels 128, 190 and 251	824.2, 836.6 and 848.8	33
Channels 512, 661 and 810	1850.2, 1880 and 1909.8	30
UMTS Mode		
Channels 4132, 4183 and 4233	826.4, 836.6 and 846.6	24
Channels 9262, 9400 and 9538	1852.4, 1880 and 1907.6	24

3.2 EUT (Notebook PC) Details

Host notebook :	LifeBook T series
Model Name(Reg No.):	T900 / TH900
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core i7 M620 2.67GHz
LCD	13.3"WXGA
Wired LAN:	Intel 82577LM : 10 Base-T/100 Base-TX/1000Base-T
Modem:	Agere MDC1.5 modem Model: D40
Port Replicator Model:	ZPR0030
AC Adapter Model:	80W: SEE100P2-19.0 (Sanken), SEC100P3-19.0 (Sanken), ADP-80NB A (Delta) 100W: SEE120P2-19.0 (Sanken)
Voltage:	19V
Current Specs:	4.22A / 5.27A
Watts:	80W / 100W

Host System # 1 : FCC Granted HOST PC FCC ID: EJE-WB0080 , IC ID: 337J-WB0080

Radio Module #1:	WLAN (Puma Peak IEEE802.11a/b/g/n, 2x2)
WLAN Model Number:	622ANHMW
WLAN Manufacturer:	Intel Corp.
Interface Type:	Half Mini-Card Wireless LAN Module
Radio Module #2:	Bluetooth module
Model Number:	EYSMJCS
Manufacturer:	Taiyo Yuden
Interface Type:	USB

Host System # 2 : FCC Granted FCC ID: EJE-WB0059 , IC ID: 337J-WB0059

Radio Module #1:	WLAN (HB92 IEEE802.11a/b/g/n)
WLAN Model Number:	AR5BHB92
WLAN Manufacturer:	Atheros Corp.
Interface Type:	Half Mini-Card Wireless LAN Module
Radio Module #2:	Bluetooth module
Model Number:	EYSMJCS
Manufacturer:	Taiyo Yuden
Interface Type:	USB

3.3 Test sample Accessories

3.3.1 Battery Types

One type of Fujitsu Lithium Ion Battery is used to power the Portable TABLET Computer with Wireless WAN Model: GOBI2000. SAR measurements were performed with the battery as shown below.

Standard Battery

Battery #1

Product No. FPCBP215
V/mAh 10.8V/5800mAh
Serial No. 01A-Z090511000293Z

Battery #2

Product No. FPCBP215
V/mAh 10.8V/5800mAh
Serial No. 01A-Z090429000610Z



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4.0 Test Signal, Frequency and Output Power

The Portable Tablet Computer Wireless WAN had a total of 423 channels (USA model) within the 824.2 to 848.8 MHz and 1850.2 to 1909.8 MHz GPRS frequency bands and 379 channels within the frequency ranges 826.4 to 846.6 MHz and 1852.4 to 1907.6 MHz. For the SAR measurements the device was operating at full transmit power. The fixed frequency channels used in the testing are shown in Table Below.

The Portable Tablet Computer Wireless LAN had a total of 11 channels (USA model) within the 2412 to 2462 MHz frequency band and 24 channels within the frequency range 5180 – 5825 MHz. The Bluetooth module operates over 79 channels within the frequency range 2402 to 2480 MHz. It is possible for the WLAN and Bluetooth modules to operate simultaneously with the WWAN module (co-transmission). Due to the output power of the Bluetooth module being <60/f, and a separation of the Bluetooth antenna from all other simultaneous transmitting antennas >5cm, the Bluetooth module was not assessed in the SAR measurements. See section 13 for further details.

The frequency span of the GSM and UMTS 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.

The conducted power of the device was measured after temporary modification of antenna connector inside the device's TX RX compartment. Measurements were performed with a calibrated Power Meter. The results of this measurement are listed in tables below.

Table: Frequency and Conducted Power Results GSM

Coding Scheme	GPRS Power Class	RF Channel	Measured Power (dBm)
CS1	10	128	32.05
CS1	10	190	32.39
CS1	10	251	31.95

Coding Scheme	EGPRS Power Class	RF Channel	Measured Power (dBm)
MCS5	10	128	27.96
MCS5	10	190	28.35
MCS5	10	251	27.81

Coding Scheme	GPRS Power Class	RF Channel	Measured Power (dBm)
CS1	10	512	29.85
CS1	10	661	29.30
CS1	10	810	27.89

Coding Scheme	EGPRS Power Class	RF Channel	Measured Power (dBm)
MCS5	10	512	26.53
MCS5	10	661	26.10
MCS5	10	810	24.76

Conducted Power Measurement UMTS 850 MHz

Configuration:

12.2 kbps RMC

Test Loop Mode 1

 $\beta_c = 8$, $\beta_d = 15$ (3GPP default)

TPC (Transmit Power Control) = All 1s

Channel No.	β_c	β_d	Result (dBm)
4132	8	15	24.29
4183	8	15	24.80
4233	8	15	25.16

Conducted Power Measurement UMTS + HSDPA 850 MHz

Configuration:

Device HSDPA Category 6 (Downlink 3.6 Mbps and Uplink 384 kbps)

H-Set = 1

QPSK in H-Set (1)

CQI Feedback Cycle = 4ms; CQI Repetition Rate = 2ms

3GPP default HS-DPCCH power offset parameters $\Delta AKN = 5$; $\Delta NAKN = 5$; $\Delta CQI = 2$

Sub Test No.	β_c	β_d	ΔAKN	$\Delta NAKN$	ΔCQI	Result (dBm)		
						4132	4183	4233
1	2	15	8	8	8	23.99	24.63	24.85
2	12	15	8	8	8	22.84	23.34	23.52
3	15	8	8	8	8	22.61	23.64	23.34
4	15	4	8	8	8	22.56	23.17	23.34
1	2	15	5	5	2	24.20	24.73	24.71
2	12	15	5	5	2	23.87	24.57	24.49
3	15	8	5	5	2	23.05	23.46	23.73
4	15	4	5	5	2	22.70	23.38	23.36



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Conducted Power Measurement UMTS 1900 MHz

Configuration:

12.2 kbps RMC

Test Loop Mode 1

 $\beta_c = 8$, $\beta_d = 15$ (3GPP default)

TPC (Transmit Power Control) = All 1s

Channel No.	β_c	β_d	Result (dBm)
9262	8	15	24.25
9400	8	15	24.27
9538	8	15	23.91

Conducted Power Measurement UMTS + HSDPA 1900 MHz

Configuration:

Device HSDPA Category 6 (Downlink 3.6 Mbps and Uplink 384 kbps)

H-Set = 1

QPSK in H-Set (1)

CQI Feedback Cycle = 4ms; CQI Repetition Rate = 2ms

3GPP default HS-DPCCH power offset parameters $\Delta AKN = 5$; $\Delta NAKN = 5$; $\Delta CQI = 2$

Sub Test No.	β_c	β_d	ΔAKN	$\Delta NAKN$	ΔCQI	Result (dBm)		
						9262	9400	9538
1	2	15	8	8	8	23.55	24.12	23.75
2	12	15	8	8	8	22.81	23.00	22.47
3	15	8	8	8	8	22.89	22.86	22.41
4	15	4	8	8	8	22.83	22.86	22.47
1	2	15	5	5	2	24.18	24.16	23.79
2	12	15	5	5	2	23.90	23.97	23.55
3	15	8	5	5	2	23.23	23.13	22.96
4	15	4	5	5	2	22.94	22.82	22.71



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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 $20\pm1^{\circ}\text{C}$, the humidity was in the range 54% to 75%. The liquid parameters are measured daily prior to the commencement of each test. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN3563 probe was less than $5\mu\text{V}$ in both air and liquid mediums.

6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

Applicable Head Configurations	: None
Applicable Body Configurations	: 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 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. Please refer to appendix C for detailed information.

6.3 Validation

6.3.1 Validation Results (900 MHz, 1800 MHz and 1950 MHz)

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

Table: Validation Results

1. Validation Date & Frequency	2. ϵ_r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
20 th November 2009 900 MHz	41.1	0.95	2.80	1.80
22 nd November 2009 1800 MHz	39.5	1.40	9.66	5.02
22 nd November 2009 1950 MHz	38.9	1.46	10.9	5.48

6.3.2 Deviation from reference validation values

The reference SAR values are derived using reference dipoles and flat section of the SAM phantom suitable for centre frequencies of 900, 1800 MHz and 1950 MHz. 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 during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table below (2450MHz) below.

Table: Deviation from reference validation values @ (900MHz, 1800 MHz and 1950 MHz)

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 (%)
20 th Nov 2009 900MHz	2.80	11.20	10.9	2.75	10.8	3.70
22 nd Nov 2009 1800MHz	9.66	38.64	38.2	1.15	38.1	1.42
22 nd Nov 2009 1950MHz	10.9	43.60	41.3	5.57	40.5	7.65

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



6.3.3 Liquid Depth 15cm

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

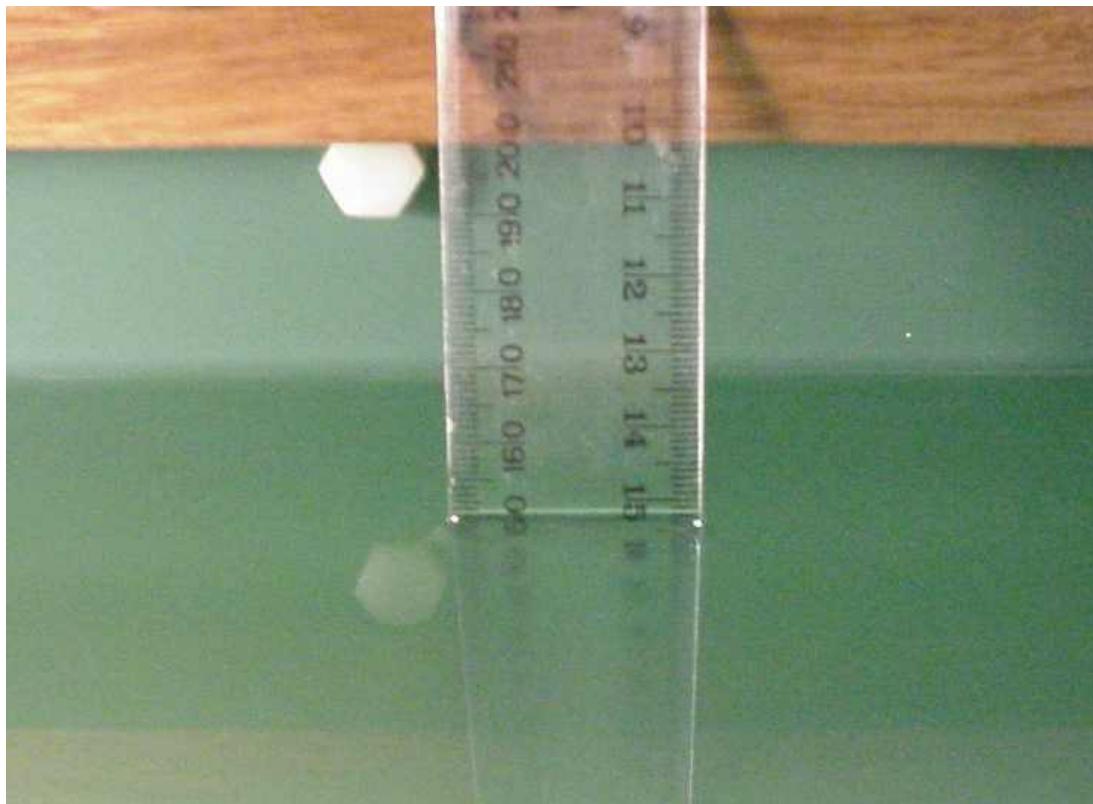


Photo of liquid Depth in Flat Phantom

6.4 Phantom Properties

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

6.5 Tissue Material Properties

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

Table: Measured Brain Simulating Liquid Dielectric Values for Validations

Frequency Band	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
900 MHz Brain	41.1	41.5 \pm 5% (39.4 to 43.6)	0.95	0.97 \pm 5% (0.92 to 1.02)	1000
1800 MHz Brain	39.5	40.0 \pm 5% (38.0 to 42.0)	1.40	1.40 \pm 5% (1.33 to 1.47)	1000
1950 MHz Brain	38.9	40.0 \pm 5% (38.0 to 42.0)	1.46	1.40 \pm 5% (1.33 to 1.47)	1000

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

Table: Measured Body Simulating Liquid Dielectric Values at 850MHz

Frequency Band	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
825 MHz Body	53.8	55.2 \pm 5% (52.4 to 58.0)	0.98	0.97 \pm 5% (0.92 to 1.02)	1000
835 MHz Body	53.7	55.2 \pm 5% (52.4 to 58.0)	0.99	0.97 \pm 5% (0.92 to 1.02)	1000
850 MHz Body	53.6	55.2 \pm 5% (52.4 to 58.0)	1.00	0.97 \pm 5% (0.92 to 1.02)	1000

Note: The body liquid parameters were within the required tolerances of \pm 5%.

Table: Measured Body Simulating Liquid Dielectric Values at 1880MHz

Frequency Band	ϵ_r (measured range)	ϵ_r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m ³
1850 MHz Body	51.6	53.3 \pm 5% (50.6 to 56.0)	1.54	1.52 \pm 5% (1.44 to 1.60)	1000
1880.0 MHz Body	51.5	53.3 \pm 5% (50.6 to 56.0)	1.56	1.52 \pm 5% (1.44 to 1.60)	1000
1910 MHz Body	51.4	53.3 \pm 5% (50.6 to 56.0)	1.57	1.52 \pm 5% (1.44 to 1.60)	1000

Note: The body liquid parameters were within the required tolerances of \pm 5%.



6.5.1 Liquid Temperature and Humidity

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

Table: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
20 th November 2009	20.1	19.8	54
22 nd November 2009	20.5	20.2	75

6.6 Simulated Tissue Composition Used for SAR Test

The tissue simulating liquids are created prior to the SAR evaluation and often require slight modification each day to obtain the correct dielectric parameters.

Table: Tissue Type: Brain @ 850/900MHz
Volume of Liquid: 30 Litres

Approximate Composition	% By Weight
Distilled Water	41.05
Salt	1.35
Sugar	56.5
HEC	1.0
Bactericide	0.1

Table: Tissue Type: Brain @ 1800/1950MHz
Volume of Liquid: 30 Litres

Approximate Composition	% By Weight
Distilled Water	61.17
Salt	0.31
Bactericide	0.29
Triton X-100	38.23

Table: Tissue Type: Body @ 850/900MHz
Volume of Liquid: 30 Litres

Approximate Composition	% By Weight
Distilled Water	56
Salt	0.76
Sugar	41.76
HEC	1.21
Bactericide	0.27

Table: Tissue Type: Body @ 1800/1950MHz
Volume of Liquid: 30 Litres

Approximate Composition	% By Weight
Distilled Water	40.4
Salt	0.5
Sugar	58
HEC	1
Bactericide	0.1

*Refer "OET Bulletin 65 97/01 P38"

6.7 Phantom Properties

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

6.8 Device Holder for Laptops and P 10.1 Phantom

A low loss clamp was used to position the TABLET underneath the phantom surface. Small pieces of foam were then used to press the TABLET flush against 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 3.9 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 15 mm x 15 mm. The actual Area Scan has dimensions of 75mm x 120mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.
- c) Around this point, a volume of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:
 - (i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.
 - (ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the "Not a knot"- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.
 - (iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.
 - (iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

8.0 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: Uncertainty Budget for DASY4 V4.7 Build 53 – EUT SAR

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	10.56	R	1.73	1	1	6.1	6.1	∞
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				11.7	11.5	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				23.3	22.96	

Estimated total measurement uncertainty for the DASY4 measurement system was $\pm 11.7\%$. The extended uncertainty ($K = 2$) was assessed to be $\pm 23.3\%$ based on 95% confidence level. The uncertainty is not added to the measurement result.



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

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 $\pm 9.0\%$. The extended uncertainty ($K = 2$) was assessed to be $\pm 17.9\%$ based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table: SPEAG DASY4 Version V4.7 Build 53

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX90BL	N/A	Not applicable	✓
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	✓
SAM Phantom	SPEAG	N/A	1260	Not applicable	✓
SAM Phantom	SPEAG	N/A	1060	Not applicable	✓
Flat Phantom	AndreT	10.1	P 10.1	Not Applicable	✓
Flat Phantom	AndreT	9.1	P 9.1	Not Applicable	✓
Flat Phantom	SPEAG	PO1A 6mm	1003	Not Applicable	
Data Acquisition Electronics	SPEAG	DAE3 V1	359	08-July-2010	✓
Data Acquisition Electronics	SPEAG	DAE3 V1	442	10-Dec-2009	✓
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	
Probe E-Field	SPEAG	ET3DV6	1380	18-Dec-2009	
Probe E-Field	SPEAG	ET3DV6	1377	14-July-2010	
Probe E-Field	SPEAG	ES3DV6	3029	Not Used	
Probe E-Field	SPEAG	EX3DV4	3563	16-July-2010	✓
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	14-Dec-2009	
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	17-Dec-2010	
Antenna Dipole 900 MHz	SPEAG	D900V2	047	7-July-2010	✓
Antenna Dipole 1640 MHz	SPEAG	D1640V2	314	16-July-2010	
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	8-July-2010	✓
Antenna Dipole 1950 MHz	SPEAG	D1950V3	1113	12-Dec-2010	✓
Antenna Dipole 3500 MHz	SPEAG	D3500V2	1002	17-July-2010	
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	10-Dec-2010	
Antenna Dipole 5600 MHz	SPEAG	D5GHzV2	1008	07-Dec-2009	
RF Amplifier	EIN	603L	N/A	*In test	
RF Amplifier	Mini-Circuits	ZHL-42	N/A	*In test	✓
RF Amplifier	Mini-Circuits	ZVE-8G	N/A	*In test	
Synthesized signal generator	Hewlett Packard	ESG-D3000A	GB37420238	*In test	✓
RF Power Meter Dual	Hewlett Packard	437B	3125012786	29-June-2010	✓
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	01-July-2010	✓
RF Power Meter Dual	Gigatronics	8542B	1830125	26-Mar-2010	
RF Power Sensor	Gigatronics	80301A	1828805	26-Mar-2010	
RF Power Meter Dual	Hewlett Packard	435A	1733A05847	*In test	✓
RF Power Sensor	Hewlett Packard	8482A	2349A10114	*In test	✓
Network Analyser	Hewlett Packard	8714B	GB3510035	30-Sept-2010	✓
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.



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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.

10.1.1 “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.

Testing in Tablet Mode was conducted, and Antenna-to-user separation distance is 2.75 cm.

10.1.2 “Edge On” Position

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.*

Measurements in Primary portrait and Primary landscape modes were Not required because Antenna-to-user separation distance is > 20cm, also testing in Secondary landscape mode is Not required - WWAN TX function will be disabled via firmware when secondary viewing position is selected.

Testing was conducted in Secondary portrait mode, and Antenna-to-user separation distance is 1.10 cm.

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

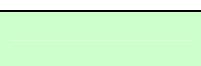
The device has a fixed antenna. Depending on the measured SAR level up to three test channels with the test sample operating at maximum power were recorded. The following table represents the matrix used to determine what testing was required. All relevant provisions of KDB 447498 (v03r02 Dec 2008), KDB 616217 (v01r01 Dec 2007) and KDB 941225 (v02 Oct 2007) are applied for SAR measurements of the host system.

Table: Testing configurations

Phantom Configuration	*Device Mode WWAN Band Name	Test Configurations		
		Channel (Low)	Channel (Middle)	Channel (High)
Tablet	GPRS 850 MHz		x	
	GPRS 1900 MHz		x	
	WCDMA 850 MHz		x	
	WCDMA 1900 MHz		x	
Edge On	GPRS 850 MHz		x	
	GPRS 1900 MHz		x	
	WCDMA 850 MHz		x	
	WCDMA 1900 MHz		x	

Legend

 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.



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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.

11.1.1 SAR Results

There are two modes of operation which include UMTS and GPRS transmission. Refer to section 7.2 for selection of all device test configurations. Table below displays the SAR results.

Table: SAR MEASUREMENT RESULTS – 850MHz GPRS

Test Position	Plot No.	Ant (In/Out)	Test Channel	Test Freq (MHz)	Measured 1g SAR Results (mW/g)	Measured Drift (dB)
Tablet	1	In	190	836.6	0.015	-0.436
	2	Out	190	836.6	0.018	-0.346
Secondary Portrait	3	In	190	836.6	0.051	-0.012
	4	Out	128	824.2	0.064	-0.043
	5	Out	190	836.6	0.086	0.170
	6	Out	251	848.8	0.103	-0.021

NOTE: The measurement uncertainty of 23.3% was not added to the result.

Table: SAR MEASUREMENT RESULTS – 1900MHz GPRS

Test Position	Plot No.	Ant (In/Out)	Test Channel	Test Freq (MHz)	Measured 1g SAR Results (mW/g)	Measured Drift (dB)
Tablet	7	In	661	1880	0.013	-0.319
	-	Out	661	1880	Noise Floor	N/A
Secondary Portrait	8	Out	661	1880	0.029	0.342
	9	In	512	1850.2	0.072	0.243
	10	In	661	1880	0.058	-0.087
	11	In	810	1909.8	0.066	0.206

NOTE: The measurement uncertainty of 23.3% was not added to the result.

Table: SAR MEASUREMENT RESULTS – 850MHz UMTS

Test Position	Plot No.	Ant (In/Out)	Test Channel	Test Freq (MHz)	Measured 1g SAR Results (mW/g)	Measured Drift (dB)
Tablet	12	In	4183	836.6	0.013	0.065
	13	Out	4183	836.6	0.017	-0.376
Secondary Portrait	14	In	4183	836.6	0.060	-0.049
	15	Out	4132	826.4	0.063	-0.161
	16	Out	4183	836.6	0.100	-0.081
	17	Out	4233	846.6	0.099	-0.011

NOTE: The measurement uncertainty of 23.3% was not added to the result.



Table: SAR MEASUREMENT RESULTS – 1900MHz UMTS

Test Position	Plot No.	Ant (In/Out)	Test Channel	Test Freq (MHz)	Measured 1g SAR Results (mW/g)	Measured Drift (dB)
Tablet	18	In	9400	1880	0.028	-0.317
	19	Out	9400	1880	0.019	0.236
Secondary Portrait	20	Out	9400	1880	0.073	-0.123
	21	In	9262	1852.4	0.133	-0.262
	22	In	9400	1880	0.135	-0.013
	23	In	9538	1907.6	0.129	0.036

NOTE: The measurement uncertainty of 23.3% was not added to the result.

The highest SAR level recorded was 0.135 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in the Secondary Portrait position in UMTS mode, utilizing channel 9400 (1880 MHz).

12.0 COMPLIANCE STATEMENT

The Fujitsu TABLET PC, Model: T900 / TH900 with SIERRA WIRELESS Mini-PCI Wireless WAN Module, Model: GOBI2000 was found to comply with the FCC and RSS-102 SAR requirements.

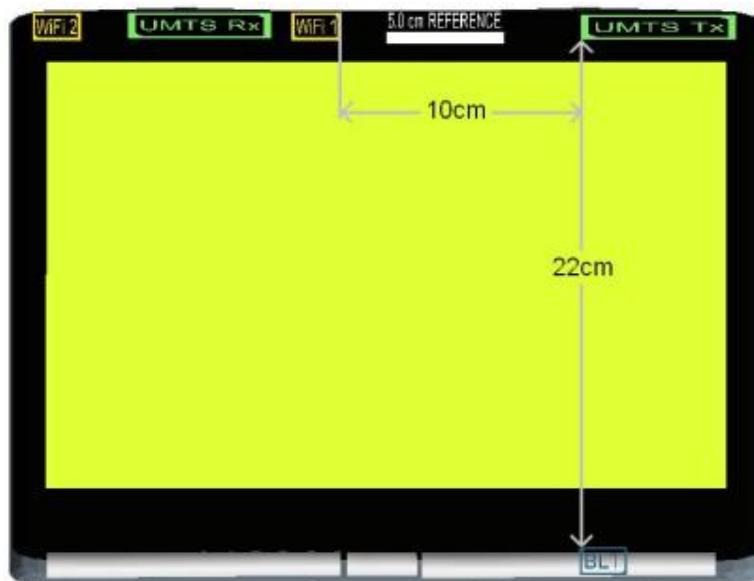
The highest SAR level recorded was 0.135 mW/g for a 1g cube. This value was measured at 1880 MHz (channel 9400) in the "Secondary Portrait" position in UMTS transmission mode. This was below the limit of 1.6 mW/g for uncontrolled exposure, even taking into account the measurement uncertainty of 23.3 %.

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13.0 MULTIBAND EVALUATION CONSIDERATIONS

The Fujitsu Tablet PC has multiple antennas that are capable of simultaneous transmission.

The Bluetooth module operates in the 2.4GHz range. According to the FCC rules, applying $60/f$ gives an output power threshold of 25mW ($60/2.4 = 25$). The Bluetooth module has a maximum output power <5mW and therefore stand-alone SAR was not required.



The shortest distance between the BT module and any other transmitting antenna was 22cm.

Because $22cm > 5cm$, and $5mW < 25mW$, the Bluetooth module was not considered for SAR evaluation. This is in accordance with the test reduction methods detailed in KDB 616217 and KDB 447498.

Stand-alone SAR was required for the WLAN modules. The highest 1g SAR for all applicable configurations is listed in the tables below.

Fujitsu T900 / TH900 with Intel 622ANHMW (FCC ID: EJE-WB0080 IC ID: 337J-WB0080)

	Intel 622ANHMW WLAN 1g SAR (mW/g)	GOBI2000 WWAN 1g SAR (mW/g)	$\Sigma(SAR_{1g})$
Secondary Portrait*	0.024	0.135	0.159
Tablet**	0.043	0.028	0.071

*Refer to report entitled M091069_CERT_622ANHMW_SAR_2.4 for further details

**Refer to report entitled M091069_CERT_622ANHMW_SAR_5.6 for further details

Fujitsu T900 / TH900 with Atheros AR5BHB92 (FCC ID: EJE-WB0059 IC ID: 337J-WB0059)

	Atheros AR5BHB92 WLAN 1g SAR (mW/g)	GOBI2000 WWAN 1g SAR (mW/g)	$\Sigma(SAR_{1g})$
Tablet*	0.035	0.028	0.063

*Refer to report entitled M080425_CERT_AR5BHB92_SAR_5.6 for further details

In accordance with KDB 616217 (Table 2, pg 8), "Summary of SAR Evaluation Requirements", multi-band SAR is not required when the sum of the 1g SAR < 1.6 mW/g.

