EMC Technologies Pty Ltd
ABN 82 057 105 549
176 Harrick Road
Keilor Park
Victoria Australia 3042

Ph: + 613 9365 1000
Fax: + 613 9331 7455
email: melb@emctech.com.au

SAR Test Report

Report Number: M100859_FCC_622ANHMW_SAR_5.6

Test Sample:	Portable TABLET Computer
Host PC Model Number:	T580/TH550
Radio Modules:	WLAN PUMA PEAK 622ANHMW & Bluetooth BSMAN3
PC System FCC ID:	EJE-WB0083 (with Bluethooth variant) EJE-WL0023 (with No Bluethooth variant)
PC System IC:	337J-WB0083 (with Bluethooth variant) 337J-WL0023 (with No Bluethooth variant)
Date of Issue:	29th September 2010

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CONTENTS

1.0 GENERAL INFORMATION 3
2.0 INTRODUCTION 4
3.0 TEST SAMPLE TECHNICAL INFORMATION 4
3.1 DUT (WLAN) Details 4
3.2 DUT (Bluetooth) Details 7
3.3 DUT (Notebook PC) Details (client supplied info): 8
3.4 Test sample Accessories 8
3.4.1 Battery Types 8
4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER 9
4.1 Battery Status 9
5.0 DETAILS OF TEST LABORATORY 10
5.1 Location 10
5.2 Accreditations 10
5.3 Environmental Factors 10
6.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM 11
6.1 Probe Positioning System 11
6.2 E-Field Probe Type and Performance 11
6.4 System verification 11
6.4.1 System verification results @ 5GHz 11
6.4.2 Deviation from reference system verification values 12
6.4.3 Liquid Depth 15cm 13
6.5 Phantom Properties 13
6.6 Tissue Material Properties 13
6.6.1 Liquid Temperature and Humidity 14
6.7 Simulated Tissue Composition Used for SAR Test 15
6.8 Device Holder for Laptops and P 10.1 Phantom 15
7.0 SAR MEASUREMENT PROCEDURE USING DASY4 15
8.0 MEASUREMENT UNCERTAINTY 16
9.0 EQUIPMENT LIST AND CALIBRATION DETAILS 18
10.0 TEST METHODOLOGY 19
10.0 Position 19
10.1.1 "Tablet" Position Definition (0mm spacing) 19
10.1.2 "Edge On" Position (Portrait or Landscape) 19
10.1.3 "Lap Held" Position (0mm spacing) 19
10.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes) 19
11.0 SAR MEASUREMENT RESULTS 20
11.1 5 GHz Band SAR Results 20
12.0 COMPLIANCE STATEMENT 23
13.0 MULTIBAND EVALUATION CONSIDERATIONS 24
APPENDIX A1 TEST SAMPLE PHOTOGRAPHS 25
APPENDIX A2 TEST SAMPLE PHOTOGRAPHS 26
APPENDIX A3 TEST SAMPLE PHOTOGRAPHS 27
APPENDIX A4 TEST SETUP PHOTOGRAPHS 28
APPENDIX A5 TEST SETUP PHOTOGRAPHS 29
APPENDIX A6 TEST SETUP PHOTOGRAPHS 30
APPENDIX A7 TEST SETUP PHOTOGRAPHS 31
APPENDIX A8 TEST SAMPLE PHOTOGRAPHS 32
APPENDIX B PLOTS OF THE SAR MEASUREMENTS 33
APPENDIX C CALIBRATION DOCUMENTS 124

SAR TEST REPORT

Report Number: M100859_FCC_622ANHMW_SAR_5.6

PC System FCC ID: EJE-WB0083 (with Bluethooth variant), EJE-WL0023 (with No Bluethooth variant)
PC System IC: 337J-WB0083 (with Bluethooth variant), 337J-WL0023 (with No Bluethooth variant)

1.0 GENERAL INFORMATION

Table 1

Test Sample:	Portable TABLET Computer
Model Name:	T580/TH550
Radio Modules:	WLAN 622ANHMW & Bluetooth BSMAN3
Interface Type:	Half Mini-Card Module
Device Category:	Portable Transmitter
Test Device:	Pre-Production Unit
FCC System ID:	EJE-WB0083 (with Bluethooth variant) EJE-WL0023 (with No Bluethooth variant)
PC System IC:	337J-WB0083 (with Bluethooth variant) 337J-WL0023 (with No Bluethooth variant)
RF exposure Category:	General Population/Uncontrolled
Manufacturer:	Fujitsu Limited
Test Standard/s:	**1.** Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) **2.** Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), RSS-102
Statement Of Compliance:	The Fujitsu TABLET Computer T580/TH550 with Wireless LAN model 622ANHMW 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:	2nd to 17th September 2010
Test Officer:	**Peter Jakubiec**
Authorised Signature:	**Chris Zombolas** **Technical Director**

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SAR TEST REPORT
Portable TABLET Computer, Model: T580/TH550
Report Number: M100859_FCC_622ANHMW_SAR_5.6

2.0 INTRODUCTION

SAR testing was performed on the Fujitsu TABLET PC, Model: T580/TH550 with INTEL Half Mini-Card Wireless LAN Module (PUMA PEAK 802.11a/b/g/n), Model: 622ANHMW & CSR Bluetooth Module, Model: BSMAN3. The PUMA PEAK module is an OEM product. The Half Mini-Card Wireless LAN (WLAN) was tested in the dedicated host – LIFEBOOK T SERIES, Model T580/TH550. The system tested will be referred to as the DUT throughout this report.

There are two variants of the Fujitsu Tablet PC, Model: T580/TH550 one that is equipped with the Bluetooth transmitter and Bluetooth antenna FCC ID: EJE-WB0083 IC: 337J-WB0083, and one variant that does not contain Bluetooth transmitter or Bluetooth antenna FCC ID: EJE-WL0023 IC: 337J-WL0023.

SAR testing was conducted on the sample that is equipped with the Bluetooth transmitter and Bluetooth antenna.

The measurement test results mentioned herein only apply to the 5GHz frequency band; an additional report titled “M100859_FCC_622ANHMW_SAR_2.4” applies to the 2450MHz frequency range.

3.0 TEST SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 DUT (WLAN) Details

Table 2

Transmitter:	Half Mini-Card Wireless LAN Module
Wireless Module:	Intel Centrino Advanced-N 6200(Puma Peak) (11a/b/g/n)
Model Number:	622ANHMW
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 = 450 Mbps
Frequency Range:	2.412–2.472 GHz for 11b/g/n 5.18-5.32 GHz and 5.745-5.825 GHz for 11a/n
Number of Channels:	13 channels for 802.11b/g/n 24 channels for 802.11a/n with 20MHz Bandwidth 18 channels for 802.11n with 40MHz Bandwidth
Antenna Types:	Nissei Inverted F (1st, 2nd), Yokowo Monopole (3rd) Model: Tx1 Antenna: CP492575 Tx2 (or Rx2) Antenna: CP492575 Location: Top edge of LCD screen
Power Supply:	3.3 VDC from PCI Express bus

Table 3: Channels and Output power setting

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)	Power Control - PCDAC Setting		Average Power Measured (dBm)	
						Gain Control Tx A	Gain Control Tx B	Tx A	Tx B
802.11a	**5.2 GHz**		6	-					
	36	5180			**16.5 Ant A**	30.5	26.0	16.70	14.62
	40	5200				-	-	-	-
	44	5220				-	-	-	-
	48	5240			**14.5 Ant B**	29.5	25.5	16.69	14.79
	5.3 GHz								
	52	5260			**16.5 Ant A**	29.0	25.5	16.56	14.59
	56	5280				-	-	-	-
	60	5300				-	-	-	-
	64	5320			**14.5 Ant B**	28.5	26.0	16.51	14.52
	5.6 GHz								
	100	5500				-	-	-	-
	104	5520				26.5	29.0	15.55	15.68
	108	5540				-	-	-	-
	112	5560			**15.5 Ant A**	-	-	-	-
	116	5580				26.5	30.0	15.52	15.53
	120	5600				-	-	-	-
	124	5620			**15.5 Ant B**	27.5	30.5	15.77	15.59
	128	5640				-	-	-	-
	132	5660				-	-	-	-
	136	5680				28.0	30.5	15.59	15.64
	140	5700				-	-	-	-
	5.8 GHz								
	149	5745			**16.5 Ant A**	30.0	30.0	16.60	15.78
	153	5765				-	-	-	-
	157	5785				30.0	30.0	16.52	15.58
	161	5805			**15.5 Ant B**	-	-	-	-
	165	5825				30.5	30.5	16.58	15.72

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)	Power Control - PCDAC Setting		Average Power Measured (dBm)	
						Gain Control Tx A	Gain Control Tx B	Tx A	Tx B
802.11n	**5.2 GHz**		HT0	20					
	36	5180			**16.5 Ant A**	-	-	-	-
	40	5200				-	-	-	-
	44	5220				-	-	-	-
	48	5240			**14.5 Ant B**	-	-	-	-
	5.3 GHz								
	52	5260			**16.5 Ant A**	-	-	-	-
	56	5280				-	-	-	-
	60	5300				-	-	-	-
	64	5320			**14.5 Ant B**	-	-	-	-
	5.6 GHz								
	100	5500				-	-	-	-
	104	5520				-	-	-	-
	108	5540				-	-	-	-
	112	5560			**15.5 Ant A**	-	-	-	-
	116	5580				-	-	-	-
	120	5600				-	-	-	-
	124	5620			**15.5 Ant B**	-	-	-	-
	128	5640				-	-	-	-
	132	5660				-	-	-	-
	136	5680				-	-	-	-
	140	5700				-	-	-	-
	5.8 GHz								
	149	5745			**16.5 Ant A**	-	-	-	-
	153	5765				-	-	-	-
	157	5785				-	-	-	-
	161	5805			**15.5 Ant B**	-	-	-	-
	165	5825				-	-	-	-
	5.2 GHz								
	38	5190		40 Wide	**16.5 Ant A**	-	-	-	-
	46	5230			**14.5 Ant B**	-	-	-	-
	5.3 GHz								
	54	5270			**16.5 Ant A**	-	-	-	-
	62	5310			**14.5 Ant B**	-	-	-	-
	5.6 GHz								
	102	5510			**15.5 Ant A**	-	-	-	-
	110	5550				-	-	-	-
	118	5590				-	-	-	-
	126	5630			**15.5 Ant B**	-	-	-	-
	134	5670				-	-	-	-

	5.8 GHz							
	151	5755			**16.5 Ant A**	-	-	-	-
	159	5795				-	-	-	-
					15.5 Ant				

NOTE: For 2450 MHz SAR results refer to report titled “M100859_FCC_622ANHMW_SAR_2.4”.

The WLAN’s maximum power settings for all bands is 16.5dBm. Up to 2 dB power reduction was necessary 5.2GHz and 5.3GHz bands in the Secondary Landscape orientation of the tablet mode as shown in the table above.

The SAR results show that the above power reduction is not required when the system is used in notebook mode (lapheld).

3.2 DUT (Bluetooth) Details

Table 4

Transmitter:	Bluetooth
Model Number:	BSMAN3
Manufacturer:	CSR
Network Standard:	Bluetooth™ RF Test Specification
Modulation Type:	Frequency Hopping Spread Spectrum (FHSS)
Frequency Range:	2402 MHz to 2480 MHz
Number of Channels:	79
Carrier Spacing:	1.0 MHz
Antenna Types:	Monopole Antenna included in module Module location: Left side of hinge
Max. Output Power:	4 dBm
Reference Oscillator:	16 MHz (Built-in)
Power Supply:	3.3 VDC from host.

Table 5: Frequency allocation

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

3.3 DUT (Notebook PC) Details (client supplied info):

Table 6

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

There are 2 models T580/TH550.

Both are identical except for the colour and target market and model designation.

The DUT is a notebook convertible tablet PC. When the external power supply is connected, the device is a mobile notebook PC. When the external power supply is disconnected and is in battery operation the device is a portable tablet PC.

3.4 Test sample Accessories

3.4.1 Battery Types

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

Table 7: Battery Details

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

4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

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

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

The test results mentioned in this report only apply to the 5.6 GHz frequency range. An additional report titled *"*M100859_FCC_622ANHMW_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 for the 5.2 GHz, 5.6 GHZ, and 5.8 GHz bands. This lowest data rate corresponds to 6Mbps in OFDM mode and 1Mbps in DSSS mode. The highest source based time averaged power for the 5.2 GHz band was in the HT0 20 MHz mode.

The frequency span of the 2450 MHz and 5600MHz bands was more than 10MHz in both cases so the SAR levels of the test sample were measured for lowest, centre and highest channels in the applicable modes. The DUT is capable of using two antennas transmitting simultaneously (HT8 DATA mode) the power level is 3dB lower (50%) than if a single antenna was transmitting. There were no wires or other connections to the DUT during the SAR measurements.

At the beginning of the SAR tests, the conducted power of the DUT was measured after temporary modification of antenna connector inside the DUT's TX RX compartment. Measurements were performed with a calibrated Power Meter. The Transmitter power was set to be equal or higher than power specified by the manufacturer.

Table 8 Frequency and Conducted Power Results Bluetooth

Channel	Channel Frequency MHz	*Data Rate (Mbps)	Maximum Conducted Output Power Measured (dBm)
Channel 40	2441	N/A	3.9

4.1 Battery Status

The DUT 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 DUT, 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

EMC Technologies Pty Ltd
176 Harrick Road
Keilor Park, (Melbourne) Victoria
Australia 3042

Telephone: +61 3 9365 1000
Facsimile: +61 3 9331 7455
email: melb@emctech.com.au
website: www.emctech.com.au

5.2 Accreditations

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

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

Table 9

AS/NZS 2772.1:	RF and microwave radiation hazard measurement
ACMA:	Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003, Amdt (No. 1):2007
FCC:	Guidelines for Human Exposure to RF Electromagnetic Field OET65C 01/01
EN 50360: 2001	Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)
EN 62209-1:2006	Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures. **Part 1:** Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (300 MHz to 3 GHz)
***EN62209-2:2010**	Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures **Part 2**: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz
IEEE 1528: 2003	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

*NATA accreditation pending – standard to be adopted by ACMA.
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 36 % to 46 %. 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

Table 10

Applicable Head Configurations Applicable Body Configurations	: None Lap Held: Tablet Position Edge On Position

6.1 Probe Positioning System

The measurements were performed with the state-of-the-art automated near-field scanning system **DASY4 V4.7 Build 80** from Schmid & Partner Engineering AG (SPEAG). The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN62209-1 and EN62209-2 SAR measurement requirements.

6.2 E-Field Probe Type and Performance

The SAR measurements were conducted with SPEAG dosimetric probe EX3DV4 Serial: 3563. Please refer to Appendix C for detailed information.

6.4 System verification

6.4.1 System verification results @ 5GHz

The following table lists the dielectric properties of the tissue simulating liquid measured prior to SAR system verification. The results of the system verification are listed in columns 4 and 5. The forward power into the reference dipole for SAR system verification was adjusted to 100 mW.

Table 11: System verification results (Dipole: SPEAG D5GHzV2 SN: 1008)

1. System Frequency and verification Date	2. ∈r (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
5800 MHz 2nd September 2010	44.0	6.19	9.73	2.72
5500 MHz 3rd September 2010	46.7	5.73	9.84	2.80
5500 MHz 6th September 2010	45.1	5.70	9.51	2.71
5200 MHz 8th September 2010	44.9	5.43	9.35	2.63
5200 MHz 9th September 2010	45.1	5.23	8.77	2.48
5500 MHz 17th September 2010	44.3	5.75	9.79	2.77

6.4.2 Deviation from reference system verification values

Currently no IEEE Std 1528-2003 SAR reference values are available in 5.6 GHz band, as a consequence all system verification results were compared against the SPEAG calibration reference SAR values.

The reference EMCT SAR value is the SAR system verification 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 12: Deviation from reference system verification values in 5.6 GHz band

Frequency and Date	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	EMCT Calibration reference SAR Value 1g (mW/g)	Deviation From EMCT Reference 1g (%)
5200MHz 8th September 2010	9.35	93.50	87.7	6.61
5200 MHz 9th September 2010	8.77	87.70	87.7	0.00
5500MHz 3rd September 2010	9.84	98.40	92.9	5.92
5500 MHz 6th September 2010	9.51	95.10	92.9	2.37
5500 MHz 17th September 2010	9.79	97.90	92.9	5.38
5800MHz 2nd September 2010	9.73	97.30	95.6	1.78

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

6.4.3 Liquid Depth 15cm

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

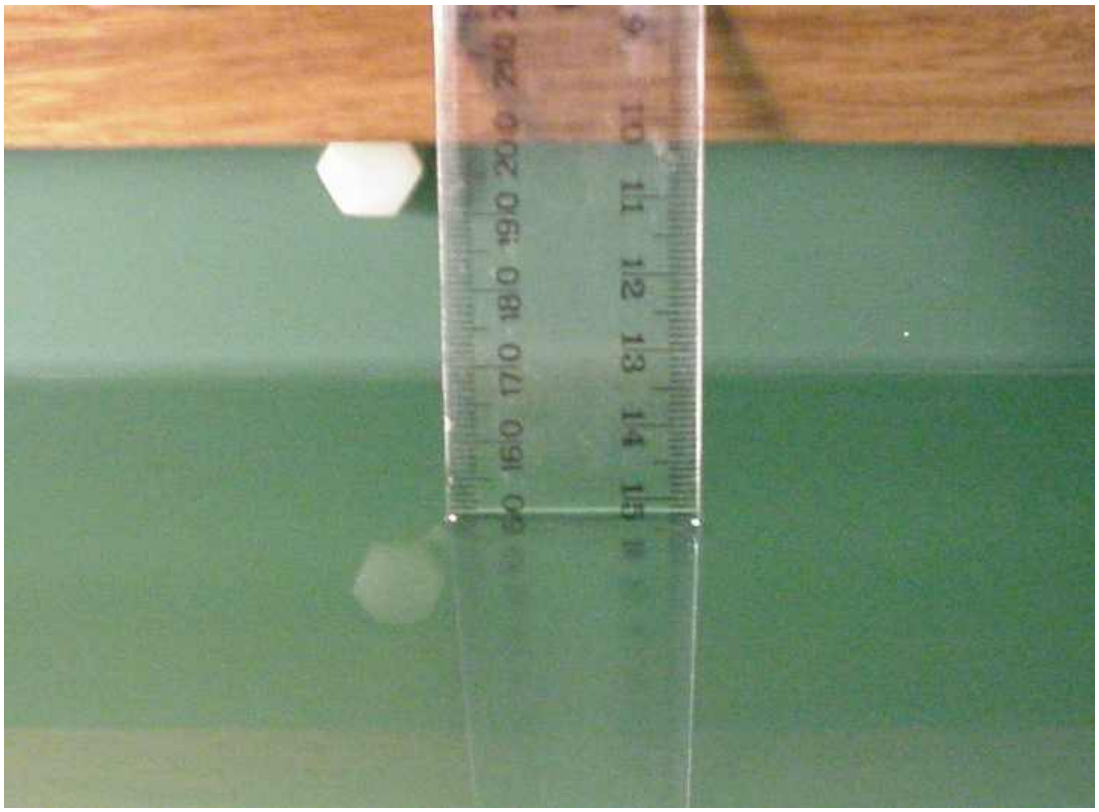


Photo of liquid Depth in Flat Phantom

6.5 Phantom Properties

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

6.6 Tissue Material Properties

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

Table 13: Measured Body Simulating Liquid Dielectric Values for System verifications

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
5200 MHz Body	44.9-45.1	49.0 ±10% (44.1 to 53.9)	5.23-5.43	5.3 ±5% (5.04 to 5.57)	1000
5500 MHz Body	45.1-46.7	48.6 ±10% (43.7 to 53.4)	5.70-5.73	5.6 ±5% (5.32 to 5.88)	1000
5800 MHz Body	44.0-44.3	48.2 ±10% (43.38 to 53.02)	5.75-6.19	6.0 ±5% (5.7 to 6.3)	1000

Table 14: 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/m^3
5180 MHz Body	44.9-45.1	49.0 ±10% (44.1 to 53.9)	5.20-5.40	5.3 ±5% (5.04 to 5.57)	1000
5240 MHz Body	44.8-45.0	48.9 ±10% (44.0 to 53.8)	5.31-5.49	5.4 ±5% (5.13 to 5.67)	1000
5260 MHz Body	44.7-44.9	48.9 ±10% (44.0 to 53.8)	5.33-5.53	5.4 ±5% (5.13 to 5.67)	1000
5320 MHz Body	44.5-44.8	48.8 ±10% (43.9 to 53.7)	5.43-5.63	5.4 ±5% (5.13 to 5.67)	1000

Table 15: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/m^3
5520 MHz Body	44.3-45.1	48.6 ±10% (43.7 to 53.4)	5.73-5.79	5.6 ±5% (5.32 to 5.88)	1000
5580 MHz Body	44.1-44.8	48.5 ±10% (43.8 to 53.5)	5.84-5.88	5.77 ±5% (5.48 to 6.06)	1000
5620 MHz Body	44.0-44.7	48.5 ±10% (43.8 to 53.5)	5.91-5.94	5.77 ±5% (5.48 to 6.06)	1000
5680 MHz Body	43.8-44.5	48.4 ±10% (43.6 to 53.2)	6.00-6.04	5.9 ±5% (5.61 to 6.20)	1000

Table 16: 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/m^3
5745 MHz Body	44.2	48.3 ±10% (43.47 to 53.13)	6.07	5.9 ±5% (5.61 to 6.20)	1000
5785 MHz Body	44.1	48.2 ±10% (43.38 to 53.02)	6.17	6.0 ±5% (5.7 to 6.3)	1000
5825 MHz Body	44.0	48.2 ±10% (43.38 to 53.02)	6.20	6.0 ±5% (5.7 to 6.3)	1000

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 17 Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
2nd September 2010	20.9	20.5	46.0
3rd September 2010	21.2	21.0	38.0
6th September 2010	21.5	21.2	41.0
8th September 2010	21.7	21.5	36.0
9th September 2010	20.9	20.7	40.0
17th September 2010	21.2	21.0	36.0

6.7 Simulated Tissue Composition Used for SAR Test

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.

Table 18: Tissue Type: Muscle @ 5600MHz

EMCT Liquid, Volume of Liquid: 60 Litres

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 DUT underneath the phantom surface.
Refer to Appendix A for photographs of device positioning

7.0 SAR MEASUREMENT PROCEDURE USING DASY4

The SAR evaluation was performed with the SPEAG DASY4 system. A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the DUT. 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 DUT 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 19 Uncertainty Budget for DASY4 Version V4.7 Build 80 – DUT 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	11.97	R	1.73	1	1	6.9	6.9	∞
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	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				14.6	14.2	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				29.1	28.32	

Estimated total measurement uncertainty for the DASY4 measurement system was ±14.6%. The extended uncertainty (K = 2) was assessed to be ±29.1% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 20: Uncertainty Budget for DASY4 Version V4.7 Build 80 – System verification 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	10	R	1.73	0.6	0.49	3.5	2.8	∞
Liquid Permittivity – Measurement uncertainty	2.5	N	1.00	0.6	0.49	1.5	1.2	5
Combined standard Uncertainty		RSS				11.7	11.4	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				23.5	22.79	

Estimated total measurement uncertainty for the DASY4 measurement system was ±11.7%. The extended uncertainty (K = 2) was assessed to be ±23.5% based on 95% confidence level. The uncertainty is not added to the measurement result.

9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table 21: SPEAG DASY4 Version V4.7 Build 80

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX90BL	N/A	Not applicable	✓
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	✓
SAM Phantom	SPEAG	N/A	1260	Not applicable	
SAM Phantom	SPEAG	N/A	1060	Not applicable	
Flat Phantom	AndreT	10.1	P 10.1	Not Applicable	✓
Flat Phantom	AndreT	9.1	P 9.1	Not Applicable	
Flat Phantom	SPEAG	PO1A 6mm	1003	Not Applicable	
Data Acquisition Electronics	SPEAG	DAE3 V1	359	07-July-2011	
Data Acquisition Electronics	SPEAG	DAE3 V1	442	08-Dec-2010	✓
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	
Probe E-Field	SPEAG	ET3DV6	1380	11-Dec-2010	
Probe E-Field	SPEAG	ET3DV6	1377	7-July-2011	
Probe E-Field	SPEAG	ES3DV6	3029	Not Used	
Probe E-Field	SPEAG	EX3DV4	3563	16-July-2011	✓
Probe E-Field	SPEAG	EX3DV4	3657	15-July-2011	
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	15-Dec-2011	
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	17-Dec-2010	
Antenna Dipole 900 MHz	SPEAG	D900V2	047	5-July-2012	
Antenna Dipole 1640 MHz	SPEAG	D1640V2	314	9-July-2012	
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	13-July-2012	
Antenna Dipole 1950 MHz	SPEAG	D1950V3	1113	12-Dec -2010	
Antenna Dipole 3500 MHz	SPEAG	D3500V2	1002	17-July-2010	
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	10-Dec-2010	
Antenna Dipole 5600 MHz	SPEAG	D5GHzV2	1008	16-Dec-2011	✓
RF Amplifier	EIN	603L	N/A	*In test	
RF Amplifier	Mini-Circuits	ZHL-42	N/A	*In test	
RF Amplifier	Mini-Circuits	ZVE-8G	N/A	*In test	✓
Synthesized signal generator	Hewlett Packard	ESG-D3000A	GB37420238	*In test	
RF Power Meter	Hewlett Packard	437B	3125012786	9-Aug-2011	
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	13-Aug-2011	
RF Power Meter	Rohde & Schwarz	NRP	101415	5-May-2011	✓
RF Power Sensor	Rohde & Schwarz	NRP - Z81	100174	16-July-2011	✓
RF Power Meter Dual	Hewlett Packard	435A	1733A05847	*In test	✓
RF Power Sensor	Hewlett Packard	8482A	2349A10114	*In test	✓
Network Analyser	Hewlett Packard	8714B	GB3510035	30-Sept-2010	
Network Analyser	Hewlett Packard	8753ES	JP39240130	24-Nov-2010	✓
Dual Directional Coupler	Hewlett Packard	778D	1144 04700	*In test	
Dual Directional Coupler	NARDA	3022	75453	*In test	✓

* Calibrated during the test for the relevant parameters.

10.0 TEST METHODOLOGY

Notebooks should be evaluated in normal use positions, typical for lap-held bottom-face only. However the number of positions will depend on the number of configurations the laptop can be operated in. The "LIFEBOOK T SERIES" can be used in either a conventional laptop position (see Appendix A1) or a Tablet configuration. The antenna location in the "LIFEBOOK T SERIES" is closest to the top of the screen when used in a conventional laptop configuration.

10.0 Position

10.1.1 "Tablet" Position Definition (0mm spacing)

The DUT was tested in the 2.00 mm flat section of the AndreT Flat phantom P 10.1 for the "Tablet" position. The Transceiver was placed at the bottom of the phantom and suspended in such way that the back of the DUT was touching the phantom. This device orientation simulates the PC's normal use – being held on the lap of the user. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

10.1.2 "Edge On" Position (Portrait or Landscape)

The DUT was tested in the (2.00 mm) flat section of the AndreT phantom for the "Edge On" position. The Antenna edge of the Transceiver was placed underneath the flat section of the phantom and suspended until the edge touched the phantom. *Refer to Appendix A for photos of measurement positions.*

10.1.3 "Lap Held" Position (0mm spacing)

The DUT was tested in the 2.00 mm flat section of the AndreT Flat phantom P 10.1 for the "Lap Held" position. The DUT was placed at the bottom of the phantom and suspended in such way that the back of the device was touching the phantom. The LCD screen was angled at 90 degrees to the base of the Tablet. This device orientation simulates the PC's normal use – being held on the lap of the user. (A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.)

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

The DUT has a fixed antenna. Depending on the measured SAR level, up to three test channels with the test sample operating at maximum power were recorded. The following table represents the matrix used to determine what testing was required. All relevant provisions of KDB 447498 are applied for SAR measurements of the host system. Due to the screen size being less than 12 inches, KDB 616217 was not used in the SAR evaluation instead "Supplement to the KDB 616217" was followed.

Table 22: Testing configurations

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

Legend

X	Testing Required in this configuration
	Testing required in this configuration only if SAR of middle channel is more than 3dB below the SAR limit or it is the worst case.

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

11.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1g tissue masses were determined for the sample DUT for all test configurations listed in section 10.2.

11.1 5 GHz Band SAR Results

Table 23: 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)
Tablet	1	A	6	-	48	5240	0.074	-0.489
Tablet	2	B	6	-	48	5240	0.222	-0.134
Edge on Secondary Portrait	-	A	6	-	48	5240	Noise Floor	-
Edge on Primary Portrait	3	B	6	-	36	5180	1.270	-0.382
	4				48	5240	1.160	0.119
	5				52	5260	1.080	0.068
	6				64	5320	**1.400**	-0.062
Edge on Secondary Landscape	7	A	6	-	36	5180	0.914	-0.231
	8				48	5240	0.964	0.063
	9				52	5260	1.040	-0.131
	10				64	5320	1.100	0.244
Edge on Secondary Landscape	11	B	6	-	36	5180	0.907	-0.491
	12				48	5240	0.973	-0.342
	13				52	5260	0.954	-0.140
	14				64	5320	1.210	-0.099

NOTE: The measurement uncertainty of 29.1% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.2 GHz band was **1.400** mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Edge on Primary Portrait position in OFDM mode, utilizing channel 64 (5320 MHz) and antenna B.

Table 24: 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)
Tablet	15	A	6	-	124	5620	0.174	0.079
	16	B	6	-	124	5620	0.255	-0.008
Lap held	-	A	6	-	124	5620	Noise Floor	-
	-	B			124	5620	Noise Floor	-
Edge on Secondary Portrait	-	A	6	-	124	5620	Noise Floor	-
Edge on Primary Portrait	17	B	6	-	104	5520	0.958	-0.325
	18				116	5580	0.866	-0.029
	19				124	5620	0.995	0.059
	20				136	5680	1.270	0.162
Edge on Secondary Landscape	21	A	6	-	104	5520	1.060	0.030
	22				116	5580	0.990	0.068
	23				124	5620	1.080	-0.045
	24				136	5680	0.960	-0.356
Edge on Secondary Landscape	25	B	6	-	104	5520	**1.320**	-0.211
	26				116	5580	1.210	-0.049
	27				124	5620	1.080	-0.260
	28				136	5680	1.310	-0.261

NOTE: The measurement uncertainty of 29.1% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.6 GHz band was **1.320** mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Edge on Secondary Landscape position in OFDM mode, utilizing channel 104 (5520 MHz) and antenna B.

Table 25: 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)
Tablet	29	A	6	-	157	5785	0.082	0.022
	30	B	6	-	157	5785	0.110	-0.262
Edge on Secondary Portrait	31	A	6	-	157	5785	0.040	-0.391
Edge on Primary Portrait	32	B	6	-	157	5785	0.743	0.256
Edge on Secondary Landscape	33	A	6	-	149	5745	0.928	0.081
	34				157	5785	0.767	0.213
	35				165	5825	0.819	0.088
Edge on Secondary Landscape	36	B	6	-	149	5745	0.752	-0.325
	37				157	5785	0.848	-0.449
	38				165	5825	**1.380**	-0.151

NOTE: The measurement uncertainty of 29.1% for 5GHz testing is not added to the result.

The highest SAR level recorded in the 5.8 GHz band was 1.380 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Edge on Secondary Landscape position in OFDM mode, utilizing channel 165 (5825MHz) and antenna B.

12.0 COMPLIANCE STATEMENT

The Fujitsu TABLET PC, Model: T580/TH550 with INTEL Mini-Card Wireless LAN Module (PUMA PEAK 802.11a/b/g/n), Model: 622ANHMW & CSR Bluetooth Module, Model: BSMAN3 was found to comply with the FCC and RSS-102 SAR requirements. The Tablet complies with FCC SAR requirements in any of the following conditions:

- With WLAN power settings as shown in table 3 of this report, and
- If the Secondary landscape orientation is disabled in tablet mode when the WLAN switch is activated.

The highest SAR level recorded was 1.400 mW/g for a 1g cube. This value was measured at 5320 MHz (channel 64) in the “Edge on Primary Portrait” position in OFDM modulation mode at the antenna B. This was below the limit of 1.6 mW/g for uncontrolled exposure, but was within the band of measurement uncertainty around the limit.

13.0 MULTIBAND EVALUATION CONSIDERATIONS

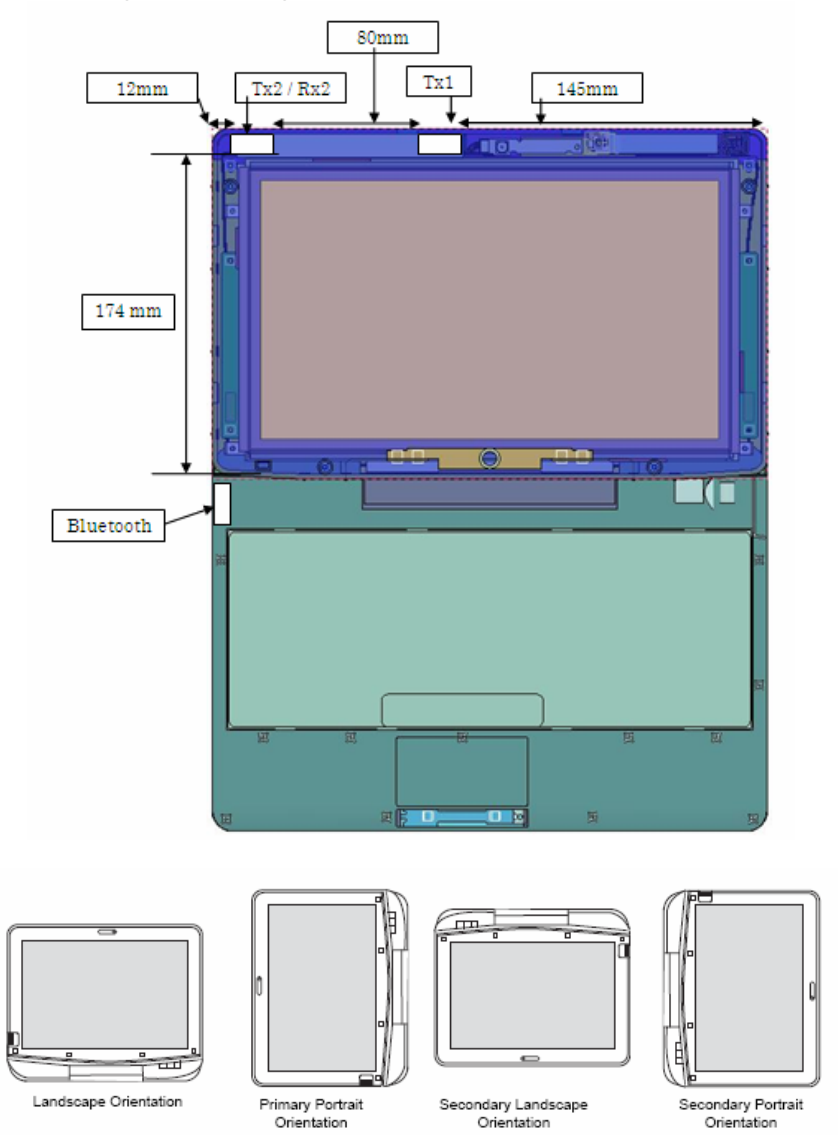
Fujitsu **TABLET** PC, Model: **T580/TH550** is equipped with WLAN (622ANHMW) and Bluetooth (BSMAN3).

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

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

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

Diagram Showing distance between Antenna Locations



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