

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

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (%)	Prob. Dist.	Div.	C _i (1g)	C _i (10g)	1g u _i (%)	10g u _i (%)	v _i
Measurement System									
Probe Calibration (k=1) (standard calibration)	E.2.1	6.6	N	1	1	1	6.6	6.6	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Hemispherical Isotropy	E.2.2	0	R	1.73	1	1	0.0	0.0	∞
Boundary Effect	E.2.3	2	R	1.73	1	1	1.2	1.2	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1	N	1	1	1	1.0	1.0	∞
Response Time	E.2.7	0	R	1.73	1	1	0.0	0.0	∞
Integration Time	E.2.8	0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions	E.6.1	0.075	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.73	1	1	0.5	0.5	∞
Probe Positioning with respect to Phantom Shell	E.6.3	5.7	R	1.73	1	1	3.3	3.3	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	4	R	1.73	1	1	2.3	2.3	∞
Test Sample Related									
Dipole Axis to Liquid distance	E.4.2	2	N	1	1	1	2.0	2.0	11
Output Power Variation – SAR Drift Measurement	6.6.2	4.7	R	1.73	1	1	2.7	2.7	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	E.3.2	5	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – Measurement uncertainty	E.3.3	2.5	N	1	0.64	0.43	1.6	1.1	5
Liquid Permittivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	E.3.3	2.5	N	1	0.6	0.49	1.5	1.2	5
Combined standard Uncertainty			RSS				10.3	10.0	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				20.5	20.02	

Estimated total measurement uncertainty for the DASY4 measurement system was $\pm 10.3\%$. The extended uncertainty (K = 2) was assessed to be $\pm 20.5\%$ based on 95% confidence level. The uncertainty is not added to the 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	Yes
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	Yes
SAM Phantom	SPEAG	N/A	1260	Not applicable	Yes
SAM Phantom	SPEAG	N/A	1060	Not applicable	Yes
Flat Phantom	AndreT	10.1	P 10.1	Not Applicable	Yes
Flat Phantom	AndreT	9.1	P 9.1	Not Applicable	No
Flat Phantom	SPEAG	PO1A 6mm	1003	Not Applicable	No
Data Acquisition Electronics	SPEAG	DAE3 V1	359	03-July-2008	Yes
Data Acquisition Electronics	SPEAG	DAE3 V1	442	17-Dec-2008	No
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	No
Probe E-Field	SPEAG	ET3DV6	1380	18-Dec-2008	No
Probe E-Field	SPEAG	ET3DV6	1377	09-July-2008	No
Probe E-Field	SPEAG	ES3DV6	3029	Not Used	No
Probe E-Field	SPEAG	EX3DV4	3563	13-July-2008	Yes
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	14-Dec-2009	No
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	14-Dec-2008	No
Antenna Dipole 900 MHz	SPEAG	D900V2	047	6-July-2008	No
Antenna Dipole 1640 MHz	SPEAG	D1640V2	314	30-June-2008	No
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	3-July-2008	No
Antenna Dipole 1950 MHz	SPEAG	D1950V3	1113	5-March-2009	No
Antenna Dipole 3500 MHz	SPEAG	D3500V2	1002	06-July-2008	No
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	13-Dec-2008	No
Antenna Dipole 5600 MHz	SPEAG	D5GHzV2	1008	07-Dec-2009	Yes
RF Amplifier	EIN	603L	N/A	*In test	No
RF Amplifier	Mini-Circuits	ZHL-42	N/A	*In test	No
RF Amplifier	Mini-Circuits	ZVE-8G	N/A	*In test	Yes
Synthesized signal generator	Hewlett Packard	ESG-D3000A	GB37420238	*In test	Yes
RF Power Meter Dual	Hewlett Packard	437B	3125012786	30-May-2008	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	30-May-2008	Yes
RF Power Meter Dual	Gigatronics	8542B	1830125	11-May-2008	Yes
RF Power Sensor	Gigatronics	80301A	1828805	11-May-2008	Yes
RF Power Meter Dual	Hewlett Packard	435A	1733A05847	*In test	Yes
RF Power Sensor	Hewlett Packard	8482A	2349A10114	*In test	Yes
Network Analyser	Hewlett Packard	8714B	GB3510035	06-Sept-2008	Yes
Network Analyser	Hewlett Packard	8753ES	JP39240130	02 Oct-2008	No
Dual Directional Coupler	Hewlett Packard	778D	1144 04700	*In test	No
Dual Directional Coupler	NARDA	3022	75453	*In test	Yes

* 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 “RYUGA” can be used in either a conventional laptop position (see Appendix A1) or a Tablet configuration. The antenna location in the “RYUGA” 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 Position

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

The “RYUGA” Portable PCs use interactive screen modes that allow the user to place their arms/hands on the screen. To account for occasional exposure to the arms, SAR tests were performed with the PC screen facing the phantom.

Therefore SAR measurements were performed with the front and back of the laptop facing the flat section of the AndreT Flat phantom (P 10.1). See Appendix A for photos of test positions.

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

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.*



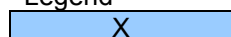
10.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)

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, as specified in section 4.0 were recorded. The following table represents the matrix used to determine what testing was required. The worst case result was verified with the Bluetooth transmitting at full power in co-transmission with the WLAN.

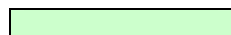
Table: Testing configurations

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

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 7.2.

11.1 GHz 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)
*Tablet	1	A	6	-	52	5240	Pre-scan 0.09	-
*Tablet	2	B	6	-	52	5240	Pre-scan 0.19	-
*Edge On Far Side	3	B	6	-	52	5240	Pre-scan	-
Edge On Side	4	A	6	-	52	5240	0.09	0.17
Edge On Side	5	B	6	-	36	5180	0.30	-0.27
Edge On Side	6	B	6	-	52	5240	0.41	-0.06
Edge On Side	7	B	6	-	64	5320	0.45	-0.06
Edge On w/ Extended Battery	8	B	6	-	64	5320	0.56	-0.08
Edge On w/ Bluetooth On	9	B	6	-	64	5320	0.43	-0.36

NOTE: The measurement uncertainty of 23.2% for 5GHz testing is not added to the result.

*Pre-scan

The highest SAR level recorded in the 5.2 GHz band was 0.56 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Edge On position in OFDM mode with the extended battery, utilizing channel 64 (5320 MHz) and antenna B. The Bluetooth was ON at the Frequency of 2441 MHz.



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)
*Tablet	10	A	6	-	157	5785	Pre-scan 0.16	-
*Tablet	11	B	6	-	157	5785	Pre-scan 0.12	-
*Edge On Far Side	12	B	6	-	157	5785	Pre-scan	-
Edge On	13	B	6	-	149	5745	0.58	-0.45
	14	B	6	-	157	5785	0.56	-0.22
	15	B	6	-	165	5805	0.79	-0.50
Edge On Side	16	A	6	-	157	5785	0.19	-0.03
Edge On w/ Extended Battery	17	B	6	-	165	5805	0.78	-0.50
Edge On w/ Bluetooth On	18	B	6	-	165	5805	0.84	-0.16

NOTE: The measurement uncertainty of 23.2% for 5GHz testing is not added to the result.

*This plot was used for identifying the “hotspot” only.

The highest SAR level recorded in the 5.8 GHz band was 0.84 mW/g as evaluated in a 1g cube of averaging mass. This value was obtained in Edge On Side position with Bluetooth On in OFDM mode, utilizing channel 165 (5805MHz) and antenna B. The Bluetooth was ON at the Frequency of 2441 MHz.

12.0 COMPLIANCE STATEMENT

The Fujitsu TABLET PC, Model: P1620 with INTEL Mini-PCI Wireless LAN Module (KEDRON 802.11a/b/g), Model: 4965AG & TAIYO YUDEN Bluetooth Module, Model: EYTF3CS FT was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level recorded was 0.84 mW/g for a 1g cube. This value was measured at 5805 MHz (channel 165) in the “Edge On Side” position with Bluetooth On at the frequency of 2441 MHz in OFDM modulation mode at the antenna B. This was below the limit of 1.6 mW/g for uncontrolled exposure, even taking into account the measurement uncertainty of 23.2 %.



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APPENDIX A1 TEST SAMPLE PHOTOGRAPHS

P1620 Host - Conventional Laptop Configuration



P1620 Host - Tablet Configuration



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APPENDIX A2 TEST SAMPLE PHOTOGRAPHS

Model: 4965AG – WLAN Module

Front



Back



APPENDIX A3 TEST SAMPLE PHOTOGRAPHS

Standard Battery



Extended Battery

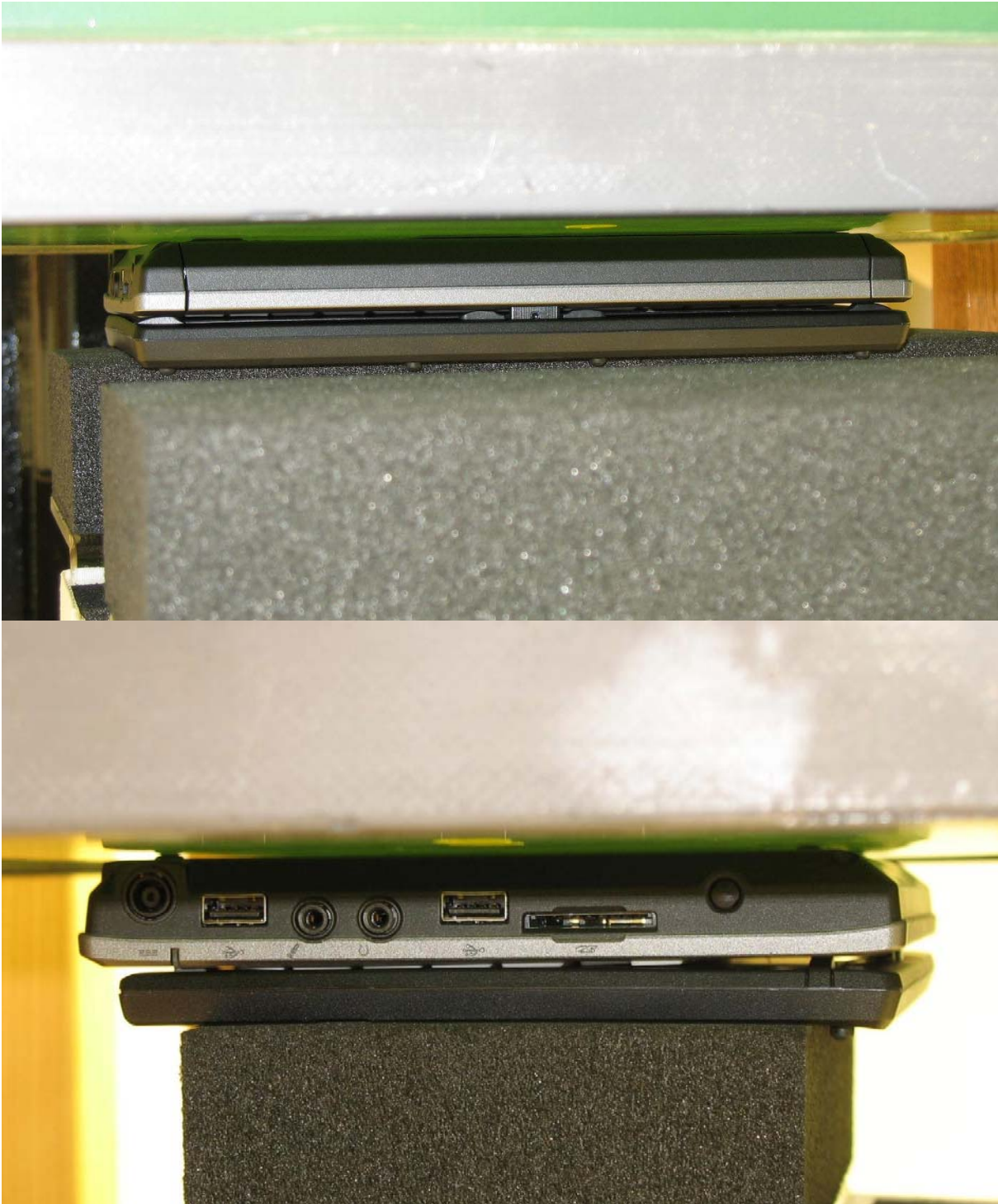


4965AG inside the Fujitsu TABLET Computer



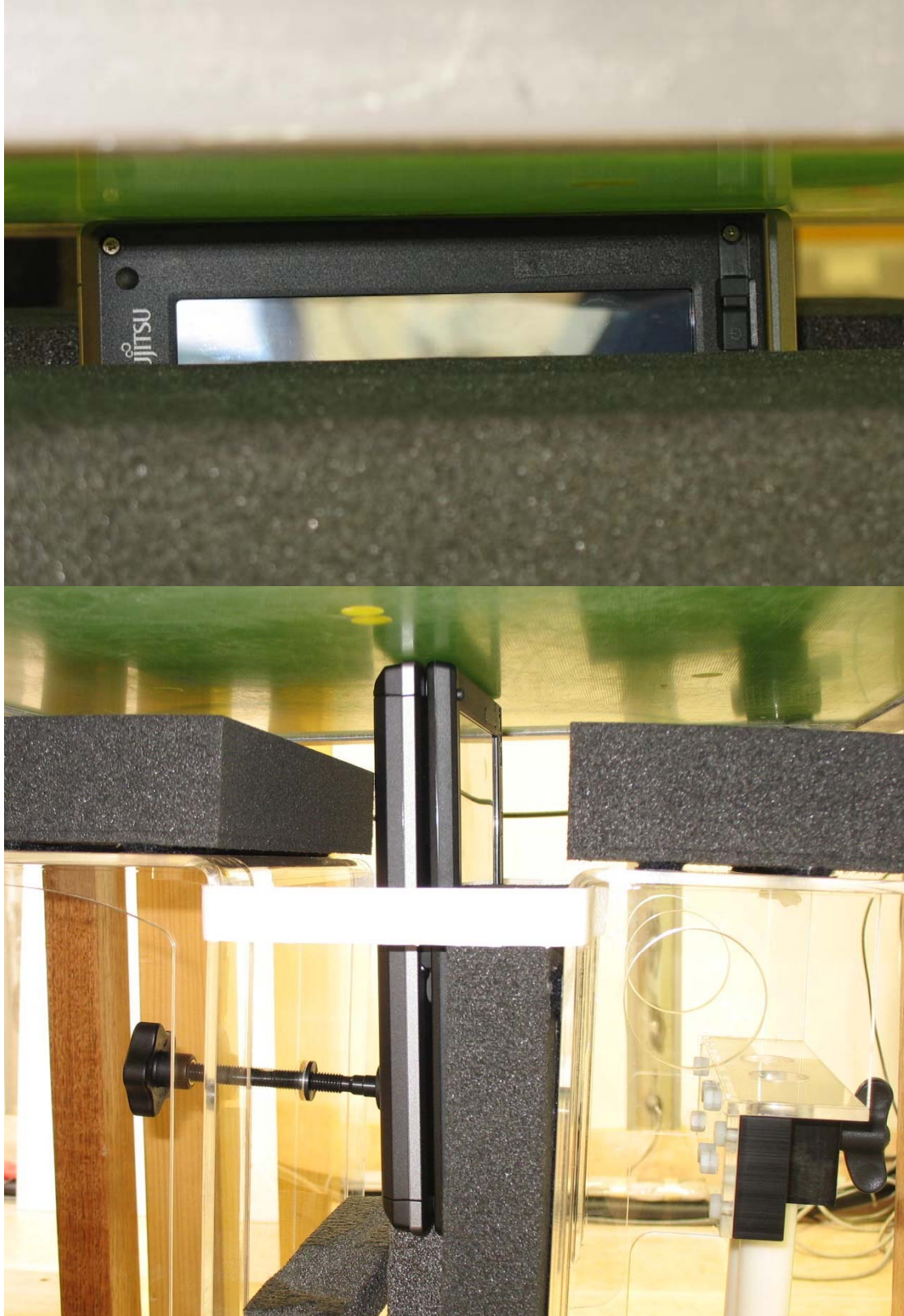
APPENDIX A4 TEST SETUP PHOTOGRAPHS

Tablet Position



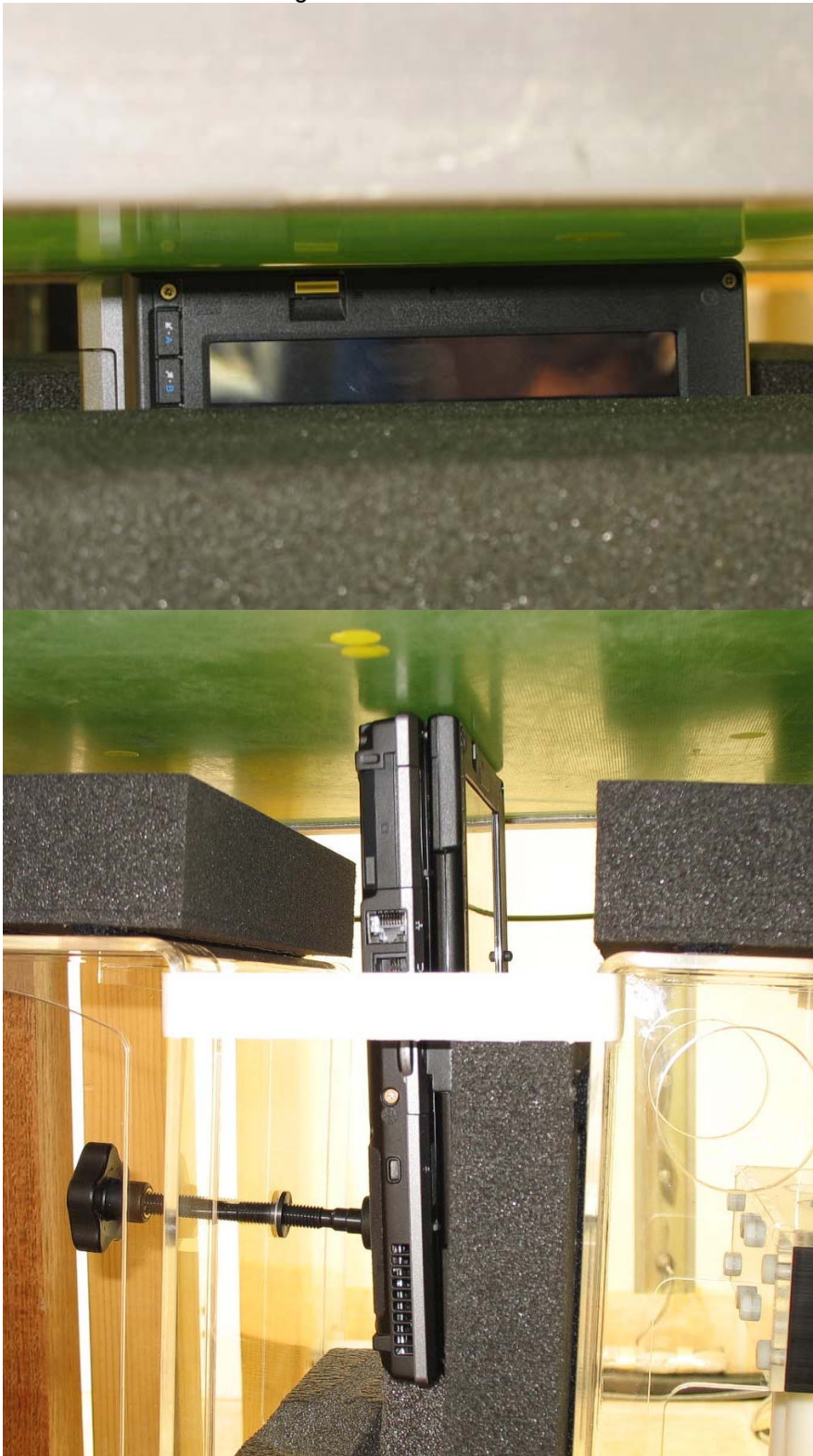
APPENDIX A5 TEST SAMPLE PHOTOGRAPHS

Edge On Side Position



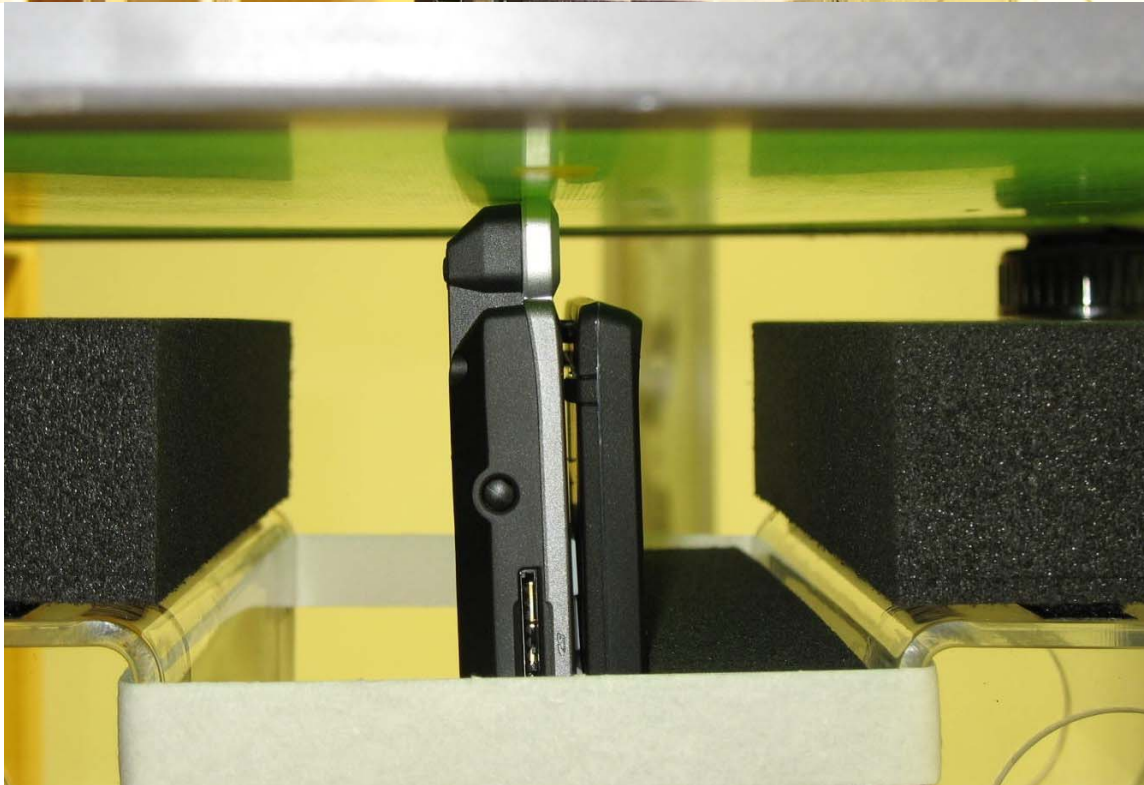
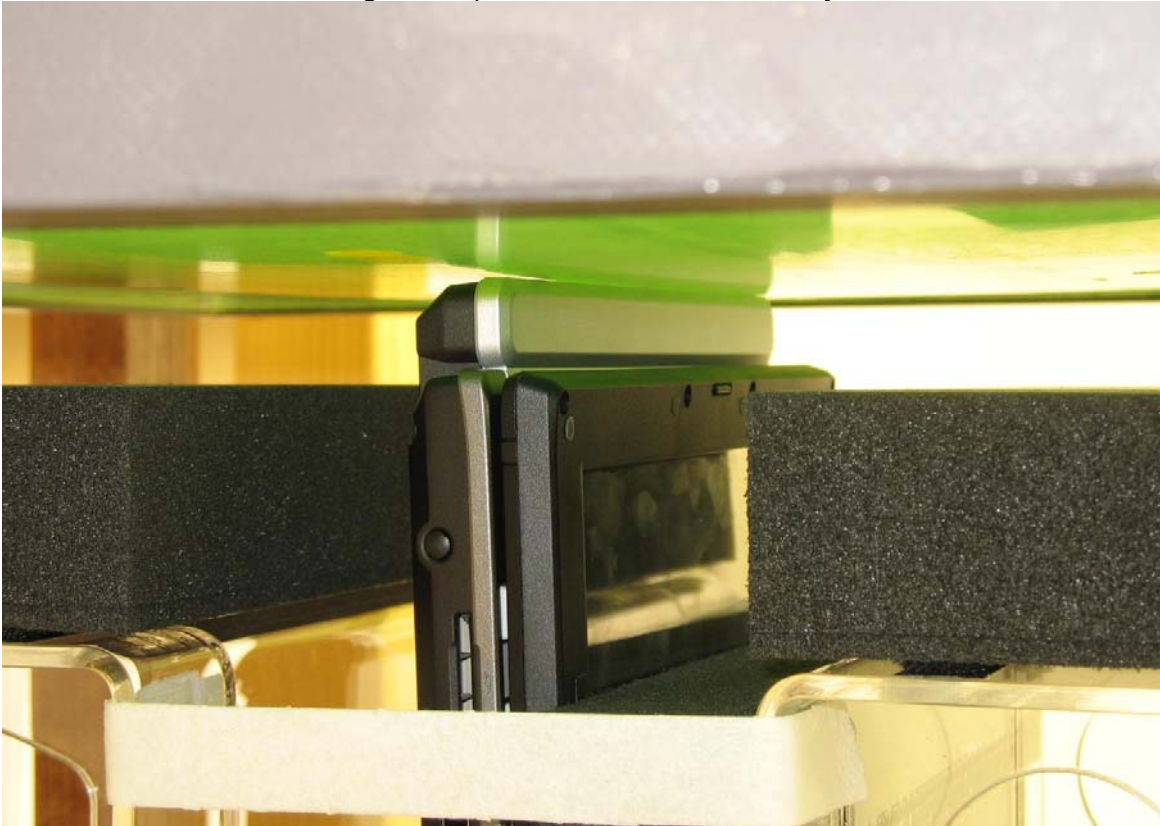
APPENDIX A6 TEST SAMPLE PHOTOGRAPHS

Edge On Far Side Position



APPENDIX A7 TEST SAMPLE PHOTOGRAPHS

Edge On Top Position w/ Extended Battery



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APPENDIX B PLOTS OF THE SAR MEASUREMENTS

Plots of the measured SAR distributions inside the phantom are given in this Appendix for all tested configurations. The spatial peak SAR values were assessed with the procedure described in this report.

Table: 5200 MHz Band SAR Measurement Plot Numbers

Test Position	Plot No.	Ant	Bit rate Mode (Mbps)	Test Channel
*Tablet	1	A	6	52
*Tablet	2	B	6	52
Z-Graphs for Plots 1 - 2				
*Edge On Far Side	3	B	6	52
Edge On Side	4	A	6	52
Edge On Side	5	B	6	36
Z-Graphs for Plots 4 - 5				
Edge On Side	6	B	6	52
Edge On Side	7	B	6	64
Z-Graphs for Plots 6 - 7				
Edge On w/ Extended Battery	8	B	6	64
Edge On w/ Bluetooth On	9	B	6	64
Z-Graphs for Plots 8 - 9				

Table: 5800 MHz Band SAR Measurement Plot Numbers

Test Position	Plot No.	Ant	Bit rate Mode (Mbps)	Test Channel
*Tablet	10	A	6	157
*Tablet	11	B	6	157
Z-Graphs for Plots 10 - 11				
*Edge On Far Side	12	B	6	157
Edge On	13	B	6	149
	14	B	6	157
	15	B	6	165
Z-Graphs for Plots 13 - 14				
Edge On Side	16	A	6	157
Edge On w/ Extended Battery	17	B	6	165
Edge On w/ Bluetooth On	18	B	6	165
Z-Graphs for Plots 16 - 18				

Table: Validation Plots

Plot 19	Validation 5200 MHz 8 th Dec 2008
Plot 20	Validation 5800 MHz 9 th Dec 2008
Z-Axis graphs for Plots 19 to 20	



Test Date: 09 January 2008

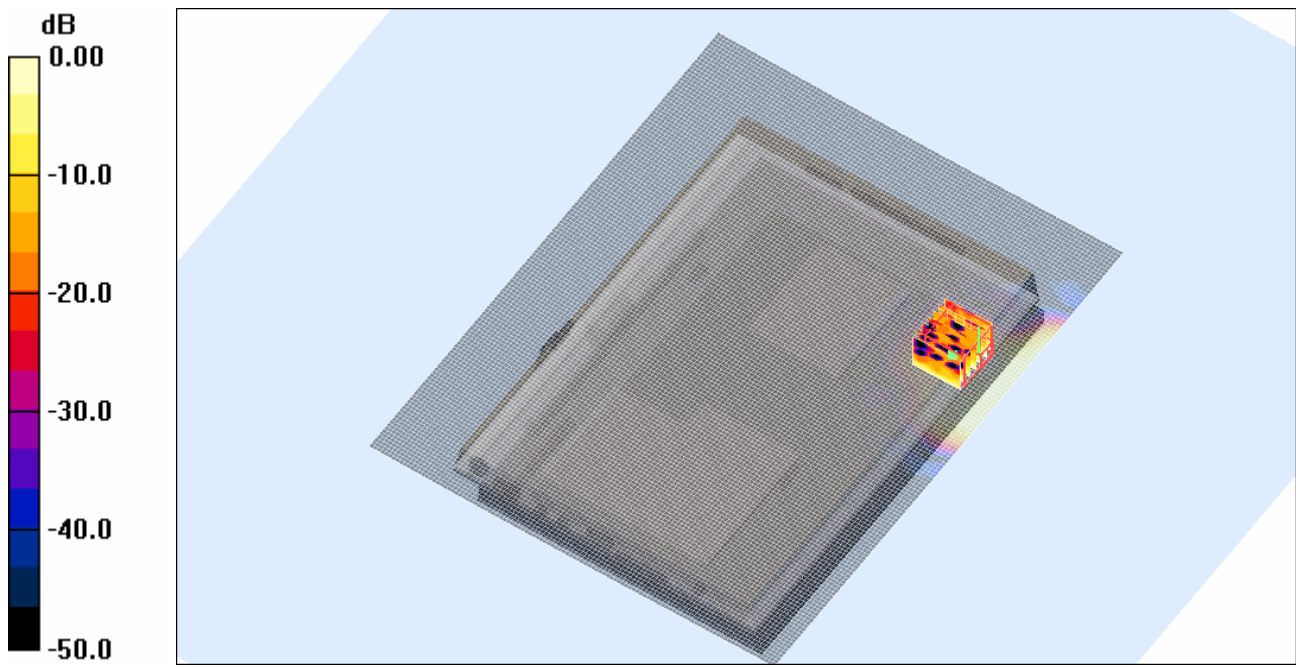
File Name: Tablet OFDM 5.2 GHz Antenna A Bluetooth Off Prescan 09-01-08.da4

DUT: Fujitsu Tablet Ryuga with Kedron 11abg and Bluetooth; Type: 4965 AG; Serial: MAC: 0013E805C841

- * Communication System: OFDM 5250 MHz; Frequency: 5260 MHz; Duty Cycle: 1:1
- * Medium parameters used: $\sigma = 5.46476$ mho/m, $\epsilon_r = 47.737$; $\rho = 1000$ kg/m³
- Electronics: DAE3 Sn359; Probe: EX3DV4 - SN3563; ConvF(3.79, 3.79, 3.79)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 52 Test/Area Scan (111x141x1): Measurement grid: dx=20mm, dy=20mm
 Maximum value of SAR (interpolated) = 0.224 mW/g

Channel 52 Test/Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
 Reference Value = 4.92 V/m; Power Drift = -1.15 dB
 Peak SAR (extrapolated) = 0.317 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.024 mW/g
 Maximum value of SAR (measured) = 0.183 mW/g



0 dB = 0.183mW/g

SAR MEASUREMENT PLOT 1

Ambient Temperature
Liquid Temperature
Humidity

21.6 Degrees Celsius
21.3 Degrees Celsius
60.0 %

