SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C

FOR

BROADCOM 802.11AG/DRAFT 802.11N WIRELESS LAN PCI-E MINI CARD

MODEL: BCM94321MC

FCC ID: QDS-BRCM1022-H

REPORT NUMBER: 06U10557-4C

ISSUE DATE: OCTOBER 9, 2006

Prepared for

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LAB CODE:200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	October 3, 2006	Initial issue	HS
B	October 3, 2006	Corrected FCC ID and Model Number.	SR
C	October 9, 2006	Extracted contents of Section 7., “PROCEDURE USED TO ESTABLISH TEST SIGNAL” to separate document, SAR REPORT ADDENDUM, number 06U10557-4A.	SR

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: September 11-15, and 28-29, 2006

APPLICANT: ADDRESS:	Broadcom Corporation 190 Mathilda Place, Sunnyvale, CA 94086 USA
FCC ID: MODEL:	QDS-BRCM1022-H BCM94321MC
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

Broadcom 802.11ag/Draft 802.11n Wireless LAN PCI-E Mini Card is installed in HP Pavilion TS1000, model HSTNN-Q22C along with Bluetooth module Model BCM92045NMD FFC ID: QDS-BRCM1018.

Test Sample is a:	Production unit
Modulation type:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11agn Frequency Hopping Spread Spectrum (FHSS) for Bluetooth module

Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	Collocation SAR Values [1g_mW/g]
FCC 15.247	2412-2462	1.28	1.19
	5745 - 5825	1.488	1.431
FCC 15.407	5180 - 5320	1.37	1.281

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C (Edition 01-01).

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Hsin Fu Shih
Senior Engineer
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Tested By:

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EMC Engineer
Compliance Certification Services

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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Broadcom 802.11ag/Draft 802.11n Wireless LAN PCI-E Mini Card is installed in HP Pavilion TS1000, model HSTNN-Q22C along with Bluetooth module Model BCM92045NMD FFC ID: QDS-BRCM1018.	
Normal operation:	Lap-held position, and LCD Edge positions
Accessory:	N/A
Earphone/Headset Jack:	N/A
Duty cycle:	97%
Host Device(s):	HP Pavilion TS1000, model HSTNN-Q22C
Antenna(s)	Main: Hon HAI Precision IND. CO., LTD, PIFA, PN # WDAN-HQT T8001-DF AUX: Hon HAI Precision IND. CO., LTD, PIFA, PN # WDAN-HQT T8003-DF
Power supply:	Power supplied through the laptop computer (host device).

2 FACILITIES AND ACCREDITATION

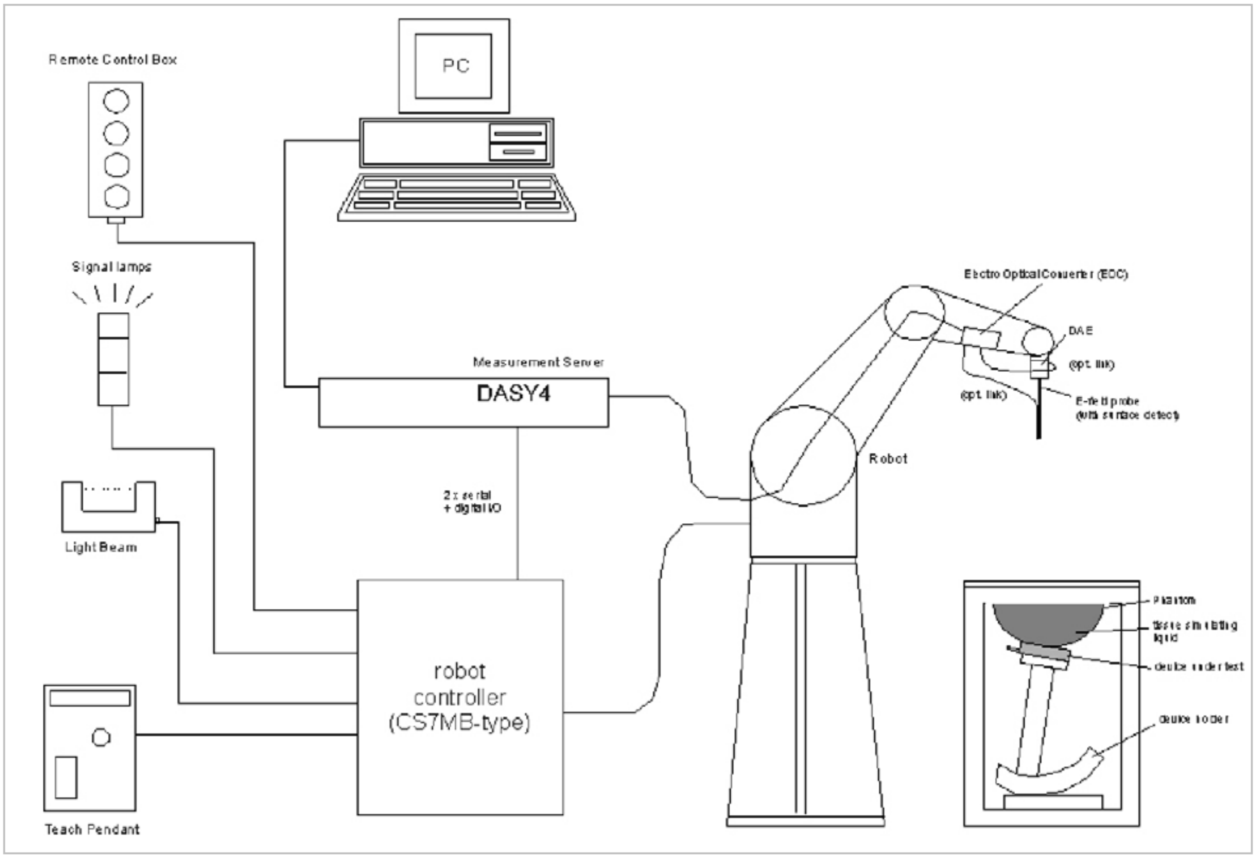
The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

LAB CODE:200065-0

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

3 SYSTEM DESCRIPTION



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

3.1 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATIG LIQUIDS

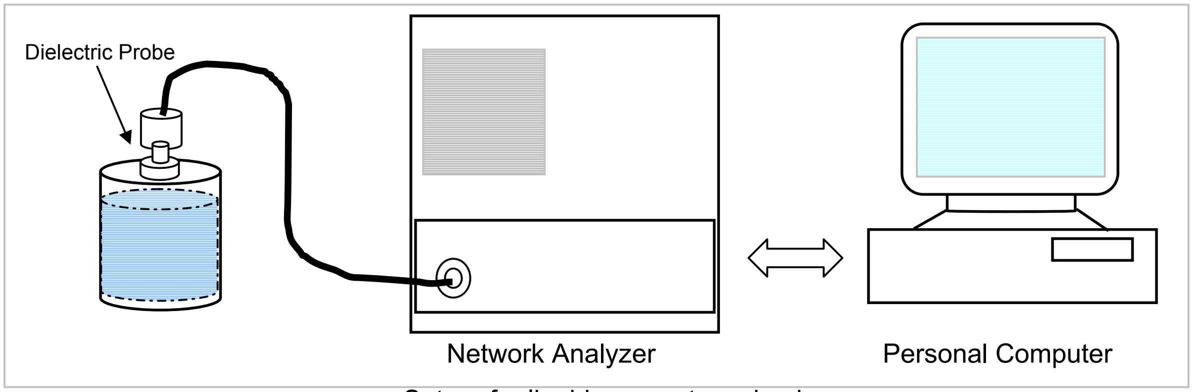
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

4 SIMULATING LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within ± 5% of the values given in the table below.



Set-up for liquid parameters check

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	**52.7**	**1.95**
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 3000 MHz – 5800 MHz)

In the current guidelines and draft standards for compliance testing of mobile phones (i.e., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see table below).

SPEAG has developed suitable head and body tissue simulating liquids consisting of the following ingredients: de-ionized water, salt and a special composition including mineral oil and an emulgators. Dielectric parameters of these liquids were measured using a HP 8570C Dielectric Probe Kit in conjunction with HP 8753ES Network Analyzer (30 kHz – 6G Hz). The differences with respect to the interpolated values were well within the desired ±5% for the whole 5 to 5.8 GHz range.

f (MHz)	Head Tissue		Body Tissue		Reference
	rel. permitivity	conductivity	rel. permitivity	conductivity	
3000	38.5	2.40	52.0	2.73	Standard
5800	35.3	5.27	**48.2**	**6.00**	Standard
5000	36.2	1.45	49.3	5.07	Interpolated
5100	36.1	4.55	49.1	5.18	Interpolated
5200	36.0	4.66	**49.0**	**5.30**	Interpolated
5300	35.9	4.76	48.9	5.42	Interpolated
5400	35.8	4.86	48.7	5.53	Interpolated
5500	35.6	4.96	48.6	5.65	Interpolated
5600	35.5	5.07	48.5	5.77	Interpolated
5700	35.4	5.17	48.3	5.88	Interpolated

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

4.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	22	15	e'	50.5506	Relative Permittivity (ε_r):	50.5506	52.7	-4.08	± 5
			e"	14.7061	Conductivity (σ):	2.00439	1.95	2.79	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
September 11, 2006 09:11 AM

Frequency	e'	e"
2400000000.	50.7291	14.4892
2410000000.	50.6975	14.5264
2420000000.	50.6658	14.5715
2430000000.	50.6361	14.6259
2440000000.	50.5900	14.6533
2450000000.	**50.5506**	**14.7061**
2460000000.	50.5242	14.7292
2470000000.	50.4808	14.7702
2480000000.	50.4497	14.8259
2490000000.	50.4107	14.8739
2500000000.	50.3701	14.9135

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	22	15	e'	50.7877	Relative Permittivity (ε_r):	50.7877	52.7	-3.63	± 5
			e"	14.8018	Conductivity (σ):	2.01744	1.95	3.46	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
September 12, 2006 09:13 AM

Frequency	e'	e"
2400000000.	50.9831	14.5834
2410000000.	50.9447	14.6388
2420000000.	50.9138	14.6748
2430000000.	50.8709	14.7298
2440000000.	50.8329	14.7573
2450000000.	**50.7877**	**14.8018**
2460000000.	50.7526	14.8383
2470000000.	50.6953	14.8735
2480000000.	50.6784	14.9073
2490000000.	50.6209	14.9666
2500000000.	50.6058	15.0143

The conductivity (σ) can be given as:

$$\sigma = \omega\varepsilon_0 e'' = 2\pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	22	15	e'	52.2587	Relative Permittivity (ε_r):	52.2587	52.7	-0.84	± 5
			e"	14.8777	Conductivity (σ):	2.02778	1.95	3.99	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
September 15, 2006 08:41 AM

Frequency	e'	e"
2400000000.	52.4204	14.6434
2410000000.	52.3798	14.7076
2420000000.	52.3417	14.7542
2430000000.	52.3266	14.7875
2440000000.	52.2960	14.8374
2450000000.	**52.2587**	**14.8777**
2460000000.	52.2197	14.9094
2470000000.	52.1686	14.9306
2480000000.	52.1083	14.9494
2490000000.	52.0738	15.0046
2500000000.	52.0413	15.0426

The conductivity (σ) can be given as:

$$\sigma = \omega\varepsilon_0 e'' = 2\pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	23	15	e'	48.7873	Relative Permittivity (ε_r):	48.7873	48.2	1.22	± 5
			e"	19.4178	Conductivity (σ):	6.26537	6.00	4.42	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
September 13, 2006 09:20 AM

Frequency	e'	e"
4600000000.	51.0977	17.7707
4650000000.	50.9781	17.8151
4700000000.	50.9402	17.9520
4750000000.	50.8083	17.9816
4800000000.	50.7239	18.1012
4850000000.	50.6353	18.1391
4900000000.	50.5117	18.2425
4950000000.	50.4296	18.3231
5000000000.	50.3261	18.3669
5050000000.	50.2213	18.4778
5100000000.	50.1269	18.4939
5150000000.	50.0219	18.6012
5200000000.	49.9343	18.6527
5250000000.	49.8234	18.7403
5300000000.	49.7523	18.7883
5350000000.	49.6301	18.8562
5400000000.	49.5574	18.9146
5450000000.	49.4452	18.9655
5500000000.	49.3384	19.0591
5550000000.	49.2487	19.0988
5600000000.	49.1596	19.1606
5650000000.	49.0699	19.2055
5700000000.	48.9787	19.2954
5750000000.	48.8806	19.3290
5800000000.	**48.7873**	**19.4178**
5850000000.	48.6951	19.4554
5900000000.	48.5827	19.5145
5950000000.	48.5175	19.5856
6000000000.	48.4135	19.6728

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	23	15	e'	48.4904	Relative Permittivity (ε_r):	48.4904	48.2	0.60	± 5
			e"	19.3244	Conductivity (σ):	6.23524	6.00	3.92	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
September 14, 2006 07:23 AM

Frequency	e'	e"
4600000000.	50.7829	17.7021
4650000000.	50.6738	17.7594
4700000000.	50.6119	17.8761
4750000000.	50.4818	17.9323
4800000000.	50.4162	18.0282
4850000000.	50.3175	18.0843
4900000000.	50.1998	18.1612
4950000000.	50.1529	18.2537
5000000000.	49.9991	18.3160
5050000000.	49.9084	18.4013
5100000000.	49.8100	18.4433
5150000000.	49.7078	18.5389
5200000000.	49.6227	18.5678
5250000000.	49.5073	18.6495
5300000000.	49.4265	18.7137
5350000000.	49.3177	18.7754
5400000000.	49.2250	18.8422
5450000000.	49.1251	18.8980
5500000000.	49.0367	18.9585
5550000000.	48.9413	19.0241
5600000000.	48.8589	19.0764
5650000000.	48.7436	19.1429
5700000000.	48.6914	19.1917
5750000000.	48.5540	19.2485
5800000000.	**48.4904**	**19.3244**
5850000000.	48.3763	19.3662
5900000000.	48.2905	19.4580
5950000000.	48.2105	19.4900
6000000000.	48.0987	19.5774

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$
$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Room Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	23	15	e'	50.3252	Relative Permittivity (ε_r):	50.3252	49.0	2.70	± 5
			e"	18.8826	Conductivity (σ):	5.46241	5.30	3.06	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
September 28, 2006 03:43 PM

Frequency	e'	e"
4600000000.	51.5221	17.9083
4650000000.	51.4488	17.9853
4700000000.	51.3337	18.0743
4750000000.	51.2406	18.1573
4800000000.	51.1386	18.2426
4850000000.	51.0505	18.3274
4900000000.	50.9285	18.4133
4950000000.	50.7962	18.4932
5000000000.	50.7483	18.5675
5050000000.	50.6242	18.6494
5100000000.	50.5478	18.7447
5150000000.	50.4249	18.7914
5200000000.	**50.3252**	**18.8826**
5250000000.	50.2279	18.9452
5300000000.	50.1170	19.0187
5350000000.	50.0232	19.0699
5400000000.	49.9161	19.1460
5450000000.	49.8106	19.2144
5500000000.	49.7361	19.2780
5550000000.	49.6272	19.3444
5600000000.	49.5395	19.4119
5650000000.	49.4261	19.4558
5700000000.	49.3630	19.5401
5750000000.	49.2229	19.5949
5800000000.	49.1526	19.6846
5850000000.	49.0320	19.7192
5900000000.	48.9564	19.8127
5950000000.	48.8604	19.8836
6000000000.	48.7790	19.9412

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Room Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	23	15	e'	50.7567	Relative Permittivity (ε_r):	50.7567	49.0	3.59	± 5
			e"	18.9425	Conductivity (σ):	5.47974	5.30	3.39	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
September 29, 2006 03:16 PM

Frequency	e'	e"
4600000000.	51.8046	17.9697
4650000000.	51.7638	18.0085
4700000000.	51.6273	18.1713
4750000000.	51.6429	18.1792
4800000000.	51.4616	18.2871
4850000000.	51.4597	18.3955
4900000000.	51.3246	18.4890
4950000000.	51.2308	18.5689
5000000000.	51.1707	18.6370
5050000000.	51.0409	18.7276
5100000000.	50.9752	18.7791
5150000000.	50.8174	18.8847
5200000000.	**50.7567**	**18.9425**
5250000000.	50.6436	19.0035
5300000000.	50.5450	19.0738
5350000000.	50.4762	19.1361
5400000000.	50.3705	19.2342
5450000000.	50.2748	19.2734
5500000000.	50.1689	19.3700
5550000000.	50.0253	19.3266
5600000000.	49.9963	19.4646
5650000000.	49.9088	19.4610
5700000000.	49.7517	19.6673
5750000000.	49.7388	19.6490
5800000000.	49.5758	19.7366
5850000000.	49.6614	19.8382
5900000000.	49.4929	19.8392
5950000000.	49.4365	20.0412
6000000000.	49.3401	20.0025

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

5 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 5 x 5 x 7 fine cube was chosen for cube integration(dx=dy=7.5mm; dz=5mm).
  For 5 GHz band - Special 8x8x8 fine cube was chosen for cube integration(dx=dy=4.3mm; dz=3mm)
- Distance between probe sensors and phantom surface was set to 4 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.0mm
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using the finite-difference time-domain method and the geometry parameters.

Dipole Type	Distance (mm)	Frequency (MHz)	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	**51.2**	**23.7**	97.6

Note: All SAR values normalized to 1 W forward power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using finite-difference time-domain FDTD method (feed point-impedance set to 50 ohms) and the mechanical dimensions of the D5GHzV2 dipole (manufactured by SPEAG).

f (MHz)	Head Tissue		Body Tissue		
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}	SAR_{Peak}
5000	72.9	20.7	68.1	19.2	260.3
5100	74.6	21.1	78.8	19.6	272.3
5200	76.5	21.6	**71.8**	**20.1**	284.7
5800	78.0	21.9	**74.1**	**20.5**	324.7

Note: All SAR values normalized to 1 W forward power.

5.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D2450V2 SN: 706

Date: September 11, 2006

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	22	15	1g	12.90	51.6	51.2	0.78	± 10
			10g	5.91	23.64	23.7	-0.25	± 10

Date: September 12, 2006

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	22	15	1g	13.00	52	51.2	1.56	± 10
			10g	5.94	23.76	23.7	0.25	± 10

Date: September 15, 2006

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	22	15	1g	13.10	52.4	51.2	2.34	± 10
			10g	5.97	23.88	23.7	0.76	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: September 13, 2006

Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	23	15	1g	19.00	76	74.1	2.56	± 10
			10g	5.24	20.96	20.5	2.24	± 10

Date: September 14, 2006

Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	23	15	1g	18.90	75.6	74.1	2.02	± 10
			10g	5.21	20.84	20.5	1.66	± 10

Date: September 28, 2006

Room Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	23	15	1g	18.00	72	71.8	0.28	± 10
			10g	5.07	20.28	20.1	0.90	± 10

Date: September 29, 2006

Room Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	23	15	1g	18.10	72.4	71.8	0.84	± 10
			10g	5.08	20.32	20.1	1.09	± 10

6 SAR MEASURMENT PROCEDURE

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 4 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. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

For 5 GHz band - 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. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

c) Around this point, a volume of X=Y= 30 and Z=21 mm is assessed by measuring 5 x 5 x 7 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

For 5 GHz band - Around this point, a volume of X=Y=Z=30 mm is assessed by measuring 8 x 8 x 8 mm 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 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 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.

6.1 DASY4 SAR MEASURMENT PROCEDURE

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures 5 x 5 x 7 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

For 5 GHz band – Same as above except the Zoom Scan measures 8 x 8 x 8 points.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

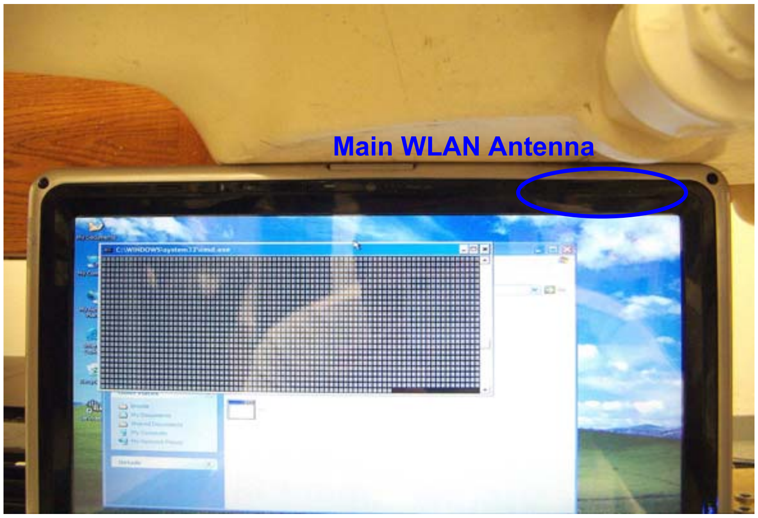
7 PROCEDURE USED TO ESTABLISH TEST SIGNAL

NOTE: This section has been extracted to a separate document.

8 SAR MEASURMENT RESULTS

8.1 2.4GHZ

8.1.1 LCD EDGE MAIN ANTENNA POSITION

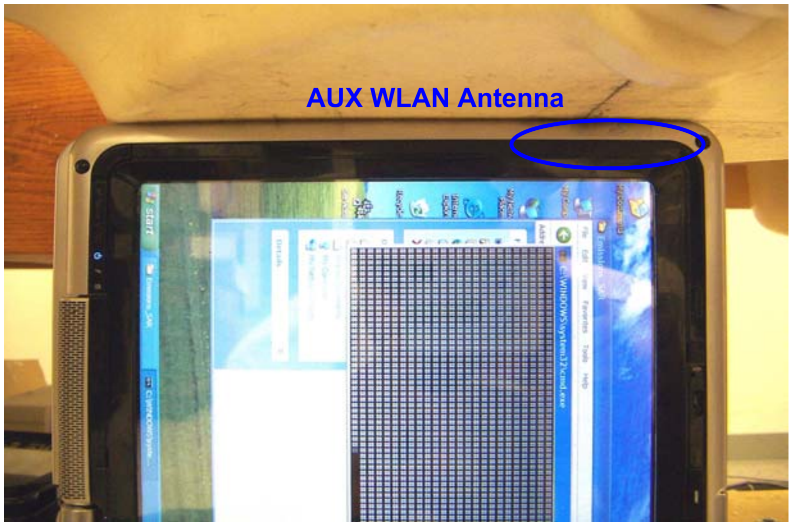


802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2412			
6	2437	0.610	0.000	0.610
11	2462			
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.849	0.000	0.849
6	2437	0.862	-0.154	0.893
11	2462	1.110	0.000	1.110
802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2412			
6	2437	0.318	0.000	0.318
11	2462			
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2422			
6	2437	0.253	0.000	0.253
11	2452			

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.2 LCD EDGE AUX ANTENNA POSITION



802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.966	0.000	0.966
6	2437	0.770	0.000	0.770
11	2462	0.739	0.000	0.739
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2412	1.060	0.000	1.060
6	2437	1.120	-0.030	**1.128**
11	2462	0.977	0.000	0.977
6[4]	2437	1.190	0.000	**1.190**
802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2412			
6	2437	0.386	0.000	0.386
11	2462			
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1	2422			
6	2437	0.317	-0.150	0.328
11	2452			

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) Collocation with Bluetooth module.

8.1.3 LAP HELD MAIN ANTENNA POSITION

802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.043	-0.170	0.045
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.042	0.000	0.042
802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.023	-0.195	0.024
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2422 2437 2452	0.018	-0.177	0.019

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.4 LAP HELD AUX ANTENNA POSITION

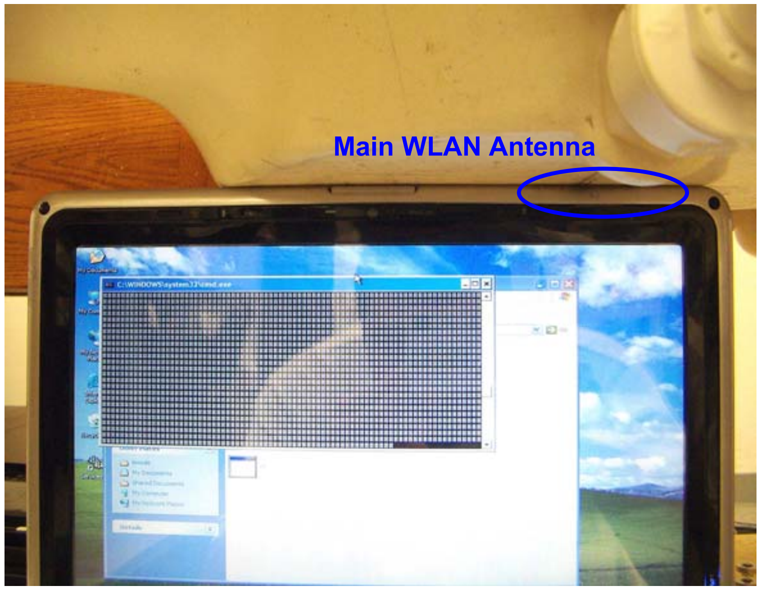
802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.034	0.000	0.034
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.036	0.000	0.036
802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.017	0.000	0.017
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
1 6 11	2422 2437 2452	0.008	0.000	0.008

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2 5.2GHZ

8.2.1 LCD EDGE MAIN ANTENNA POSITION

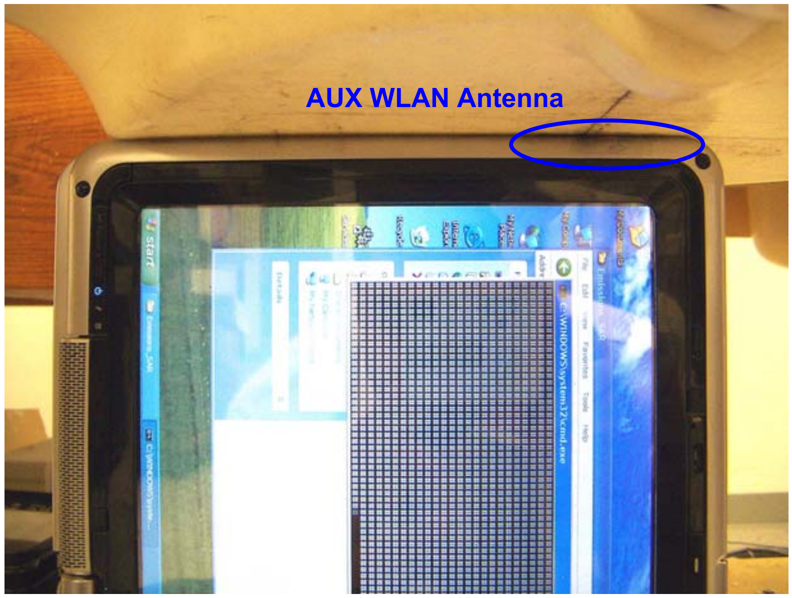


802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
36	5180	0.959	-0.188	1.001
52	5260	1.090	-0.189	1.138
64	5320	1.250	-0.118	1.284
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36	5180	0.735	-0.122	0.756
52	5260	0.968	-0.019	0.972
64	5320	1.270	-0.091	1.297
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38	5190	0.896	-0.129	0.923
54	5270	1.130	0.000	1.130
62	**5310**	**1.360**	**-0.033**	**1.370**

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.2 LCD EDGE AUX ANTENNA POSITION



802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
36	5180	1.230	0.000	1.230
52	5260	0.909	-0.152	0.941
64	5320	0.864	0.000	0.864
36 [4]	**5180**	**1.230**	**-0.176**	**1.281**
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36	5180	1.130	-0.052	1.144
52	5260	0.989	-0.126	1.018
64	5320	0.801	-0.138	0.827
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38	5190	1.140	0.000	1.140
54	5270	0.880	-0.120	0.905
62	5310	0.953	0.000	0.953

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) Collocation with Bluetooth module. The collocation is performed on this position because the Bluetooth location is far from the LCD edge main antenna which is the worst case.

8.2.3 LAP HELD MAIN ANTENNA POSITION

802.11a

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.085	0.000	0.085

802.11n HT20

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.073	-0.057	0.074

802.11n HT40

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38 54 62	5190 5270 5310	0.087	0.000	0.087

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

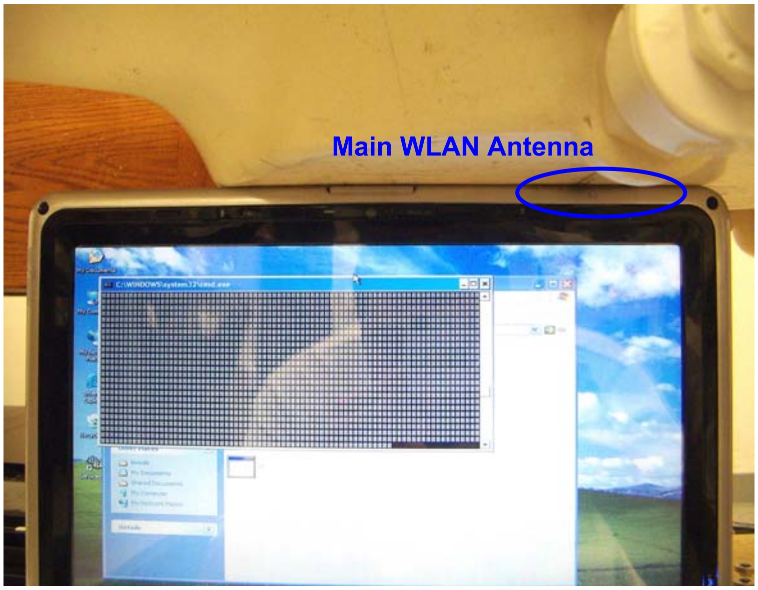
8.2.4 LAP HELD AUX ANTENNA POSITION

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) SAR Values for this position are too low to be measured.

8.3 5.8GHZ

8.3.1 LCD EDGE MAIN ANTENNA POSITION



802.11a

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149	5745	1.230	0.000	1.230
157	5785	1.390	-0.126	1.431
165	5825	1.470	0.000	1.470

802.11n HT20

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149	5745	0.766	0.000	0.766
157	5785	0.832	-0.175	0.866
165	5825	0.792	-0.117	0.814

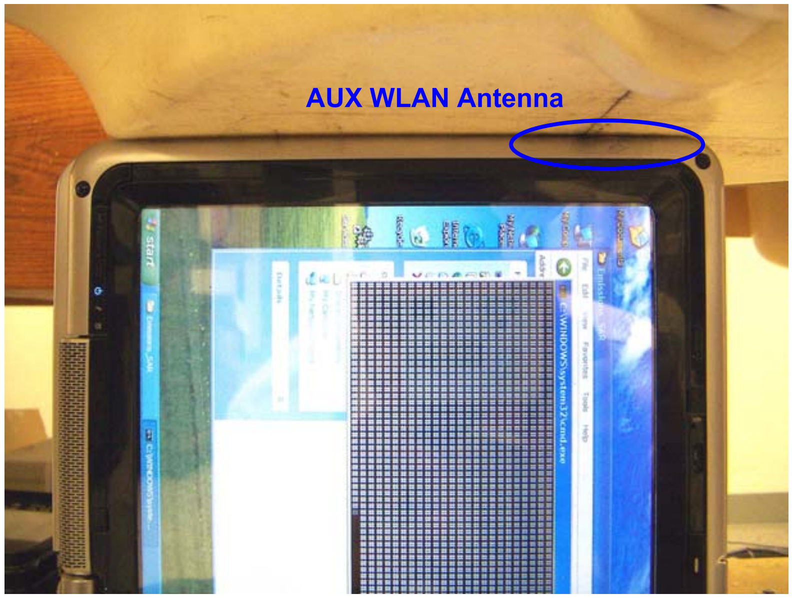
802.11n HT40

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
151	5755	0.864	-0.137	0.892
159	5795	0.894	-0.199	0.936

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.3.2 LCD EDGE AUX ANTENNA POSITION



Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
802.11a				
149	5745	1.310	-0.166	1.361
157	5785	1.360	0.000	1.360
165	5825	1.440	-0.143	**1.488**
165 [4]	5825	1.410	-0.064	**1.431**
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149	5745			
157	5785	0.629	-0.163	0.653
165	5825			
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
151	5755	0.617	-0.155	0.639
159	5795	0.661	-0.166	0.687

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) Collocation with Bluetooth module.

8.3.3 LAP HELD MAIN ANTENNA POSITION

802.11a				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.114	-0.186	0.119
802.11n HT20				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.094	0.000	0.094
802.11n HT40				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
151 159	5755 5795	0.105	-0.058	0.106

Notes:
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.3.4 LAP HELD AUX ANTENNA POSITION

802.11a

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.002	0.000	0.002

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) HT20 and HT40 modes are skipped since SAR values are too low.

9 MEASURMENT UNCERTAINTY

9.1 MEASURMENT UNCERTAINTY FOR 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

9.2 MEASURMENT UNCERTAINTY 3 GHz – 6 GHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	3.00	R	1.732	1	1	1.73	1.73
RF Ambient Conditions - Reflections	3.00	R	1.732	1	1	1.73	1.73
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.66	10.73
Expanded Uncertainty (95% Confidence Interval)	K=2					23.32	21.46

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

10 EQUIPMENT LIST AND CALIBRATION

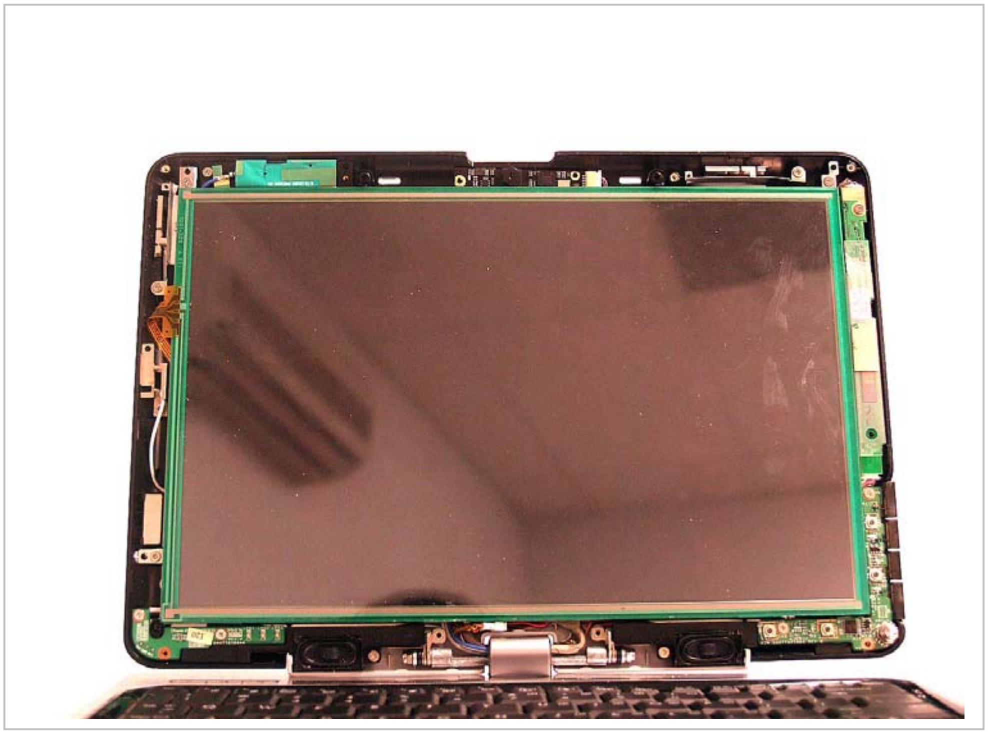
Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2/9/07
Electronic Probe kit	Hewlett Packard	85070C	N/A	N/A
E-Field Probe	SPEAG	EX3DV4	3552	5/30/07
Thermometer	ERTCO	639-1S	1718	1/11/07
SAM Phantom (SAM1)	SPEAG	TP-1185	QD000P40CA	N/A
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A	N/A
Data Acquisition Electronics	SPEAG	DAE4	558	1/20/07
System Validation Dipole	SPEAG	D2450V2	706	4/27/08
System Validation Dipole	SPEAG	D5GHzV2	1003	11/22/07
Power Meter	Giga-tronics	8651A	8651404	12/27/06
Power Sensor	Giga-tronics	80701A	1834588	12/27/07
Amplifier	Mini-Circuits	ZVE-8G	0360	N/A
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A
Radio Communication Tester	Rohde & Schwarz	CMU 200	838114/032	3/21/07
Signal Generator	HP	83732B	US34490599	10/5/2006
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test
Simulating Liquid	SPEAG	M5200-5800	N/A	Within 24 hrs of first test

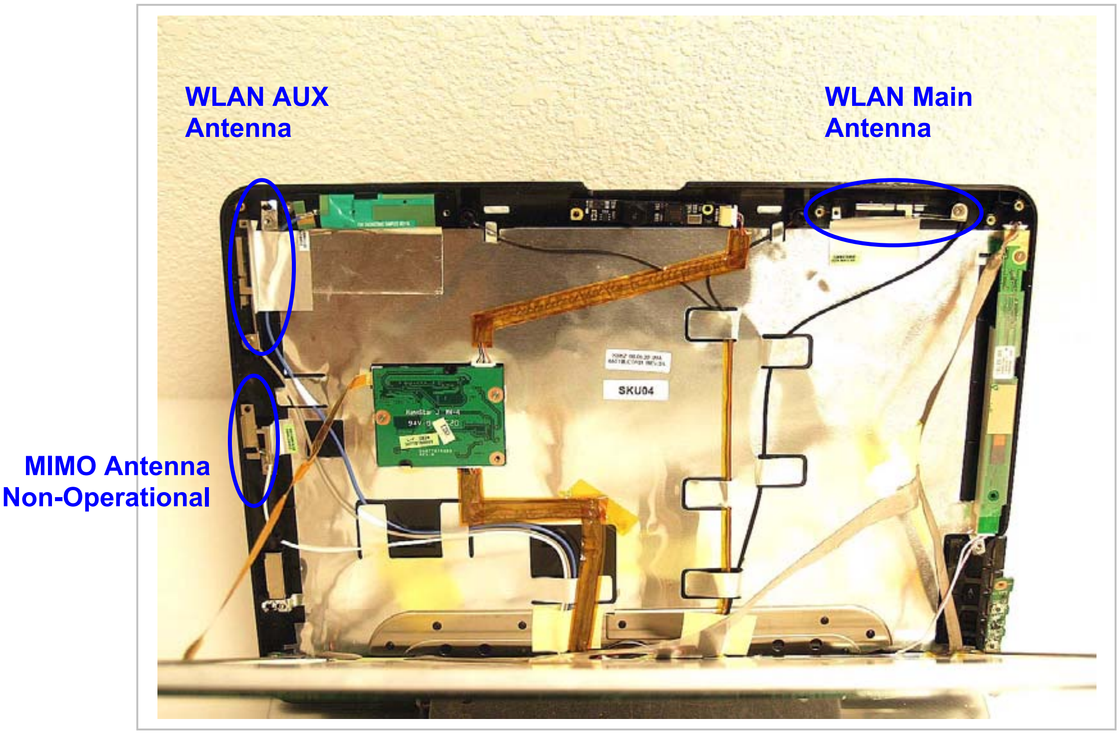
11 PHOTOS

DUT

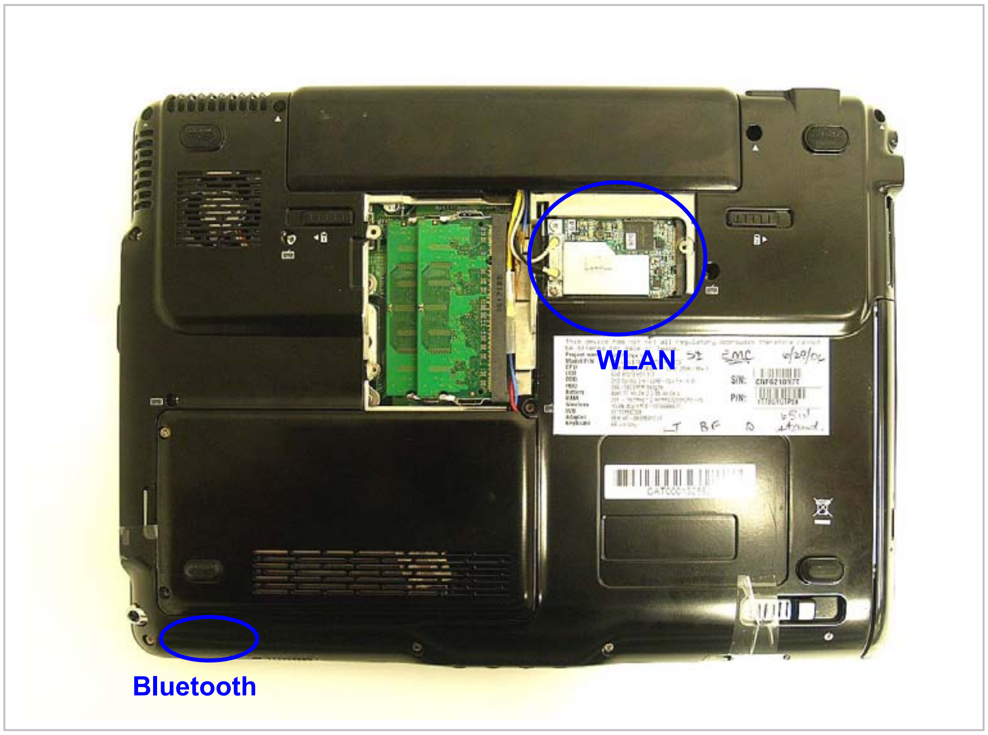
Host Laptop

Antenna Location





DUT location



12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	14
2-1	SAR Test Plots-2.4GHz	24
2-2	SAR Test Plots-5.2GHz	23
2-3	SAR Test Plots-5.8GHz	19
3	Certificate of E-Field Probe - EXDV4SN3552	9
4	Certificate of System Validation Dipole - D2450 SN:706	9
5	Certificate of System Validation Dipole - D5GHzV2 SN:1003	10
6	Material Specification Data Sheet of Body Simulating Liquid (5GHz)	3

END OF REPORT