SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C
IC RSS 102 ISSUE 2 : NOVERMBER 2005

FOR

802.11AG/DRAFT 802.11N WLAN PCI-E MINI CARD
INSTALLED INSIDE HP SOYUZ TABLET, MODEL: HSTNN-Q22C

MODEL: BCM94322MC
FCC ID: QDS-BRCM1036
IC: 4324A-BRCM1036

REPORT NUMBER: 08U11713-6

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Prepared for

BROADCOM CORPORATION
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SUNNYVALE, CA 94086, USA

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	May 4, 2008	Initial issue	Sunny Shih

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: April 22, 24, 29, 30 and May 1, 2008

APPLICANT: ADDRESS:	BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, USA
FCC ID: MODEL:	QDS-BRCM1036 BCM94322MC
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

802.11AG/DRAFT 802.11N WLAN PCI-E MINI CARD is installed in a HP Soyuz tablet laptop, model: HSTNN-Q22C

Test Sample is a:	Production unit	
Modulation type:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11agn	
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]
FCC 15.247	2400 - 2483.5 5725 - 5850	1.380 1.520
FCC 15.407	5150 – 5250 5250 – 5350 5470 - 5725	0.777 1.510 1.416

Testing has been carried out in accordance with:

47CFR §2.1093 - Radiofrequency Radiation Exposure Evaluation: Portable Devices

FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01) - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

RSS-102 - Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields

IEEE 1528_2003 - IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

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:

Sunny Shih
Engineering Supervisor
Compliance Certification Services

Tested By:

Jonathan King
EMC Engineer
Compliance Certification Services

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1 DEVICE UNDER TEST (DUT) DESCRIPTION

802.11AG/DRAFT 802.11N WLAN PCI-E MINI CARD is installed in a HP Soyuz tablet laptop, model: HSTNN-Q22C	
Normal operation:	Lap-held position, and underarm position
Duty cycle:	802.11b mode – 97% 802.11agn modes – 91%
Host Device(s):	HP HSTNN-Q22C (HP Soyuz) tablet laptop.
Power supply:	Power supplied through the laptop computer (host device).
Antenna(s):	<u>Antenna Supplier</u> <u>Type</u> <u>Model number</u> Foxconn IFA WDAN-HQTT8001-DF (Main) IFA WDAN-HQTT8003-DF (Aux) WNC IFA 81.EGG15.003 (Main) IFA 81.EGG15.004 (Aux) All SAR tests were performed on the WNC antenna, since this antenna has the highest antenna gains.

2 FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, CA 94538 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.”

NVLAP 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.

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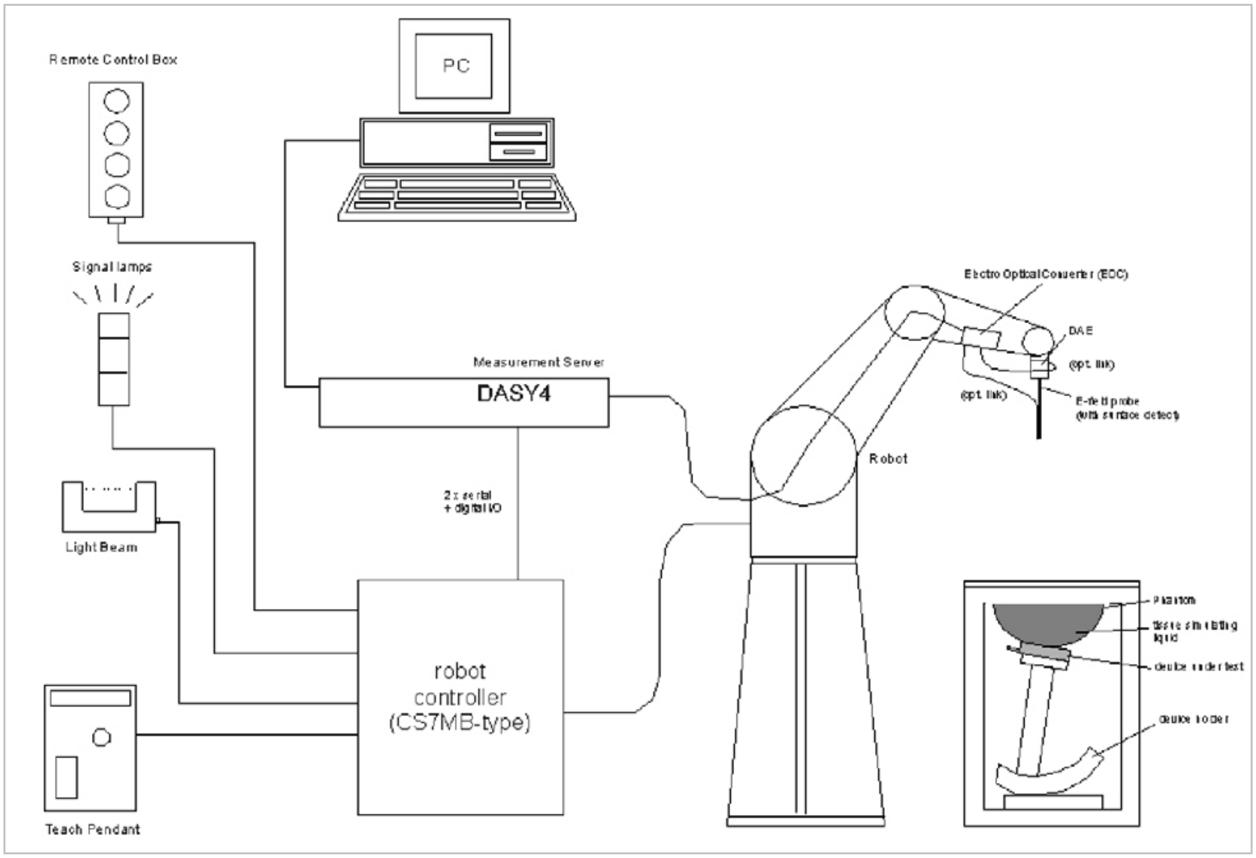
3 SYSTEM DESCRIPTION



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 SIMULATING LIQUIDS

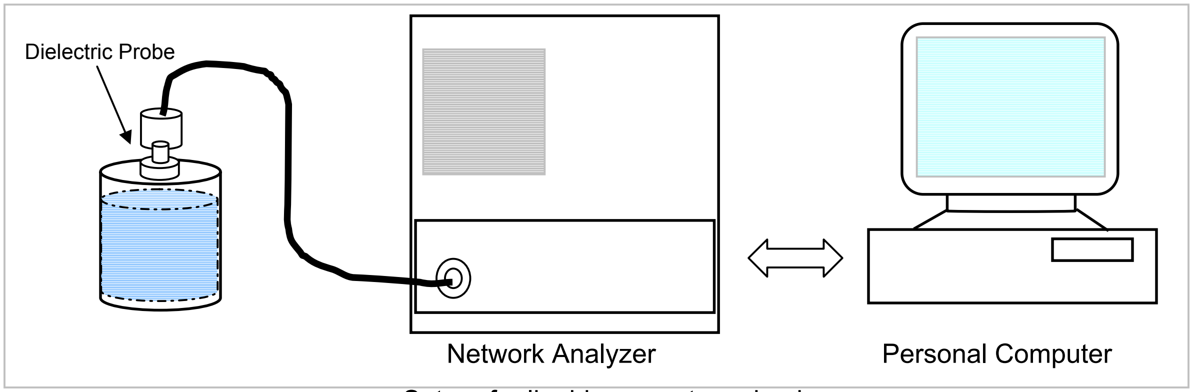
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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 suing 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 = 24°C; Relative humidity = 35% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	23	15	e'	51.5525	Relative Permittivity (ϵ_r):	51.5525	52.7	-2.18	± 5
			e''	14.5968	Conductivity (σ):	1.98949	1.95	2.03	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
May 01, 2008 02:58 PM

Frequency	e'	e''
2400000000.	51.6802	14.3960
2405000000.	51.6587	14.4084
2410000000.	51.6531	14.4273
2415000000.	51.6499	14.4358
2420000000.	51.6352	14.4587
2425000000.	51.6291	14.4823
2430000000.	51.6018	14.5214
2435000000.	51.6020	14.5224
2440000000.	51.5821	14.5488
2445000000.	51.5566	14.5674
2450000000.	**51.5525**	**14.5968**
2455000000.	51.5278	14.6035
2460000000.	51.5122	14.6439
2465000000.	51.4975	14.6609
2470000000.	51.4801	14.6815
2475000000.	51.4695	14.7011
2480000000.	51.4439	14.7175
2485000000.	51.4313	14.7438
2490000000.	51.4031	14.7752
2495000000.	51.3973	14.7856
2500000000.	51.3905	14.8125

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 5GHz

Room Ambient Temperature = 24°C; Relative humidity = 30% Measured by: Ekta Budhbhatti

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	23	15	e'	46.437	Relative Permittivity (ε_r):	46.4370	49.0	-5.23	± 10
			e"	18.5531	Conductivity (σ):	5.36709	5.30	1.27	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
April 22, 2008 04:49 PM

Frequency	e'	e"
4600000000.	47.6774	17.6907
4650000000.	47.5551	17.7594
4700000000.	47.4952	17.8368
4750000000.	47.3695	17.9197
4800000000.	47.3017	18.0200
4850000000.	47.1827	18.0554
4900000000.	47.0694	18.1473
4950000000.	46.9570	18.2045
5000000000.	46.8494	18.3140
5050000000.	46.7753	18.3661
5100000000.	46.6396	18.4307
5150000000.	46.5745	18.5122
5200000000.	**46.4370**	**18.5531**
5250000000.	46.3508	18.6434
5300000000.	46.2658	18.6977
5350000000.	46.1320	18.7517
5400000000.	46.0474	18.7875
5450000000.	45.9397	18.8803
5500000000.	45.8466	18.9289
5550000000.	45.7528	19.0086
5600000000.	45.6508	19.0468
5650000000.	45.5474	19.1336
5700000000.	45.4937	19.1664
5750000000.	45.3435	19.2312
5800000000.	45.2875	19.2897
5850000000.	45.1274	19.3256
5900000000.	45.0707	19.4130
5950000000.	44.9357	19.4145
6000000000.	44.8329	19.5425

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 5GHz

Room Ambient Temperature = 25°C; Relative humidity = 35% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	24	15	e'	47.4754	Relative Permittivity (ε_r):	47.4754	49.0	-3.11	± 10
			e''	18.3966	Conductivity (σ):	5.32182	5.30	0.41	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
April 29, 2008 2:23 PM

Frequency	e'	e''
4600000000.	48.5907	17.5810
4650000000.	48.6089	17.6350
4700000000.	48.4186	17.6925
4750000000.	48.4090	17.8506
4800000000.	48.3012	17.8470
4850000000.	48.1549	17.9618
4900000000.	48.1548	18.0071
4950000000.	47.9829	18.0751
5000000000.	47.8814	18.1241
5050000000.	47.7974	18.2351
5100000000.	47.6428	18.2568
5150000000.	47.5567	18.3500
5200000000.	**47.4754**	**18.3966**
5250000000.	47.3163	18.4603
5300000000.	47.2927	18.5497
5350000000.	47.1630	18.5743
5400000000.	47.0189	18.6669
5450000000.	47.0373	18.7551
5500000000.	46.7633	18.7586
5550000000.	46.7984	18.9070
5600000000.	46.6328	18.8508
5650000000.	46.5091	19.0160
5700000000.	46.5150	19.0488
5750000000.	46.2943	19.0666
5800000000.	46.3197	19.2425
5850000000.	46.1625	19.1768
5900000000.	46.0849	19.3698
5950000000.	46.0453	19.3229
6000000000.	45.7771	19.4319

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 5GHz

Room Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5500	23	15	e'	46.9177	Relative Permittivity (ε_r):	46.9177	48.6	-3.46	± 10
			e''	18.8036	Conductivity (σ):	5.75338	5.65	1.83	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
April 24, 2008 08:35 AM

Frequency	e'	e''
4600000000.	48.7700	17.5391
4650000000.	48.8937	17.8554
4700000000.	48.6168	17.5967
4750000000.	48.4829	18.0618
4800000000.	48.5903	17.8687
4850000000.	48.1467	17.9981
4900000000.	48.3690	18.0837
4950000000.	48.0089	18.0509
5000000000.	47.9757	18.2948
5050000000.	47.9843	18.1950
5100000000.	47.6370	18.4477
5150000000.	47.8328	18.4300
5200000000.	47.4445	18.5531
5250000000.	47.4418	18.5731
5300000000.	47.3916	18.6189
5350000000.	47.2226	18.6868
5400000000.	47.1302	18.7174
5450000000.	47.0406	18.8304
5500000000.	**46.9177**	**18.8036**
5550000000.	46.9466	19.1383
5600000000.	46.7101	18.9758
5650000000.	46.5936	19.2702
5700000000.	46.6760	19.0875
5750000000.	46.3107	19.2543
5800000000.	46.4845	19.3515
5850000000.	45.9522	19.2656
5900000000.	46.1840	19.5429
5950000000.	45.8863	19.2737
6000000000.	45.8185	19.6161

The conductivity (σ) can be given as:

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

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

Simulating Liquid Parameter Check Result @ Muscle 5GHz

Room Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5500	23	15	e'	47.8933	Relative Permittivity (ϵ_r):	47.8933	48.6	-1.45	± 10
			e''	18.7403	Conductivity (σ):	5.73401	5.65	1.49	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
May 01, 2008 07:29 AM

Frequency	e'	e''
4600000000.	49.6097	17.3822
4650000000.	49.8819	17.7254
4700000000.	49.5119	17.4443
4750000000.	49.4546	17.9179
4800000000.	49.5299	17.7236
4850000000.	49.0626	17.8995
4900000000.	49.3159	17.9362
4950000000.	48.9794	17.9037
5000000000.	48.9374	18.1864
5050000000.	48.9420	18.0500
5100000000.	48.6296	18.3594
5150000000.	48.8357	18.3519
5200000000.	48.3518	18.4734
5250000000.	48.4062	18.4679
5300000000.	48.3046	18.5224
5350000000.	48.1857	18.5633
5400000000.	48.1552	18.6238
5450000000.	47.9717	18.6583
5500000000.	**47.8933**	**18.7403**
5550000000.	47.8992	18.9519
5600000000.	47.6458	18.8645
5650000000.	47.6199	19.1056
5700000000.	47.5946	18.9577
5750000000.	47.3437	19.1671
5800000000.	47.4776	19.1576
5850000000.	46.9410	19.1530
5900000000.	47.2243	19.3825
5950000000.	46.8160	19.1588
6000000000.	46.8409	19.5445

The conductivity (σ) can be given as:

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

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

Simulating Liquid Parameter Check Result @ Muscle 5GHz

Room Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	23	15	e'	46.4845	Relative Permittivity (ϵ_r):	46.4845	48.2	-3.56	± 10
			e"	19.3515	Conductivity (σ):	6.24398	6.00	4.07	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
April 24, 2008 08:35 AM

Frequency	e'	e"
4600000000.	48.7700	17.5391
4650000000.	48.8937	17.8554
4700000000.	48.6168	17.5967
4750000000.	48.4829	18.0618
4800000000.	48.5903	17.8687
4850000000.	48.1467	17.9981
4900000000.	48.3690	18.0837
4950000000.	48.0089	18.0509
5000000000.	47.9757	18.2948
5050000000.	47.9843	18.1950
5100000000.	47.6370	18.4477
5150000000.	47.8328	18.4300
5200000000.	47.4445	18.5531
5250000000.	47.4418	18.5731
5300000000.	47.3916	18.6189
5350000000.	47.2226	18.6868
5400000000.	47.1302	18.7174
5450000000.	47.0406	18.8304
5500000000.	46.9177	18.8036
5550000000.	46.9466	19.1383
5600000000.	46.7101	18.9758
5650000000.	46.5936	19.2702
5700000000.	46.6760	19.0875
5750000000.	46.3107	19.2543
5800000000.	**46.4845**	**19.3515**
5850000000.	45.9522	19.2656
5900000000.	46.1840	19.5429
5950000000.	45.8863	19.2737
6000000000.	45.8185	19.6161

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$

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

Simulating Liquid Parameter Check Result @ Muscle 5GHz

Room Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	23	15	e'	46.3867	Relative Permittivity (ϵ_r):	46.3867	48.2	-3.76	± 10
			e''	19.1604	Conductivity (σ):	6.18232	6.00	3.04	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
April 30, 2008 01:59 PM

Frequency	e'	e''
4600000000.	48.7119	17.5464
4650000000.	48.7411	17.6994
4700000000.	48.5527	17.6723
4750000000.	48.4220	17.8411
4800000000.	48.4853	17.8872
4850000000.	48.1670	17.8938
4900000000.	48.2605	18.0746
4950000000.	48.0225	18.0381
5000000000.	47.9317	18.1993
5050000000.	47.9539	18.2087
5100000000.	47.6622	18.2916
5150000000.	47.7555	18.4514
5200000000.	47.5437	18.4116
5250000000.	47.3776	18.5691
5300000000.	47.4468	18.5493
5350000000.	47.1286	18.6369
5400000000.	47.2159	18.7021
5450000000.	46.9956	18.7387
5500000000.	46.8825	18.8376
5550000000.	46.9036	18.9490
5600000000.	46.6925	18.8902
5650000000.	46.6518	19.1262
5700000000.	46.5571	19.0240
5750000000.	46.3701	19.1934
5800000000.	**46.3867**	**19.1604**
5850000000.	46.0686	19.2605
5900000000.	46.2201	19.3698
5950000000.	45.9446	19.2722
6000000000.	45.8448	19.4459

The conductivity (σ) can be given as:

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

where f = 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 Isotropic E-Field Probe EX3DV4-SN: 3554 and 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.

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
5500	83.3	23.4	79.1	22.0	326.3
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: 748

Date: May 01, 2008

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Ekta Budhbhatti

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	23	15	1g	12.80	51.2	51.2	0.00	± 10
			10g	5.99	23.96	23.7	1.10	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: April 22 2008

Ambient Temperature =24 °C; Relative humidity = 30% Measured by: Ekta Budhbhatti

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	23	15	1g	17.80	71.2	71.8	-0.84	± 10
			10g	5.44	21.76	20.1	8.26	± 10

Date: April 29, 2008

Ambient Temperature = 25°C; Relative humidity = 35% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	24	15	1g	18.20	72.8	71.8	1.39	± 10
			10g	5.44	21.76	20.1	8.26	± 10

Date: April 24, 2008

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5500	23	15	1g	20.60	82.4	79.1	4.17	± 10
			10g	5.9	23.6	22.0	7.27	± 10

Date: May 1, 2008

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5500	23	15	1g	19.70	78.8	79.1	-0.38	± 10
			10g	5.71	22.84	22.0	3.82	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: April 24, 2008

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

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	5.37	21.48	20.5	4.78	± 10

Date: April 30, 2008

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	23	15	1g	18.30	73.2	74.1	-1.21	± 10
			10g	5.38	21.52	20.5	4.98	± 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 2.5 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=24 mm is assessed by measuring 7 x 7 x 9 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=24 and Z=20 mm is assessed by measuring 7 x 7 x 9 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 7 x 7 x 9 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 7 x 7 x 9 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

The following procedures had been used to prepare the EUT for the SAR test.

The client provided a special driver and program, w1_tools, which enable a user to control the frequency and output power of the module.

The cable assembly insertion loss of 20.3 dB (including attenuator and connectors) was entered as an offset in the power meter to allow for direct reading of power.

RF Conducted Output Power Measurement Results:

See Broadcom's Operational Description document for Average Power information.

8 SAR MEASURMENT RESULTS

8.1 SECONDARY LANDSCAPE POSITION

8.1.1 2.4 GHz Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11b mode - Main Antenna				
6	2437	0.641	0.000	0.641
802.11n HT20 mode - Main Antenna				
6	2437	0.645	0.000	0.645

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.

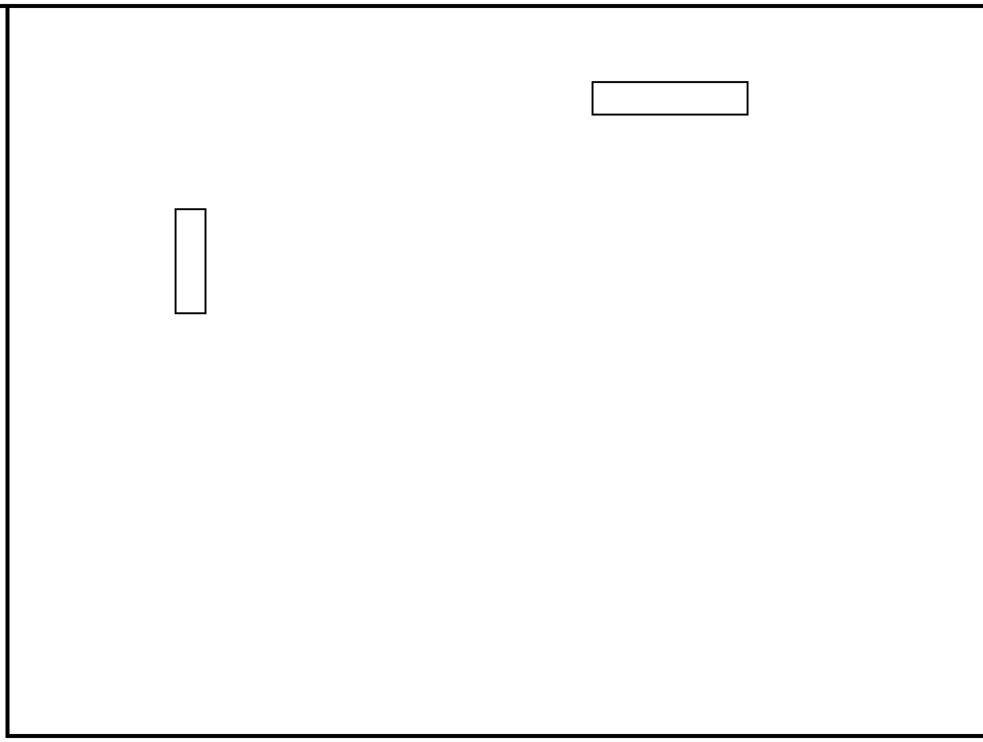
8.1.2 5.2 GHz Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11a - Legacy mode - Main Antenna				
40	5200	0.457	0.000	0.457
802.11a - HT20 mode - Main Antenna				
40	5200	0.161	-0.912	0.199

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.

8.1.3 5.3 GHz Band



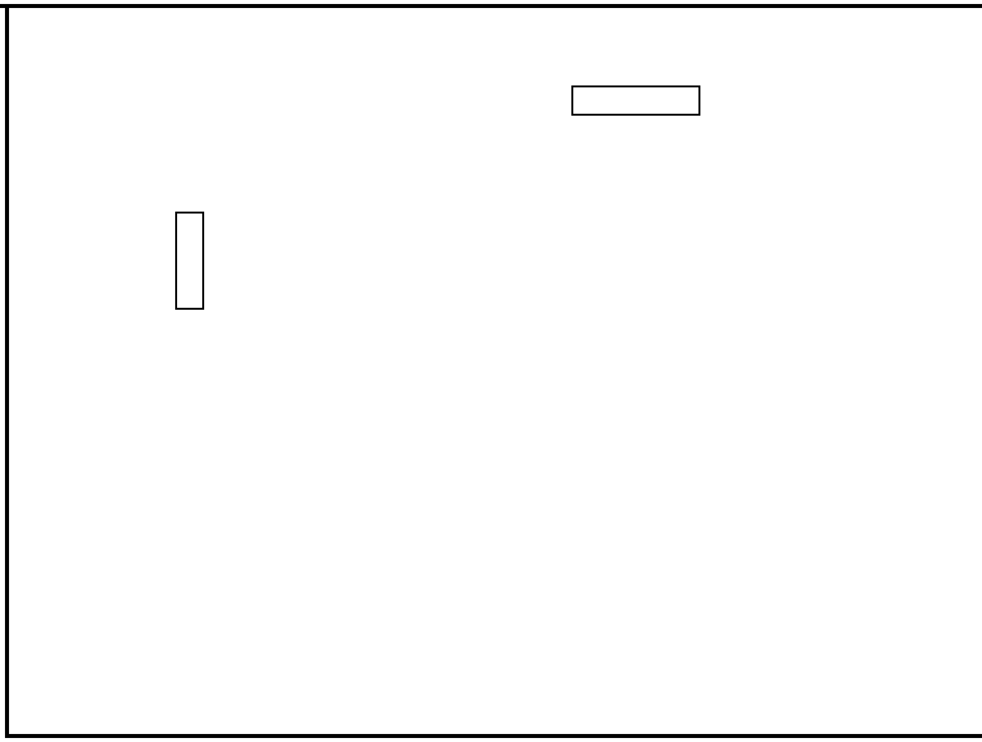
802.11a - Legacy mode - Main Antenna				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
52	5260	0.723	-0.223	0.761
60	5300	1.030	-0.977	1.290
64	5320	0.783	-0.202	0.820

802.11a - HT20 mode - Main Antenna				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
52	5260			
60	5300	0.636	-0.420	0.701
64	5320			

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 5.5 GHZ Band

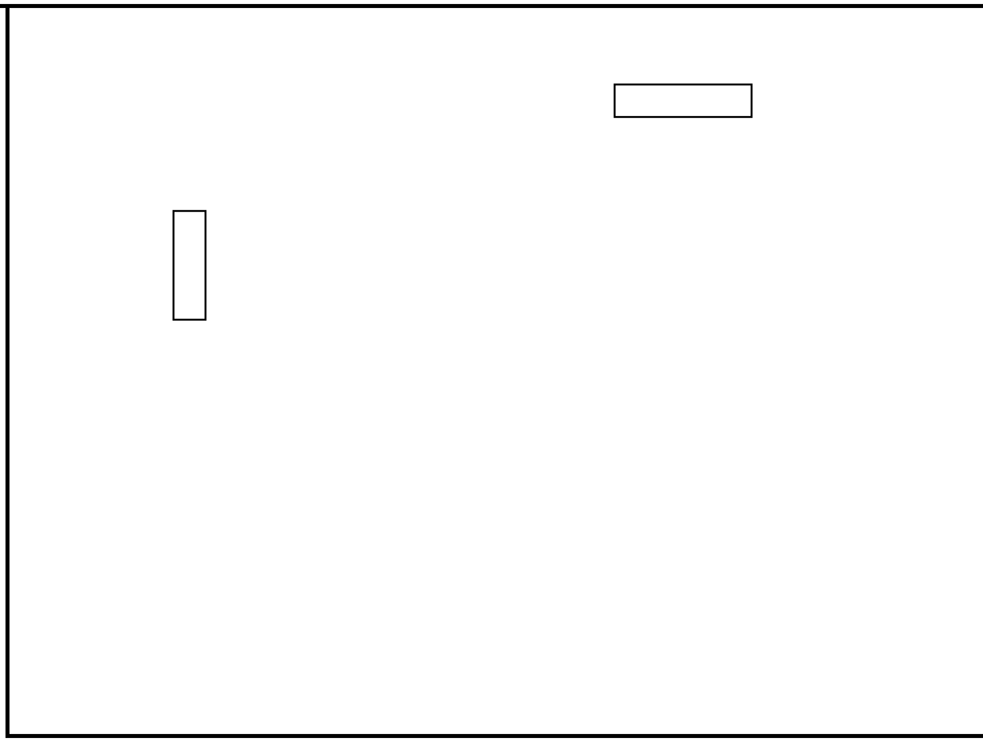


Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11a - Legacy mode - Main Antenna				
100	5500	0.813	0.000	0.813
120	5600	1.390	-0.082	1.416
140	5700	1.040	0.000	1.040
802.11n HT20 mode - Main Antenna				
100	5500	0.837	-0.154	0.867
120	**5600**	**1.400**	**0.000**	**1.400**
140	5700	1.040	0.000	1.040

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.

8.1.5 5.8 GHz Band



Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11a - Legacy mode - Main Antenna				
149	5745	1.040	0.000	1.040
157	5785	1.280	-0.225	1.348
165	5825	1.370	0.000	1.370
802.11a - HT20 mode - Main Antenna				
149	5745	1.060	0.000	1.060
157	5785	1.370	-0.323	1.476
165	**5825**	**1.520**	**0.000**	**1.520**

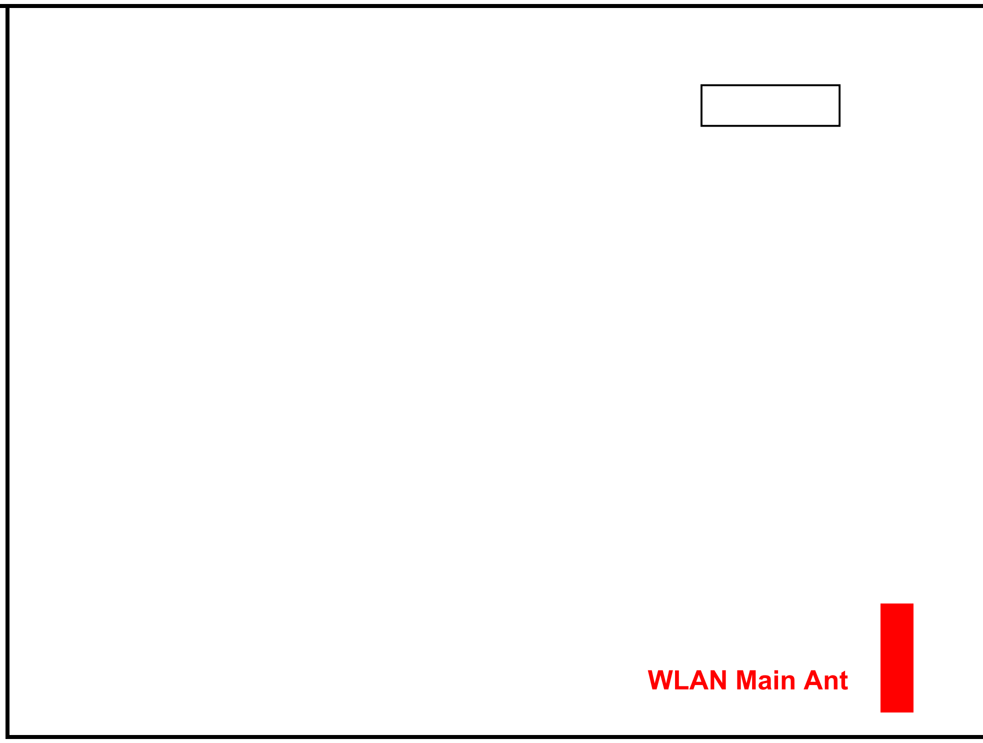
Notes:

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) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2 SECONDARY PORTRAIT

8.2.1 2.4 GHz Band

Note: Only the Aux antenna was tested at this position due to the large distance between the phantom and main antenna.

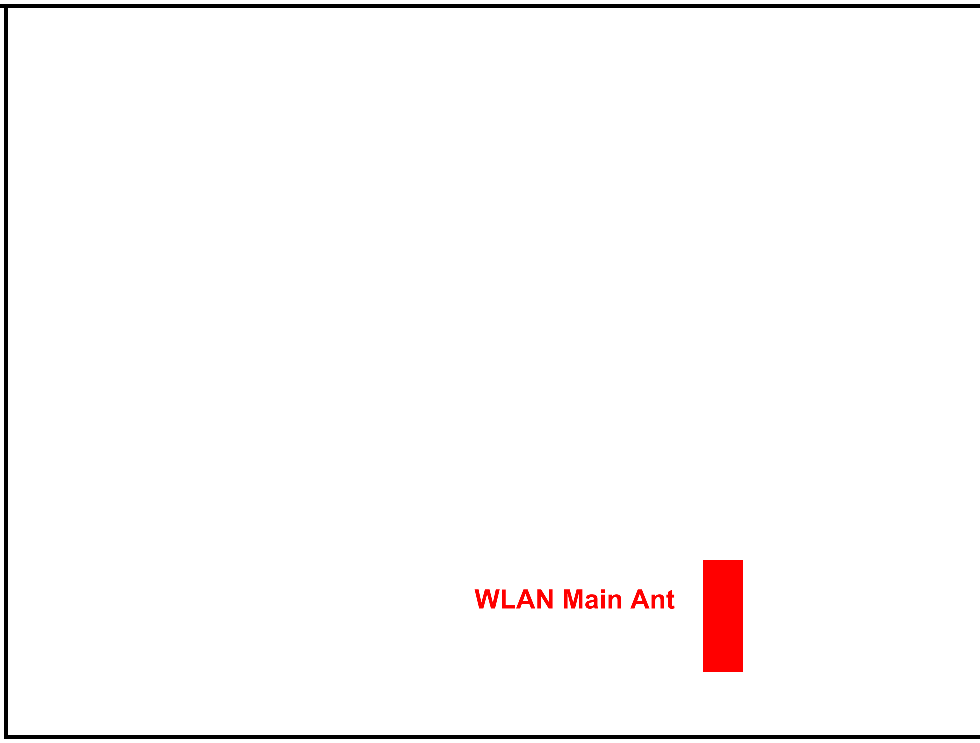


Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11b mode - AUX Antenna				
1	2412	0.965	-0.084	0.984
6	**2437**	**1.380**	**0.000**	**1.380**
11	2442	1.120	-0.251	1.187
802.11n HT20 mode - AUX Antenna				
6 [4]	2437	0.873	0.000	0.873

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) **802.11n HT20 mode L and H channels testing were skipped since the M channel output power is 5 dB higher than L and H channel output power.**

8.2.2 5.2 GHz Band

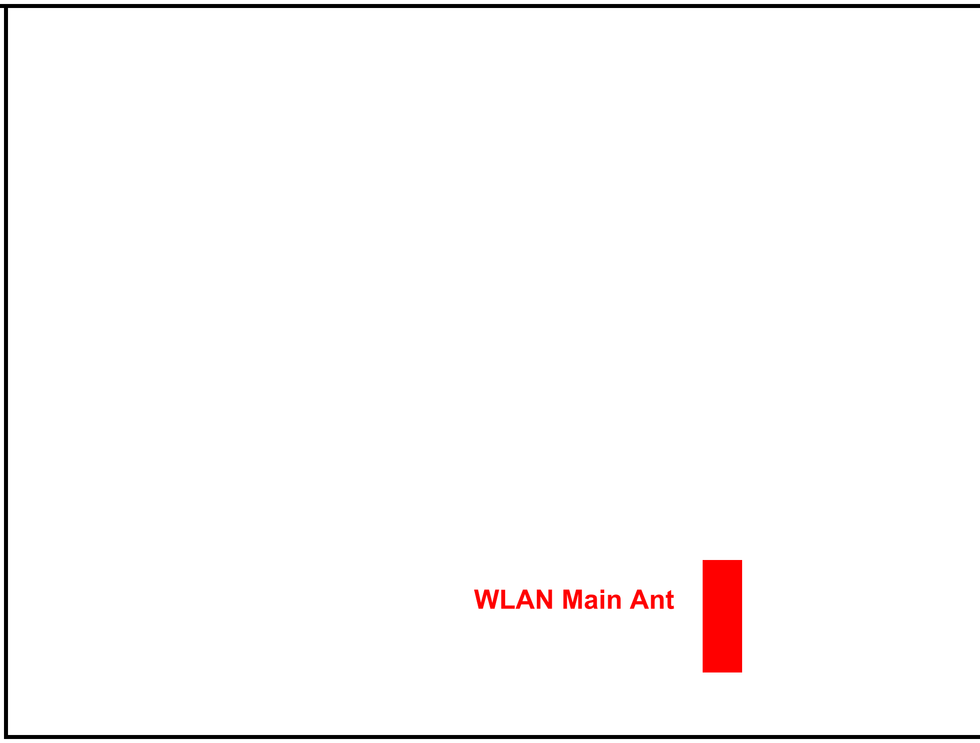


802.11a - Legacy mode - AUX Antenna				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
36 **40** 48	5180 **5200** 5240	**0.777**	**0.000**	**0.777**
802.11a - HT20 mode - AUX Antenna				
36 40 48	5180 5200 5240	0.271	-0.235	0.286

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.

8.2.3 5.3 GHz Band

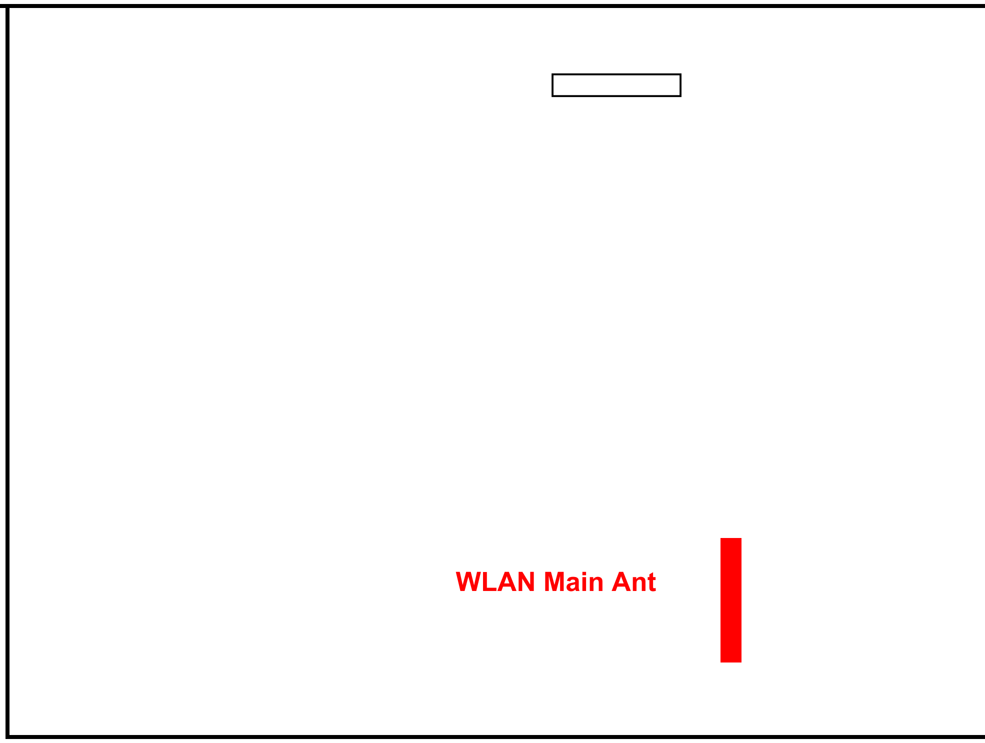


802.11a - Legacy mode - AUX Antenna				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
52	**5260**	**1.510**	**0.000**	**1.510**
60	5300	1.490	0.000	1.490
64	5320	1.310	0.000	1.310
802.11a - HT20 mode - Aux Antenna				
52	5260	1.470	0.000	1.470
60	5300	1.490	0.000	1.490
64	5320	1.280	0.000	1.280

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) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.4 5.5 GHz Band

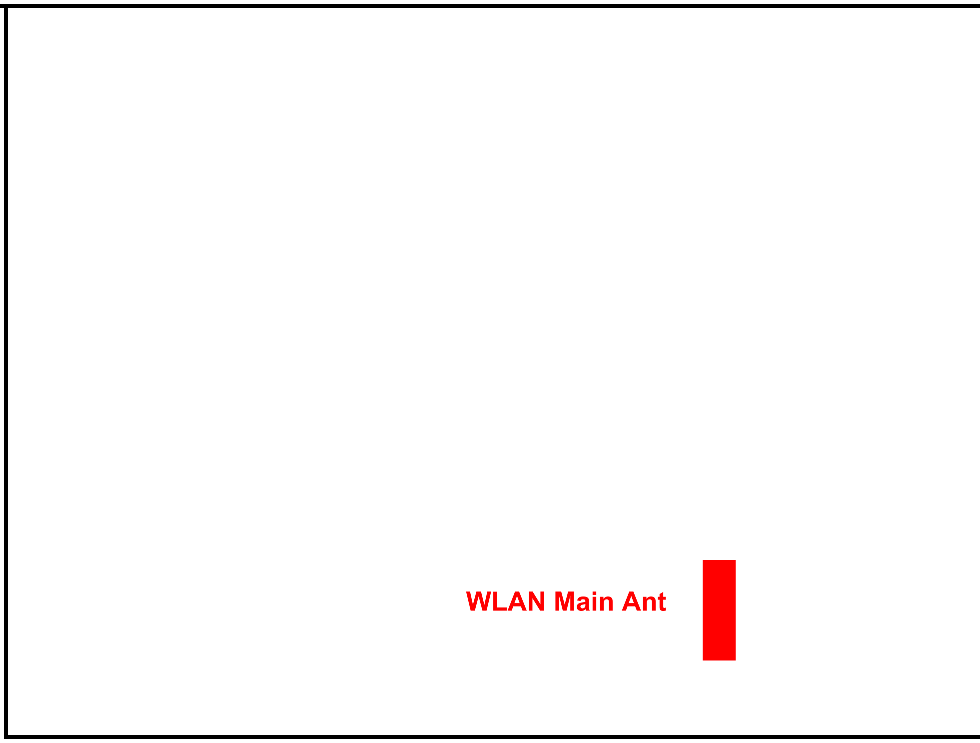


Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11a - Legacy mode - Aux Antenna				
100	5500	1.130	-0.138	1.166
120	5600	1.390	-0.061	1.410
140	5700	1.120	-0.251	1.187
802.11a - HT20 mode - Aux Antenna				
100	5500	1.090	-0.145	1.127
120	5600	1.140	-0.226	1.201
140	5700	1.080	-0.183	1.126

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) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.5 5.8 GHz Band



Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11a - Legacy mode - AUX Antenna				
149	5745	1.170	0.000	1.170
157	5785	1.480	0.000	1.480
165	5825	1.360	0.000	1.360
802.11a - HT20 mode - Aux Antenna				
149	5745	1.190	0.000	1.190
157	5785	1.390	0.000	1.390
165	5825	1.220	0.000	1.220

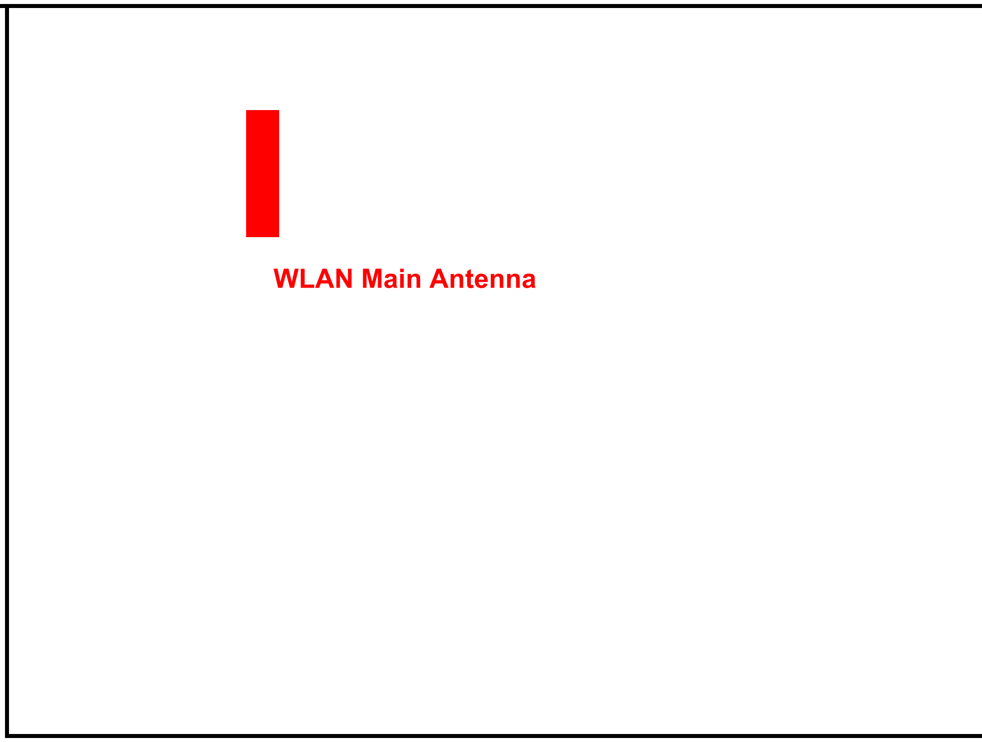
Notes:

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) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.3 PRIMARY PORTRAIT

8.3.1 2.4 GHz Band

Note: Only the Main antenna was tested at this position due to the large distance between the phantom and Aux antenna.



Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11n HT20 mode - Main Antenna				
6	2437	0.057	-0.229	0.060

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 5 GHz Band

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11a - Legacy mode - Main Antenna				
40	5200	0.016	0.000	0.016
802.11a - Legacy mode - Main Antenna				
60	5300	0.064	-0.487	0.072
802.11a - Legacy mode - Main Antenna				
120	5600	0.061	0.000	0.061
802.11a - Legacy mode - Main Antenna				
157	5785	0.089	0.000	0.089

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.

8.4 LAPHELD

8.4.1 2.4 GHz Band

Note: The Aux antenna was tested at this position based on the worst SAR values from the previous positions. The Main antenna testing was skipped due to low SAR values.

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
802.11b mode - Aux Antenna				
6	2437	0.016	-0.091	0.016

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.

8.4.2 5 GHz Bands

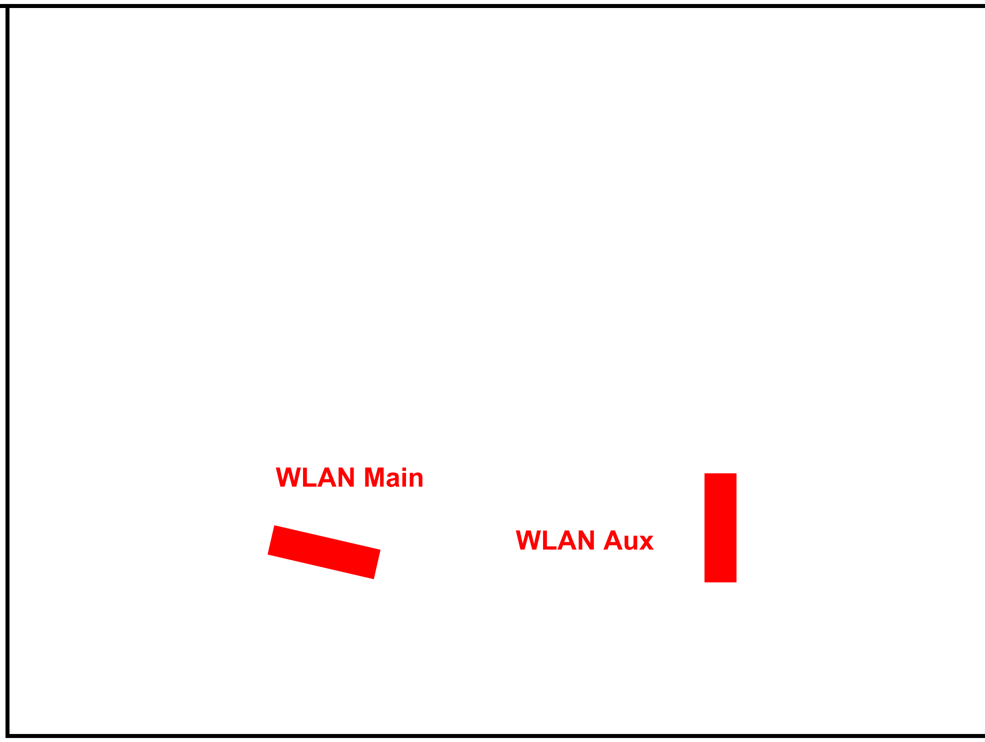
WLAN Main Antenna

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
802.11a - Legacy mode - Main Antenna				
40	5200	0.031	-0.047	0.031
802.11a - Legacy mode - Main Antenna				
60	5300	0.111	0.000	0.111
802.11n HT20 mode				
120	5600	0.066	0.000	0.066
802.11n HT20 mode				
157	5785	0.080	0.000	0.080

Notes:

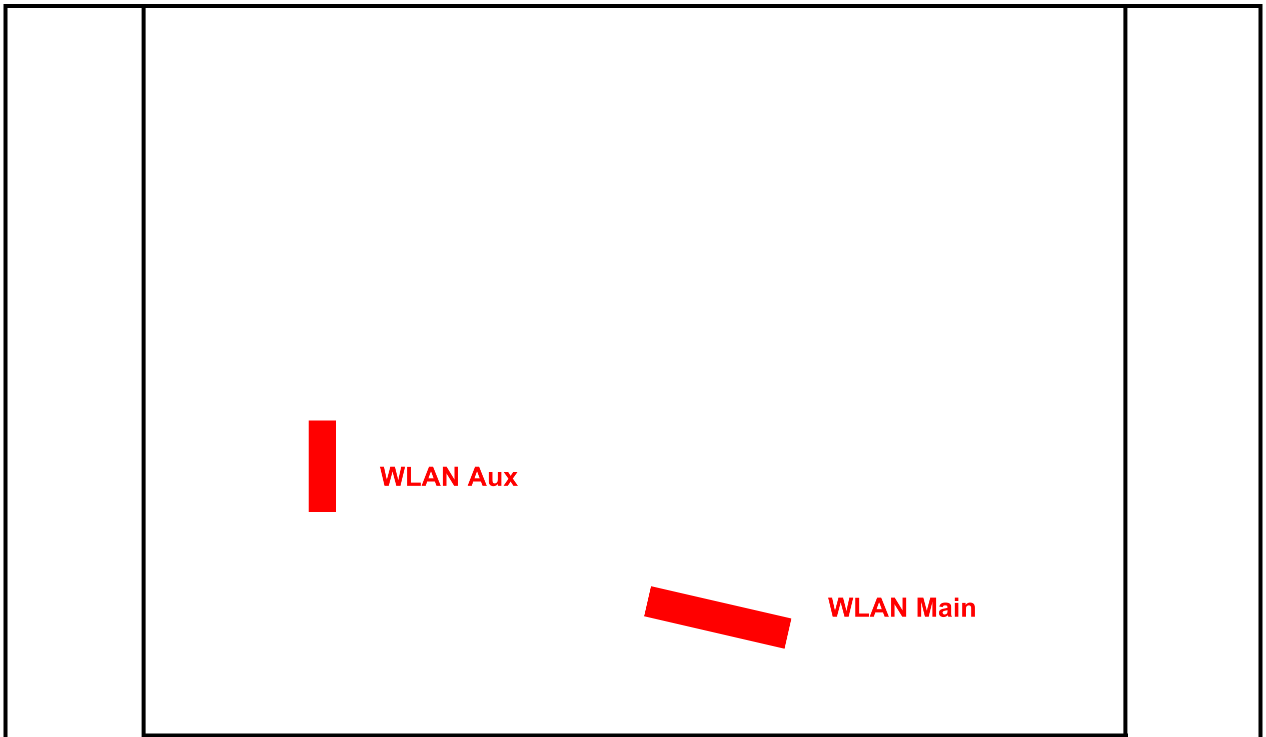
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration 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.

8.5 PRIMARY LANDSCAPE



This position was skipped due to larger distance between the antennas and the phanton

8.6 NORMAL USE POSITION



This position was skipped due to larger distance between the antennas and the phanton

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 the 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		
				MM	DD	Year
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		
SAM Phantom (SAM1)	SPEAG	QD000P40CA	1185	N/A		
SAM Phantom (SAM2)	SPEAG	QD000P40CA	1050	N/A		
Oval Flat Phantom (ELI 4.0)	SPEAG	QD OVA001 B	1003	N/A		
Electronic Probe kit	HP	85070C	N/A	N/A		
S-Parameter Network Analyzer	Agilent	8753ES-6	MY40001647	11	14	2008
E-Field Probe	SPEAG	EX3DV4	3554	4	24	2008
E-Field Probe	SPEAG	EX3DV3	3531	4	23	2010
Thermometer	ERTCO	639-1S	1718	8	30	2008
Data Acquisition Electronics	SPEAG	DAE3 V1	500	11	16	2008
System Validation Dipole	SPEAG	D2450V2	706	4	27	2008
System Validation Dipole	SPEAG	D2450V2	748	4	14	2010
System Validation Dipole	SPEAG	D5GHzV2	1003	11	21	2009
Signal Generator	R&S	SMP 04	DE34210	2	16	2009
Power Meter	Giga-tronics	8651A	8651404	1	11	2010
Power Sensor	Giga-tronics	80701A	1834588	1	11	2010
Amplifier	Mini-Circuits	ZVE-8G	360	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
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		

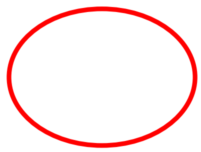
11 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	14
2-1	SAR Test Plots – Secondary Landscape Position	20
2-2	SAR Test Plots – Secondary Portrait Position	24
2-3	SAR Test Plots – Primary Portrait and Lap-held Positions	10
3	Certificate of E-Field Probe - EX3DV4SN3554	10
4	Certificate of E-Field Probe - EX3DV3SN3531	10
5	Certificate of System Validation Dipole - D2450V2 SN:748	6
6	Certificate of System Validation Dipole - D5GHzV2 SN:1003	15

12 PHOTOS

EUT

EUT Location



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END OF REPORT