SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C
IC RSS 102 ISSUE 1 : 1999

FOR

802.11N DUAL BAND CARDBUS ADAPTER

MODEL: AR5BCB-00072

FCC ID: PPD-AR5BCB-00072

REPORT NUMBER: 06U10485-10B

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Prepared for

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Prepared by

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LAB CODE:200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	August 22, 2006	Initial issue	HS
B	October 9, 2006	1) Liquid check for 5.5GHz band 2) System performance check 3) Average power for 5.5GHz band 4) SAR evaluation for 5.5GHz band	ND

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: August 15, 16, 17, 18, 21, and 22 and October 9, 2006

APPLICANT: ADDRESS:	ATHEROS COMMUNICATIONS, INC. 5480 GREAT AMERICA PARKWAY, SANTA CLARA, CA 95054, USA
FCC ID: MODEL:	PPD-AR5BCB-00072 AR5BCB-00072
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

802.11n Dual Band Cardbus Adapter (2x3) is installed in three host laptops.

Test Sample is a:	Production unit
Host Laptops:	1- HP Pavilion zv6000 2- Compaq Presario v2000 3- HP Pavilion ze4400

Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	
FCC 15.247	2412-2462	1- HP Pavilion zv6000	0.968
		2- Compaq Presario v2000	1.014
		3- HP Pavilion ze4400	**1.405**
	5745 - 5825	1- HP Pavilion zv6000	0.333
		2- Compaq Presario v2000	0.200
		3- HP Pavilion ze4400	**0.371**
FCC 15.401	5180 - 5310	1- HP Pavilion zv6000	0.242
		2- Compaq Presario v2000	0.237
		3- HP Pavilion ze4400	**0.382**
	5500 - 5700	1- HP Pavilion zv6000	0.287
		2- Compaq Presario v2000	0.195
		3- HP Pavilion ze4400	**0.422**

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) and RSS 102.

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
Compliance Certification Services

Tested By:

Ninous Davoudi
EMC Engineer
Compliance Certification Services

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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

802.11n Dual Band Cardbus Adapter (2x3) is installed in three host laptops.	
Normal operation:	Lap-held position
Accessory:	N/A
Earphone/Headset Jack:	N/A
Duty cycle:	99%
Host Device(s):	1- HP Pavilion zv6000 2- Compaq Presario v2000 3- HP Pavilion ze4400
Antenna(s)	Cardbus (2x3) has two Inverted F antennas for Tx and Rx and one PCB antenna for RX only. Cardbus (2x2) has two Inverted F antennas for Tx and Rx.
Power supply:	Power supplied through the laptop computer (host device).

2 FACILITIES AND ACCREDITATION

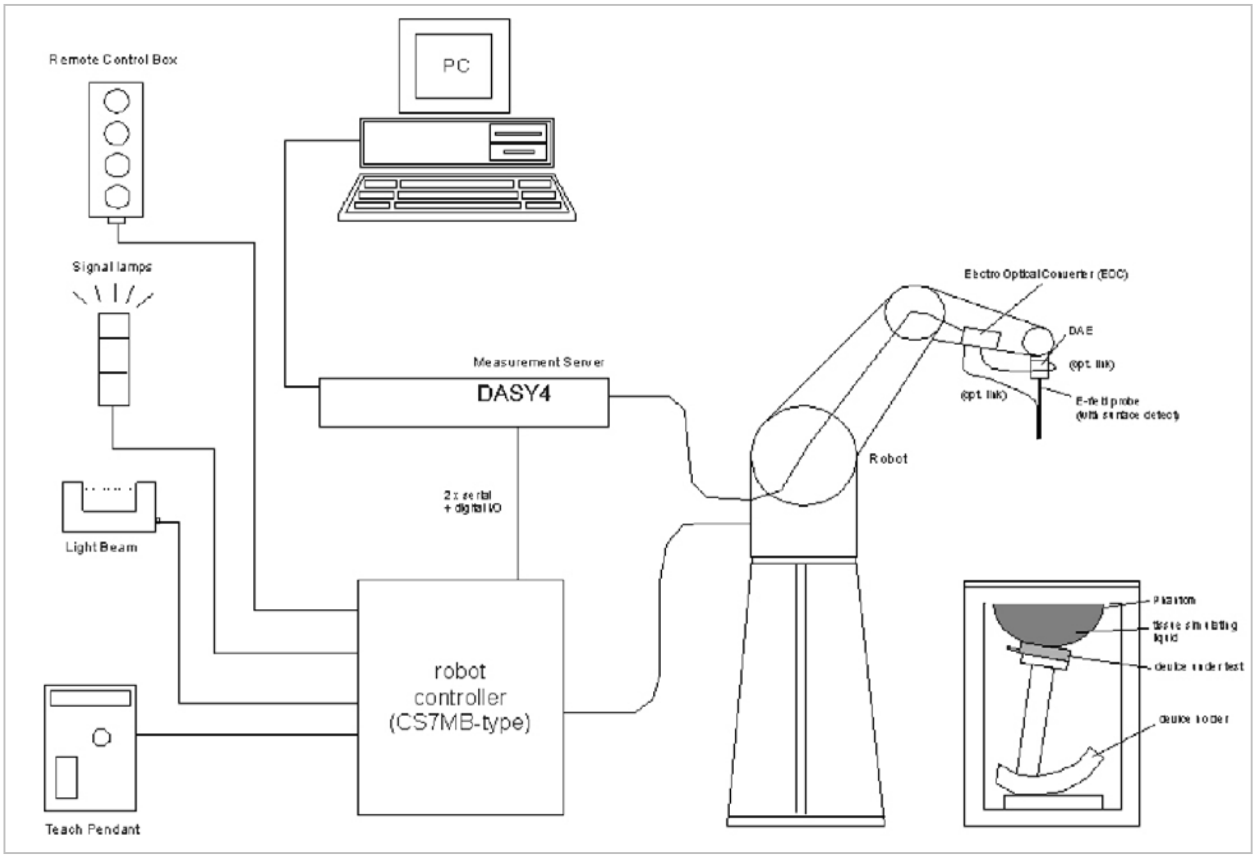
The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1,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

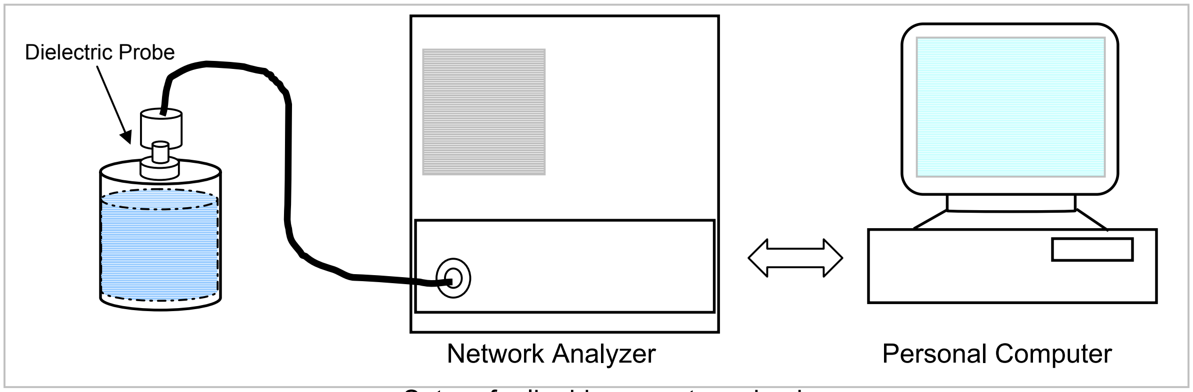
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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 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 = 23°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
2450	22	15	e'	51.5899	Relative Permittivity (ε_r):	51.5899	52.7	-2.11	? 5
			e"	14.8120	Conductivity (σ):	2.01883	1.95	3.53	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
August 15, 2006 09:07 AM

Frequency	e'	e''
2400000000.	51.7881	14.5875
2410000000.	51.7406	14.6287
2420000000.	51.7091	14.6694
2430000000.	51.6691	14.6990
2440000000.	51.6429	14.7533
2450000000.	**51.5899**	**14.8120**
2460000000.	51.5761	14.8258
2470000000.	51.5198	14.8791
2480000000.	51.4938	14.9284
2490000000.	51.4562	14.9822
2500000000.	51.4125	15.0180

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 Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 23°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
2450	22	15	e'	51.3624	Relative Permittivity (ε_r):	51.3624	52.7	-2.54	? 5
			e"	14.9083	Conductivity (σ):	2.03195	1.95	4.20	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
August 16, 2006 09:09 AM

Frequency	e'	e"
2400000000.	51.5607	14.7455
2410000000.	51.5108	14.7722
2420000000.	51.4822	14.8180
2430000000.	51.4444	14.8460
2440000000.	51.3939	14.9017
2450000000.	**51.3624**	**14.9083**
2460000000.	51.3166	14.9711
2470000000.	51.3036	14.9933
2480000000.	51.2747	15.0551
2490000000.	51.2256	15.1055
2500000000.	51.1921	15.1256

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 = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
5200	23	15	e'	48.3204	Relative Permittivity (ε_r):	48.3204	49.0	-1.39	? 5
			e"	18.9368	Conductivity (σ):	5.47809	5.30	3.36	? 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
August 17, 2006 09:23 AM

Frequency	e'	e"
4600000000.	49.6171	17.9574
4650000000.	49.5198	18.0709
4700000000.	49.4252	18.1157
4750000000.	49.3082	18.2562
4800000000.	49.2280	18.3063
4850000000.	49.0872	18.3832
4900000000.	49.0075	18.4630
4950000000.	48.8265	18.5163
5000000000.	48.7787	18.6346
5050000000.	48.6709	18.6910
5100000000.	48.5392	18.7920
5150000000.	48.4619	18.8427
5200000000.	**48.3204**	**18.9388**
5250000000.	48.2423	18.9946
5300000000.	48.1089	19.0402
5350000000.	48.0326	19.1243
5400000000.	47.9103	19.1623
5450000000.	47.8205	19.2574
5500000000.	47.7054	19.2963
5550000000.	47.6209	19.4258
5600000000.	47.5316	19.4415
5650000000.	47.4087	19.5285
5700000000.	47.3610	19.5699
5750000000.	47.1951	19.6370
5800000000.	47.1605	19.7188
5850000000.	46.9784	19.7404
5900000000.	46.9336	19.8697
5950000000.	46.8091	19.8448
6000000000.	46.6919	19.9865

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 5200 & 5800 MHz

Room Ambient Temperature = 24°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
5200	23	15	e'	47.0333	Relative Permittivity (ε_r):	47.0333	49.0	-4.01	? 5
			e"	18.9346	Conductivity (σ):	5.47745	5.30	3.35	? 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
August 18, 2006 09:08 AM

Frequency	e'	e"
4600000000.	48.2801	18.0264
4650000000.	48.1789	18.1032
4700000000.	48.0746	18.1935
4750000000.	47.9731	18.2637
4800000000.	47.8864	18.3539
4850000000.	47.7645	18.4262
4900000000.	47.6821	18.5156
4950000000.	47.6037	18.5944
5000000000.	47.4633	18.6550
5050000000.	47.3476	18.7295
5100000000.	47.2479	18.7856
5150000000.	47.1324	18.8715
5200000000.	**47.0333**	**18.9346**
5250000000.	46.9251	19.0161
5300000000.	46.8173	19.0654
5350000000.	46.7134	19.1204
5400000000.	46.6140	19.1770
5450000000.	46.5083	19.2597
5500000000.	46.3925	19.3130
5550000000.	46.3000	19.3867
5600000000.	46.2062	19.4283
5650000000.	46.0866	19.5067
5700000000.	46.0040	19.5590
5750000000.	45.8664	19.5934
5800000000.	45.7974	19.6704
5850000000.	45.6685	19.7116
5900000000.	45.5976	19.7958
5950000000.	45.4773	19.8127
6000000000.	45.3864	19.9044

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 5200 & 5800 MHz

Room Ambient Temperature = 24°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
5800	23	15	e'	45.9053	Relative Permittivity (ε_r):	45.9053	48.2	-4.76	? 5
			e"	19.3379	Conductivity (σ):	6.23959	6.00	3.99	? 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
August 21, 2006 09:11 AM

Frequency	e'	e"
4600000000.	48.2674	17.8272
4650000000.	48.1569	17.8759
4700000000.	48.0760	17.9808
4750000000.	48.0021	18.0295
4800000000.	47.8851	18.1233
4850000000.	47.8118	18.1958
4900000000.	47.7031	18.2510
4950000000.	47.5670	18.3495
5000000000.	47.4853	18.4247
5050000000.	47.3714	18.4952
5100000000.	47.2880	18.5501
5150000000.	47.1798	18.6154
5200000000.	47.0756	18.6424
5250000000.	46.9730	18.7463
5300000000.	46.8862	18.7795
5350000000.	46.7710	18.8670
5400000000.	46.6815	18.9095
5450000000.	46.5661	18.9790
5500000000.	46.4795	19.0344
5550000000.	46.3833	19.0828
5600000000.	46.2846	19.1340
5650000000.	46.1980	19.2057
5700000000.	46.1161	19.2595
5750000000.	45.9914	19.3042
5800000000.	**45.9053**	**19.3379**
5850000000.	45.8255	19.4183
5900000000.	45.7125	19.4780
5950000000.	45.6099	19.5563
6000000000.	45.5194	19.6025

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. (癈)	Depth (cm)							
5800	23	15	e'	48.5794	Relative Permittivity (ε_r):	48.5794	48.2	0.79	? 5
			e"	19.2680	Conductivity (σ):	6.21704	6.00	3.62	? 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
August 22, 2006 09:06 AM

Frequency	e'	e"
4600000000.	50.8819	17.6515
4650000000.	50.7731	17.7171
4700000000.	50.7080	17.8147
4750000000.	50.5947	17.8868
4800000000.	50.5106	17.9720
4850000000.	50.4074	18.0401
4900000000.	50.3250	18.1177
4950000000.	50.2356	18.2251
5000000000.	50.0955	18.2398
5050000000.	50.0220	18.3449
5100000000.	49.9004	18.3898
5150000000.	49.8098	18.4819
5200000000.	49.7225	18.5256
5250000000.	49.6078	18.6000
5300000000.	49.5229	18.6609
5350000000.	49.4158	18.7268
5400000000.	49.3327	18.7873
5450000000.	49.2266	18.8374
5500000000.	49.1094	18.9124
5550000000.	49.0333	18.9657
5600000000.	48.9500	19.0266
5650000000.	48.8531	19.1148
5700000000.	48.7781	19.1359
5750000000.	48.6702	19.1970
5800000000.	**48.5794**	**19.2680**
5850000000.	48.4804	19.3242
5900000000.	48.3897	19.3875
5950000000.	48.3005	19.4553
6000000000.	48.1851	19.5258

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 5600 MHz

Room Ambient Temperature = 25°C; Relative humidity = 45% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
5600	24	15	e'	49.0693	Relative Permittivity (ε_r):	49.0693	48.5	1.17	? 5
			e"	19.1516	Conductivity (σ):	5.96640	5.77	3.40	? 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg C
October 09, 2006 02:08 PM

Frequency	e'	e"
4600000000.	50.9985	17.7329
4650000000.	50.9414	17.8455
4700000000.	50.8367	17.8837
4750000000.	50.7252	17.9998
4800000000.	50.6467	18.0696
4850000000.	50.5135	18.1610
4900000000.	50.4341	18.2250
4950000000.	50.2582	18.2759
5000000000.	50.2374	18.3932
5050000000.	50.1144	18.4260
5100000000.	49.9989	18.5609
5150000000.	49.9270	18.5697
5200000000.	49.7798	18.6660
5250000000.	49.7293	18.7008
5300000000.	49.5880	18.7862
5350000000.	49.5437	18.8432
5400000000.	49.4064	18.8885
5450000000.	49.3122	18.9825
5500000000.	49.2303	19.0065
5550000000.	49.1326	19.1258
5600000000.	**49.0693**	**19.1516**
5650000000.	48.9187	19.2374
5700000000.	48.8933	19.2782
5750000000.	48.7583	19.3394
5800000000.	48.7195	19.4350
5850000000.	48.5649	19.4409
5900000000.	48.5262	19.5678
5950000000.	48.3839	19.5718
6000000000.	48.3229	19.7154

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 = 25°C; Relative humidity = 45% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
5800	24	15	e'	50.0121	Relative Permittivity (ε_r):	50.0121	48.2	3.76	? 5
			e"	18.9732	Conductivity (σ):	6.12192	6.00	2.03	? 5

Liquid Check
Ambient temperature: 25.0 deg. C; Liquid temperature: 24.0 deg C
October 09, 2006 01:37 PM

Frequency	e'	e"
4600000000.	52.1321	17.3671
4650000000.	52.0977	17.4166
4700000000.	51.9534	17.5173
4750000000.	51.9371	17.5914
4800000000.	51.7890	17.6502
4850000000.	51.7404	17.7557
4900000000.	51.6346	17.8196
4950000000.	51.5249	17.8984
5000000000.	51.4654	17.9722
5050000000.	51.3443	18.0299
5100000000.	51.2829	18.1373
5150000000.	51.1647	18.1781
5200000000.	51.0692	18.2581
5250000000.	50.9943	18.3022
5300000000.	50.8857	18.3555
5350000000.	50.8056	18.4348
5400000000.	50.7170	18.4895
5450000000.	50.6170	18.5559
5500000000.	50.5499	18.6236
5550000000.	50.4176	18.6402
5600000000.	50.3847	18.7357
5650000000.	50.2734	18.7499
5700000000.	50.1864	18.8850
5750000000.	50.1261	18.8978
5800000000.	**50.0121**	**18.9732**
5850000000.	50.0071	19.0638
5900000000.	49.9033	19.0969
5950000000.	49.8036	19.2238
6000000000.	49.7301	19.2311

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 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: August 15, 2006

Room Ambient Temperature = 23°C; Relative humidity = 50% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
2450	22	15	1g	13.00	52	51.2	1.56	? 10
			10g	5.95	23.8	23.7	0.42	? 10

Date: August 16, 2006

Room Ambient Temperature = 23°C; Relative humidity = 50% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
2450	22	15	1g	13.10	52.4	51.2	2.34	? 10
			10g	5.99	23.96	23.7	1.10	? 10

System Validation Dipole: D5GHzV2 SN 1003

Date: August 17, 2006

Room Ambient Temperature = 24°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	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

Date: August 18, 2006

Room Ambient Temperature = 24°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	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

Date: August 21, 2006

Room Ambient Temperature = 24°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
5800	23	15	1g	17.60	70.4	74.1	-4.99	? 10
			10g	4.91	19.64	20.5	-4.20	? 10

Date: August 22, 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. (癈)	Depth (cm)						
5800	23	15	1g	17.60	70.4	74.1	-4.99	? 10
			10g	4.89	19.56	20.5	-4.59	? 10

Date: October 9, 2006

Room Ambient Temperature = 25°C; Relative humidity = 45% Measured by: Sunny Shih

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
5800	24	15	1g	17.30	69.2	74.1	-6.61	? 10
			10g	4.82	19.28	20.5	-5.95	? 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

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

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

Each chain is measured separately and the combined power is calculated using:

Total Power = 10 log (10^ (Chain 0 Power / 10) + 10^ (Chain 2 Power / 10))

The cable assembly insertion loss of 21.4dB (including 20.2 dB attenuator and 1.2dB connectors) was entered as an offset in the power meter to allow for direct reading of power.

802.11b

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	2412	18.8	18.9	21.9
Middle	2437	21.3	21.1	24.2
High	2462	18.9	19.4	22.2

802.11g

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	2412	17.1	17.0	20.1
Middle	2437	20.1	20.3	23.2
High	2462	17.9	18.3	21.1

802.11n HT20

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	2412	16.4	16.9	19.7
Middle	2437	20.1	20.1	23.1
High	2462	17.4	17.5	20.5

802.11n HT40

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	2422	14.3	14.6	17.5
Middle	2437	20.1	20.2	23.2
High	2452	15.4	15.0	18.2

The cable assembly insertion loss of 21.6dB (including 19.4dB attenuator and 2.2dB connectors) was entered as an offset in the power meter to allow for direct reading of power.

802.11a

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5180	12.0	10.5	14.3
Middle	5260	18.8	17.9	21.4
High	5320	17.6	17.4	20.5

802.11n HT20

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5180	12.8	11.5	15.2
Middle	5260	18.7	17.5	21.2
High	5320	17.5	17.4	20.5

802.11n HT40

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5190	15.0	13.5	17.3
Middle	5260	19.1	16.6	21.0
High	5310	15.1	15.3	18.2

The cable assembly insertion loss of 21.3dB (including 19.1dB attenuator and 2.2dB connectors) was entered as an offset in the power meter to allow for direct reading of power.

802.11a

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5745	17.4	17.8	20.6
Middle	5785	17.7	17.5	20.6
High	5825	17.3	18.6	21.0

802.11n HT20

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5745	17.5	17.7	20.6
Middle	5785	17.6	17.6	20.6
High	5825	17.2	18.2	20.7

802.11n HT40

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5755	15.2	15.4	18.3
High	5795	18.3	18.8	21.6

The cable assembly insertion loss of 12.3dB (including 10dB attenuator and 2.3dB connectors) was entered as an offset in the power meter to allow for direct reading of power.

802.11a

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5500	18.3	18.2	21.3
Middle	5600	18.7	19.0	21.9
High	5700	18.2	18.1	21.2

802.11n HT20

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5500	18.3	18.5	21.4
Middle	5600	18.5	18.9	21.7
High	5700	18.2	18.2	21.2

802.11n HT40

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 2 (dBm)	Average Power Combined (dBm)
Low	5510	15.5	16.2	18.9
Middle	5590	18.5	18.9	21.7
High	5670	15.8	16.4	19.1

8 SAR MEASURMENT RESULTS

8.1 2.4GHZ

8.1.1 HP PAVILION ZV6000

8.1.1.1 802.11bg

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802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412	0.563	-0.102	0.576
6	**2437**	**0.952**	**-0.071**	**0.968**
11	2462	0.690	0.000	0.690

802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412			
6	2437	0.584	-0.103	0.598
11	2462			

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.

8.1.1.2 802.11n

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802.11n HT20 (6.5Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412			
6	2437	0.592	0.000	0.592
11	2462			

802.11n HT40 (13.5Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2422			
6	2437	0.627	-0.036	0.632
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 COMPAQ PRESARIO V2000

8.1.2.1 802.11bg

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802.11b (1Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412	0.539	0.000	0.539
6	**2437**	**0.973**	**-0.178**	**1.014**
11	2462	0.560	0.000	0.560

802.11g (6Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412			
6	2437	0.476	0.000	0.476
11	2462			

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.

8.1.2.2 802.11n

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802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.581	-0.021	0.584
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1 6 11	2422 2437 2452	0.615	-0.033	0.620

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 HP PAVILION ZE4400

8.1.3.1 802.11bg

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802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412	1.100	0.000	1.100
6	**2437**	**1.390**	**-0.047**	**1.405**
11	2462	1.140	-0.039	1.150
802.11g (6Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412	0.538	0.000	0.538
6	2437	1.060	-0.121	1.090
11	2462	0.615	-0.172	0.640

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.

8.1.3.2 802.11n

Photos are confidential, please see a seperate file

802.11n HT20 (6.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2412	0.533	0.000	0.533
6	2437	0.859	-0.145	0.888
11	2462	0.457	0.000	0.457
802.11n HT40 (13.5Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
1	2422	0.278	0.000	0.278
6	2437	1.100	-0.117	1.130
11	2452	0.276	0.000	0.276

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 HP PAVILION ZV6000

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802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.211	-0.136	0.218
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.195	0.000	0.195
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38	5190	0.059	0.000	0.059
52	**5260**	**0.240**	**-0.033**	**0.242**
62	5310	0.109	0.000	0.109

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 COMPAQ PRESARIO V2000

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802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36	5180	0.026	-0.162	0.027
52	**5260**	**0.230**	**-0.128**	**0.237**
64	5320	0.174	-0.024	0.175
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.179	0.000	0.179
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38 52 62	5190 5260 5310	0.215	0.000	0.215

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 HP PAVILION ZE4400

Photos are confidential, please see a seperate file

802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.325	-0.059	0.329
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.324	-0.078	0.330
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
38	5190	0.088	-0.151	0.092
52	**5260**	**0.372**	**-0.113**	**0.382**
62	5310	0.160	-0.086	0.163

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 5.8GHZ

8.3.1 HP PAVILION ZV6000

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802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.210	0.000	0.210
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.187	-0.043	0.189
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
151	5755	0.203	0.000	0.203
159	**5795**	**0.331**	**-0.026**	**0.333**

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 COMPAQ PRESARIO V2000

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802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.158	-0.012	0.158
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.132	-0.151	0.137
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
151	5755	0.147	0.000	0.147
159	**5795**	**0.193**	**-0.162**	**0.200**

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.

8.3.3 HP PAVILION ZE4400

Photos are confidential, please see a seperate file

802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.236	0.000	0.236
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149 157 165	5745 5785 5825	0.196	0.000	0.196
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
151	5755	0.201	0.000	0.201
159	**5795**	**0.366**	**-0.055**	**0.371**

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 5.5GHZ

8.4.1 HP PAVILION ZV6000

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802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
100	5500			
120	5600	0.275	0.000	0.275
149	5700			
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
100	5500			
120	**5600**	**0.283**	**-0.059**	**0.287**
149	5700			
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
102	5510			
118	5590	0.280	0.000	0.280
134	5670			

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 COMPAQ PRESARIO V2000

Photos are confidential, please see a seperate file

802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
100	5500			
120	5600	0.173	0.000	0.173
149	5700			
802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
100	5500			
120	**5600**	**0.195**	**0.000**	**0.195**
149	5700			
802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
102	5510			
118	5590	0.190	0.000	0.190
134	5670			

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.

8.4.3 HP PAVILION ZE4400

Photos are confidential, please see a seperate file

802.11a (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
100	5500	0.318	-0.005	0.318
120	**5600**	**0.422**	**0.000**	**0.422**
149	5700	0.318	-0.163	0.330

802.11n HT20 (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
100	5500			
120	5600	0.380	0.000	0.380
149	5700			

802.11n HT40 (13.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
102	5510			
118	5590	0.387	0.000	0.387
134	5670			

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.

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

802.11n Dual Band Cardbus Adapter (2X3)

Photos are confidential, please see a seperate file

802.11n Dual Band Cardbus Adapter (2X2)

Photos are confidential, please see a seperate file

HP Pavilion zv6000

Photos are confidential, please see a seperate file

Compaq Presario v2000

Photos are confidential, please see a seperate file

HP Pavilion ze4400

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12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	14
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2-1	SAR Test Plots-2.4GHz	27
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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