SAR Evaluation Report

**IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC REPORT AND ORDER:
ET DOCKET 93-62, AND OET BULLETIN 65 SUPPLEMENT C
AND RSS-102 ISSUE 1 (PROVISIONAL) SEPTEMBER 25, 1999**

FOR

2.4GHz 802.11n CARDBUS

MODEL: AR5BCB-00071

FCC ID: PPD-AR5BCB-00071

REPORT NUMBER: 06U10183-5B

ISSUE DATE: APRIL 1, 2006

Prepared for

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LAB CODE:200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	March 30, 2006	Initial issue	HS
B	April 1, 2006	Additional SAR Tests for alternate housing. New materials are: 1- Simulating liquid parameter check results 2- System performance check results 3- SAR measurement results for 2.4GHz 802.11n cardbus with alternate housing 4- Photos 5- Attachments	ND

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: March 27, 28, 29, and April 1, 2006

APPLICANT: ADDRESS:	ATHEROS COMMUNICATIONS, INC 5480 GREAT AMERICA PARKWAY, SANTA CLARA, CA 95054, USA
FCC ID: MODEL:	PPD-AR5BCB-00071 AR5BCB-00071
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

2.4GHz 802.11n Cardbus is installed in three host laptops. 2.4GHz 802.11n Cardbus has an alternate housing.

Test Sample is a:	Production unit	
Modulation type:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11g Orthogonal Frequency Division Multiplexing (OFDM) for 802.11n HT20 Orthogonal Frequency Division Multiplexing (OFDM) for 802.11n HT40	
Host Laptops	Host 1: Dell Inspiron 6000 Host 2: Compaq Presario V2000 Host 3: HP Pavilion ZV6000	
Antenna(s)	EUT utilizes two Inverted-F antennas for transmit and receive and one PCB Integrated monopole antenna for receiving only.	
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]
FCC 15.247 RSS102	2412 - 2462	Host 1: 0.865 Host 2: 0.820 Host 3: 0.846

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

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

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1 EQUIOMENT UNDER TEST (EUT) DESCRIPTION

The EUT is an 802.11n MIMO transceiver in cardbus form factor. . It has two transmitter chains and three receive chains (2x3 configurations). The 2x3 configuration is implemented with two outside chains (Chain 0 and 2) and the middle chain (chain 1) Rx only. The device may be sold in a 2x2 configuration where the middle receive chain is depopulated.

RF TX chains #0 & #2 connect to Inverted-F Antennas for Tx/Rx; RF chain #1 connects to a PCB Antenna for Rx only.

The EUT description was changed after testing commenced. All data in this report is applicable to the EUT description documented in Section 1 above.

There two housing included in this report, both housings are identical in term of PCB design / layout. The original housing does not incorporate gasket on the top of metal plate and the bottom of PCB. The alternate housing has incorporated gaskets on both positions. The alternate housing is using same plastic and metal material, the alternate housing is litter thicker (the difference is < 1 mm) than the original housing.

Normal operation:	Lap-held position.
Accessory:	N/A
Earphone/Headset Jack:	N/A
Duty cycle:	99%
Host Device(s):	Host 1: Dell Inspiron 6000 Host 2: Compaq Presario V2000 Host 3: HP Pavilion ZV6000
Antenna(s)	EUT utilizes two Inverted-F antennas for transmit and receive and one PCB Integrated monopole antenna for receiving only.
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.

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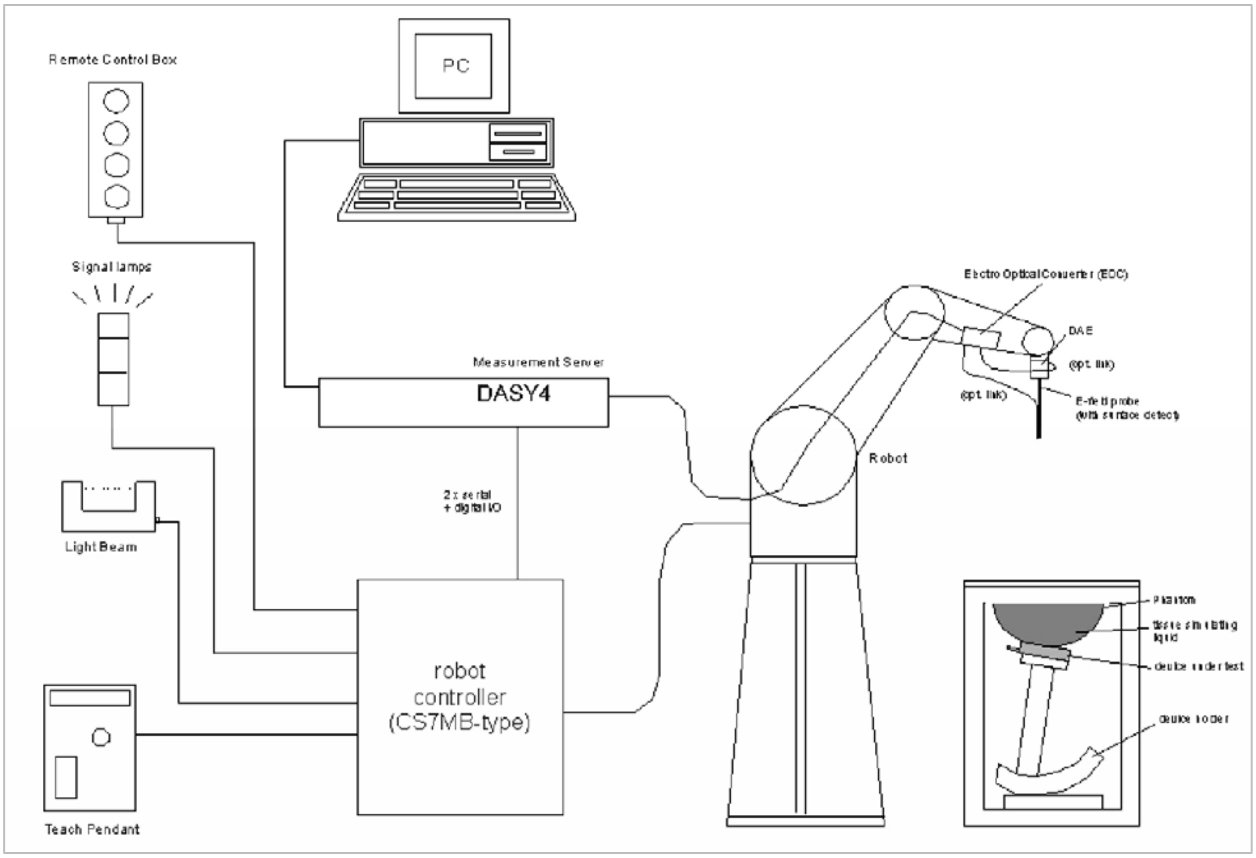
3 SYSTEM DESCRIPTION



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 INGREDIANTS FOR TISSUE SIMULATIG LIQUIDS

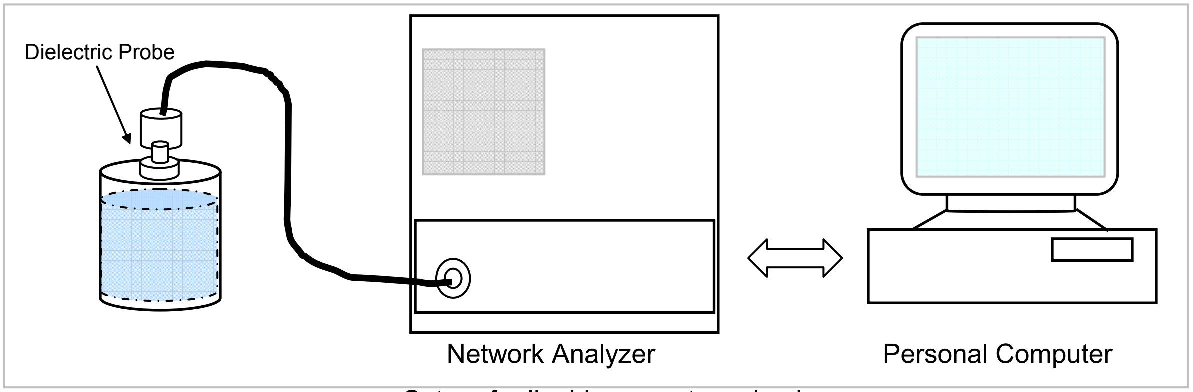
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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)

4.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

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

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (蚓)	Depth (cm)						
2450	22	15	e"	Relative Permittivity (e'):	52.7	52.4805	-0.42	? 5
			14.7883	Conductivity (σ):	1.95	2.01560	3.36	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
March 28, 2006 09:02 AM

Frequency	e'	e"
2400000000.	52.6623	14.5911
2410000000.	52.6199	14.6145
2420000000.	52.5871	14.6533
2430000000.	52.5476	14.6975
2440000000.	52.5182	14.7602
2450000000.	52.4805	14.7883
2460000000.	52.4294	14.8462
2470000000.	52.4170	14.8854
2480000000.	52.3735	14.9467
2490000000.	52.3391	14.9929
2500000000.	52.3048	15.0322

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 = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (蚓)	Depth (cm)						
2450	22	15	e"	Relative Permittivity (e'):	52.7	52.4612	-0.45	? 5
			14.8477	Conductivity (σ):	1.95	2.02369	3.78	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
March 29, 2006 09:06 AM

Frequency	e'	e"
2400000000.	52.6405	14.6374
2410000000.	52.6028	14.6704
2420000000.	52.5667	14.6944
2430000000.	52.5354	14.7628
2440000000.	52.5043	14.7971
2450000000.	52.4612	14.8477
2460000000.	52.4203	14.8809
2470000000.	52.3967	14.9349
2480000000.	52.3533	14.9961
2490000000.	52.3176	15.0443
2500000000.	52.2890	15.0877

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 = 35% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (蚓)	Depth (cm)						
2450	22	15	e"	Relative Permittivity (e'):	52.7	50.3297	-4.50	? 5
			14.6315	Conductivity (σ):	1.95	1.99422	2.27	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
April 01, 2006 08:17 AM

Frequency	e'	e''
2400000000.	50.5207	14.4139
2410000000.	50.4834	14.4407
2420000000.	50.4347	14.4780
2430000000.	50.4142	14.5255
2440000000.	50.3722	14.5779
2450000000.	50.3297	14.6315
2460000000.	50.2869	14.6537
2470000000.	50.2544	14.7040
2480000000.	50.2322	14.7495
2490000000.	50.1857	14.8038
2500000000.	50.1431	14.8539

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.

5.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D2450V2 SN: 748

Date: March 28, 2006

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

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [蚓]	Depth [cm]	1g	Normalized to 1 W			
2450	22	15	12.40	49.6	51.2	-3.13	? 10
			10g	Normalized to 1 W	Target_10g	Deviation[%]	Limit [%]
			5.67	22.68	23.7	-4.30	? 10

System Validation Dipole: D2450V2 SN: 748

Date: March 29, 2006

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

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [蚓]	Depth [cm]	1g	Normalized to 1 W			
2450	22	15	12.90	51.6	51.2	0.78	? 10
			10g	Normalized to 1 W	Target_10g	Deviation[%]	Limit [%]
			5.85	23.4	23.7	-1.27	? 10

System Validation Dipole: D2450V2 SN: 748

Date: April 1, 2006

Ambient Temperature = 23°C; Relative humidity = 35% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [蚓]	Depth [cm]	1g	Normalized to 1 W			
2450	22	15	12.90	51.6	51.2	0.78	? 10
			10g	Normalized to 1 W	Target_10g	Deviation[%]	Limit [%]
			5.89	23.56	23.7	-0.59	? 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, v0_1_b2, which enables a user to control the frequency and output power of the module.

The settings for the power are controlled by PCDAC menu option in Art program.

The cable assembly insertion loss of 21.95dB (including 20.55dB pad and 1.4dB for cable connector) was entered as an offset in the power meter to allow for direct reading of power.

b mode 1 Mbs

Channel	Frequency (MHz)	Chain 0 Average Power (dBm)	Chain 2 Average power (dBm)
Low	2412	21.19	21.98
Middle	2437	21.91	21.96
High	2462	19.62	19.63

g mode 6 Mbs

Channel	Frequency (MHz)	Chain 0 Average Power (dBm)	Chain 2 Average power (dBm)
Low	2412	17.57	18.18
Middle	2437	20.94	20.79
High	2462	18.60	18.33

HT20 mode 6.5 Mbs

Channel	Frequency (MHz)	Chain 0 Average Power (dBm)	Chain 2 Average power (dBm)
Low	2412	17.02	17.95
Middle	2437	21.07	21.02
High	2462	18.78	18.56

HT40 mode 13.5 Mbs

Channel	Frequency (MHz)	Chain 0 Average Power (dBm)	Chain 2 Average power (dBm)
Low	2422	15.32	16.32
Middle	2437	19.93	20.17
High	2452	17.43	17.66

8 SAR RESULTS FOR 2.4GHZ 802.11N CARDBUS

8.1 LAPTOP # 1-DELL INSPIRON 6000

802.11b (1Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.266	0.000	0.266
6	2437	0.857	-0.040	**0.865**
11	2462	0.571	0.000	0.571
6[3]	2437	0.545	0.000	0.545
6[4]	2437	0.353	0.000	0.353
802.11g (6 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.189	-0.113	0.194
6	2437	0.408	-0.174	0.425
11	2462	0.310	0.000	0.310

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.
3) Power Save Mode when only chain0 is operational. For normal mode, both chain0 and chain2 are operational.
4) Power Save Mode when only chain2 is operational. For normal mode, both chain0 and chain2 are operational.

802.11g MIMO 20MHz Operation (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.198	0.000	0.198
6	2437	0.428	-0.058	0.434
11	2462	0.289	-0.021	0.290
802.11g MIMO 40MHz Operation (13.5 Mbps)				
Channel[3]	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1, 5	2422	0.139	-0.085	0.142
4, 8	2437	0.395	-0.021	0.397
7, 11	2452	0.251	0.000	0.251

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.
3) Channel numbers of control & extension channels.

8.2 LAPTOP # 2-COMPAQ PRESARIO V2000

802.11b (1Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.513	-0.082	0.523
6	2437	0.793	-0.148	**0.820**
11	2462	0.404	-0.069	0.410
6[4]	2437	0.379	0.000	0.379
6[5]	2437	0.265	0.000	0.265

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412			
6	2437	0.411	-0.124	0.423
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.
4) Power Save Mode when only chain0 is operational. For normal mode, both chain0 and chain2 are operational.
5) Power Save Mode when only chain2 is operational. For normal mode, both chain0 and chain2 are operational.

802.11g MIMO 20MHz Operation (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1)] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.460	-0.104	0.471
802.11g MIMO 40MHz Operation (13.5 Mbps)				
Channel[4)]	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1)] SAR 1g (mW/g)
1, 5 4, 8 7, 11	2422 2437 2452	0.330	-0.159	0.342

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) Channel numbers of control & extension channels.

8.3 LAPTOP # 3-HP PAVALION ZV6000

802.11b (1Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.757	0.000	0.757
6	2437	0.846	0.000	**0.846**
11	2462	0.771	0.000	0.771
6[4]	2437	0.475	0.000	0.475
6[5]	2437	0.301	0.000	0.301

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412			
6	2437	0.479	-0.037	0.483
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.
4) Power Save Mode when only chain0 is operational. For normal mode, both chain0 and chain2 are operational.
5) Power Save Mode when only chain2 is operational. For normal mode, both chain0 and chain2 are operational.

802.11g MIMO 20MHz Operation (6.5 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412			
6	2437	0.489	-0.054	0.495
11	2462			

802.11g MIMO 40MHz Operation (13.5 Mbps)

Channel[4]	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1,5	2422			
4,8	2437	0.400	-0.0707	0.407
7,11	2452			

Notes:

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

9 SAR RESULTS FOR 2.4GHZ 802.11N CARDBUS WITH ALTERNATE HOUSING

9.1 LAPTOP # 1-DELL INSPIRON 6000

802.11b (1Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412	0.534	-0.196	0.559
6	2437	0.747	-0.208	**0.784**
11	2462	0.531	-0.151	0.550
6[3]	2437	0.438	0.000	0.438
6[4]	2437	0.410	-0.030	0.413

802.11g (6 Mbps)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1] SAR 1g (mW/g)
1	2412			
6	2437	0.348	-0.039	0.351
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) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
3) Power Save Mode when only chain0 is operational. For normal mode, both chain0 and chain2 are operational.
4) Power Save Mode when only chain2 is operational. For normal mode, both chain0 and chain2 are operational.

802.11g MIMO 20MHz Operation (6.5 Mbps)				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1)] SAR 1g (mW/g)
1 6 11	2412 2437 2462	0.451	-0.193	0.471

802.11g MIMO 40MHz Operation (13.5 Mbps)				
Channel[3)]	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dBm)	Extrapolated[1)] SAR 1g (mW/g)
1, 5 4, 8 7, 11	2422 2437 2452	0.285	-0.073	0.290

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.
3) Channel numbers of control & extension channels.

10 MEASURMENT UNCERTAINTY

10.1 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

11 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	EX3DV3	3531	7/21/06
Thermometer	ERTCO	639-1	8636	10/20/06
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	748	5/14/06
Power Meter	Giga-tronics	8651A	8651404	12/27/06
Power Sensor	Giga-tronics	80701A	1834588	12/27/07
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A
Radio Communication Tester	Rohde & Schwarz	CMU 200	838114/032	12/17/06
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test