SAR Evaluation Report

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

FOR

WIRELESS WIFI LINK 4965AG

MODEL: PA3539U-1MPC

FCC ID: CJ6UPA3539WL
IC: 248H-DPA3539W

REPORT NUMBER: 07U11379-8

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Prepared for

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DIGITAL MEDIA NETWORK COMPANY
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	11/1/07	Initial issue	Hsin Fu Shih

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: October 25, 26, 27 and 28 2007

APPLICANT: ADDRESS:	TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY OME COMPLEX, 2-9, SUEHIRO-CHO TOKYO, 198-8710, JAPAN
FCC ID: MODEL:	CJ6UPA3539WL PA3539U-1MPC
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

WIRELESS WIFI LINK 4965AG IS INSTALLED IN TOSHIBA PROTÉGÉ M700 TABLET, ALONG WITH BLUETOOTH MODULE FCC ID: RYYEYTFXCS

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

Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	Collocation SAR Values [1g_mW/g]
FCC 15.247	2412 - 2462	0.335	0.331
	5745 - 5825	1.481	1.492
FCC 15.407	5180 - 5320	1.010	1.010

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
Engineering Supervisor
Compliance Certification Services

Tested By:

Jonathan King
EMC Engineer
Compliance Certification Services

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1 DEVICE UNDER TEST (DUT) DESCRIPTION

WIRELESS WIFI LINK 4965AG IS INSTALLED IN TOSHIBA PROTÉGÉ M700 TABLET, ALONG WITH BLUETOOTH MODULE FCC ID: RYYEYTFXCS	
Normal operation:	Lap-held position, and underarm position
Duty cycle:	B mode: 98% G mode: 91% A mode: 91%
Host Device(s):	Toshiba Protégé M700 Tablet
Antenna(s)	PIFA type, Tyco Electronics P/N: TBN003
Power supply:	Power supplied through the laptop computer (host device).

2 FACILITIES AND ACCREDITATION

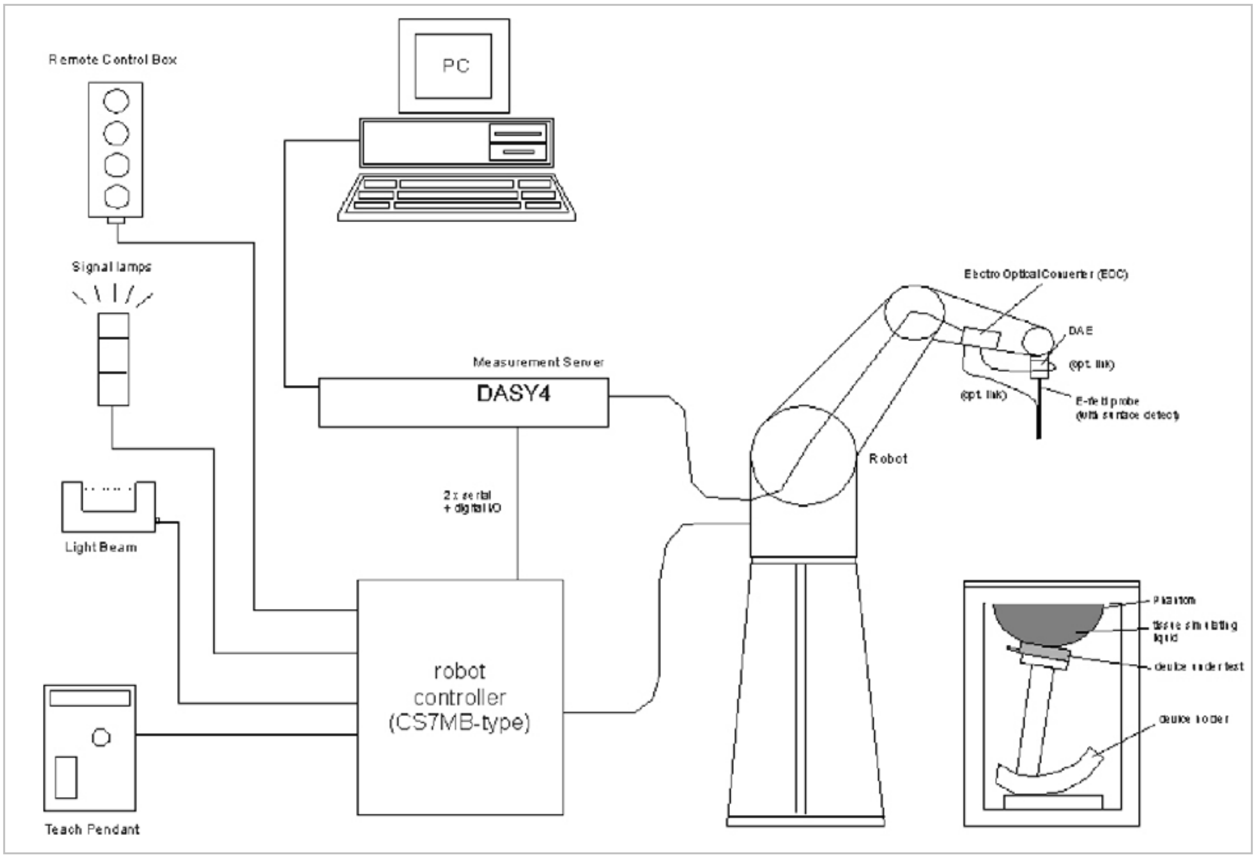
The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, CA 94538 USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, “Radio 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.

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 SIMULATING LIQUIDS

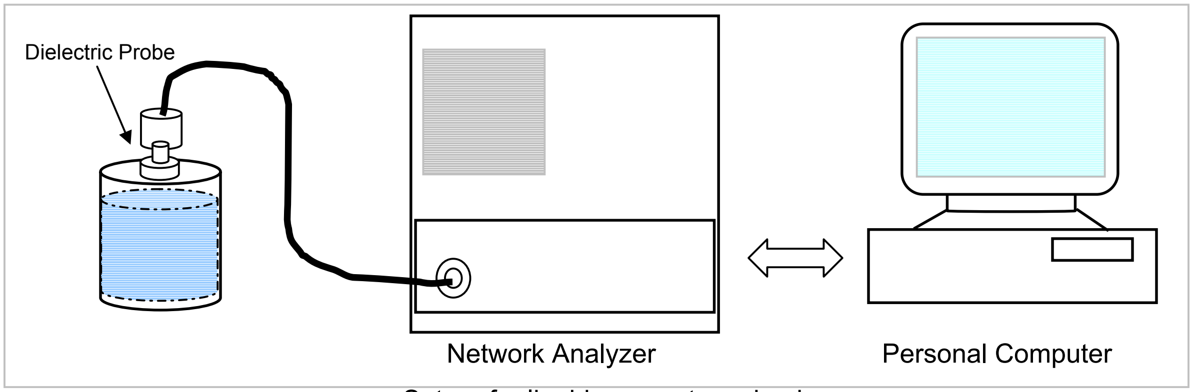
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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 = 50% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	23	15	e'	50.7228	Relative Permittivity (ε_r):	50.7228	52.7	-3.75	± 5
			e"	14.8991	Conductivity (σ):	2.03070	1.95	4.14	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
October 28, 2007 12:36 AM

Frequency	e'	e"
2400000000.	50.8930	14.6762
2405000000.	50.8776	14.7086
2410000000.	50.8579	14.7463
2415000000.	50.8402	14.7671
2420000000.	50.8333	14.7751
2425000000.	50.7980	14.7957
2430000000.	50.7933	14.8232
2435000000.	50.7836	14.8461
2440000000.	50.7749	14.8606
2445000000.	50.7420	14.8789
2450000000.	**50.7228**	**14.8991**
2455000000.	50.6999	14.9461
2460000000.	50.6793	14.9646
2465000000.	50.6564	14.9568
2470000000.	50.6393	14.9715
2475000000.	50.6000	14.9917
2480000000.	50.5879	15.0189
2485000000.	50.5744	15.0445
2490000000.	50.5491	15.0664
2495000000.	50.5317	15.0823
2500000000.	50.5189	15.0928

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 = 25°C; Relative humidity = 45% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	24	15	e'	46.4351	Relative Permittivity (ε_r):	46.4351	49.0	-5.23	± 10
			e''	18.6130	Conductivity (σ):	5.38442	5.30	1.59	± 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
October 26, 2007 12:29 PM

Frequency	e'	e''
4600000000.	47.6572	17.7799
4650000000.	47.5527	17.8728
4700000000.	47.4983	17.9236
4750000000.	47.3238	18.0222
4800000000.	47.3088	18.0947
4850000000.	47.1345	18.1384
4900000000.	47.0909	18.2467
4950000000.	46.9737	18.2986
5000000000.	46.8452	18.3884
5050000000.	46.8038	18.4411
5100000000.	46.6213	18.5043
5150000000.	46.5810	18.6039
5200000000.	**46.4351**	**18.6130**
5250000000.	46.3311	18.7192
5300000000.	46.2642	18.7381
5350000000.	46.1260	18.8282
5400000000.	46.0714	18.8782
5450000000.	45.9395	18.9148
5500000000.	45.8514	18.9990
5550000000.	45.7561	19.0503
5600000000.	45.6232	19.0811
5650000000.	45.6010	19.1769
5700000000.	45.4448	19.1718
5750000000.	45.3631	19.3015
5800000000.	45.3127	19.2934
5850000000.	45.1308	19.3611
5900000000.	45.1020	19.4371
5950000000.	44.9331	19.4623
6000000000.	44.8746	19.5723

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 = 50% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	24	15	e'	46.0089	Relative Permittivity (ϵ_r):	46.0089	48.2	-4.55	± 10
			e"	19.2928	Conductivity (σ):	6.22504	6.00	3.75	± 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
October 27, 2007 04:02 PM

Frequency	e'	e"
4600000000.	48.3306	17.7180
4650000000.	48.1827	17.7312
4700000000.	48.1060	17.9493
4750000000.	48.0439	17.8535
4800000000.	47.8800	18.0834
4850000000.	47.8929	18.0386
4900000000.	47.6846	18.1413
4950000000.	47.6055	18.2841
5000000000.	47.5251	18.2253
5050000000.	47.3949	18.4483
5100000000.	47.3670	18.3491
5150000000.	47.1651	18.5393
5200000000.	47.1541	18.5617
5250000000.	47.0112	18.5518
5300000000.	46.9084	18.7817
5350000000.	46.8511	18.6439
5400000000.	46.6762	18.8439
5450000000.	46.6829	18.8282
5500000000.	46.4805	18.8696
5550000000.	46.4314	19.0185
5600000000.	46.3660	18.9150
5650000000.	46.1690	19.1561
5700000000.	46.1982	19.0870
5750000000.	45.9650	19.1848
5800000000.	**46.0089**	**19.2928**
5850000000.	45.8443	19.1924
5900000000.	45.7255	19.4538
5950000000.	45.7192	19.3181
6000000000.	45.4794	19.5034

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 = 25°C; Relative humidity = 50% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	24	15	e'	49.3414	Relative Permittivity (ε_r):	49.3414	48.2	2.37	± 10
			e''	19.4114	Conductivity (σ):	6.26331	6.00	4.39	± 5

Liquid Check
Ambient temperature: 25 deg. C; Liquid temperature: 24 deg. C
October 25, 2007 04:25 PM

Frequency	e'	e''
5950000000.	44.4670	19.4395
6000000000.	44.4163	19.5285
4600000000.	51.5191	17.7151
4650000000.	51.6163	17.7956
4700000000.	51.4244	17.8936
4750000000.	51.3755	17.8930
4800000000.	51.3167	18.0811
4850000000.	51.1692	18.0903
4900000000.	51.1074	18.3127
4950000000.	50.8888	18.2327
5000000000.	50.9221	18.4502
5050000000.	50.8973	18.4922
5100000000.	50.7876	18.5434
5150000000.	50.6925	18.7673
5200000000.	50.5191	18.6864
5250000000.	50.4776	18.8841
5300000000.	50.3628	18.7959
5350000000.	50.2595	18.9180
5400000000.	50.2669	18.9670
5450000000.	50.0184	18.9888
5500000000.	50.0311	19.1316
5550000000.	49.7845	18.9095
5600000000.	49.7822	19.1799
5650000000.	49.6961	19.0466
5700000000.	49.4602	19.3783
5750000000.	49.6388	19.3062
5800000000.	**49.3414**	**19.4114**
5850000000.	49.6821	19.5612
5900000000.	49.2689	19.4532
5950000000.	49.3668	19.8677
6000000000.	49.3268	19.6667

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: 3554 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: 706

Date: October 28, 2007

Ambient Temperature = 24°C; Relative humidity = 50% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	23	15	1g	13.40	53.6	51.2	4.69	± 10
			10g	6.19	24.76	23.7	4.47	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: October 26, 2007

Ambient Temperature = 25°C; Relative humidity = 45% 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	18.40	73.6	71.8	2.51	± 10
			10g	5.26	21.04	20.1	4.68	± 10

Date: October 25, 2007

Ambient Temperature = 25°C; Relative humidity = 50% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	24	15	1g	19.10	76.4	74.1	3.10	± 10
			10g	5.34	21.36	20.5	4.20	± 10

Date: October 27, 2007

Ambient Temperature = 25°C; Relative humidity = 50% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	24	15	1g	19.00	76	74.1	2.56	± 10
			10g	5.31	21.24	20.5	3.61	± 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 DUT. 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 DUT 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 DUT 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 DUT 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 DUT 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=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 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 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, CRTU, which enables a user to control the frequency and output power of the module.

2.4GHz Band

802.11b

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	2412	15.5	15.4	18.5
Middle	2437	15.7	15.6	18.7
High	2462	16.7	16.7	19.7

802.11g

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	2412	16.7	16.5	19.6
Middle	2437	17.6	17.6	20.6
High	2462	16.6	16.8	19.7

802.11n 20M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	2412	15.6	15.6	18.6
Middle	2437	15.6	15.6	18.6
High	2462	15.6	15.6	18.6

802.11n MIMO 20M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	2422	14.7	14.4	17.6
Middle	2437	14.6	14.4	17.5
High	2452	14.6	14.4	17.5

5.2GHz Band

802.11a

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5180	16.5	16.4	19.5
Middle	5260	17.5	17.6	20.6
High	5320	16.5	16.5	19.5

802.11n 20M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5180	17.5	17.5	20.5
Middle	5260	17.5	17.5	20.5
High	5320	16.6	16.5	19.6

802.11n 40M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5190	15.4	15.4	18.4
Middle	5270	17.4	17.5	20.5
High	5310	15.4	15.5	18.5

802.11n MIMO 20M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5180	12.6	12.5	15.6
Middle	5260	14.7	14.6	17.7
High	5320	14.6	14.4	17.5

802.11n MIMO 40M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5190	12.7	12.8	15.8
Middle	5270	14.6	14.7	17.7
High	5310	14.6	14.7	17.7

5.8GHz Band

802.11a

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5745	17.6	17.5	20.6
Middle	5785	17.6	17.6	20.6
High	5825	17.6	17.6	20.6

802.11n 20M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5745	17.6	17.5	20.6
Middle	5785	17.4	17.5	20.5
High	5825	17.5	17.5	20.5

802.11n 40M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5755	17.3	17.4	20.4
High	5795	17.6	17.5	20.6

802.11n 20M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5745	14.5	14.4	17.5
Middle	5785	14.5	14.5	17.5
High	5825	14.5	14.6	17.6

802.11n 40M

Channel	Frequency (MHz)	Average Power Chain A (dBm)	Average Power Chain B (dBm)	Average Power Total (dBm)
Low	5755	14.6	14.7	17.7
High	5795	14.6	14.6	17.6

8 SAR MEASURMENT RESULTS

8.1 2.4 GHZ BAND

8.1.1 SECONDARY LANDSCAPE

802.11b 2.4 GHz Chain A (Main)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
6	2437	0.193	0.000	0.193
802.11b 2.4 GHz Chain B (Sub-A)				
6	2437	0.223	0.000	0.223
802.11g 2.4 GHz Chain A (Main)				
6	**2437**	**0.331**	**-0.055**	**0.335**
6[4)]	**2437**	**0.323**	**-0.109**	**0.331**
802.11g 2.4 GHz Chain B (Sub-A)				
6	2437	0.319	0.000	0.319
802.11n 2.4 GHz MIMO 20 MHz Bandwidth *MIMO CONFIGURATIONS WAS MEASURED WITH ALL ANTENNAS TRANSMITTING SIMULTANEOUSLY*				
6	2437	0.177	0.000	0.177

Notes:

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

8.1.2 LAP HELD

NOTE: Testing for 802.11b mode and MIMO configuration were skipped due significantly lower output power and low SAR measurement from the 802.11g mode.

802.11g 2.4 GHz Chain A (Main)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
1	2412			
6	2437	0.097	0.000	0.097
11	2462			
802.11g 2.4 GHz Chain B (Sub-A)				
1	2412			
6	2437	0.102	-0.030	0.103
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.

8.1.3 PRIMARY PORTRAIT

NOTE: Testing for 802.11b mode and MIMO configuration were skipped due significantly lower output power and low SAR measurement from the 802.11g mode.

802.11g 2.4 GHz Chain A (Main)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
1	2412			
6	2437	0.084	0.000	0.084
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.

8.1.4 SECONDARY PORTRAIT

NOTE: Testing for 802.11b mode and MIMO configuration were skipped due significantly lower output power and low SAR measurement from the 802.11g mode.

802.11g 2.4 GHz Chain B (Sub-A)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
1	2412			
6	2437	0.069	-0.090	0.070
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.

8.1.5 PRIMARY LANDSCAPE

NOTE: This position was not tested due to the large distance between the antennas and the phantom.

8.2 5.2 GHZ BAND

8.2.1 SECONDARY LANDSCAPE

802.11a 5.2 GHz Chain A (Main)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
52	5260	0.741	0.000	0.741
[4]	5260	0.753	0.000	0.753
802.11a 5.2 GHz Chain B (Sub-A)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
36	5180	0.852	-0.096	0.871
52	**5260**	**1.010**	**0.000**	**1.010**
64	5320	0.744	0.000	0.744
52[4]	**5260**	**1.010**	**0.000**	**1.010**
802.11n 5.2 GHz MIMO 20 MHz Bandwidth *MIMO CONFIGURATIONS WAS MEASURED WITH ALL ANTENNAS TRANSMITTING SIMULTANEOUSLY*				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
52	5260	0.618	0.000	0.618

Notes:

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

8.2.2 LAP-HELD

802.11a 5.2 GHz Chain A (Main)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.263	0.000	0.263

802.11a 5.2 GHz Chain B (Sub-A)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.248	0.000	0.248

802.11a 5.2 GHz MIMO 20 MHz Bandwidth

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
36 52 64	5180 5260 5320	0.302	0.000	0.302

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 PRIMARY PORTRAIT

NOTE: The Chain B (Sub-A) antenna is skipped due to the large distance between the antenna and the phantom. (Please see the photo section)

802.11a 5.2 GHz Chain A (Main)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
36 52 64	5180 5260 5320	0.116	-0.151	0.120
802.11a 5.2 GHz MIMO 20 MHz Bandwidth				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
36 52 64	5180 5260 5320	0.144	-0.185	0.150

Notes:

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

8.2.4 SECONDARY PORTRAIT

NOTE: The Chain A (Main) antenna is skipped due to the large distance between the antenna and the phantom. (Please see the photo section)

802.11a 5.2 GHz Chain B (Sub -A)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
36 52 64	5180 5260 5320	0.156	0.000	0.156
802.11a 5.2 GHz MIMO 20 MHz Bandwidth				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
36 52 64	5180 5260 5320	0.164	0.000	0.164

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 PRIMARY LANDSCAPE

NOTE:

This position was not tested due to the large distance between the antennas and the phantom.

8.3 5.8 GHZ BAND

8.3.1 SECONDARY LANDSCAPE

802.11a 5.8 GHz Chain A (Main)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149	5745	1.010	-0.058	1.024
157	5785	1.070	0.000	1.070
165	5825	1.110	0.000	1.110
165[4]	5825	1.130	0.000	1.130

802.11a 5.8 GHz Chain B (Sub-A)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149	5745	1.410	-0.046	1.425
157	5785	1.450	-0.050	1.467
165	**5825**	**1.420**	**-0.183**	**1.481**
165[4]	**5825**	**1.430**	**-0.184**	**1.492**

802.11n 5.8 GHz MIMO 20 MHz Bandwidth

MIMO CONFIGURATIONS WAS MEASURED WITH ALL ANTENNAS TRANSMITTING SIMULTANEOUSLY

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
149	5745	0.840	-0.106	0.861
157	5785	0.847	0.000	0.847
165	5825	0.870	0.000	0.870

Notes:

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

8.3.2 LAP-HELD

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
802.11a 5.8 GHz Chain A (Main)				
149 157 165	5745 5785 5825	0.684	0.000	0.684
802.11a 5.8 GHz Chain B (Sub-A)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
149 157 165	5745 5785 5825	0.790	0.000	0.790
802.11a 5.8 GHz MIMO 20 MHz Bandwidth				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
149 157 165	5745 5785 5825	0.769	-0.039	0.776

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 PRIMARY PORTRAIT

TESTING FOR THE CHAIN B (SUB-A) ANTENNA IS SKIPPED DUE TO THE LARGE DISTANCE BETWEEN THE ANTENNA AND THE PHANTOM. (PLEASE SEE THE PHOTO SECTION)

802.11a 5.8 GHz Chain A (Main)				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
149	5745			
157	5785	0.365	0.000	0.365
165	5825			

802.11a 5.8 GHz MIMO 20 MHz Bandwidth				
Channel	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
149	5745			
157	5785	0.378	-0.012	0.379
165	5825			

Notes:

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

8.3.4 SECONDARY PORTRAIT

THE CHAIN A (MAIN) ANTENNA IS SKIPPED DUE TO THE LARGE DISTANCE BETWEEN THE ANTENNA AND THE PHANTOM. (PLEASE SEE THE PHOTO SECTION)

802.11a 5.8 GHz Chain B (Sub -A)

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149	5745			
157	5785	0.373	0.000	0.373
165	5825			

802.11a 5.8 GHz MIMO 20 MHz Bandwidth

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated1) SAR 1g (mW/g)
149	5745			
157	5785	0.339	0.000	0.339
165	5825			

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 PRIMARY LANDSCAPE

NOTE:

THIS POSITION WAS NOT TESTED DUE TO THE LARGE DISTANCE BETWEEN THE ANTENNAS AND THE PHANTOM.

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		
				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	US39173569	2	14	2008
E-Field Probe	SPEAG	EX3DV4	3554	4	24	2008
Thermometer	ERTCO	639-1S	1718	11	7	2007
Data Acquisition Electronics	SPEAG	DAE3 V1	427	11	16	2007
System Validation Dipole	SPEAG	D2450V2	706	4	27	2008
System Validation Dipole	SPEAG	D5GHzV2	1003	11	22	2007
Power Meter	Giga-tronics	8651A	8651404	4	3	2008
Power Sensor	Giga-tronics	80701A	1834588	4	17	2008
Amplifier	Mini-Circuits	ZVE-8G	360	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Signal Generator	HP	83732B	US34490599	10	5	2008
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

EUT

Tablet Mode

EUT Location

Bluetooth Module Location

Antenna Location

12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	8
2-1	SAR Test Plots – 2.4 GHz Band	10
2-2	SAR Test Plots – 5.2 GHz Band	16
2-3	SAR Test Plots – 5.8 GHz Band	21
3	Certificate of E-Field Probe - EX3DV4SN3554	10
4	Certificate of System Validation Dipole - D2450 SN:706	9
5	Certificate of System Validation Dipole - D5GHzV2 SN:1003	10

END OF REPORT