SAR Evaluation Report

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

FOR

850/900/1800/1900 MHZ QUADBAND MODULE

MODEL: MC8765

FCC ID: N7NMC8765

REPORT NUMBER: 06U10631-3B

ISSUE DATE: OCTOBER 20, 2006

Prepared for

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Revision History

Rev.	Issued date	Revisions	Revised By
--	October 5, 2006	Initial issue	HS
B	October 20, 2006	1. Additional SAR data for PRIMARY PORTRAIT configuration and removed the data related to collocations. 2. Updated system performance check plots due to additional SAR test. 3. Updated SAR test plots and removed the plots related to collocations.	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: October 2, 3, 4, 18 and 19, 2006

APPLICANT: ADDRESS:	SIERRA WIRELESS INC 13811 WIRELESS WAY, RICHMOND, BC V6V 3A4 CANADA
FCC ID: MODEL:	N7NMC8765 MC8765
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

850/900/1800/1900 MHz QuadBand Module installed into Lenovo ThinkPad X60 Tablet.

Note: This device contains 900/1800 MHz bands that are not operational in US territories. This report is applicable to 850 and 1900 MHz bands.

Test Sample is a:	Production unit
Host Laptop	Lenovo ThinkPad X60 Tablet

Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]
22H	824.2-848.8	0.285
24E	1850.2-1909.8	0.358

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

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

Approved & Released For CCS By:

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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

850/900/1800/1900 MHz QuadBand Module installed into Lenovo ThinkPad X60 Tablet. Note: This device contains 900/1800 MHz bands that are not operational in US territories. This report is applicable to 850 and 1900 MHz bands.	
GPRS Multi-slot Classes:	Class 10 (2up, 3 down) for both GPRS and EGPRS
Normal operation:	Lenovo Lap-held position
Duty cycle:	25% both GPRS and EGPRS modes 100% for WCDMA
Normal operation:	Lap-held position
Host Device(s):	Lenovo ThinkPad X60 Tablet
Antenna(s)	Wistron Neweb Corp. PIFA Antenna, P/N: 60.4Q423.001
Power supply:	Power supplied through the laptop computer (host device).

2 FACILITIES AND ACCREDITATION

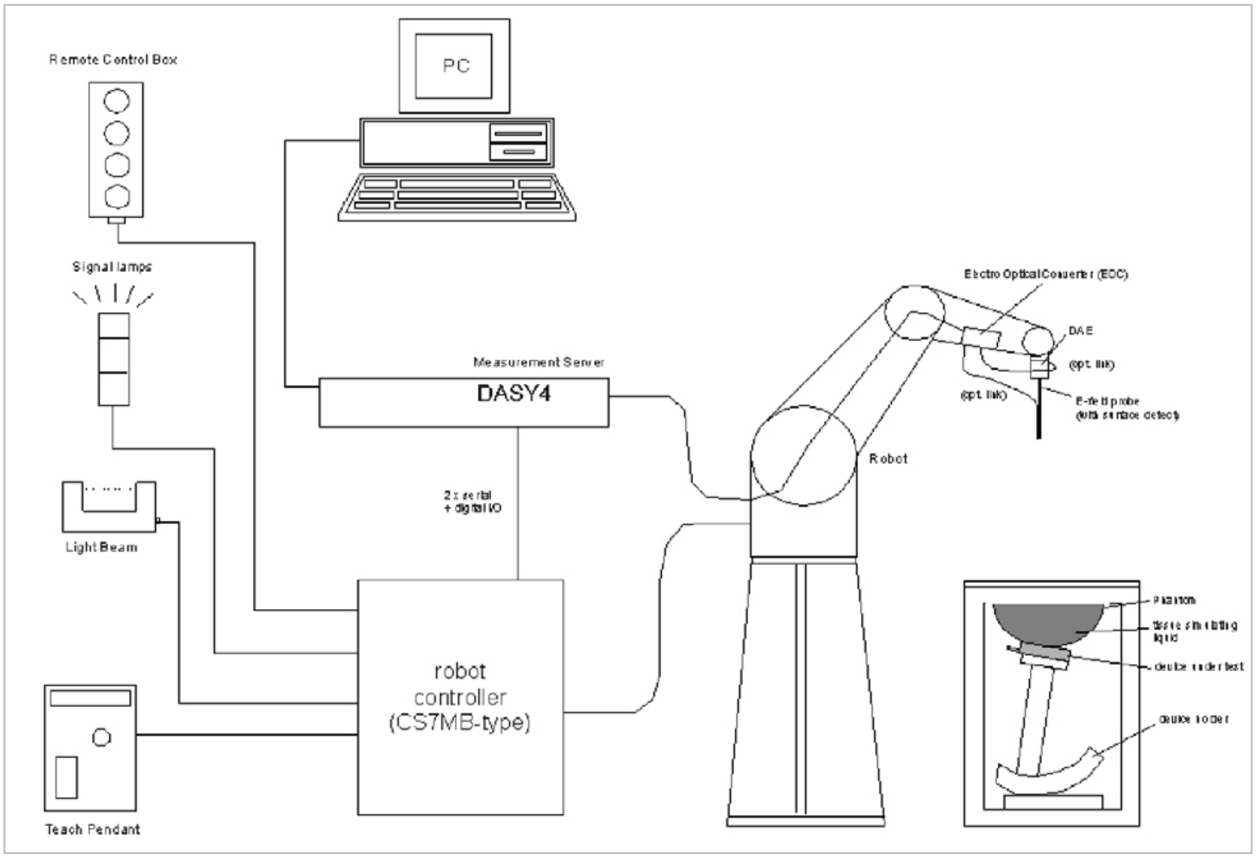
The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1,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

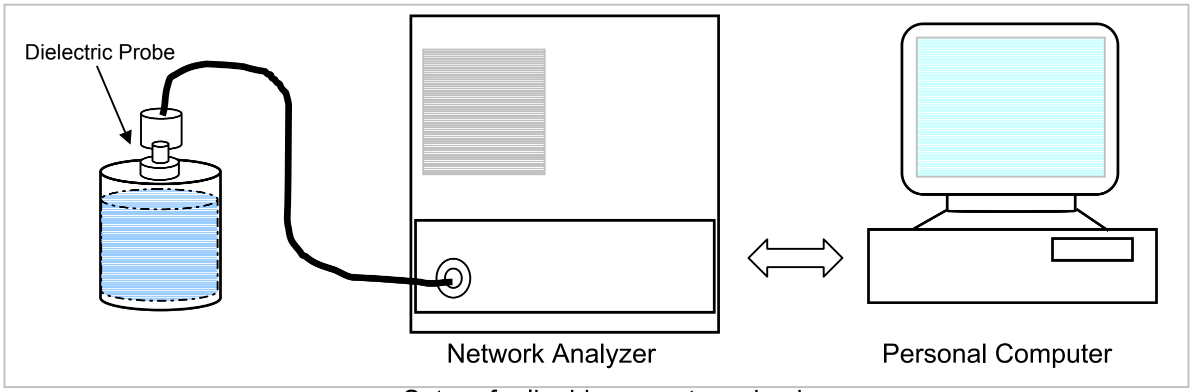
The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

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)

4.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

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

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
835	22	15	e'	53.8506	Relative Permittivity (ε_r):	53.8506	55.2	-2.44	? 5
			e"	20.6732	Conductivity (σ):	0.96031	0.97	-1.00	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
October 02, 2006 05:18 PM

Frequency	e'	e"
800000000.	54.1868	20.8718
805000000.	54.1337	20.8104
810000000.	54.1160	20.7989
815000000.	54.0502	20.7598
820000000.	53.9957	20.7338
825000000.	53.9356	20.7047
830000000.	53.8962	20.6684
835000000.	**53.8506**	**20.6732**
840000000.	53.7786	20.6329
845000000.	53.7603	20.6170
850000000.	53.7106	20.6019
855000000.	53.6453	20.5712
860000000.	53.6012	20.5652
865000000.	53.5438	20.5215
870000000.	53.5087	20.5339
875000000.	53.4395	20.5379
880000000.	53.4063	20.5494
885000000.	53.3231	20.5379
890000000.	53.2974	20.5361
895000000.	53.2528	20.5102
900000000.	53.2219	20.4636

The conductivity (σ) can be given as:

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

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

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

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
835	22	15	e'	54.4764	Relative Permittivity (ε_r):	54.4764	55.2	-1.31	? 5
			e"	20.8178	Conductivity (σ):	0.96703	0.97	-0.31	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
October 03, 2006 04:27 PM

Frequency	e'	e"
800000000.	54.7650	20.9629
805000000.	54.7570	20.9395
810000000.	54.7305	20.8944
815000000.	54.6755	20.8769
820000000.	54.6148	20.8560
825000000.	54.5602	20.8332
830000000.	54.5028	20.8450
835000000.	**54.4764**	**20.8178**
840000000.	54.4543	20.8000
845000000.	54.3539	20.7460
850000000.	54.3194	20.7769
855000000.	54.2857	20.7206
860000000.	54.2032	20.7048
865000000.	54.1314	20.6853
870000000.	54.0867	20.6772
875000000.	54.0321	20.6411
880000000.	53.9836	20.6456
885000000.	53.9345	20.6185
890000000.	53.8899	20.6006
895000000.	53.9023	20.5919
900000000.	53.8521	20.5555

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

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

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
835	22	15	e'	54.4519	Relative Permittivity (ε_r):	54.4519	55.2	-1.36	? 5
			e"	20.8709	Conductivity (σ):	0.96950	0.97	-0.05	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
October 18, 2006 05:23 PM

Frequency	e'	e"
800000000.	54.7671	21.0647
805000000.	54.7548	20.9969
810000000.	54.6826	20.9963
815000000.	54.6659	20.9590
820000000.	54.6184	20.9274
825000000.	54.5523	20.9029
830000000.	54.5073	20.8877
835000000.	**54.4519**	**20.8709**
840000000.	54.4168	20.8469
845000000.	54.3670	20.8395
850000000.	54.3039	20.7937
855000000.	54.2561	20.7859
860000000.	54.1964	20.7721
865000000.	54.1716	20.7344
870000000.	54.1081	20.7333
875000000.	54.0642	20.7247
880000000.	54.0157	20.7287
885000000.	53.9645	20.7232
890000000.	53.9053	20.7209
895000000.	53.8854	20.6825
900000000.	53.8561	20.6584

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

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

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
1900	22	15	e'	53.8416	Relative Permittivity (ϵ_r):	53.8416	53.3	1.02	? 5
			e"	13.8394	Conductivity (σ):	1.46282	1.52	-3.76	? 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
October 03, 2006 09:22 PM

Frequency	e'	e"
1710000000.	54.4787	13.1383
1720000000.	54.4507	13.1772
1730000000.	54.4224	13.2089
1740000000.	54.3658	13.2652
1750000000.	54.3273	13.3097
1760000000.	54.2872	13.3411
1770000000.	54.2580	13.3781
1780000000.	54.2222	13.4136
1790000000.	54.1898	13.4462
1800000000.	54.1700	13.4863
1810000000.	54.1331	13.5050
1820000000.	54.1119	13.5428
1830000000.	54.0656	13.5669
1840000000.	54.0349	13.6137
1850000000.	53.9943	13.6554
1860000000.	53.9609	13.6905
1870000000.	53.9434	13.7444
1880000000.	53.8978	13.7658
1890000000.	53.8756	13.8061
1900000000.	**53.8416**	**13.8394**
1910000000.	53.7896	13.8902

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 23°C; Relative humidity = 42% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)							
1900	22	15	e'	53.5749	Relative Permittivity (ϵ_r):	53.5749	53.3	0.52	? 5
			e"	14.2586	Conductivity (σ):	1.50713	1.52	-0.85	? 5

Liquid Check
Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C
October 19, 2006 12:00 PM

Frequency	e'	e"
1750000000.	54.1736	13.5085
1760000000.	54.0818	13.6150
1770000000.	54.0388	13.6980
1780000000.	54.0213	13.7479
1790000000.	54.0581	13.7981
1800000000.	54.0528	13.8482
1810000000.	54.0293	13.8628
1820000000.	53.9811	13.8150
1830000000.	53.9854	13.7790
1840000000.	53.9553	13.8333
1850000000.	53.8660	13.9491
1860000000.	53.7239	14.0442
1870000000.	53.5959	14.0797
1880000000.	53.5504	14.1028
1890000000.	53.5706	14.1788
1900000000.	**53.5749**	**14.2586**
1910000000.	53.5711	14.2726
1920000000.	53.5772	14.2294
1930000000.	53.6399	14.2055
1940000000.	53.6376	14.2655
1950000000.	53.5636	14.3213

The conductivity (σ) can be given as:

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

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

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

5 SYSTEM PERFORMANCE CHECK

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

System Performance Check Measurement Conditions

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

Reference SAR Values for body-tissue

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

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

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

System Validation Dipole: D835V2 SN:4d002

Date: October 2, 2006

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

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
835	22	15	1g	2.46	9.84	9.71	1.34	? 10
			10g	1.62	6.48	6.38	1.57	? 10

Date: October 3, 2006

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

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
835	22	15	1g	2.48	9.92	9.71	2.16	? 10
			10g	1.63	6.52	6.38	2.19	? 10

Date: October 18, 2006

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

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
835	22	15	1g	2.48	9.92	9.71	2.16	? 10
			10g	1.64	6.56	6.38	2.82	? 10

System Validation Dipole: D1900V2 SN:5d043

Date: October 3, 2006

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

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
1900	22	15	1g	9.46	37.84	39.8	-4.92	? 10
			10g	5.04	20.16	20.8	-3.08	? 10

Date: October 19, 2006

Room Ambient Temperature = 23°C; Relative humidity = 42% Measured by: Sunny Shih

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (癈)	Depth (cm)						
1900	22	15	1g	9.75	39	39.8	-2.01	? 10
			10g	5.2	20.8	20.8	0.00	? 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 following setting is used to prepare the EUT in GSM850/1900MHz bands for the SAR test.

Agilent 8960 series 10 E5515C, Wireless Communication Test Set is used to control the EUT and measure the output power.

The following setting was used to establish the signal.

System Config: GSM/GPRS Mobile Test
E1968A A.06.31

Call Parms:
BCH ➔ Cell Band: GSM850/PCS
TCH ➔ Traffic Band: GSM850/PCS
Traffic Channel: 128/192/251 or 512/661/810
MS Tx Level: 3 (33dBm) for cell band; 3 (30 dBm) for PCS band
MultiSlot Config: 2up, 3down

PDTCH ➔ Traffic Band: GSM850/PCS
Traffic Channel: 128/192/251 or 512/661/810
MS Tx Level: 6 (27dBm) for cell band; 5 (26 dBm) for PCS band
Coding Scheme: CS-4
MultiSlot Config: 2up, 3down

Control: Active Cell ➔ GSM/GPRS/EGPRS

GSM850, GPRS

Channel	Frequency (MHz)	Power (dBm)
128	824.2	32.15
192	837.0	32.20
251	848.8	32.12

GSM1900, GPRS

Channel	Frequency (MHz)	Power (dBm)
512	1850.2	29.76
661	1880.0	29.69
810	1909.8	29.24

GSM850, EGPRS

Channel	Frequency (MHz)	Power (dBm)
128	824.2	27.89
192	837.0	27.73
251	848.8	27.70

GSM1900, EGPRS

Channel	Frequency (MHz)	Power (dBm)
512	1850.2	27.53
661	1880.0	27.42
810	1909.8	27.43

The following settings were used to configure the Wireless Communications Test Set, Agilent 8960 Series 10, E5515C.

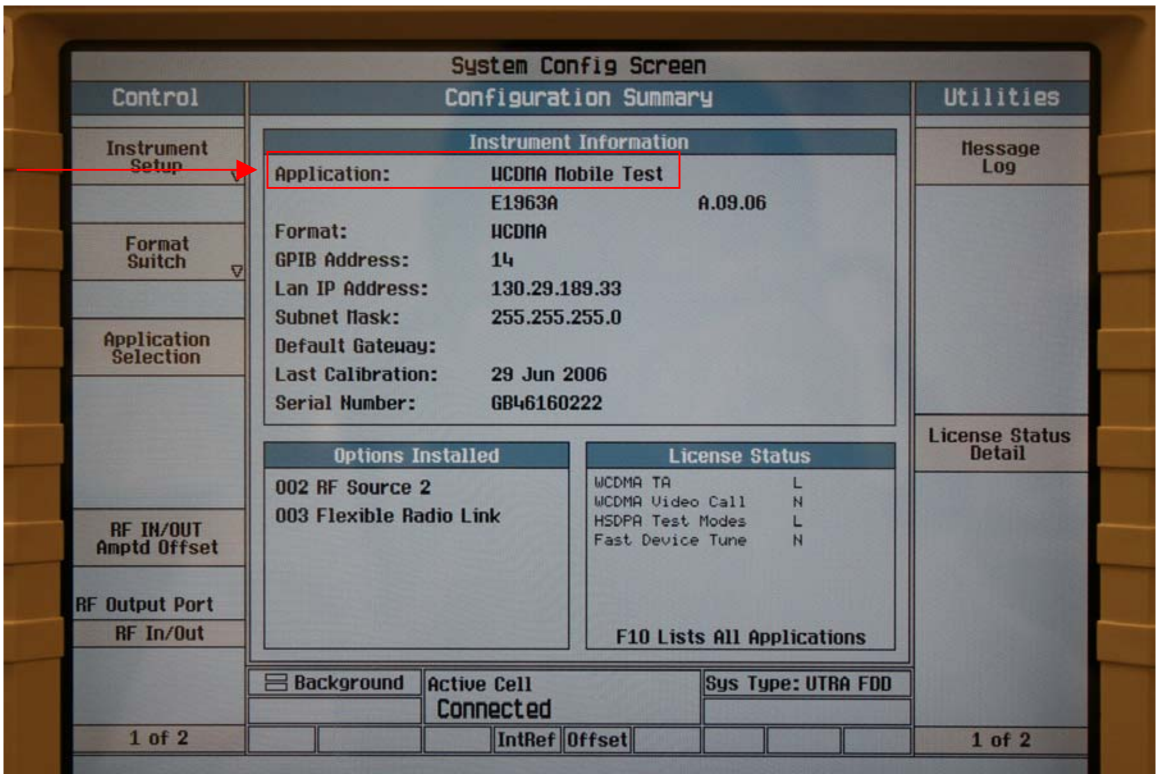
Application: WCDMA Mobile Test

Channel Type: 12.2k RMC

Paging Service: RB Test Mode

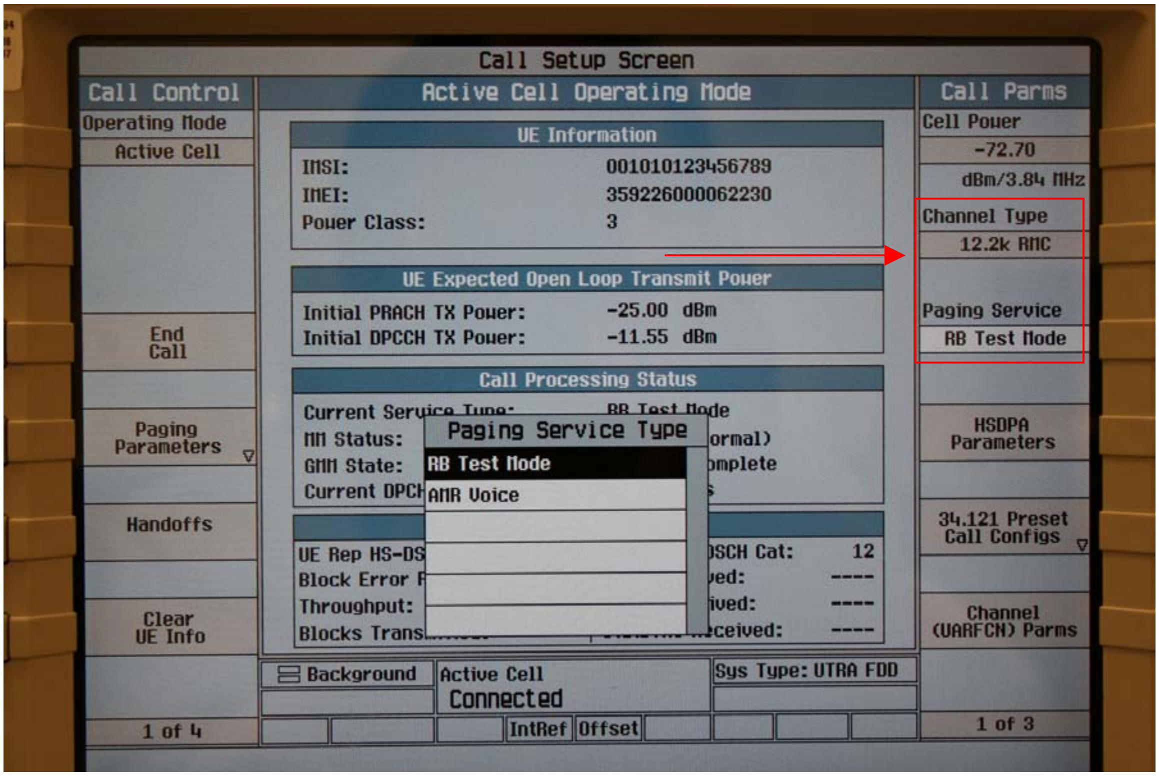
DL DTCH Data: All Ones

UL CL Power Ctrl Parameters: All Up bits

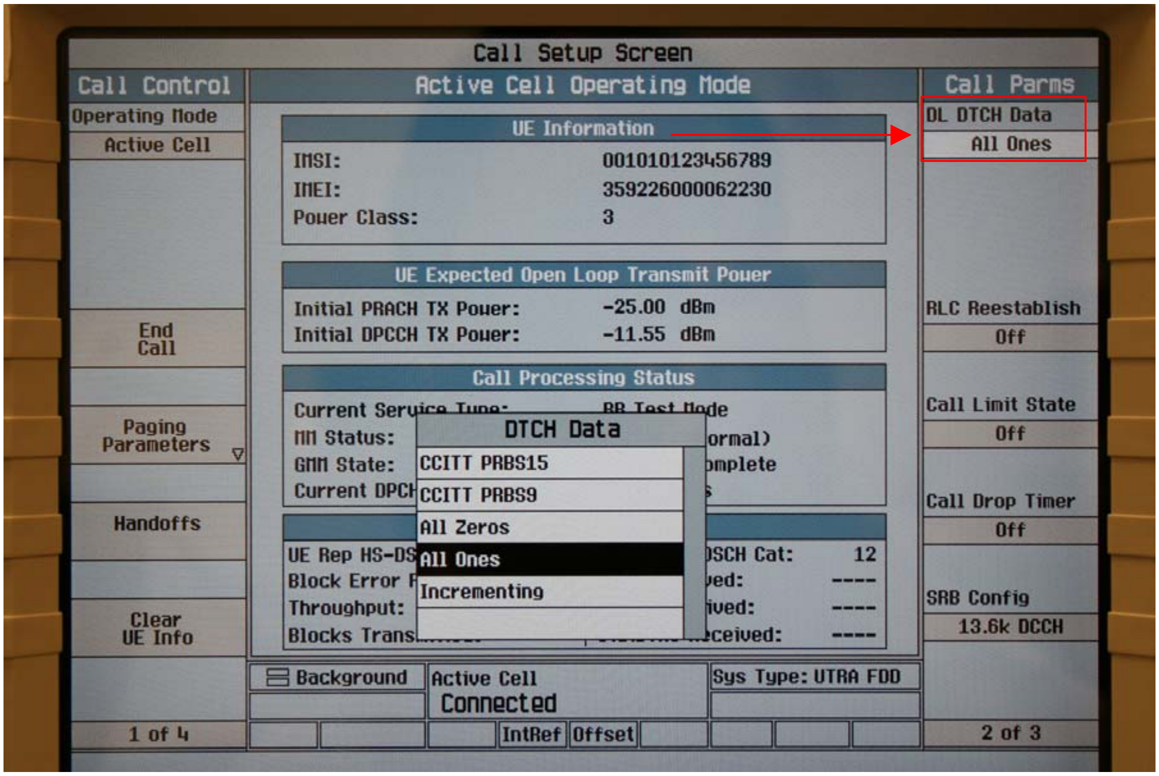


Channel Type: 12.2k RMC

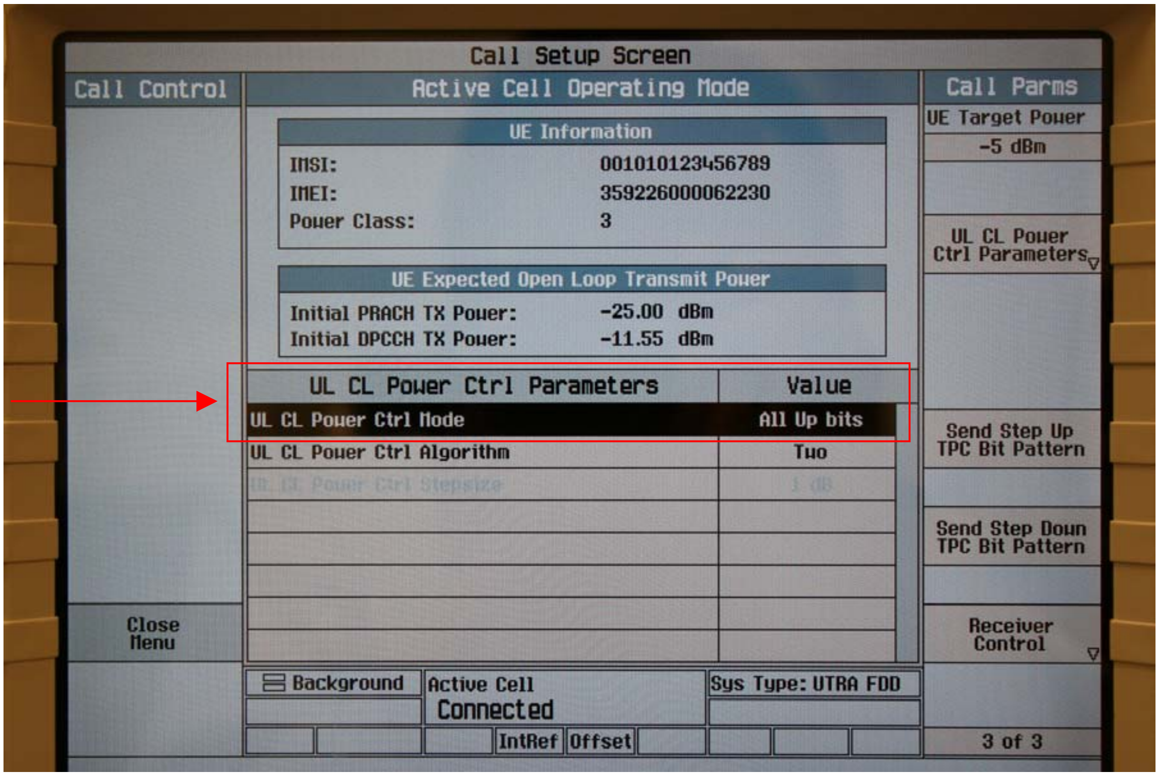
Paging Service: RB Test Mode



DL DTCH Data: All Ones



UL CL Power Ctrl Parameters: All Up bits



Conducted powers were measured prior to SAR measurement:

W-CDMA850

The cable assembly insertion loss of 8.30 dB (including 8.0 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
4132	826.40	23.88
4182	836.40	23.94
4233	846.60	23.91

W-CDMA1900

The cable assembly insertion loss of 8.47 dB (including 8 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
9262	1852.40	23.95
9400	1880.00	23.19
9538	1907.60	23.90

8 SAR MEASURMENT RESULTS

The following positions are skipped.

LCD EDGE POSITION – PRIMARY LANDSCAPE
Primary Landscape is skipped since SAR values are too low.

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LCD EDGE POSITION – SECONDARY LANDSCAPE

Primary Landscape is skipped since WWAN is disabled at this position.

	Photos are confidential, please see a seperate file	

8.1 CELL BAND

8.1.1 EDGE POSITION – PRIMARY PORTRAIT

Photos are confidential, please see a seperate file

GPRS

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128	824.2			
192	837.0	0.183	0.000	0.183
251	848.8			

EGPRS

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128	824.2			
192	837.0	0.058	0.000	0.058
251	848.8			

WCDMA

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
4132	826.4			
4182	836.4	0.074	0.000	0.074
4233	846.6			

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) When measured SAR is less than 3dB limit, testing on high and low channels are optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.2 LCD EDGE POSITION – SECONDARY PORTRIAT

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GSM GPRS				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128	**824.2**	**0.273**	**-0.180**	**0.285**
192	837.0	0.195	-0.074	0.198
251	848.8	0.139	0.000	0.139
GSM EGPRS				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128	824.2			
192	837.0	0.067	0.000	0.067
251	848.8			
WCDMA				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
4132	826.4			
4182	836.4	0.096	0.000	0.096
4233	846.6			

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) When measured SAR is less than 3dB limit, testing on high and low channels are optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.1.3 LAP HELD POSITION

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GPRS

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128 192 251	824.2 837.0 848.8	0.118	-0.131	0.122

EGPRS

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
128 192 251	824.2 837.0 848.8	0.033	-0.268	0.035

WCDMA

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
4132 4182 4233	826.4 836.4 846.6	0.055	-0.013	0.055

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) When measured SAR is less than 3dB limit, testing on high and low channels are optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2 PCS BAND

8.2.1 EDGE POSITION – PRIMARY PORTRAIT

Photos are confidential, please see a seperate file

GPRS				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512 661 810	1850.2 1880.0 1909.8	0.025	0.000	0.025
EGPRS				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512 661 810	1850.2 1880.0 1909.8	0.015	0.000	0.015
WCDMA				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
9262 9400 9538	1852.4 1880.0 1907.6	0.032	0.000	0.032

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) When measured SAR is less than 3dB limit, testing on high and low channels are optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.2 LCD EDGE POSITION – SECONDARY PORTRIAT

Photos are confidential, please see a seperate file

GSM GPRS

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512 661 810	1850.2 1880.0 1909.8	0.127	0.000	0.127

GSM EGPRS

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512 661 810	1850.2 1880.0 1909.8	0.066	-0.178	0.069

WCDMA

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
9262 9400 9538	1852.4 1880.0 1907.6	0.127	-0.084	0.129

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) When measured SAR is less than 3dB limit, testing on high and low channels are optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.2.3 LAP HELD POSITION

Photos are confidential, please see a seperate file

Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
GSM GPRS				
512	1850.2			
661	1880.0	0.277	0.000	0.277
810	1909.8			
GSM EGPRS				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
512	1850.2			
661	1880.0	0.137	0.000	0.137
810	1909.8			
WCDMA				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
9262	**1852.4**	**0.345**	**-0.157**	**0.358**
9400	1880.0	0.285	-0.170	0.296
9538	1907.6	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) When measured SAR is less than 3dB limit, testing on high and low channels are 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

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	D835V2	4d002	1/23/08
System Validation Dipole	SPEAG	D1900V2	5d043	1/29/08
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
Radio Communication Tester	Agilent	E1968A	GB46160222	1/29/2007
Simulating Liquid	CCS	M835	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test

11 PHOTOS

DUT

Photos are confidential, please see a seperate file

Laptop mode

Photos are confidential, please see a seperate file

Tablet mode

Antenna Location

Photos are confidential, please see a seperate file

DUT Location

Photos are confidential, please see a seperate file

12 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	10
2-1	SAR Test Plots – Cell band	12
2-2	SAR Test Plots – PCS Band	12
3	Certificate of E-Field Probe - EXDV4SN3552	9
4	Certificate of System Validation Dipole - D835V2 SN:4d002	9
5	Certificate of System Validation Dipole - D1900V2 SN:5d043	9

END OF REPORT