



SAR Evaluation Report

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

FOR

850/900/1800/1900/2100 MHZ MULTI-BAND MODULE

MODEL: MC8775

FCC ID: N7NMC8775-L

REPORT NUMBER: 07U11026-2

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Prepared for

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Revision History

Rev.	Issued date	Revisions	Revised By
--	April 21, 2007	Initial issue	Sunny Shih

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)**DATES OF TEST:** April 20 and 21, 2007

APPLICANT:	SIERRA WIRELESS, INC.
ADDRESS:	13811 WIRELESS WAY, RICHMOND, BC V6V 3A4 CANADA
FCC ID:	N7NMC8775-L
MODEL:	MC8775
DEVICE CATEGORY:	Portable Device
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure

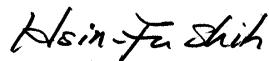
850/900/1800/1900/2100 MHz Multi-Band Module is installed in Lenovo ThinkPad X61 Tablet Series along with Bluetooth module FCC ID: MCLJ07H081.

Test Sample is a:	Production unit		
Host Device(s):	Lenovo ThinkPad X61 Tablet Series		
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	Collocation SAR Values [1g_mW/g]
FCC 22H	824.2 - 848.8	0.187	0.186
FCC 24E	1850.20 - 1909.8	0.457	0.458

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 DEVICE UNDER TEST (DUT) DESCRIPTION

850/900/1800/1900/2100 MHz multi-band transceiver is installed in Lenovo ThinkPad X61 Tablet Series along with Bluetooth module FCC ID: MCLJ07H081.	
Normal operation:	Lap-held position, and underarm position (Tablet)
Duty cycle:	GPRS/EGPRS: 1 slot: 12.5% 2 slots: 25% 3 slots: 37.5% 4 slots: 50% WCDMA & HSDPA: 100%
Host Device(s):	Lenovo ThinkPad X61 Tablet Series
Antenna(s)	Wistron NeWeb Corp. Planner Inverted Antenna PT# 60.4Q422.001
Power supply:	Power supplied through the laptop computer (host device).

2 FACILITIES AND ACCREDITATION

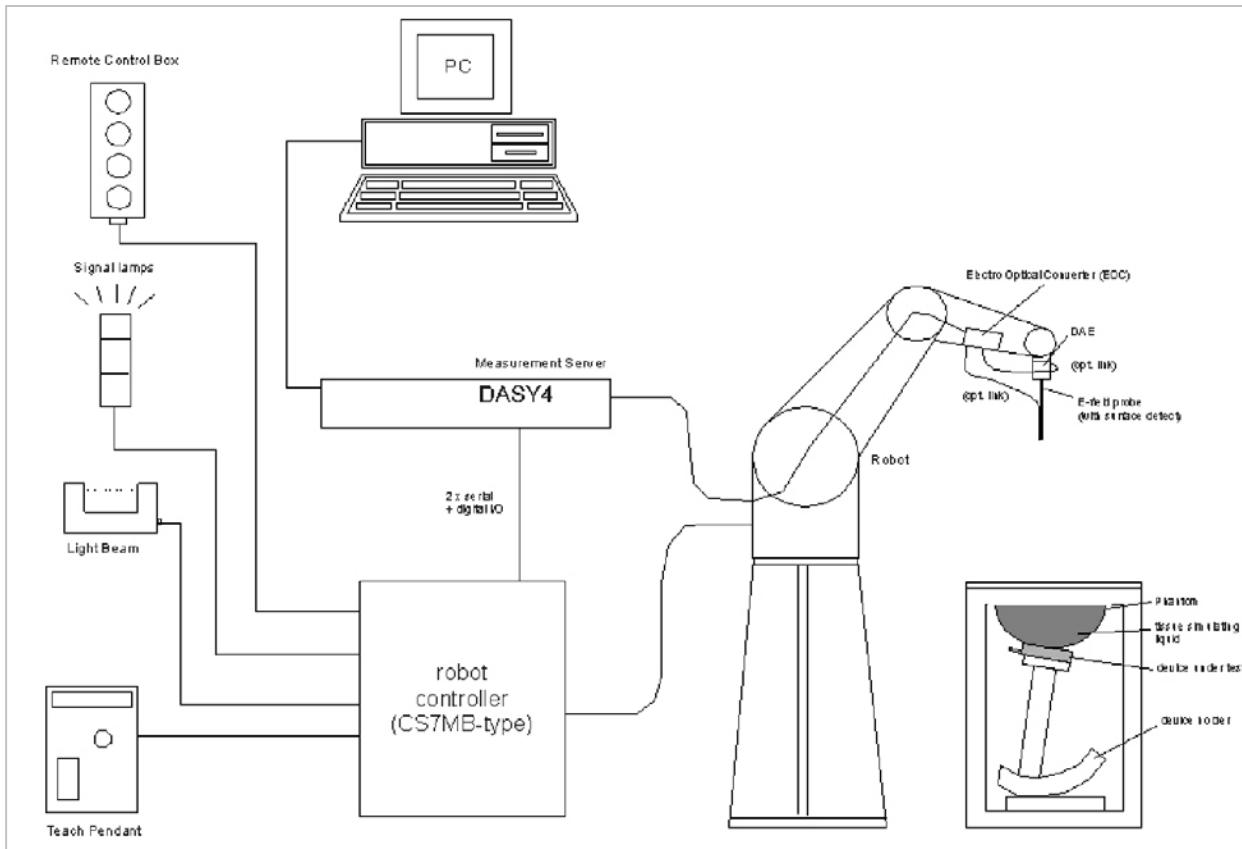
The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, CA 94538 USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio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



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

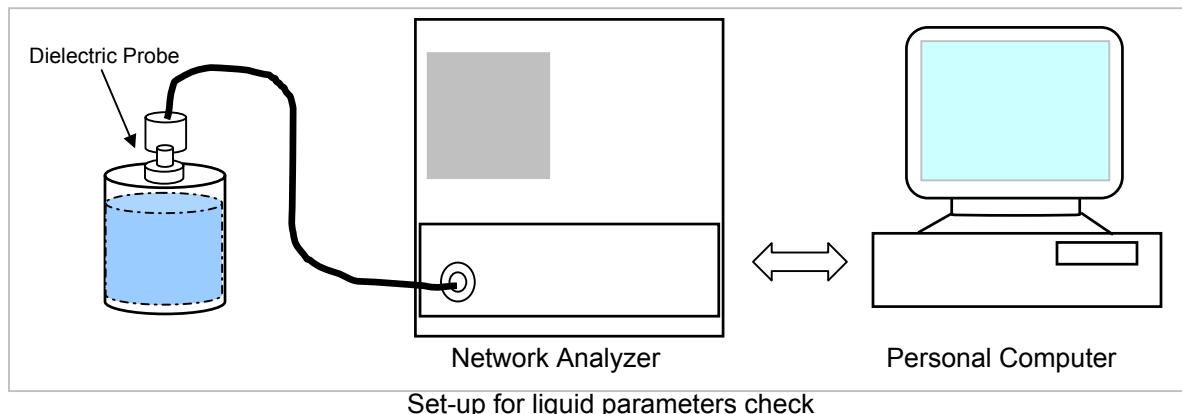
HEC: Hydroxyethyl Cellulose

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 if the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within $\pm 5\%$ 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 $\rho = 1000 \text{ kg/m}^3$)

5 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

Room Ambient Temperature = 22°C; Relative humidity = 40%

Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	e'	55.0381	Relative Permittivity (ϵ_r):	55.0381	55.2	-0.29	± 5
835	22	15	e"	21.0510	Conductivity (σ):	0.97786	0.97	0.81	± 5

Liquid Check

Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C

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Frequency	e'	e"
750000000.	55.5572	21.4097
755000000.	55.4675	21.3870
760000000.	55.4610	21.3600
765000000.	55.3984	21.3051
770000000.	55.3547	21.2678
775000000.	55.3225	21.2269
780000000.	55.2843	21.2000
785000000.	55.2853	21.1826
790000000.	55.2393	21.1932
795000000.	55.2017	21.2237
800000000.	55.1645	21.2194
805000000.	55.1439	21.1637
810000000.	55.1149	21.1453
815000000.	55.0849	21.1217
820000000.	55.0652	21.0777
825000000.	55.0631	21.0496
830000000.	55.0426	21.0451
835000000.	55.0381	21.0510
840000000.	55.0197	21.0178
845000000.	54.9731	20.9953
850000000.	54.9276	20.9727

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 \epsilon'' = 2 \pi f \epsilon_0 \epsilon''$$

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

$$\epsilon_0 = 8.854 * 10^{-12}$$

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Jonathan King

Simulating Liquid			Parameters		Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	e'	Relative Permittivity (ϵ_r):	53.8632	53.3	1.06	± 5
1900	22	15	e"	Conductivity (σ):	14.1389	1.49447	1.52	-1.68
								± 5

Liquid Check

Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C

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Frequency	e'	e"
1750000000.	54.4228	13.5230
1760000000.	54.3536	13.5792
1770000000.	54.3114	13.6083
1780000000.	54.2758	13.6173
1790000000.	54.2616	13.6815
1800000000.	54.2361	13.7594
1810000000.	54.1662	13.8219
1820000000.	54.1123	13.8298
1830000000.	54.0746	13.8532
1840000000.	54.0674	13.9080
1850000000.	54.0576	13.9654
1860000000.	53.9993	14.0157
1870000000.	53.9441	14.0270
1880000000.	53.9283	14.0352
1890000000.	53.8955	14.0742
1900000000.	53.8632	14.1389
1910000000.	53.7819	14.1768
1920000000.	53.7328	14.1920
1930000000.	53.7111	14.2184
1940000000.	53.6711	14.2774
1950000000.	53.6308	14.3299

The conductivity (σ) can be given as:

$$\sigma = \omega \epsilon_0 \epsilon'' = 2 \pi f \epsilon_0 \epsilon''$$

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

$$\epsilon_0 = 8.854 * 10^{-12}$$

6 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 $\pm 10\%$.

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($dx=dy=7.5\text{mm}$; $dz=5\text{mm}$).
For 5 GHz band - Special 8x8x8 fine cube was chosen for cube integration($dx=dy=4.3\text{mm}$; $dz=3\text{mm}$)
- 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 $250\text{ mW}\pm 3\%$.
- 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.

6.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D835V2 SN:4d002

Date: April 20, 2007

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	1g	2.33	9.32	9.71	-4.02	± 10
835	22	15	1g	2.33	9.32	9.71	-4.02	± 10
			10g	1.54	6.16	6.38	-3.45	± 10

System Validation Dipole: D1900V2 SN:5d043

Date: April 20, 2007

Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)	1g	2.33	9.32	9.71	-4.02	± 10
1900	22	15	1g	10.60	42.4	39.8	6.53	± 10
			10g	5.62	22.48	20.8	8.08	± 10

7 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.

7.1 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.

8 PROCEDURE USED TO ESTABLISH TEST SIGNAL

The following setting is used to configure the CMU200 to establish the link for SAR testing.

Service selection → Test Mode A – Auto Slot Config. → off
 Main Service → Packet Data
 Network Support → GSM+GPRS
 Slot Config → 33 dBm for GSM850/EGSM900 and 30 dBm for GSM1800

Conducted power:

GSM850

Channel	Frequency (MHz)	GPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
128	824.2	31.9	31.8	28.9	25.9
192	837.0	32.1	32.0	29.1	26.1
251	848.8	31.9	32.0	28.9	26.0

GSM850

Channel	Frequency (MHz)	EGPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
128	824.2	27.0	27.0	27.0	25.9
192	837.0	27.2	27.3	27.2	26.1
251	848.8	27.1	27.1	27.0	26.0

GSM1900

Channel	Frequency (MHz)	GPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
512	1850.2	29.5	29.5	29.4	29.3
661	1880.0	29.7	29.6	29.6	29.5
810	1909.8	29.7	29.6	29.5	29.4

GSM1900

Channel	Frequency (MHz)	EGPRS			
		1 slot Power (dBm)	2 slots Power (dBm)	3 slots Power (dBm)	4 slots Power (dBm)
512	1850.2	26.6	26.6	26.6	26.5
661	1880.0	26.8	26.8	26.8	26.7
810	1909.8	26.9	26.9	26.8	26.6

WCDMA + HSDPA Procedure

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

<u>Application</u>	<u>Rev. License</u>
WCDMA Mobile Test	A.09.06

WCDMA

- Call Setup > Shift & Preset
- Cell Parameters: PS Domain Information > Present
 - ATT (IMSI Attach) Flag State > Set
- Security Parameter - System Operations > None
- Channel Type:
 - RMC: 12.2k, 64k, 144k, or 384k
 - AMC: 12.2 UL / 64/ DL AM RMC, 12.2 UL / 144/ DL AM RMC, or 12.2 UL / 384/ DL AM RMC,
- Paging Service: RB Test Mode
- Channel (UARFCN) Parms:

	<u>PCS band</u>	<u>Cell band</u>
▪ DL Channel:	9662 / 9800 / 9938 / 4357 / 4407 / 4458	
▪ UL Channel:	9262 / 9400 / 9538 / 4132 / 4182 / 4233	
- DL DTCH Data: All Ones
- RLC Reestablish: Off
- Call Limit State: Off
- Call Drop Timer: Off
- SRB Config.: 13.6k DCCH
- UE Target Power: 25 dBm
- UL CL Power Ctrl Parameters
 - UL CL Power Ctrl Mode: All Up Bits

RF Output Power Measurement Results – for RMC Channel Type**Channel Type: 12.2K RMC****Cell Band**

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.5
4182	836.4	23.5
4233	846.6	23.5

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.6
9400	1880.0	23.6
9538	1907.6	23.1

Channel Type: 64k RMC**Cell Band**

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.5
4182	836.4	23.4
4233	846.6	23.5

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.7
9400	1880.0	23.5
9538	1907.6	23.1

Channel Type: 144k RMC**Cell Band**

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.4
4182	836.4	23.5
4233	846.6	23.6

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.6
9400	1880.0	23.4
9538	1907.6	23.2

Channel Type: 384k RMC**Cell Band**

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.5
4182	836.4	23.5
4233	846.6	23.6

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.9
9400	1880.0	23.9
9538	1907.6	23.3

RF Output Power Measurement Results - for AMC Channel Type**Channel Type: 12.2K UL / 64 DL AM RMC****Cell Band**

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.5
4182	836.4	23.5
4233	846.6	23.6

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.6
9400	1880.0	23.5
9538	1907.6	23.2

Channel Type: 12.2K UL / 144 DL AM RMC**Cell Band**

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.5
4182	836.4	23.5
4233	846.6	23.6

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.7
9400	1880.0	23.5
9538	1907.6	23.2

Channel Type: 12.2K UL / 384 DL AM RMC**Cell Band**

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.5
4182	836.4	23.5
4233	846.6	23.6

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.7
9400	1880.0	23.6
9538	1907.6	23.3

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

<u>Application</u>	<u>Rev. License</u>
WCDMA Mobile Test	A.09.06

WCDMA + HSDPA

- Uplink Parameter:
 - PRACH Bc / Bd control: Manual
 - Manual PRACH Bc: 9
 - Manual PRACH: Bd: 15
- Channel Type: 12.2k + HSDPA
- HSDPA Parameters:
 - HSDPA RB Test Mode Setup
 - HS-DSCH Configuration Type: FRC
 - FRC Type: <Selected H-set according to the UE category>

HS-DSCH category	Corresponding requirement
Category 1	H-Set 1
Category 2	H-Set 1
Category 3	H-Set 2
Category 4	H-Set 2
Category 5	H-Set 3
Category 6	H-Set 3
Category 7	H-Set 6 (Rel-6)
Category 8	H-Set 6 (Rel-6)
Category 10	H-Set 4
Category 11	H-Set 5

- CN Domain: CS Domain
- Uplink 64k DTCH for HSDPA Loopback State: On
- HS-DSCH Data Pattern: All Ones
- RLC Header on HS-DSCH: Present
- HSDPA Uplink Parameters
 - DelatACK: 5
 - DeltaNACK: 5
 - DeltaCQI: 2

RF OUTPUT POWER MEASUREMENT RESULTS - FOR 12.2K RMC HSDPA CHANNEL TYPE

12.2k RMC + HSDPA

Cell Band

Channel	Frequency (MHz)	Ch Power (dBm)
4132	826.4	23.1
4182	836.4	23.2
4233	846.6	23.4

PCS Band

Channel	Frequency (MHz)	Ch Power (dBm)
9262	1852.4	23.5
9400	1880.0	23.5
9538	1907.6	23.0

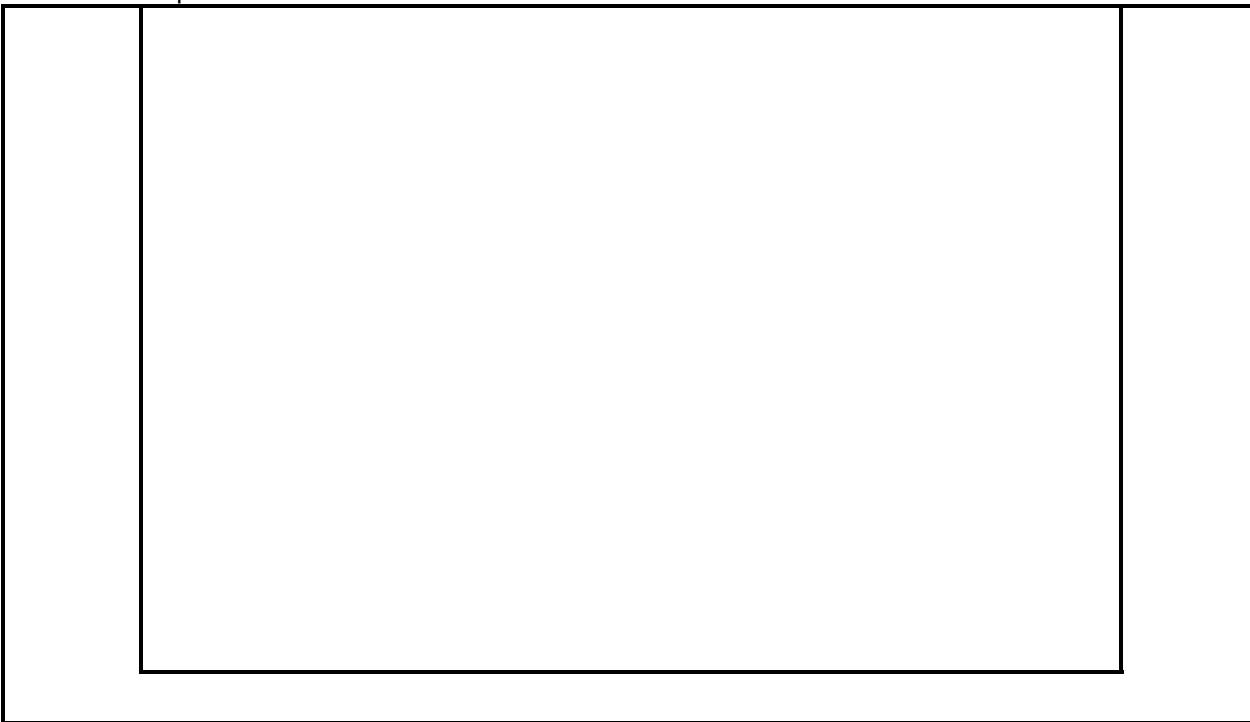
9 SAR MEASURMENT RESULTS**9.1 CELL BAND****9.1.1 PRIMARY LANDSCAPE**

This position is skipped since SAR values are too low.



9.1.2 SECONDARY LANDSCAPE

WWAN at this position is disabled.



9.1.3 PRIMARY PORTRAIT

GPRS 2 slots				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
128	824.20			
192	837.00	0.018	-0.170	0.019
251	848.80			
WCDMA 12.2k RMC				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
4132	826.40			
4182	836.40	0.015	0.000	0.015
4233	846.60			
Notes:				
1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.				
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.				
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.				

9.1.4 SECONDARY PORTRAIT

GPRS 2 slots				
WCDMA 12.2k RMC				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
128	824.20			
192	837.00	0.154	0.000	0.154
251	848.80			
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
4132	826.40			
4182	836.40	0.114	0.000	0.114
4233	846.60			

Notes:

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

9.1.5 LAP HELD

GPRS 2 slots																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Channel</th><th>f (MHz)</th><th>Measured SAR 1g (mW/g)</th><th>Power Drift (dB)</th><th>Extrapolated¹⁾ SAR 1g (mW/g)</th></tr> </thead> <tbody> <tr> <td>128</td><td>824.20</td><td></td><td></td><td></td></tr> <tr> <td>192</td><td>837.00</td><td>0.181</td><td>-0.131</td><td>0.187</td></tr> <tr> <td>251</td><td>848.80</td><td></td><td></td><td></td></tr> <tr> <td>192⁴⁾</td><td>837.00</td><td>0.181</td><td>-0.110</td><td>0.186</td></tr> </tbody> </table>					Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)	128	824.20				192	837.00	0.181	-0.131	0.187	251	848.80				192⁴⁾	837.00	0.181	-0.110	0.186
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)																									
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9.2 PCS BAND**9.2.1 PRIMARY LANDSCAPE**

This position is skipped since SAR values are too low.



9.2.2 SECONDARY LANDSCAPE

WWAN at this position is disabled.



9.2.3 PRIMARY PORTRAIT

GPRS 4 slots				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
512	1850.20			
661	1880.00	0.289	-0.187	0.302
810	1909.80			
WCDMA 12.2k RMC				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
9262	1852.40			
9400	1880.00	0.186	0.000	0.186
9538	1907.60			
Notes:				
1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.				
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.				
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.				

9.2.4 SECONDARY PORTRAIT

GPRS 4 slots																													
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Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)																									
9262	1852.40																												
9400	1880.00	0.324	0.000	0.324																									
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9.2.5 LAP HELD

GPRS 4 slots				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
512	1850.20			
661	1880.00	0.306	-0.071	0.311
810	1909.80			
WCDMA 12.2k RMC				
Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
9262	1852.40			
9400	1880.00	0.203	0.000	0.203
9538	1907.60			

Notes:

- 1) The exact method of extrapolation is Measured SAR $\times 10^{(-\text{drift}/10)}$. 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.

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 Mechanical 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					
Notes for table												
1. Tol. - tolerance in influence quality												
2. N - Nominal												
3. R - Rectangular												
4. Div. - Divisor used to obtain standard uncertainty												
5. Ci - is the sensitivity coefficient												

11 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	TP-1185	QD000P40CA			N/A
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A			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	3552	5	30	2007
Thermometer	ERTCO	639-1S	1718	11	7	2007
Data Acquisition Electronics	SPEAG	DAE3 V1	427	11	16	2007
System Validation Dipole	SPEAG	D835V2	4d002	1	23	2008
System Validation Dipole	SPEAG	D1900V2	5d043	1	29	2008
Signal Generator	R&S	SMP 04	DE34210	10	9	2007
Power Meter	HP	438A	3513U04320	9	4	2007
Amplifier	Mini-Circuits	ZHL-42W	D072701-5			N/A
Radio Communication Tester	R &S	CMU 200	104096	11	16	2007
Radio Communication Tester	Agilent	E5515C	GB46160222	6	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		

12 PHOTOS

DUT

Lenovo ThinkPad X61 Tablet Series

Antenna Location

DUT Location

13 ATTACHMENTS

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4	Certificate of System Validation Dipole - D835V2 SN:4d002	9
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END OF REPORT