



SAR Evaluation Report

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

FOR

CDMA MOBILE PHONE

MODEL: M328

FCC ID: QISM328

REPORT NUMBER: 08U11569-1

ISSUE DATE: APRIL 1, 2008

Prepared for

**HUEWEI TECHNOLOGIES CO., LTD
10180 TELECIS CT #365
SAN DIEGO, CA 92121 USA**

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	April 1, 2008	Initial issue	Sunny Shih

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)**DATES OF TEST: March 25th, 26th, and 27th 2008**

APPLICANT: ADDRESS:	HUEWEI TECHNOLOGIES CO., LTD 10180 TELECIS CT #365 SAN DIEGO, CA 92121 USA
FCC ID: MODEL:	QISM328 M328
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

CDMA Mobile Phone operating in Cell, PCS, and AWS band		
Test Sample is a:	Production unit	
FCC Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]
22H	824 - 849	Head: 1.190 Body: 0.821
24E	1850 - 1910	Head: 1.378 Body: 0.389
27L	1710 - 1755	Head: 1.360 Body: 0.698

Testing has been carried out in accordance with:

47CFR §2.1093 - Radiofrequency Radiation Exposure Evaluation: Portable Devices

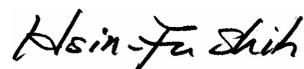
FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01) - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

RSS-102 - Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields

IEEE 1528_2003 - IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

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

Dual Band Cell Phone model M318 is tested for SAR in Cell, PCS and AWS bands (US frequencies).	
Mobile capabilities:	CDMA200 1XRTT (IS-2000)
Accessories:	N/A
Earphone/Headset Jack:	N/A
Duty cycle:	100%
Battery:	Manufacturer: Huawei PN: HBU570, 3.7Vdc, 900mAh

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."

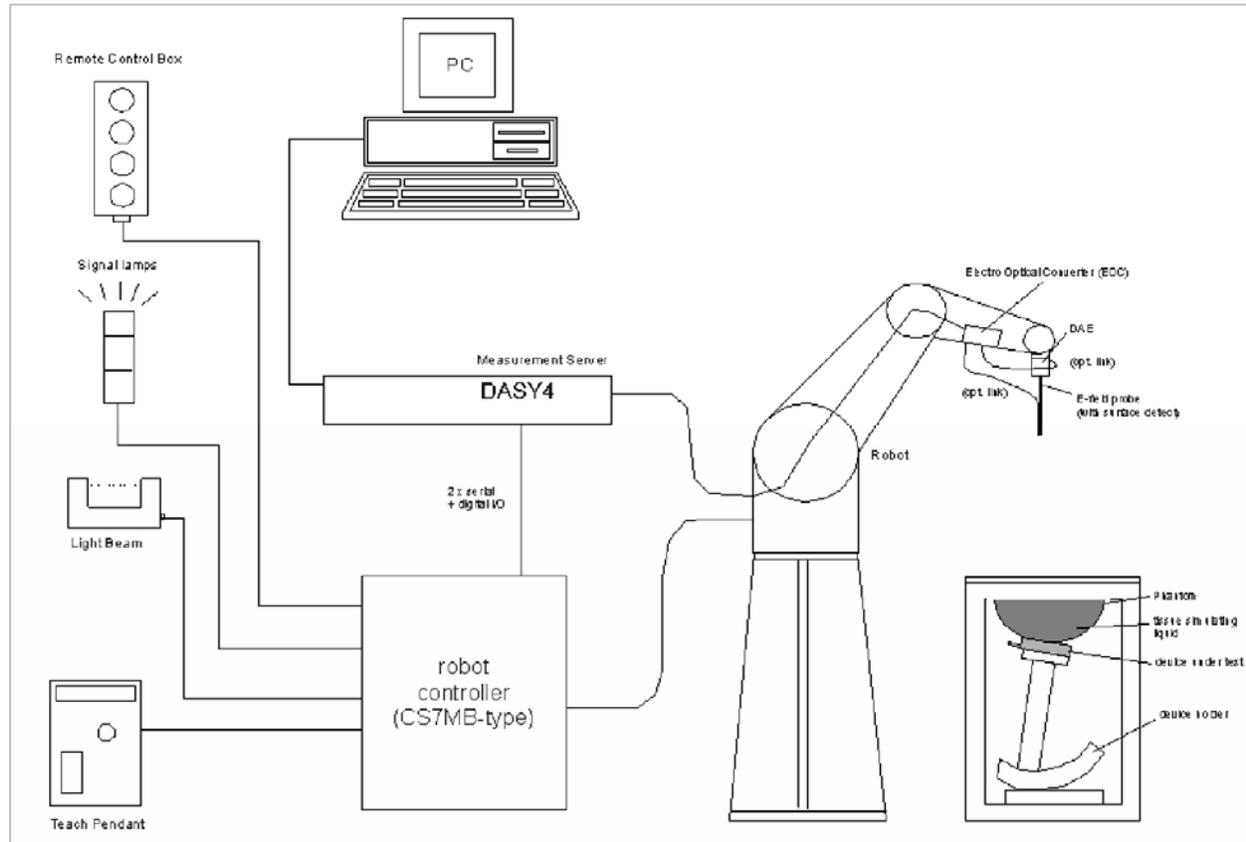


NVLAP LAB CODE 200065-0

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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

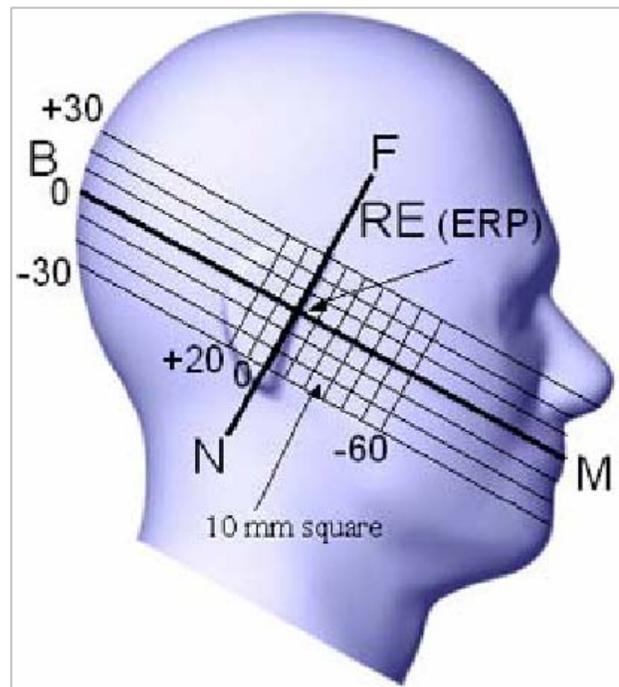
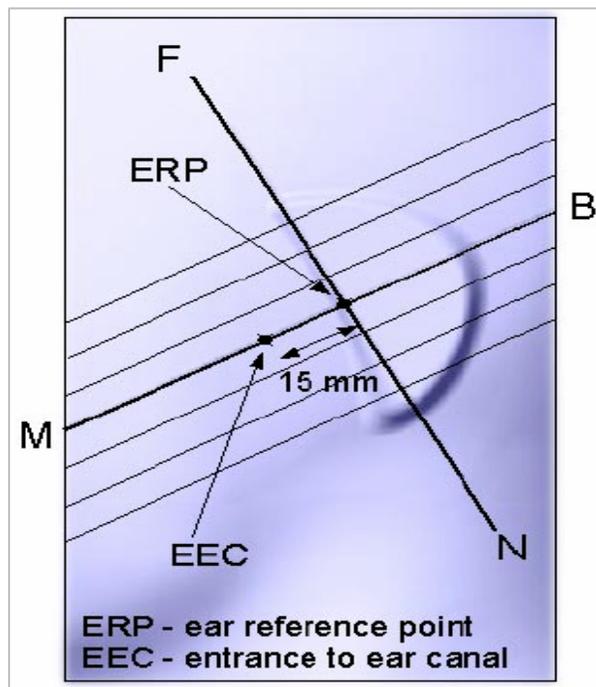
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

4 TEST POSITIONS FOR DEVICES OPERATING NEXT TO A PERSON’S EAR

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point”. The “test device reference point” should be located at the same level as the center of the earpiece region. The “vertical centerline” should bisect the front surface of the handset at its top and bottom edges. A “ear reference point” is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the “phantom reference plane” defined by the three lines joining the center of each “ear reference point” (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the “N-F” line defined along the base of the ear spacer that contains the “ear reference point”. For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The “test device reference point” is aligned to the “ear reference point” on the head phantom and the “vertical centerline” is aligned to the “phantom reference plane”. This is called the “initial ear position”. While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:



4.1 CHEEK/TOUCH POSITION

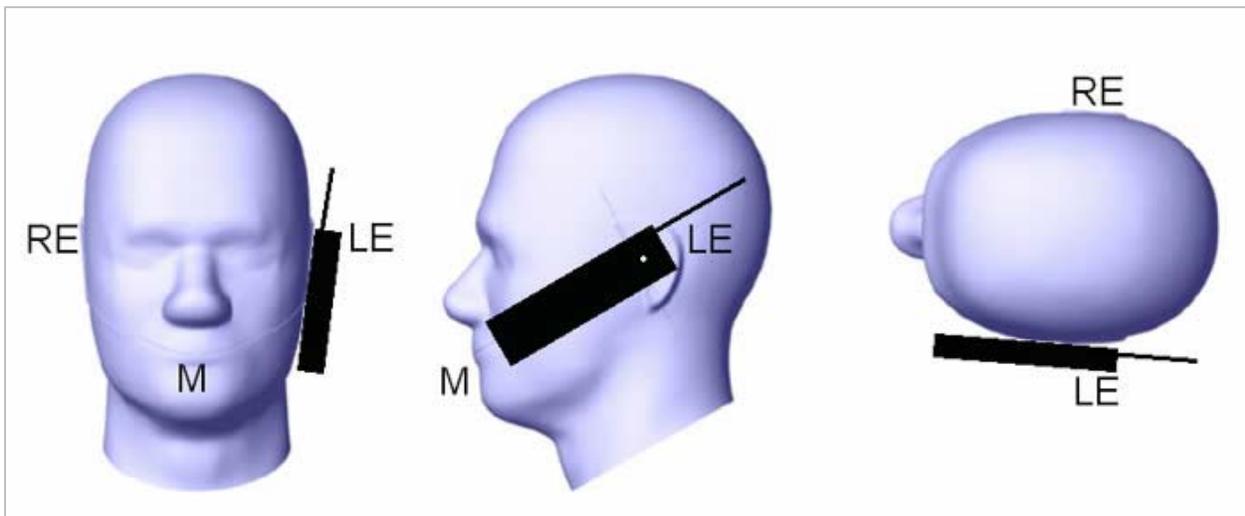
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

- i. When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
- ii. (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek / Touch Position



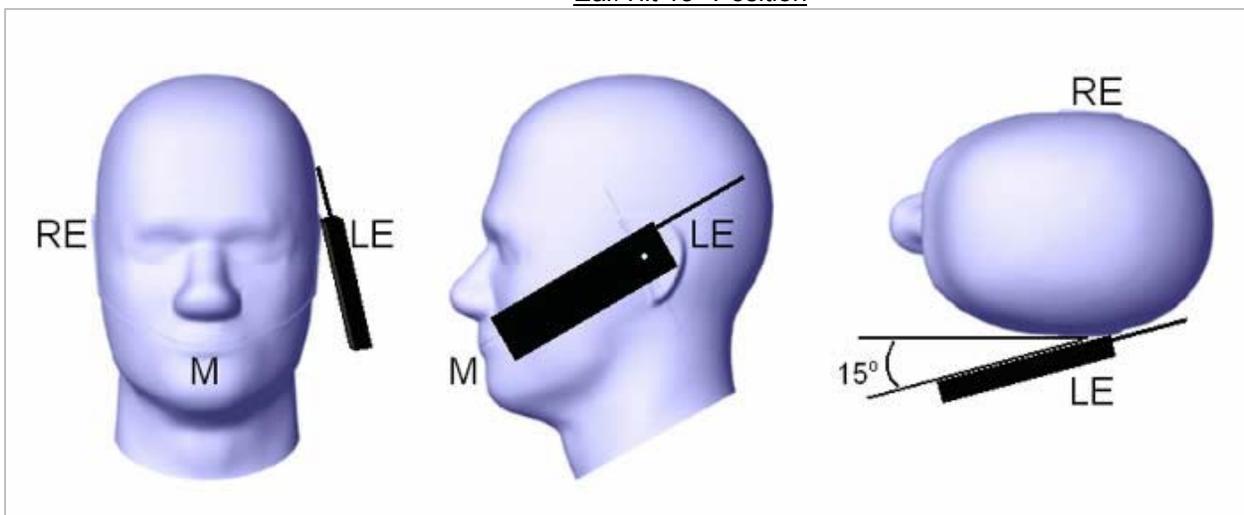
4.2 EAR/TILT POSITION

With the handset aligned in the “Cheek/Touch Position”:

- i. If the earpiece of the handset is not in full contact with the phantom’s ear spacer (in the “Cheek/Touch position”) and the peak SAR location for the “Cheek/Touch” position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the “initial ear position” by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.
- ii. (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both “ear reference points” (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the “test device reference point” until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both “ear reference points” until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the “Cheek/Touch” and “Ear/Tilt” positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tilt/Ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear/Tilt 15° Position



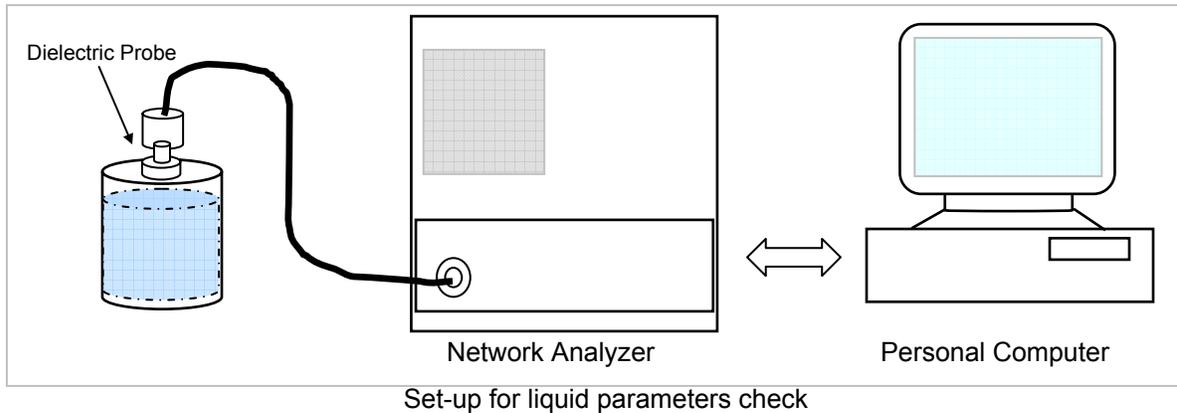
4.3 TEST POSITIONS FOR BODY-WORN AND OTHER SIMILAR CONFIGURATIONS

Without the belt-clips or holsters

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

5 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.



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 $\rho = 1000 \text{ kg/m}^3$)

5.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameters Check Result @ Head 835 MHz

Room Ambient Temperature = 23°C; Relative humidity = 45%

Measured by: Jonathan King

Simulating Liquid			Parameters		Measured	Target	Deviation (%)	Limit (%)	
f (MHz)	Temp. (°C)	Depth (cm)							
835	22	15	e'	42.5053	Relative Permittivity (ε _r):	42.5053	41.5	2.42	± 5
			e"	18.9376	Conductivity (σ):	0.87969	0.90	-2.26	± 5

Liquid Check

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

March 25, 2008 10:17 AM

Frequency	e'	e"
800000000.	42.9292	19.0501
805000000.	42.8722	19.0244
810000000.	42.8073	19.0444
815000000.	42.7511	18.9761
820000000.	42.6715	18.9739
825000000.	42.6142	18.9710
830000000.	42.5593	18.9728
835000000.	42.5053	18.9376
840000000.	42.4316	18.9400
845000000.	42.3342	18.9286
850000000.	42.3325	18.9210
855000000.	42.2536	18.8945
860000000.	42.1813	18.8872
865000000.	42.1046	18.8610
870000000.	42.0493	18.8696
875000000.	41.9895	18.8594
880000000.	41.9426	18.8557
885000000.	41.8569	18.8537
890000000.	41.8091	18.8406
895000000.	41.7839	18.8010
900000000.	41.7340	18.8089
905000000.	41.6721	18.7909
910000000.	41.6194	18.7999
915000000.	41.5503	18.7846
920000000.	41.5092	18.7464
925000000.	41.4311	18.7589
930000000.	41.3950	18.7633
935000000.	41.3339	18.7467
940000000.	41.3025	18.7307
945000000.	41.2429	18.7142
950000000.	41.1783	18.7091

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Head 1730 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)							
1730	22	15	e'	39.6288	Relative Permittivity (ε _r):	39.6288	40.1	-1.21	± 5
			e"	13.7989	Conductivity (σ):	1.32804	1.36	-2.13	± 5

Liquid Check

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

March 27, 2008 08:58 AM

Frequency	e'	e"
1610000000.	40.2509	13.5619
1620000000.	40.1175	13.6377
1630000000.	40.0675	13.7386
1640000000.	40.1440	13.8561
1650000000.	40.2808	13.9866
1660000000.	40.4176	14.1023
1670000000.	40.5046	14.1610
1680000000.	40.5273	14.1273
1690000000.	40.4596	14.0406
1700000000.	40.3190	13.9526
1710000000.	40.0964	13.8730
1720000000.	39.8519	13.8115
1730000000.	39.6288	13.7989
1740000000.	39.4844	13.8758
1750000000.	39.4524	14.0147
1760000000.	39.5006	14.1498
1770000000.	39.6384	14.3024
1780000000.	39.7872	14.3816
1790000000.	39.9413	14.4155
1800000000.	39.9925	14.4109
1810000000.	39.9178	14.2947

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Head 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)							
1900	22	15	e'	38.9784	Relative Permittivity (ε _r):	38.9784	40.0	-2.55	± 5
			e"	13.7791	Conductivity (σ):	1.45644	1.40	4.03	± 5

Liquid Check

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

March 26, 2008 08:42 AM

Frequency	e'	e"
1710000000.	39.8684	13.2971
1720000000.	39.8099	13.3279
1730000000.	39.7815	13.3599
1740000000.	39.7176	13.3818
1750000000.	39.6663	13.3964
1760000000.	39.6294	13.4335
1770000000.	39.5747	13.4535
1780000000.	39.5292	13.4867
1790000000.	39.4757	13.5094
1800000000.	39.4412	13.5362
1810000000.	39.3938	13.5495
1820000000.	39.3435	13.6011
1830000000.	39.2875	13.6110
1840000000.	39.2200	13.6492
1850000000.	39.1640	13.6746
1860000000.	39.1305	13.6955
1870000000.	39.1067	13.7253
1880000000.	39.0685	13.7492
1890000000.	39.0284	13.7683
1900000000.	38.9784	13.7791
1910000000.	38.9636	13.8064

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 835 MHz

Room Ambient Temperature = 23°C; Relative humidity = 45%

Measured by: Jonathan King

Simulating Liquid			Parameters		Measured	Target	Deviation (%)	Limit (%)	
f (MHz)	Temp. (°C)	Depth (cm)							
835	22	15	e'	57.3839	Relative Permittivity (ε _r):	57.3839	55.2	3.96	± 5
			e"	21.3121	Conductivity (σ):	0.98999	0.97	2.06	± 5

Liquid Check

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

March 25, 2008 04:21 PM

Frequency	e'	e"
800000000.	57.6399	21.4014
805000000.	57.5975	21.3776
810000000.	57.5916	21.3572
815000000.	57.5666	21.3441
820000000.	57.4867	21.3180
825000000.	57.4584	21.3344
830000000.	57.4070	21.3316
835000000.	57.3839	21.3121
840000000.	57.3310	21.2711
845000000.	57.2274	21.2393
850000000.	57.2014	21.2327
855000000.	57.1706	21.1840
860000000.	57.1085	21.1372
865000000.	57.0288	21.0981
870000000.	56.9933	21.0851
875000000.	56.9549	21.0625
880000000.	56.9320	21.0231
885000000.	56.8640	21.0023
890000000.	56.8245	20.9702
895000000.	56.8348	20.9282
900000000.	56.7968	20.9594
905000000.	56.7562	20.9440
910000000.	56.7185	20.9327
915000000.	56.6530	20.9281
920000000.	56.5850	20.9143
925000000.	56.5186	20.9625
930000000.	56.4609	20.9189
935000000.	56.4105	20.9139
940000000.	56.3969	20.8725
945000000.	56.3627	20.8300
950000000.	56.3234	20.8207

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1730 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)							
1730	22	15	e'	51.2996	Relative Permittivity (ε _r):	51.2996	53.5	-4.11	± 5
			e"	15.2153	Conductivity (σ):	1.46435	1.47	-0.38	± 5

Liquid Check

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

March 27, 2008 08:40 AM

Frequency	e'	e"
1610000000.	51.8474	14.9729
1620000000.	51.7372	15.0790
1630000000.	51.7209	15.1938
1640000000.	51.8145	15.3190
1650000000.	51.9891	15.4892
1660000000.	52.1177	15.6033
1670000000.	52.1940	15.6446
1680000000.	52.2178	15.5811
1690000000.	52.1329	15.4616
1700000000.	51.9707	15.3597
1710000000.	51.7248	15.2704
1720000000.	51.4976	15.2023
1730000000.	51.2996	15.2153
1740000000.	51.1889	15.3275
1750000000.	51.1727	15.4923
1760000000.	51.2487	15.6418
1770000000.	51.4044	15.7920
1780000000.	51.5858	15.8799
1790000000.	51.7274	15.9109
1800000000.	51.7560	15.8550
1810000000.	51.6696	15.7163

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Muscle 1800 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)							
1800	22	15	e'	52.5672	Relative Permittivity (ε _r):	52.5672	53.3	-1.37	± 5
			e''	15.9083	Conductivity (σ):	1.59300	1.52	4.80	± 5

Liquid Check

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

March 27, 2008 08:31 AM

Frequency	e'	e''
1700000000.	52.9324	15.6795
1710000000.	52.8969	15.6866
1720000000.	52.8523	15.7310
1730000000.	52.8068	15.7393
1740000000.	52.7467	15.7820
1750000000.	52.7233	15.7989
1760000000.	52.6852	15.8135
1770000000.	52.6500	15.8517
1780000000.	52.6122	15.8665
1790000000.	52.5847	15.8914
1800000000.	52.5672	15.9083
1810000000.	52.5250	15.9461
1820000000.	52.4968	15.9761
1830000000.	52.4453	15.9895
1840000000.	52.4052	16.0523
1850000000.	52.3604	16.0902
1860000000.	52.3337	16.1128
1870000000.	52.3048	16.1267
1880000000.	52.2780	16.1574
1890000000.	52.2252	16.1856
1900000000.	52.1909	16.2200

The conductivity (σ) can be given as:

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

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)							
1900	22	15	e'	51.4234	Relative Permittivity (ε _r):	51.4234	53.3	-3.52	± 5
			e"	14.2349	Conductivity (σ):	1.50462	1.52	-1.01	± 5

Liquid Check

Ambient temperature: 22 deg. C; Liquid temperature: 21 deg. C

March 26, 2008 12:37 PM

Frequency	e'	e"
1710000000.	51.9871	13.6500
1720000000.	51.9532	13.7111
1730000000.	51.9374	13.7829
1740000000.	51.8988	13.8011
1750000000.	51.8654	13.8189
1760000000.	51.8562	13.8027
1770000000.	51.8411	13.7950
1780000000.	51.8007	13.8368
1790000000.	51.7584	13.8482
1800000000.	51.7098	13.9010
1810000000.	51.6580	13.9601
1820000000.	51.6134	14.0420
1830000000.	51.5484	14.1095
1840000000.	51.4813	14.1508
1850000000.	51.4689	14.1458
1860000000.	51.4990	14.1432
1870000000.	51.5254	14.1754
1880000000.	51.5278	14.2104
1890000000.	51.4859	14.2133
1900000000.	51.4234	14.2349
1910000000.	51.3869	14.2798

The conductivity (σ) can be given as:

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

where $f = target\ f * 10^6$

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

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 Head 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 $\pm 3\%$.
- The results are normalized to 1 W input power.

IEEE Standard 1528-2003 Recommended Reference Value.

Frequency (MHz)	Distance (mm)	1g SAR [W/kg]	10g SAR [W/kg]
300	15	3.0	2.0
450	15	4.9	3.3
835	15	9.5	6.2
900	15	10.8	6.9
1450	10	29.0	16.0
1800	10	38.1	19.8
1900	10	39.7	20.5
2000	10	41.1	21.1
2450	10	52.4	24.0
3000	10	63.8	25.7

Note: All SAR values normalized to 1 W forward 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.

6.1 SYSTEM PERFORMANCE CHECK RESULTS**System Validation Dipole: D835V2 SN:4d002**

Date: March 25, 2008

Ambient Temperature = 23°C; Relative humidity = 45%

Measured by: Jonathan King

Head Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	22	15	1g	2.48	9.92	9.5	4.42	± 10
			10g	1.63				

System Validation Dipole: D1800V2 SN: 294

Date: March 27, 2008

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)						
1800	22	15	1g	9.47	37.88	38.5	-1.61	± 10
			10g	4.9				

System Validation Dipole: D1900V2 SN:5d043

Date: March 26, 2008

Ambient Temperature = 23°C; Relative humidity = 40%

Measured by: Jonathan King

Head Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	22	15	1g	10.70	42.8	39.7	7.81	± 10
			10g	5.41				

7 SAR MEASUREMENT 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 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 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=24 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:

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 MEASUREMENT 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 7 x 7 x 9 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 procedures had been used to prepare the EUT for the SAR test.

3G-CDMA2000 1xRTT

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

<u>Application</u>	<u>Rev. License</u>
CDMA2000 Mobil Test	B.13.08, L

1xRTT

- Call Setup > Shift & Preset
- Protocol Rev > 6 (IS-2000-0)
- Cell Band > US Cellular (for Cell Band)
> US PCS (for PCS Band)
> AWS (for AWS Band)
- Radio Config (RC) > RC3 (Fwd3, Rvs3) (For both head and body SAR)
- FCH Service Option (SO) Setup > 55 (Loopback) (for head SAR)
32 (+ F-SCH) (for body SAR)
- Traffic Data Rate > Full
- TDSO SCH Info > F-SCH Parameters > F-SCH Data Rate > 153.6 kbps
> R-SCH Parameters > R-SCH Data Rate > 153.6 kbps
- Cell Info > Cell Parameters > System ID (SID) > 6503
> Network ID (NID) > 0

Once "Active Cell" shows "Connected" then change "Rvs Power Ctrl" from "Active bits" to "**All Up bits**" to get the maximum power.

Preliminary Measurement Results @ Middle channel

Radio Configuration (RC)	Service Option (SO)	Average Output Power (dBm)		
		Cell Band	AWS Band	PCS Band
RC1(Fwd1, Rvs1)	1 (Voice)			
	2 (Loopback)	24.80	24.08	24.25
	3 (Voice)			
	55 (Loopback)	24.80	24.07	25.22
RC2 (Fwd2, Rvs2)	9 (Loopback)	24.81	24.09	24.27
	17 (Voice)			
	55 (Loopback)	24.82	24.07	24.23
RC3 (Fwd3, Rvs3)	1 (Voice)			
	2 (Loopback)	24.85	24.10	24.27
	3 (Voice)			
	55 (Loopback)	24.85	24.10	24.31
	32 (+ F-SCH)	24.85	24.13	24.20
	32 (+ SCH)	24.85	24.10	24.17
RC43 (Fwd4, Rvs3)	1 (Voice)			
	2 (Loopback)	24.82	24.05	24.28
	3 (Voice)			
	55 (Loopback)	24.84	24.06	24.29
	32 (+ F-SCH)	24.84	24.08	24.28
	32 (+ SCH)	24.85	24.07	24.28
RC54 (Fwd5, Rvs4)	9 (Loopback)	24.85	24.06	24.25
	17 (Voice)			
	55 (Loopback)	24.85	24.05	24.25

Worst-case Measurement Result @ Low, Middle and High Channel

RC3, SO55 (Loopback) – for Head SAR

Channel	Frequency (MHz)	Conducted Power
		Average (dBm)
Cell band		
1013	824.70	24.27
384	836.52	24.85
777	848.31	24.40
AWS band		
25	1711.25	24.07
425	1732.50	24.10
850	1752.50	24.08
PCS band		
25	1851.25	24.20
600	1880.00	24.31
1175	1908.75	24.30

RC3, SO32 (+F-SCH) – for Body SAR

Channel	Frequency (MHz)	Conducted Power
		Average (dBm)
Cell band		
1013	824.70	24.29
384	836.52	24.85
777	848.31	24.41
AWS band		
25	1711.25	24.09
425	1732.50	24.13
850	1752.50	24.10
PCS band		
25	1851.25	24.15
600	1880.00	24.20
1175	1908.75	24.20

9 SAR MEASUREMENT RESULTS

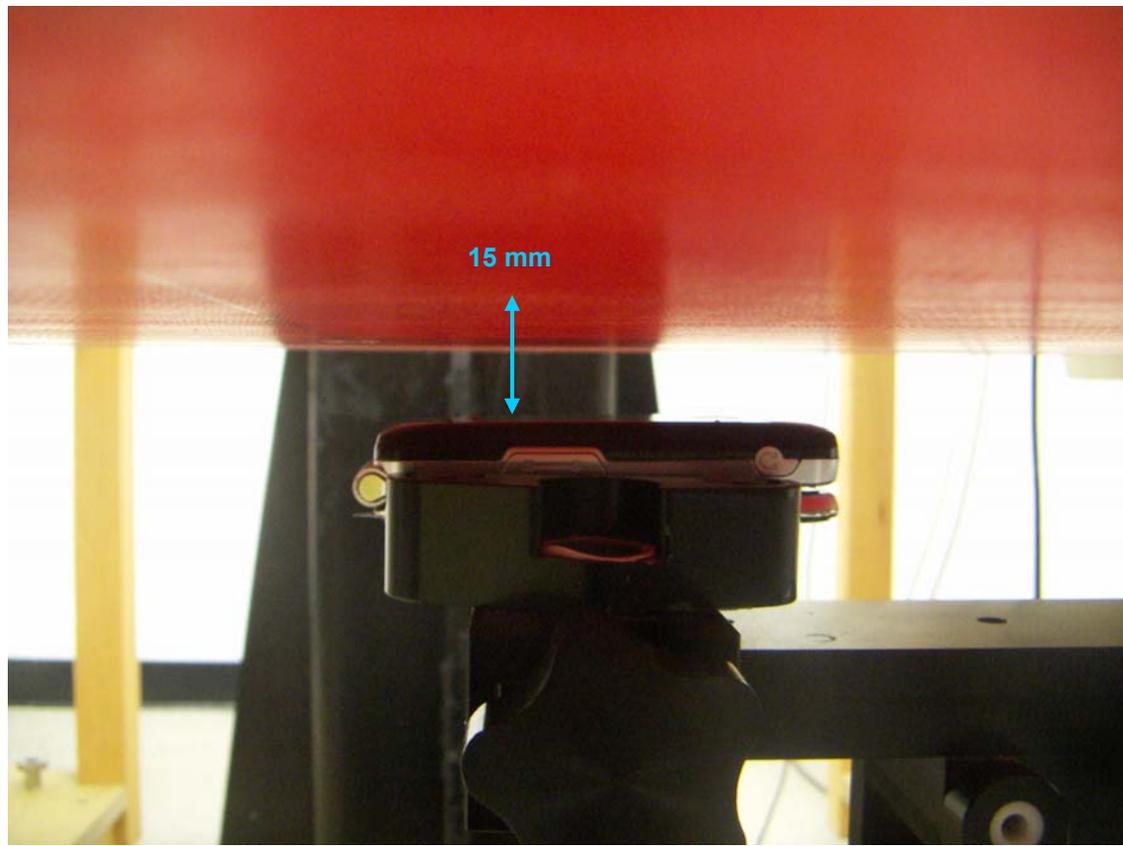
9.1 LEFT HAND SIDE

					
Touch Position		Tilt (15°) Position			
Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
CDMA Cell Band					
Touch	1013	824.70	0.904	-0.007	0.905
	384	836.52	0.987	-0.148	1.021
	777	848.31	0.829	0.000	0.829
Tilt (15°)	1013	824.70	0.496	-0.036	0.500
	384	836.52			
	777	848.31			
CDMA AWS Band					
Touch	25	1711.25	1.080	0.000	1.080
	425	1732.50	1.340	-0.063	1.360
	850	1752.5	1.330	-0.029	1.339
Tilt (15°)	25	1711.25	0.433	0.000	0.433
	425	1732.50			
	850	1752.5			
CDMA PCS Band					
Touch	25	1851.25	1.300	0.000	1.300
	600	1880.00	1.360	-0.058	1.378
	1175	1908.75	0.944	0.000	0.944
Tilt (15°)	25	1851.25	0.275	-0.031	0.277
	600	1880.00			
	1175	1908.75			
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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.					

9.2 RIGHT HAND SIDE

					
Touch Position		Tilt (15°) Position			
Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
CDMA Cell Band					
Touch	1013	824.70	1.130	-0.043	1.141
	384	836.52	1.190	0.000	1.190
	777	848.31	1.070	0.000	1.070
Tilt (15°)	1013	824.70	0.581	0.000	0.581
	384	836.52			
	777	848.31			
CDMA AWS Band					
Touch	25	1711.25	1.060	0.000	1.060
	425	1732.50	1.150	-0.047	1.163
	850	1752.5	1.240	0.000	1.240
Tilt (15°)	25	1711.25	0.422	-0.067	0.429
	425	1732.50			
	850	1752.5			
CDMA PCS Band					
Touch	25	1851.25	1.080	0.000	1.080
	600	1880.00	1.230	-0.105	1.260
	1175	1908.75	0.961	0.000	0.961
Tilt (15°)	25	1851.25	0.143	0.000	0.143
	600	1880.00			
	1175	1908.75			
Notes:					
1) The exact method of extrapolation is Measured SAR x 10 ⁴ (-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) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.					

9.3 BODY-WORN POSITION



Body-Worn Position

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated ¹⁾ SAR 1g (mW/g)
CDMA Cell Band					
Body Worn Position	1013	824.70	0.821	0.000	0.821
	383	836.49	0.686	0.000	0.686
	777	848.31	0.682	-0.050	0.690
CDMA AWS Band					
Body Worn Position	25	1711.25	0.498	0.000	0.498
	425	1732.50	0.684	-0.091	0.698
	850	1752.5	0.437	0.000	0.437
CDMA PCS Band					
Body Worn Position	25	1851.25	0.389	0.000	0.389
	600	1880.00	0.376	0.000	0.376
	1175	1908.75	0.277	-0.083	0.282

Notes:

- 1) The exact method of extrapolation is Measured SAR x 10^{^(-drift/10)}. The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
- 2) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
- 3) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.

10 MEASUREMENT UNCERTAINTY

10.1 MEASUREMENT 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 quantity							
2. N - Normal							
3. R - Rectangular							
4. Div. - Divisor used to obtain standard uncertainty							
5. Ci - is te sensitivity coefficient							

11 EQUIPMENT LIST AND CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date		
				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	11	14	2008
E-Field Probe	SPEAG	EX3DV4	3554	4	24	2008
Thermometer	ERTCO	639-1S	1718	8	30	2008
Data Acquisition Electronics	SPEAG	DAE3 V1	500	11	16	2008
System Validation Dipole	SPEAG	D835V2	4d002	6	22	2009
System Validation Dipole	SPEAG	D1800V2	294	1	29	2010
System Validation Dipole	SPEAG	D1900V2	5d043	1	29	2010
Signal Generator	R&S	SMP 04	DE34210	2	16	2009
Power Meter	Giga-tronics	8651A	8651404	4	3	2008
Power Sensor	Giga-tronics	80701A	1834588	4	17	2008
Amplifier	Mini-Circuits	ZHL-42W	D072701-5			N/A
Radio Communication Tester	Agilent	E5515C	GB46160222	6	29	2008
Simulating Liquid	CCS	H835	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	H1730	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	H1900	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M835	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1730	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1800	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test		

12 ATTACHMENTS

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