SAR Evaluation Report

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

FOR

EMBEDDED WIRELESS RADIO MODEM INSTALLED IN A CN3 HANDHELD COMPUTER

MODEL: CN3

FCC ID: EHA-04CN3

REPORT NUMBER: 06U10562-4B

ISSUE DATE: OCTOBER 16, 2006

Prepared for

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LAB CODE:200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	October 9, 2006	Initial issue	HS
B	October 16, 2006	1. Changed battery voltage from 4.2V to 3.7V 2. Updated antenna markings on pictures page 37 and 38.	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: September 22-28, 2006

APPLICANT: ADDRESS:	Intermec Technologies Corporation 550 Second Street SE,Cedar Rapids, IOWA 52401, USA
FCC ID: MODEL:	EHA-04CN3 CN3
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

Embedded wireless radio modem installed in a CN3 handheld computer includes EM5626 CDMA along with 802.11 b/g and Bluetooth Combo Radio DHIB Module.

Test Sample is a:	Production unit		
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	Collocation SAR Values [1g_mW/g]
FCC 22H	824.7-848.31	Head: 0.919 Body: 0.306	Head: 0.870 Body: 0.306
FCC 24E	1851.25-1908.75	Head: 0.647 Body: 0.520	Head: 0.811 Body: 0.515

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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Tested By:

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EMC Engineer
Compliance Certification Services

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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Embedded wireless radio modem installed in a CN3 handheld computer includes EM5626 CDMA along with 802.11 b/g and Bluetooth Combo Radio DHIB Module.	
Normal operation:	Head and body position with Holster
Accessory:	Holster PN: X991B
Earphone/Headset Jack:	N/A
Duty cycle:	100% for CDMA200 1xEv-Do and 1xRTT mode
Power supply:	3.7 V 4000mAh Lithium-Ion battery

2 FACILITIES AND ACCREDITATION

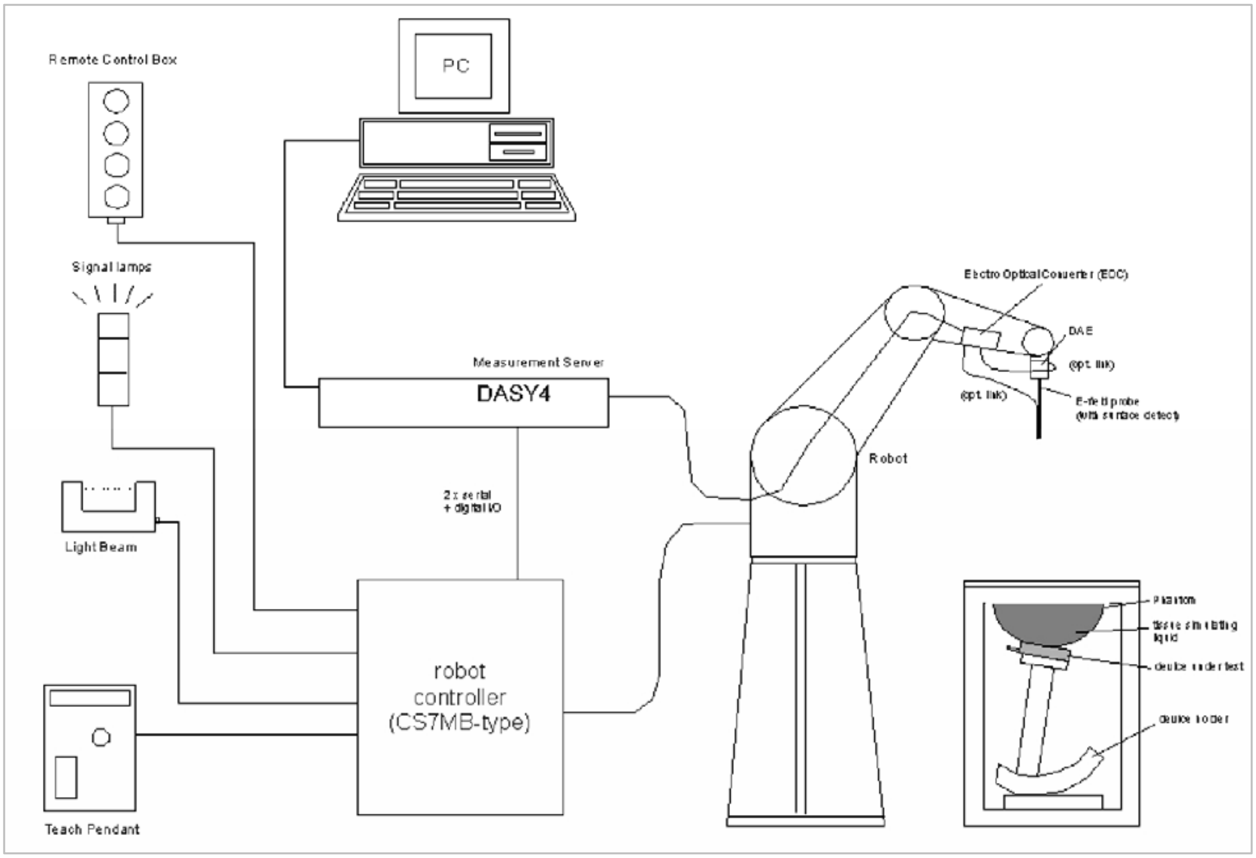
The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1,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

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.

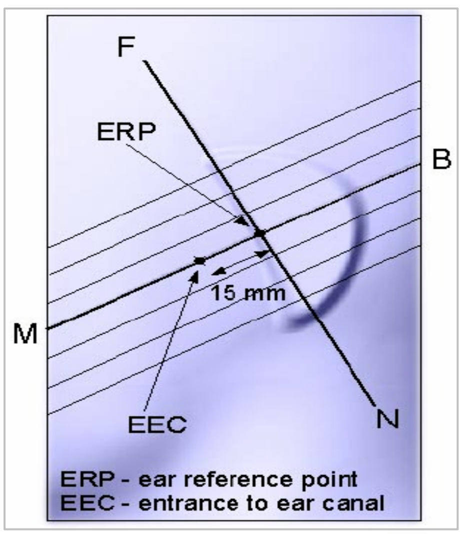
Ingredients (% by weight)	Frequency (MHz) 450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	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

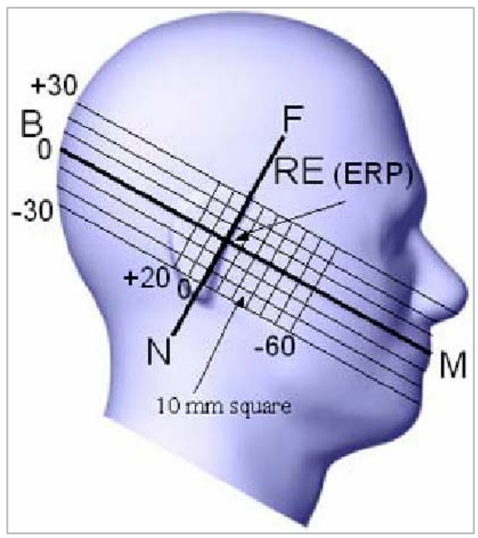
Salt: 99+% Pure Sodium Chloride
Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

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

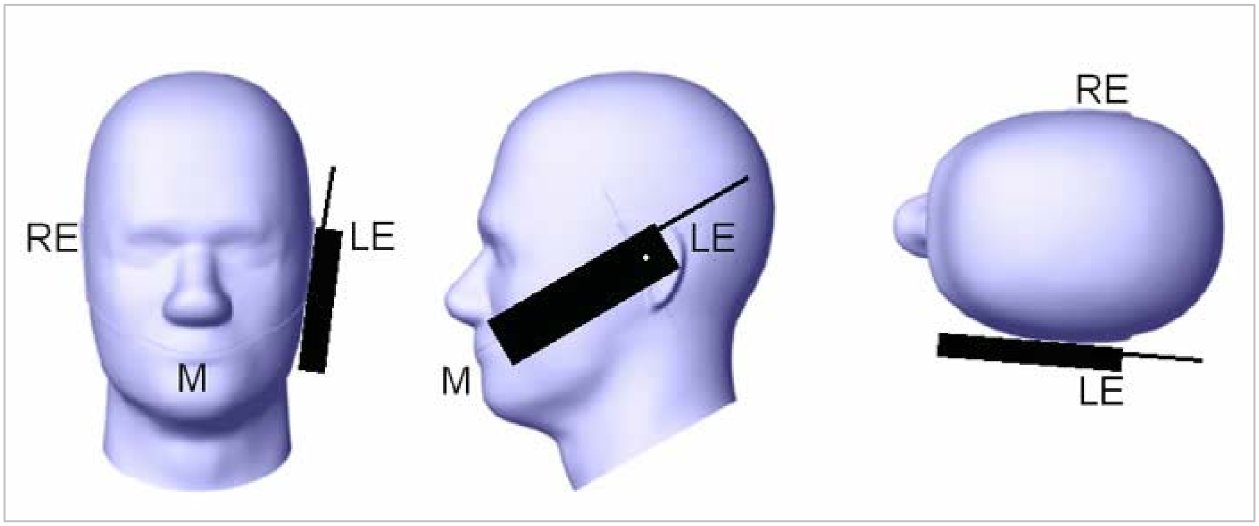
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

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

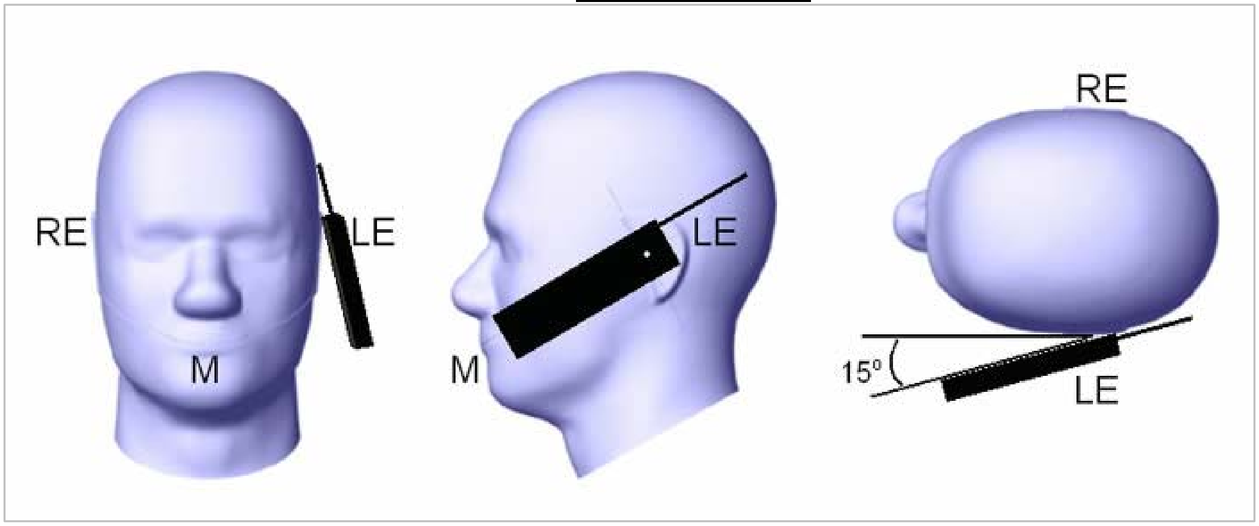
With the handset aligned in the “Cheek/Touch Position”:

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 isby 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, Tile/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



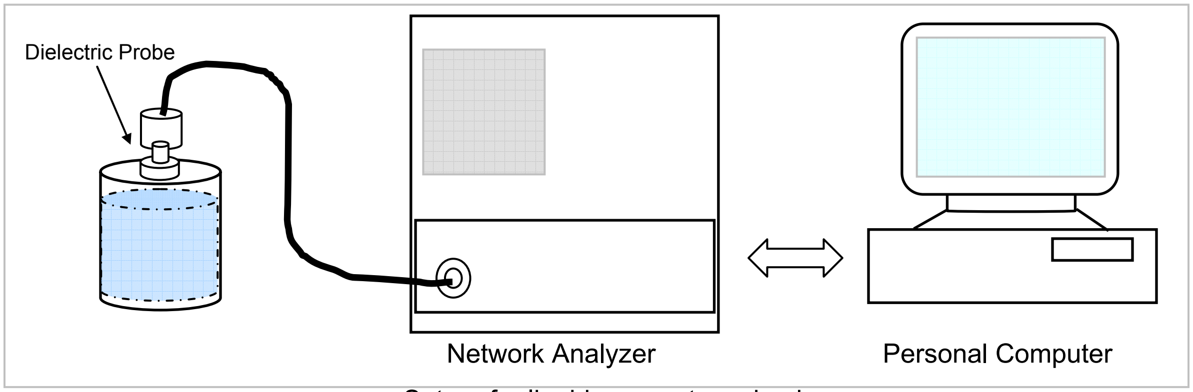
4.3 TEST POSITIONS FOR BODY-WORN AND OTHER SIMILAR CONFIGURATIONS

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 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)

5.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameters Check Result @ Head 835 MHz

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

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
835	22	15	e'	42.703	Relative Permittivity (ε_r):	42.7030	41.5	2.90	± 5
			e''	19.1862	Conductivity (σ):	0.89124	0.90	-0.97	± 5

Liquid Check

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

September 22, 2006 05:10 PM

Frequency	e'	e''
800000000.	43.0889	19.3111
805000000.	43.0314	19.2838
810000000.	42.9704	19.2794
815000000.	42.9297	19.2479
820000000.	42.8502	19.2278
825000000.	42.8127	19.2388
830000000.	42.7354	19.2188
835000000.	**42.7030**	**19.1862**
840000000.	42.5967	19.1859
845000000.	42.5360	19.1935
850000000.	42.5281	19.1651
855000000.	42.4580	19.1344
860000000.	42.3509	19.1150
865000000.	42.2913	19.1129
870000000.	42.2431	19.0771
875000000.	42.1947	19.0722
880000000.	42.1257	19.0635
885000000.	42.0578	19.0547
890000000.	42.0065	19.0313
895000000.	41.9861	19.0087
900000000.	41.9418	19.0036

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters Check Result @ Head 835 MHz

Room Ambient Temperature = 23°C; Relative humidity = 40% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
835	22	15	e'	40.8916	Relative Permittivity (ε_r):	40.8916	41.5	-1.47	± 5
			e"	18.7198	Conductivity (σ):	0.86957	0.90	-3.38	± 5

Liquid Check
Ambient temperature: 22.5 deg. C; Liquid temperature: 22 deg C
September 25, 2006 08:35 AM

Frequency	e'	e"
750000000.	41.9326	18.9324
755000000.	41.8527	18.9150
760000000.	41.7846	18.8951
765000000.	41.7493	18.8670
770000000.	41.6702	18.8395
775000000.	41.6032	18.8538
780000000.	41.5445	18.8107
785000000.	41.4949	18.7987
790000000.	41.4080	18.8077
795000000.	41.3631	18.8058
800000000.	41.3138	18.7835
805000000.	41.2707	18.7814
810000000.	41.1604	18.7652
815000000.	41.1271	18.7715
820000000.	41.0886	18.7367
825000000.	41.0214	18.7101
830000000.	40.9264	18.7126
835000000.	**40.8916**	**18.7198**
840000000.	40.8344	18.6810
845000000.	40.7589	18.6479
850000000.	40.6787	18.6681

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 = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
835	22	15	e'	54.412	Relative Permittivity (ε_r):	54.4120	55.2	-1.43	± 5
			e"	20.8526	Conductivity (σ):	0.96865	0.97	-0.14	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
September 25, 2006 07:31 AM

Frequency	e'	e"
800000000.	54.7187	21.0249
805000000.	54.6874	20.9984
810000000.	54.6704	20.9781
815000000.	54.6059	20.9638
820000000.	54.5632	20.9139
825000000.	54.5125	20.9007
830000000.	54.4744	20.8887
835000000.	**54.4120**	**20.8526**
840000000.	54.3939	20.8444
845000000.	54.3370	20.8179
850000000.	54.2681	20.7853
855000000.	54.2241	20.7872
860000000.	54.1762	20.7474
865000000.	54.1198	20.7112
870000000.	54.0658	20.7066
875000000.	54.0150	20.6797
880000000.	53.9686	20.6619
885000000.	53.9085	20.6603
890000000.	53.8605	20.6331
895000000.	53.8442	20.6042
900000000.	53.8105	20.5823

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 = 45% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
835	22	15	e'	54.3215	Relative Permittivity (ϵ_r):	54.3215	55.2	-1.59	± 5
			e"	20.7867	Conductivity (σ):	0.96559	0.97	-0.46	± 5

Liquid Check
Ambient temperature: 22.5 deg. C; Liquid temperature: 22 deg C
September 28, 2006 11:35 AM

Frequency	e'	e"
750000000.	55.1654	21.2064
755000000.	55.0848	21.2068
760000000.	55.0126	21.1572
765000000.	54.9626	21.0654
770000000.	54.8685	21.0482
775000000.	54.8738	21.0439
780000000.	54.8131	20.9810
785000000.	54.7817	20.9662
790000000.	54.7247	21.0064
795000000.	54.6612	20.9915
800000000.	54.6156	20.9591
805000000.	54.5782	20.9467
810000000.	54.5218	20.9412
815000000.	54.4625	20.9089
820000000.	54.4385	20.8474
825000000.	54.3758	20.8004
830000000.	54.3313	20.8304
835000000.	**54.3215**	**20.7867**
840000000.	54.2570	20.7415
845000000.	54.1719	20.7264
850000000.	54.1536	20.7411

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 @ Head 1900 MHz

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

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
1900	22	15	e'	39.0451	Relative Permittivity (ϵ_r):	39.0451	40.0	-2.39	± 5
			e"	13.3996	Conductivity (σ):	1.41633	1.40	1.17	± 5

Liquid check
Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C
September 25, 2006 04:35 PM

Frequency	e'	e"
1710000000.	39.8424	12.9112
1720000000.	39.8077	12.9325
1730000000.	39.7470	12.9598
1740000000.	39.7069	12.9936
1750000000.	39.6537	13.0289
1760000000.	39.6044	13.0682
1770000000.	39.5594	13.0867
1780000000.	39.5303	13.0989
1790000000.	39.4837	13.1459
1800000000.	39.4394	13.1491
1810000000.	39.3984	13.1958
1820000000.	39.3631	13.2000
1830000000.	39.2922	13.2229
1840000000.	39.2642	13.2499
1850000000.	39.2014	13.2864
1860000000.	39.1709	13.3150
1870000000.	39.1330	13.3393
1880000000.	39.1107	13.3629
1890000000.	39.0759	13.3884
1900000000.	**39.0451**	**13.3996**
1910000000.	38.9932	13.4272

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 = 45% Measured by: Sunny Shih

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
1900	22	15	e'	55.5996	Relative Permittivity (ϵ_r):	55.5996	53.3	4.31	± 5
			e"	14.2575	Conductivity (σ):	1.50701	1.52	-0.85	± 5

Liquid Check
Ambient temperature: 23 deg. C; Liquid temperature: 22 deg C
September 28, 2006 08:39 AM

Frequency	e'	e"
1750000000.	56.2414	13.4320
1760000000.	56.1345	13.5659
1770000000.	56.0924	13.6716
1780000000.	56.0899	13.7260
1790000000.	56.1393	13.8047
1800000000.	56.1337	13.8541
1810000000.	56.0747	13.8318
1820000000.	56.0442	13.7413
1830000000.	56.0486	13.6826
1840000000.	56.0391	13.7589
1850000000.	55.9441	13.9252
1860000000.	55.7415	14.0555
1870000000.	55.5718	14.1023
1880000000.	55.5396	14.1009
1890000000.	55.5708	14.1857
1900000000.	**55.5996**	**14.2575**
1910000000.	55.5611	14.2857
1920000000.	55.5563	14.2009
1930000000.	55.6127	14.1685
1940000000.	55.6437	14.2146
1950000000.	55.5669	14.3246

The conductivity (σ) can be given as:

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

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

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

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 ±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.

6.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D835V2 SN:4d002

Date: September 22, 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. (°C)	Depth (cm)						
835	22	15	1g	2.45	9.8	9.71	0.93	± 10
			10g	1.61	6.44	6.38	0.94	± 10

System Validation Dipole: D835V2 SN:4d002

Date: September 25, 2006

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	22	15	1g		0	9.71	-100.00	± 10
			10g		0	6.38	-100.00	± 10

System Validation Dipole: D835V2 SN:4d002

Date: September 28, 2006

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	22	15	1g	2.70	10.8	9.71	11.23	± 10
			10g	1.63	6.52	6.38	2.19	± 10

System Validation Dipole: D1900V2 SN:5d043

Date: September 25, 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. (°C	Depth (cm						
1900	22	15	1g	9.72	38.88	39.8	-2.31	± 10
			10g	5.18	20.72	20.8	-0.38	± 10

System Validation Dipole: D1900V2 SN:5d043

Date: September 28, 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. (°C	Depth (cm						
1900	22	15	1g	9.75	39	39.8	-2.01	± 10
			10g	5.2	20.8	20.8	0.00	± 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 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.

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 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.

8 PROCEDURE USED TO ESTABLISH TEST SIGNAL

The following procedures had been used to prepare the EUT for the SAR test.

Agilent 8960 Communication Test Set was used to control the channel and measure the conducted power. The cable loss of 0.3 dB (Cell band) and 0.4 dB (PCS band) were entered as an offset in the Agilent 8960 Communication Test Set to mmeasure the channel power.

Pwr Ctrl Parms: Active bits (Select “All Up bits” after linked to get maximum power)
Protocol Rev.: 6 (IS-2000-0)

Cell band

Channel	Frequency (MHz)	RC3, SO55 (Loopback)	RC3, SO32 (+F-SCH)
		Output Power (dBm)	Output Power (dBm)
1013	824.70	24.6	24.6
384	836.52	24.5	24.5
777	848.31	24.5	24.5

PCS band

Channel	Frequency (MHz)	RC3, SO55 (Loopback)	RC3, SO32 (+F-SCH)
		Output Power (dBm)	Output Power (dBm)
25	1851.25	24.7	24.7
600	1880.00	24.9	24.9
1175	1908.75	24.6	24.6

The following setting was used during test for 1xEV-DO Rev.0

Call Parms:

Application Config: RTAP

FTAP Rate: 307.2 Kbps; RTAP Rate: 153.6 Kbps

Pwr Ctrl Parms: Active bits (Select "All Up bits" after linked to get maximum power)

Protocol Rev.: 0 (1xEV-DO)

Call Control:

AT Max Power: 23 dBm/1.23 MHz

CDMA 1xEV-DO Rev.0 Cell Band

Channel	Frequency (MHz)	Channel Power (dBm)
1013	824.70	24.3
384	836.52	24.2
777	848.31	24.3

CDMA 1xEV-DO Rev.0 PCS Band

Channel	Frequency (MHz)	Channel Power (dBm)
25	1851.25	24.4
600	1880.00	24.3
1175	1908.75	24.4

9 SAR MEASURMENT RESULTS

9.1 LEFT HAND SIDE

Touch Position

Tilt (15°) Position

Cell band - 1xRTT: RC3; SO32 (Loopback)

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1013 384 777	824.70 836.52 848.31	0.677 0.872 0.856	-0.031 0.000 0.000	0.682 0.872 0.856
Tilt (15°)	1013 383 777	824.70 836.49 848.31	0.531	0.000	0.531

Cell band - 1xEv-Do

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1013 384 777	824.70 836.52 848.31	0.627 0.759 0.803	-0.094 -0.071 -0.116	0.641 0.771 0.825
Tilt (15°)	1013 383 777	824.70 836.49 848.31	0.487	0.000	0.487

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

Cell band - 1xRTT: RC3; SO32 (Loopback)

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1013	824.70	0.686	0.000	0.686
	384	836.52	0.835	0.000	0.835
	777	**848.31**	**0.891**	**-0.135**	**0.919**
	777 [5]	848.31	0.835	-0.098	0.854
Tilt (15°)	1013	824.70			
	383	836.49	0.506	-0.059	0.513
	777	848.31			

Cell band - 1xEv-Do

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1013	824.70	0.611	-0.115	0.627
	384	836.52	0.796	0.000	0.796
	777	848.31	0.850	0.000	0.850
	777 [5]	**848.31**	**0.870**	**0.000**	**0.870**
Tilt (15°)	1013	824.70			
	383	836.49	0.457	0.000	0.457
	777	848.31			

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.
5) Collocation with WLAN and Bluetooth modules.

9.3 BODY POSITION WITH HOLSTER

Cell band - 1xEv-Do					
Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Body Position with Holster	1013	824.70	0.232	-0.174	0.241
	384	836.52	0.243	-0.249	0.257
	777	**848.31**	**0.306**	**0.000**	**0.306**
	777[5)]	**848.31**	**0.306**	**0.000**	**0.306**
Cell band - 1xRTT: RC3, SO32 (+F-SCH)					
Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Body Position with Holster	1013	824.70	0.210	-0.262	0.223
	384	836.52			
	777	848.31			

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.
5) Collocation with WLAN and Bluetooth modules.

9.4 LEFT HAND SIDE

	
Touch Position	Tilt (15°) Position

PCS band - 1xRTT: RC3; SO32 (Loopback)

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	25	1851.25			
	600	1880.00	0.446	-0.005	0.447
	1175	1908.75			
Tilt (15°)	25	1851.25	0.482	0.000	0.482
	600	1880.00	0.507	0.000	0.507
	1175	1908.75	0.615	-0.162	0.638

PCS band - 1xEv-Do

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	25	1851.25			
	600	1880.00	0.481	0.000	0.481
	1175	1908.75			
Tilt (15°)	25	1851.25	0.490	-0.067	0.498
	600	1880.00	0.519	-0.020	0.521
	1175	1908.75	0.598	-0.171	0.622

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.

9.5 RIGHT HAND SIDE

Touch Position

Tilt (15°) Position

PCS band - 1xRTT: RC3; SO32 (Loopback)

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	25 600 1175	1851.25 1880.00 1908.75	0.429	0.000	0.429
Tilt (15°)	25	1851.25	0.477	-0.049	0.482
	600	1880.00	0.513	0.000	0.513
	1175	**1908.75**	**0.630**	**-0.118**	**0.647**
	1175 [5]	**1908.75**	**0.800**	**-0.058**	**0.811**

PCS band - 1xEv-Do

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	25 600 1175	1851.25 1880.00 1908.75	0.426	0.000	0.426
Tilt (15°)	25	1851.25	0.469	0.000	0.469
	600	1880.00	0.504	0.000	0.504
	1175	1908.75	0.625	-0.126	0.643
	1175 [5]	1908.75	0.761	0.000	0.761

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.
5) Collocation with WLAN and Bluetooth modules.

9.6 BODY POSITION WITH HOLSTER

PCS band - 1xEv-Do

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Body Position with Holster	25	1851.25	0.516	0.000	0.516
	600	1880.00	0.457	0.000	0.457
	1175	**1908.75**	**0.517**	**-0.025**	**0.520**
	1175 [5)]	1909	0.515	0.000	0.515

PCS band - 1xRTT: RC3, SO32 (+F-SCH)

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Body Position with Holster	25	1851.25	0.452	0.000	0.452
	600	1880			
	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.
5) Collocation with WLAN and Bluetooth modules.

10 MEASURMENT UNCERTAINTY

10.1 MEASURMENT UNCERTAINTY FOR 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

11 EQUIPMENT LIST AND CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2/9/07
Electronic Probe kit	Hewlett Packard	85070C	N/A	N/A
E-Field Probe	SPEAG	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
Simulating Liquid	CCS	M835	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	H835	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	H1900	N/A	Within 24 hrs of first test

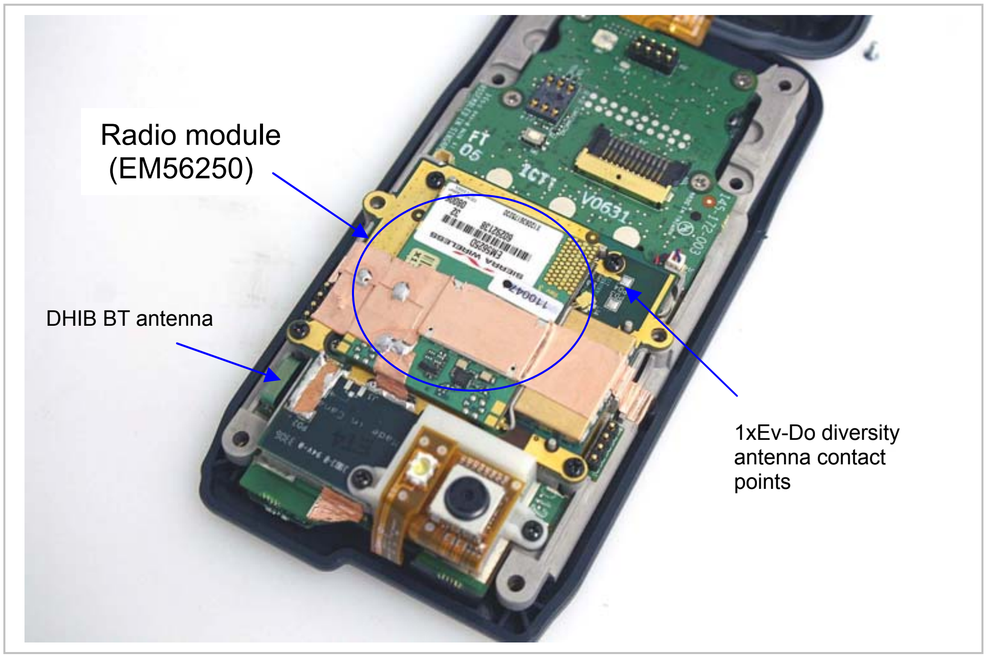
12 PHOTOS

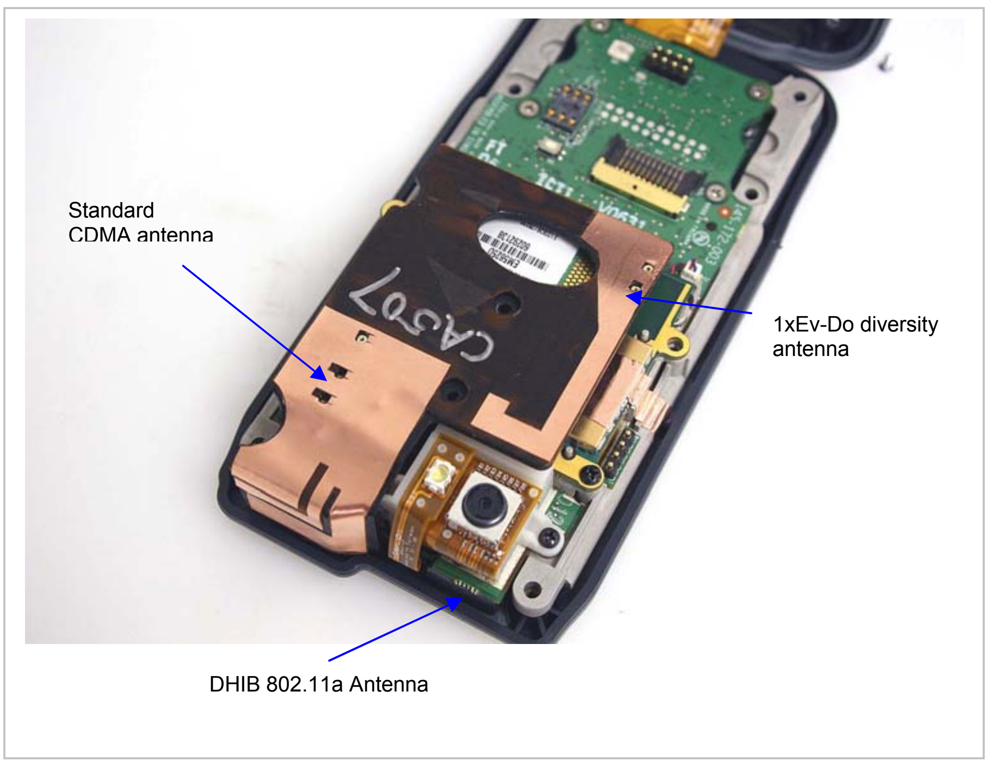
Host Device without holster

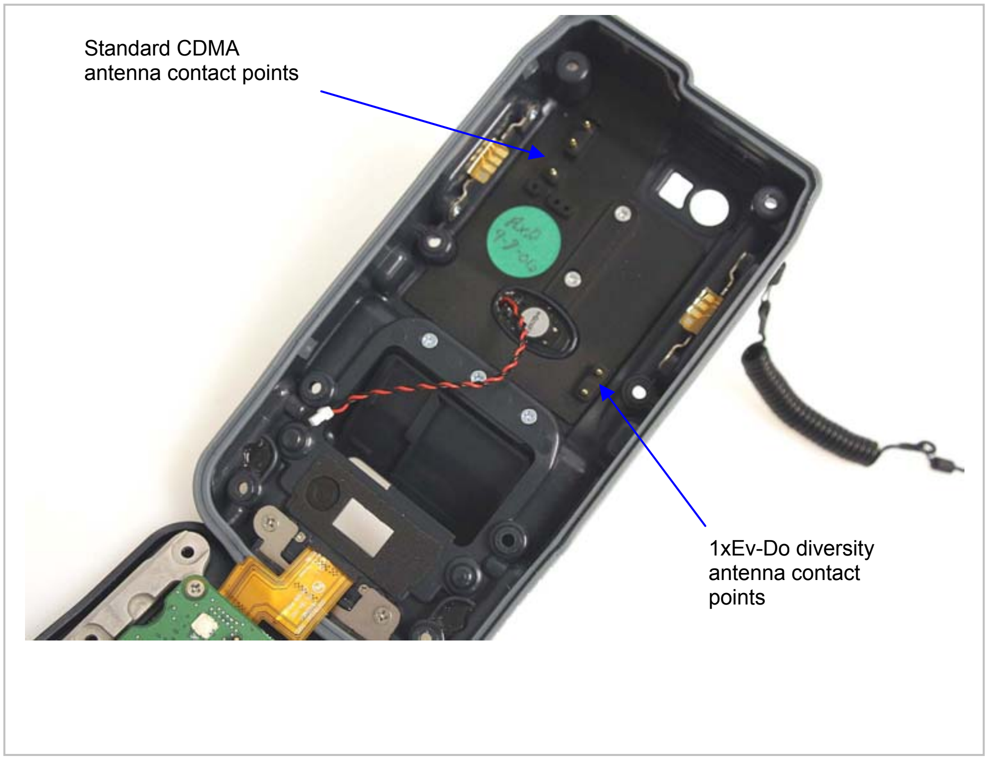
Host Device with holster

With holster (X9918) with belt clip

EUT and Antenna location






Standard CDMA
antenna contact points
1xEv-Do diversity
antenna contact
points

13 ATTACHMENTS

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