FCC OET BULLETIN 65 SUPPLEMENT C
IC RSS-102 ISSUE 3

SAR EVALUATION REPORT

For

Ruggedized Handheld PDA-type Device
W/dual-band CDMA, 802.11b/g & BT

MODEL: CN4-C, CN4e-C
FCC ID: EHA-04CN4
IC: 1223A-02CN4

REPORT NUMBER: 09U12671-11, Revision D

ISSUE DATE: October 9, 2009

Prepared for

INTERMEC TECHNOLOGIES CORPORATION
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Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	June 24, 2009	Initial Issue	--
B	July 27, 2009	Revised model numbers	A. Zaffar
C	July 28, 2009	Revised model numbers per client's request	A. Zaffar
D	October 9, 2009	1. Added g mode average power in section 10.5 WiFi 2. Added justification of exemption of testing g mode in section 11.3	Sunny Shih

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	INTERMEC TECHNOLOGIES CORPORATION 6001 – 36TH AVENUE WEST EVERETT, WA 98203, USA
EUT DESCRIPTION:	Ruggedized Handheld PDA-type Device W/dual-band CDMA, 802.11b/g & BT
MODEL NUMBER:	CN4-C, CN4e-C
DEVICE CATEGORY:	Portable
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure
DATE TESTED:	June 6 - 8 and July 15 - 20, 2009

THE HIGHEST SAR VALUES:

FCC / IC Rule Parts	Frequency Range (MHz)	The Highest SAR Values (1g_mW/g)	Limit mW/g)
22H / RSS-132	824 - 849	Head: 0.79; Body: 0.77	1.6
24E / RSS-133	1850 - 1910	Head: 1.10; Body: 0.73	
15.247 / RSS-210	2412 – 2462	Head: 0.784; Body: 0.078	

Simultaneous (Multi Band) SAR Test Results:	Test position	Multi Band	Results (mW/g)
	Head (LHS Touch)	WiFi-WWAN	1.02 mW/g
	Head (RHS Tilt)	WWAN-WiFi	1.29 mW/g

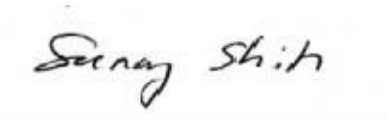
APPLICABLE STANDARDS AND TEST PROCEDURES:

STANDARDS AND TEST PROCEDURES	TEST RESULTS
• FCC OET Bulletin 65 Supplement C and the following specific Test Procedures: o KDB 941225 SAR test for 3G devices o KDB 248227 SAR measurement procedures for 802.11 a/b/g transmitters o KDB 648474 SAR evaluation considerations for handsets with multiple transmitters and antennas	Pass
• RSS-102 ISSUE 3	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:



SUNNY SHIH
ENGINEERING SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

CHAO YEN LIN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C, IC RSS 102 Issue 3 and the following specific FCC Test Procedures.

- KDB 941225 SAR test for 3G devices
- KDB 248227 SAR measurement procedures for 802.11 a/b/g transmitters
- KDB 648474 SAR evaluation considerations for handsets with multiple transmitters and antennas

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

Name of Equipment	Manufacturer	Type/Model	Serial No.	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	MY40001647	11	14	2009
Signal Generator	Agilent	8753ES-6	MY40001647	11	14	2009
E-Field Probe	SPEAG	EX3DV4	3686	3	23	2010
Thermometer	ERTCO	639-1S	1718	5	1	2010
Data Acquisition Electronics	SPEAG	DAE3 V1	427	10	20	2009
System Validation Dipole	SPEAG	D835V2	4d002	4	23	2011
System Validation Dipole	SPEAG	D900V2	108	1	21	2010
System Validation Dipole	SPEAG	D1800V2	294	1	29	2010
System Validation Dipole	SPEAG	D1900V2	5d043	1	29	2010
System Validation Dipole	SPEAG	D2450V2	748	4	14	2010
System Validation Dipole	SPEAG	D5GHzV2	1003	11	21	2009
MXA Signal Analyzer	Agilent	N9020A	US48350984	10	23	2009
ESG Vector Signal Generator	Agilent	E4438C	US44271090	9	17	2010
Power Meter	Giga-tronics	8651A	8651404	1	11	2010
Power Sensor	Giga-tronics	80701A	1834588	1	11	2010
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	CCS	H1900	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	H1800	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1800	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	H1700	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1700	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	H835	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M835	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	H900	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M900	N/A	Within 24 hrs of first test		
Simulating Liquid	SPAEG	H2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPAEG	M2450	N/A	Within 24 hrs of first test		

4.2. MEASUREMENT UNCERTAINTY

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 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

5. EQUIPMENT UNDER TEST

Ruggedized Handheld PDA-type Device

W/dual-band CDMA, 802.11b/g & BT

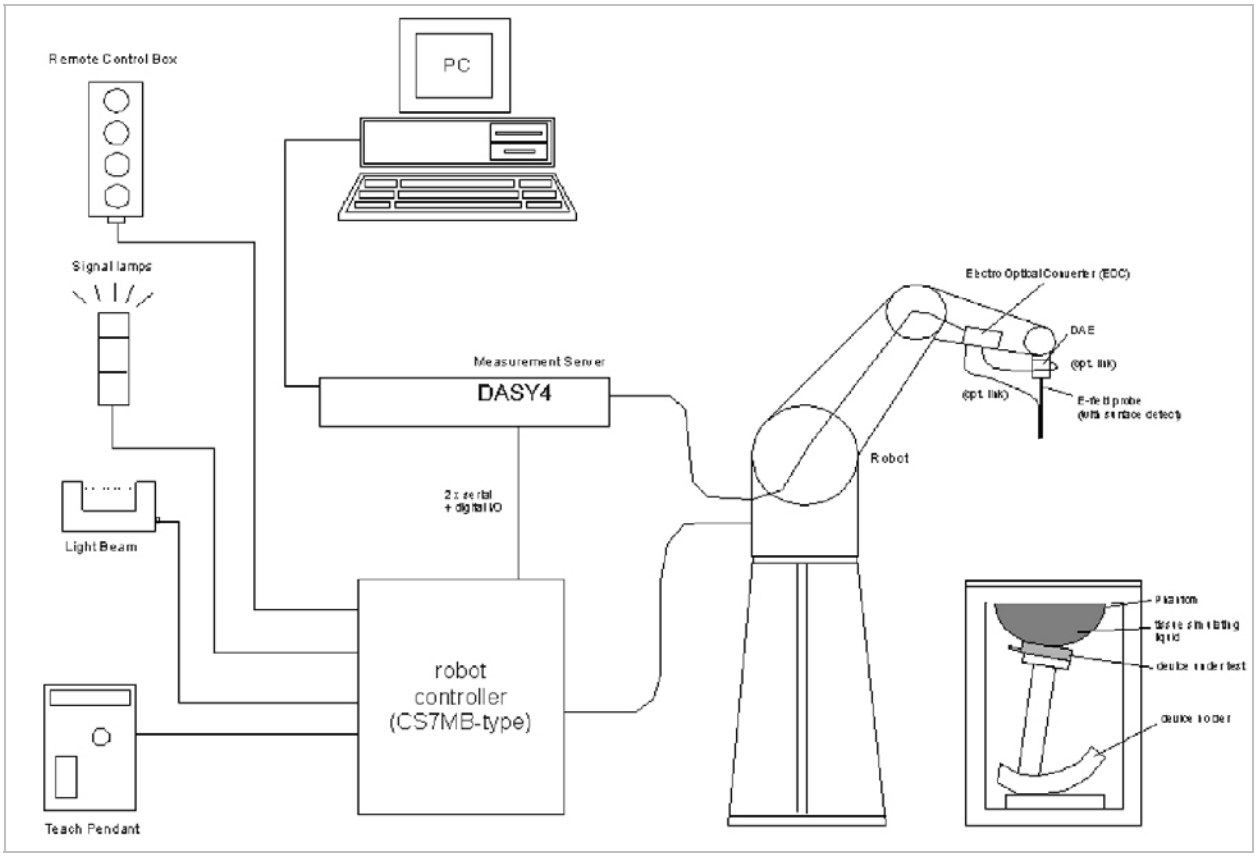
Model: CN4-C, CN4e-C

Model differences:

- Body Styles: CN4 is standard and CN4e is extended
- Both are available with numeric or QWERTY keypads

Normal operation:	• Held to head • Worn on body (LCD facing-up; LCD facing-down) with holster w/ belt-clip
Other radio modules in the host device:	• 802.11bg • Bluetooth
Battery Pack:	Li-ion Battery. • Standard - AB8 and AB15 The AB8 and AB15 batteries are identical except that they come from different suppliers • Extended - AB9 and AB16 The AB9 and AB16 batteries are identical except that they come from different suppliers The AB9/AB16 batteries have extended capacity Extended battery AB16 is used for all SAR testing. Additional SAR test with standard battery (AB15) at worst-case test configurations.
Co-located Tx:	• WWAN can transmit simultaneously with 802.11g • WWAN can transmit simultaneously with Bluetooth • 802.11g cannot transmit simultaneously with Bluetooth
Antenna Separation distances:	• 2.137 cm - WWAM antenna-to-WiFi (802.11g) • 1.164 cm - WWAN antenna-to-Bluetooth antenna • 3.894 cm - WiFi (802.11g)-to-Bluetooth antenna

6. SYSTEM SPECIFICATIONS



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.

7. 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

8. 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.

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	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1800 – 2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
3000	38.5	2.4	52	2.73
5800	35.3	5.27	48.2	6

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

8.1. LIQUID CHECK RESULTS FOR 1900 MHZ

Simulating Liquid Dielectric Parameters for Head 1900 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f MHz	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	39.454	Relative Permittivity (ε_r):	39.4535	40.0	-1.37	± 5
	e"	13.259	Conductivity (σ):	1.40148	1.40	0.11	± 5

Liquid temperature: 23 deg. C
July 17, 2009 08:18 AM

Frequency	e'	e"
1710000000.	40.5365	12.5881
1720000000.	40.4690	12.6017
1730000000.	40.4099	12.6322
1740000000.	40.4023	12.7000
1750000000.	40.3722	12.7994
1760000000.	40.2729	12.9033
1770000000.	40.1745	12.9545
1780000000.	40.0999	12.9458
1790000000.	40.0552	12.9592
1800000000.	40.0180	12.9681
1810000000.	39.9528	12.9640
1820000000.	39.8940	12.9293
1830000000.	39.8663	12.9240
1840000000.	39.8778	13.0086
1850000000.	39.8114	13.1296
1860000000.	39.6742	13.2350
1870000000.	39.5354	13.2581
1880000000.	39.4794	13.2208
1890000000.	39.4678	13.2243
1900000000.	**39.4535**	**13.2591**
1910000000.	39.4024	13.2672

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 for Muscle 1900 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	53.755	Relative Permittivity (ε_r):	53.7545	53.3	0.85	± 5
	e"	14.035	Conductivity (σ):	1.48352	1.52	-2.40	± 5

Liquid temperature: 23 deg. C
July 17, 2009 6:04 PM

Frequency	e'	e"
1710000000.	54.3564	13.5044
1720000000.	54.3457	13.5699
1730000000.	54.3445	13.6568
1740000000.	54.3412	13.7379
1750000000.	54.3408	13.7717
1760000000.	54.2843	13.7725
1770000000.	54.2490	13.7404
1780000000.	54.1877	13.7021
1790000000.	54.1289	13.7028
1800000000.	54.0654	13.7377
1810000000.	53.9925	13.7925
1820000000.	53.9249	13.8507
1830000000.	53.8724	13.9473
1840000000.	53.8681	14.0373
1850000000.	53.8441	14.0866
1860000000.	53.8166	14.1135
1870000000.	53.8015	14.0997
1880000000.	53.8018	14.0534
1890000000.	53.7753	14.0285
1900000000.	**53.7545**	**14.0353**
1910000000.	53.6753	14.0718

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 for Head 1900 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f MHz	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	39.933	Relative Permittivity (ε_r):	39.9332	40.0	-0.17	± 5
	e"	12.930	Conductivity (σ):	1.36666	1.40	-2.38	± 5

Liquid temperature: 23 deg. C
July 20, 2009 10:42 AM

Frequency	e'	e"
1710000000.	40.7288	12.4341
1720000000.	40.6737	12.5331
1730000000.	40.6495	12.6288
1740000000.	40.6197	12.6811
1750000000.	40.6113	12.7048
1760000000.	40.5745	12.6901
1770000000.	40.5479	12.6755
1780000000.	40.4847	12.6347
1790000000.	40.4156	12.6224
1800000000.	40.3445	12.6394
1810000000.	40.2668	12.6972
1820000000.	40.2003	12.7846
1830000000.	40.0873	12.9010
1840000000.	40.0363	12.9637
1850000000.	39.9959	12.9836
1860000000.	40.0036	12.9731
1870000000.	40.0243	12.9631
1880000000.	40.0217	12.9439
1890000000.	39.9846	12.9440
1900000000.	**39.9332**	**12.9297**
1910000000.	39.8505	13.0252

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

8.2. LIQUID CHECK RESULTS FOR 835 MHZ

Simulating Liquid Dielectric Parameters for Head 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	43.00	Relative Permittivity (ε_r):	42.998	41.5	3.61	± 5
	e"	18.86	Conductivity (σ):	0.876	0.90	-2.66	± 5
900	e'	42.27	Relative Permittivity (ε_r):	42.266	41.5	1.84	± 5
	e"	18.65	Conductivity (σ):	0.934	0.97	-3.73	± 5

Liquid temperature: 23 deg. C
July 15, 2009 03:38 PM

Frequency	e'	e"
800000000.	43.4634	18.9337
805000000.	43.3917	18.9437
810000000.	43.3312	18.9507
815000000.	43.2888	18.9418
820000000.	43.1930	18.9484
825000000.	43.1526	18.9393
830000000.	43.0760	18.9303
835000000.	**42.9982**	**18.8587**
840000000.	42.9440	18.8649
845000000.	42.8975	18.8586
850000000.	42.8244	18.8291
855000000.	42.7579	18.8188
860000000.	42.6924	18.8085
865000000.	42.6374	18.7953
870000000.	42.5384	18.7345
875000000.	42.4575	18.7300
880000000.	42.4118	18.7050
885000000.	42.3449	18.7069
890000000.	42.3220	18.6856
895000000.	42.3150	18.6496
900000000.	**42.2656**	**18.6517**
905000000.	42.2256	18.6657
910000000.	42.1782	18.7163
915000000.	42.0852	18.7270
920000000.	41.9862	18.7301
925000000.	41.9039	18.6895
930000000.	41.8222	18.6782
935000000.	41.7480	18.6266
940000000.	41.6687	18.5868
945000000.	41.6538	18.5367
950000000.	41.6357	18.5355
955000000.	41.5924	18.5423
960000000.	41.5556	18.5376

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 for Muscle 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	53.40	Relative Permittivity (ε_r):	53.402	55.2	-3.26	± 5
	e"	21.01	Conductivity (σ):	0.976	0.97	0.63	± 5
900	e'	52.85	Relative Permittivity (ε_r):	52.845	55.0	-3.92	± 5
	e"	20.65	Conductivity (σ):	1.034	1.05	-1.55	± 5

Liquid temperature: 23 deg. C
July 16, 2009 12:01 PM

Frequency	e'	e"
805000000.	53.7372	21.0971
810000000.	53.6850	21.0754
815000000.	53.6360	21.0753
820000000.	53.5644	21.0555
825000000.	53.5293	21.0562
830000000.	53.4587	21.0476
835000000.	**53.4018**	**21.0123**
840000000.	53.3168	20.9877
845000000.	53.2884	20.9647
850000000.	53.2597	20.9094
855000000.	53.1807	20.8623
860000000.	53.1322	20.8368
865000000.	53.1035	20.8043
870000000.	53.0217	20.7705
875000000.	52.9912	20.7286
880000000.	52.9278	20.7101
885000000.	52.9128	20.7050
890000000.	52.8789	20.6757
895000000.	52.8855	20.6415
900000000.	**52.8452**	**20.6461**
905000000.	52.7925	20.6297
910000000.	52.7289	20.6488
915000000.	52.6266	20.6316
920000000.	52.5311	20.6021
925000000.	52.4510	20.5825
930000000.	52.3729	20.5524
935000000.	52.3151	20.4944
940000000.	52.2808	20.4681
945000000.	52.2782	20.4192
950000000.	52.2502	20.3807
955000000.	52.2161	20.3749
960000000.	52.2033	20.3704

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 for Muscle 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	55.19	Relative Permittivity (ε_r):	55.191	55.2	-0.02	± 5
	e"	21.46	Conductivity (σ):	0.997	0.97	2.77	± 5
900	e'	54.62	Relative Permittivity (ε_r):	54.616	55.0	-0.70	± 5
	e"	20.94	Conductivity (σ):	1.048	1.05	-0.16	± 5

Liquid temperature: 23 deg. C
July 20, 2009 03:22 PM

Frequency	e'	e"
800000000.	55.4879	21.5149
805000000.	55.4505	21.5082
810000000.	55.4073	21.4979
815000000.	55.3798	21.5272
820000000.	55.3683	21.5052
825000000.	55.3267	21.5056
830000000.	55.2551	21.4670
835000000.	**55.1907**	**21.4595**
840000000.	55.1396	21.4251
845000000.	55.1015	21.3643
850000000.	55.0618	21.3264
855000000.	54.9872	21.2804
860000000.	54.9458	21.2332
865000000.	54.9146	21.1825
870000000.	54.8358	21.1183
875000000.	54.7560	21.0768
880000000.	54.7346	21.0450
885000000.	54.6918	21.0112
890000000.	54.6407	20.9810
895000000.	54.6396	20.9418
900000000.	**54.6163**	**20.9378**
905000000.	54.5514	20.9452
910000000.	54.4985	20.9792
915000000.	54.4100	20.9860
920000000.	54.3495	20.9816
925000000.	54.2545	20.9659
930000000.	54.1985	20.9295
935000000.	54.1239	20.8706
940000000.	54.0872	20.8273
945000000.	54.0634	20.7892
950000000.	54.0681	20.7696
955000000.	54.0490	20.7398
960000000.	54.0340	20.7184

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 for Head 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	41.90	Relative Permittivity (ε_r):	41.903	41.5	0.97	± 5
	e"	19.17	Conductivity (σ):	0.891	0.90	-1.04	± 5
900	e'	41.29	Relative Permittivity (ε_r):	41.289	41.5	-0.51	± 5
	e"	18.75	Conductivity (σ):	0.939	0.97	-3.22	± 5

Liquid temperature: 23 deg. C
July 20, 2009 02:31 PM

Frequency	e'	e"
800000000	42.2277	19.1647
805000000	42.2184	19.1754
810000000	42.1795	19.1565
815000000	42.1444	19.1851
820000000	42.0966	19.185
825000000	42.0668	19.2065
830000000	42.0033	19.2004
835000000	**41.903**	**19.1738**
840000000	41.8263	19.1512
845000000	41.7488	19.0875
850000000	41.7126	19.0539
855000000	41.6057	18.9902
860000000	41.537	18.9468
865000000	41.491	18.9074
870000000	41.4092	18.8488
875000000	41.3583	18.8221
880000000	41.3083	18.7956
885000000	41.2803	18.7726
890000000	41.2798	18.7714
895000000	41.3131	18.7494
900000000	**41.2891**	**18.7503**
905000000	41.2493	18.7462
910000000	41.2066	18.7925
915000000	41.125	18.8214
920000000	41.0479	18.8146
925000000	40.9659	18.8195
930000000	40.8912	18.7835
935000000	40.7972	18.7446
940000000	40.745	18.6832
945000000	40.705	18.6281
950000000	40.7026	18.5993
955000000	40.652	18.5674
960000000	40.622	18.5387

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

8.3. LIQUID CHECK RESULTS FOR 2450 MHZ

Simulating Liquid Dielectric Parameters for Head 2450 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	39.39	Relative Permittivity (ε_r):	39.392	39.2	0.49	± 5
	e"	13.80	Conductivity (σ):	1.881	1.80	4.48	± 5

Liquid Temperature: 23 deg. C
June 06, 2009 03:54 PM

Frequency	e'	e"
2400000000.	39.5433	13.5996
2405000000.	39.5265	13.6691
2410000000.	39.5095	13.7077
2415000000.	39.5044	13.7534
2420000000.	39.4908	13.7752
2425000000.	39.4757	13.7983
2430000000.	39.4655	13.8003
2435000000.	39.4546	13.8144
2440000000.	39.4429	13.8207
2445000000.	39.4148	13.8241
2450000000.	**39.3922**	**13.7975**
2455000000.	39.3231	13.8083
2460000000.	39.3031	13.7910
2465000000.	39.2496	13.7607
2470000000.	39.2268	13.7266
2475000000.	39.1880	13.7066
2480000000.	39.1811	13.7039
2485000000.	39.1767	13.7103
2490000000.	39.1620	13.7369
2495000000.	39.1466	13.7754
2500000000.	39.1476	13.8388

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 for Muscle 2450 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	51.95	Relative Permittivity (ε_r):	51.953	52.7	-1.42	± 5
	e"	13.97	Conductivity (σ):	1.904	1.95	-2.36	± 5

Liquid Temperature: 23 deg. C
June 08, 2009 05:30 PM

Frequency	e'	e"
2400000000.	52.0453	13.7407
2405000000.	52.0308	13.8401
2410000000.	52.0245	13.9070
2415000000.	52.0154	13.9740
2420000000.	51.9986	13.9871
2425000000.	51.9996	13.9930
2430000000.	51.9917	13.9916
2435000000.	51.9806	13.9756
2440000000.	51.9945	13.9878
2445000000.	51.9726	13.9895
2450000000.	**51.9532**	**13.9693**
2455000000.	51.8831	13.9505
2460000000.	51.8534	13.9102
2465000000.	51.7850	13.8749
2470000000.	51.7539	13.8219
2475000000.	51.7291	13.7911
2480000000.	51.7358	13.7757
2485000000.	51.7459	13.7975
2490000000.	51.7558	13.8648
2495000000.	51.7590	13.9411
2500000000.	51.7646	14.0676

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

9. SYSTEM 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 Head or Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3 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 7x7x7 fine cube was chosen for cube
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

IEEE Standard 1528-2003 Numerical reference SAR values (W/kg) for reference dipole and flat phantom

Frequency (MHz)	Distance (mm)	1g SAR [W/kg]	10g SAR [W/kg]	Local SAR at surface (above feed-point)
300	15	3	2	4.4
450	15	4.9	3.3	7.2
835	15	9.5	6.2	4.1
900	15	10.8	6.9	16.4
1450	10	29	16	5.02
1800	10	38.1	19.8	69.5
1900	10	39.7	20.5	72.1
2000	10	41.1	21.1	74.6
2450	10	52.4	24	104.2
3000	10	63.8	25.7	104.2

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

Reference SAR Values for Body-tissue (From SPEAG)

Dipole Type	Distance	Frequency	SAR (1g)	SAR (10g)	SAR (peak)
	(mm)	(MHz)	[W/kg]	[W/kg]	[W/kg]
D835V2	15	835	9.71	6.38	14.1
D1900V2	10	1900	39.8	20.8	69.6

9.1. SYSTEM CHECK RESULTS FOR D1900V2

System Validation Dipole: D1900V2 SN: 5d043

Date: July 17, 2009

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Head	1900	250	1g SAR:	38.5	39.7	-3.02	±10
			10g SAR:	20.1	20.5	-1.95	

Date: July 17, 2009

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Body	1900	250	1g SAR:	37.6	39.8	-5.53	±10
			10g SAR:	19.8	20.8	-4.81	

Date: July 20, 2009

Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Head	1900	250	1g SAR:	37.5	39.7	-5.54	±10
			10g SAR:	19.6	20.5	-4.39	

9.2. SYSTEM CHECK RESULTS FOR D835V2

System Validation Dipole: D835V2 SN:4d002

Date: July 15 2009

Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Head	835	250	1g SAR:	9.76	9.5	2.74	±10
			10g SAR:	6.4	6.2	3.23	

Date: July 16, 2009

Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Body	835	250	1g SAR:	10.2	9.71	5.05	±10
			10g SAR:	6.67	6.38	4.55	

Date: July 20, 2009

Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Body	835	250	1g SAR:	10.4	9.71	7.11	±10
			10g SAR:	6.81	6.38	6.74	

Date: July 20 2009

Ambient Temperature = 25°C; Relative humidity = 40% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Head	835	250	1g SAR:	9.93	9.5	4.53	±10
			10g SAR:	6.51	6.2	5.00	

9.3. SYSTEM CHECK RESULTS FOR D2450V2

System Validation Dipole: D2450V2 SN: 748

Date: June 6, 2009

Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Head	2450	250	1g SAR:	54.9	52.4	4.77	±10
			10g SAR:	25	24.0	4.17	

Date: June 8, 2009

Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Chaoyen Lin

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Body	2450	250	1g SAR:	53.7	51.2	4.88	±10
			10g SAR:	25.1	23.7	5.91	

10. OUTPUT POWER VERIFICATION

10.1. RF Output Power for WWAN

Maximum output power is verified on the Low, Middle and High channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E for 1xRTT, section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rel. 0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A

10.2. RF Output Power for 1XRTT

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

Application	Rev, License
CDMA2000 Mobile Test	B.13.08, L

- Call Setup > Shift & Preset
- Cell Info > Cell Parameters > System ID (SID) > 4 for cell band
- Cell Info > Cell Parameters > System ID (SID) > 4106 for cell band
  > Network ID (NID) > 65535 for cell and PCS bands.
- Protocol Rev > 6 (IS-2000-0)
- Radio Config (RC) > Please see following table or details
- FCH Service Option (SO) Setup > Please see following table or details
- 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
- Rvs Power Ctrl > Active bits

Rvs Power Ctrl > All Up bits (Maximum TxPout)

RF Power Output for 1xRTT - Cell Band				
Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 1013/824.7MHz	Ch. 384/836.52MHz	Ch. 777/848.31MHz
		Average	Average	Average
RC3 (Fwd3, Rvs3)	1 (Voice)			
	2 (Loopback)	24.70	24.80	24.44
	3 (Voice)			
	55 (Loopback)	24.70	24.85	24.45
	32 (+ F-SCH)	24.68	24.87	24.55
	32 (+ SCH)	24.90	24.90	24.50
	68 (Voice)			

RF Power Output for 1xRTT - PCS Band				
Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 25/1851.25MHz	Ch. 600/1880MHz	Ch. 1175/1908.75 MHz
		Average	Average	Average
RC3 (Fwd3, Rvs3)	1 (Voice)			
	2 (Loopback)	24.31	24.61	24.63
	3 (Voice)			
	55 (Loopback)	24.20	24.60	24.64
	32 (+ F-SCH)	24.45	24.65	24.72
	32 (+ SCH)	24.40	24.67	24.74
	68 (Voice)			
	32768 (Voice)			

10.3. RF Output Power for EVDO Release 0

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

Application	Rev, License
1xEV-DO Terminal Test	A.09.13

EVDO Release 0 - RTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > RTAP
  - RTAP Rate > 153.6 kbps
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” when “Session Open” appear in “Active Cell”
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

EVDO Release 0 - FTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > FTAP (default)
  - FTAP Rate > 307.2 kbps (2 Slot, QPSK)
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” when “Session Open” appear in “Active Cell”

Rvs Power Ctrl > All Up bits (Maximum TxPout)

RF Power Output for EV-DO Rel 0

Cell Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm) Average
307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.70	24.75
		384	836.52	24.77
		777	848.31	24.52

PCS Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm) Average
307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25	24.20
		600	1880.00	24.50
		1175	1908.75	24.77

10.4. RF Output Power for EVDO Release A

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

Application	Rev, License
1xEV-DO Terminal Test	A.09.13

EVDO Release A – RETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > RETAP
- R-Data Pkt Size > 4096
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2
> PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

EVDO Release A - FETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > FETAP
- F-Traffic Format > 4 (1024, 2,128) Canonical (307.2k, QPSK)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2
> PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

RF Power Output Results for EV-DO Rev A

Cell Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted power (dBm) Average
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	1013	824.70	24.99
		384	836.52	**25.05**
		777	848.31	24.70

PCS Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted power (dBm) Average
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	25	1851.25	24.32
		600	1880.00	24.75
		1175	1908.75	24.83

10.5. WIFI

The cable assembly insertion loss of 20.5dB (including 20dB pad and 0.5dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

802.11b

Ch. No.	f (MHz)	Average Conducted power (dBm)
1	2412	15.65
6	2437	15.87
11	2462	15.92

802.11g

Ch. No.	f (MHz)	Average Conducted power (dBm)
1	2412	14.10
6	2437	14.20
11	2462	14.40

11. SUMMARY OF TEST RESULTS

WORST-CASE CONFIGURATIONS

Extended battery AB16 is used for all SAR testing. Additional SAR with standard battery (AB15) are performed at worst-case test configurations.

A preliminary testing for both QWERTY and numeric models respectively for CN4 and CN4e was performed. The result shows the **numeric** models are the representative models as worst case for both CN4 and CN4e.

CN4 numeric model is used for all SAR testing. Additional SAR with CN4e is performed at worst-case test configurations.

11.1. CDMA1900

11.1.1. LEFT HAND SIDE – CN4

Test position	Mode	UL Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	SO55, RC3	25	1851.25		1.6
		600	1880.00	0.641	
		1175	1908.75		
Tilt (15°)	SO55, RC3	25	1851.25	0.726	1.6
		600	1880.00	0.853	
		1175	1908.75	0.773	

11.1.2. RIGHT HAND SIDE – CN4

Test position	Mode	UL Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	SO55, RC3	25	1851.25	0.791	1.6
		600	1880.00	0.815	
		1175	1908.75	0.719	
Tilt (15°)	SO55, RC3	25	1851.25	0.983	1.6
		600	1880.00	1.100	
		1175	1908.75	0.926	
	w/ standard battery pack (AB15)	600	1880.00	1.080	

11.1.3. RIGHT HAND SIDE – CN4e

Test position	Mode	UL Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Tilt (15°)	SO55, RC3	25	1851.25	0.879	1.6
		600	1880.00	0.835	
		1175	1908.75	0.841	

11.1.4. BODY WORN – CN4

Test position	Mode	Sep. dist. (cm)	UL Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
LCD down	SO32, RC3	With Holster	25	1851.25		1.6
			600	1880.00	0.726	
			1175	1908.75		
LCD up	SO32, RC3	With Holster	25	1851.25		1.6
			600	1880.00	0.146	
			1175	1908.75		

11.1.5. BODY WORN – CN4e

Test position	Mode	Sep. dist. (cm)	UL Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
LCD down	SO32, RC3	With Holster	25	1851.25		1.6
			600	1880.00	0.569	
			1175	1908.75		

11.2. CDMA850

11.2.1. LEFT HAND SIDE – CN4

Test position	Mode	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	SO55, RC3	1013	824.70		1.6
		384	836.52	0.686	
		777	848.31		
Tilt (15°)	SO55, RC3	1013	824.70		1.6
		384	836.52	0.538	
		777	848.31		

11.2.2. RIGHT HAND SIDE – CN4

Test position	Mode	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	SO55, RC3	1013	824.70		1.6
		384	836.52	0.790	
		777	848.31		
Tilt (15°)	SO55, RC3	1013	824.70		1.6
		384	836.52	0.730	
		777	848.31		

11.2.3. RIGHT HAND SIDE – CN4e

Test position	Mode	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	SO55, RC3	1013	824.70		1.6
		384	836.52	0.705	
		777	848.31		

11.2.4. BODY WORN – CN4

Test position	Mode	Sep. dist. (cm)	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
LCD down	SO32, RC3	With Holster	1013	824.70		1.6
			384	836.52	0.461	
			777	848.31		
LCD up	SO32, RC3	With Holster	1013	824.70		1.6
			384	836.52	0.313	
			777	848.31		

11.2.5. BODY WORN – CN4e

Test position	Mode	Sep. dist. (cm)	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
LCD down	SO32, RC3	With Holster	1013	824.70		1.6
			384	836.52	0.751	
			777	848.31		
	w/ standard battery pack (AB15)	With Holster	384	836.52	0.767	

11.3. WIFI

Only b mode was measured due to its output power is higher than that of g mode

11.3.1. LEFT HAND SIDE – CN4

Test position	Mode	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	802.11b	1	2412		1.6
		6	2437	0.784	
		11	2462		
Tilt (15◦)	802.11b	1	2412		1.6
		6	2437	0.637	
		11	2462		

11.3.2. RIGHT HAND SIDE – CN4

Test position	Mode	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	802.11b	1	2412		1.6
		6	2437	0.366	
		11	2462		
Tilt (15◦)	802.11b	1	2412		1.6
		6	2437	0.383	
		11	2462		

11.3.3. LEFT HAND SIDE – CN4e

Test position	Mode	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Touch	802.11b	1	2412		1.6
		6	2437	0.399	
		11	2462		

11.3.4. BODY WORN – CN4

Test position	Mode	Sep. dist. (cm)	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Face down	802.11b	With Holster	1	2412		1.6
			6	2437	0.006	
			11	2462		
Face up	802.11b	With Holster	1	2412		1.6
			6	2437	0.078	
			11	2462		

11.3.5. BODY WORN – CN4e

Test position	Mode	Sep. dist. (cm)	Ch No.	f (MHz)	1g SAR (mW/g)	Limit (mW/g)
Face up	802.11b	With Holster	1	2412		1.6
			6	2437	0.045	
			11	2462		

12. KDB 648474 SAR HANDSETS MULTI XMITER ASSESSMENT

EUT Description:	Heavy-Duty Handheld PDA-Type Device W/ Dual Band CDMA, with WiFi and Bluetooth embedded.
Co-located Tx:	• WWAN can transmit simultaneously with 802.11g • WWAN can transmit simultaneously with Bluetooth • WiFi (802.11g) cannot transmit simultaneously with Bluetooth
Antenna Separation distances:	• 2.137 cm - WWAN antenna-to-WiFi (802.11g) • 1.164 cm - WWAN antenna-to-Bluetooth antenna • 3.894 cm - WiFi (802.11g)-to-Bluetooth antenna
Separation distances between peaks SAR in area scans:	See page 36 – 38 for details.

Highest 1-g SAR:

Test position	Mode	1g SAR	Sum of the 1-g SAR
Head (LHS Touch)	802.11b	0.784 mW/g	1.474 mW/g
	WWAN	0.690 mW/g	
Head (RHS Tilt)	WWAN	1.100 mW/g	1.483 mW/g
	802.11b	0.383 mW/g	
Body (LCD down)	WWAN	0.770 mW/g	0.776 mW/g
	802.11b	0.006 mW/g	

Bluetooth:

Conducted average power is below Pref/12mW, stand alone SAR evaluation is not required.

SAR to Peak Location Separation Ratio:

WWAM antenna-to-WiFi (802.11g):

- Head - Left hand side (LHS) touch position: 0.982 (1.474/1.5), > 0.3
- Head - Right hand side (RHS) tilt position: 1.483 (1.483/1.0), > 0.3
- Body worn with 2 cm separation distance: 0.221 (0.776/3.5), < 0.3

Simultaneous TX SAR:

☐ No

☒ Yes. For the following test configurations:

- Left hand side (LHS) touch position
- Right hand side (RHS) tilt position

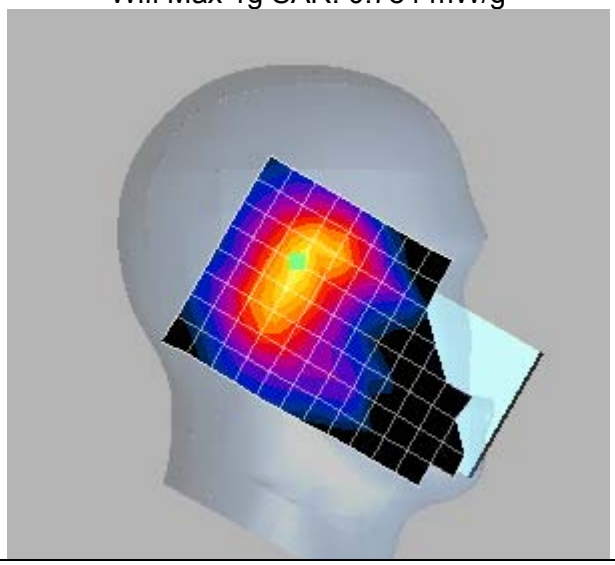
Simultaneous SAR Test Results:

Test position	Multi Band	Results (mW/g)
Head (LHS Touch)	WiFi - WWAN	1.02 mW/g
Head (RHS Tilt)	WWAN - WiFi	1.29 mW/g

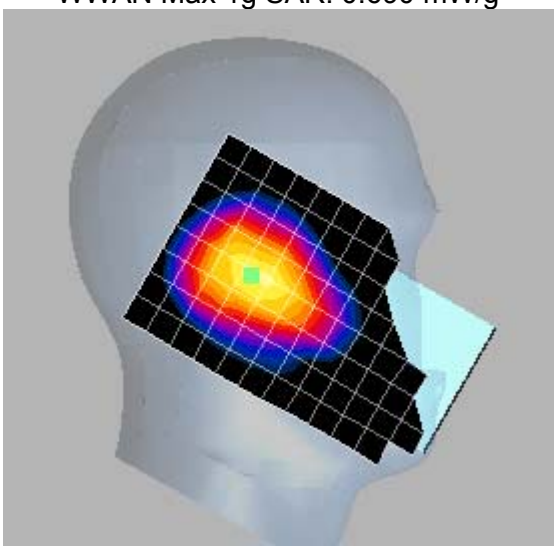
See attachment 2-6 for multi band results

Separation distances between Peaks SAR in area scans for Head (LHS touch) position

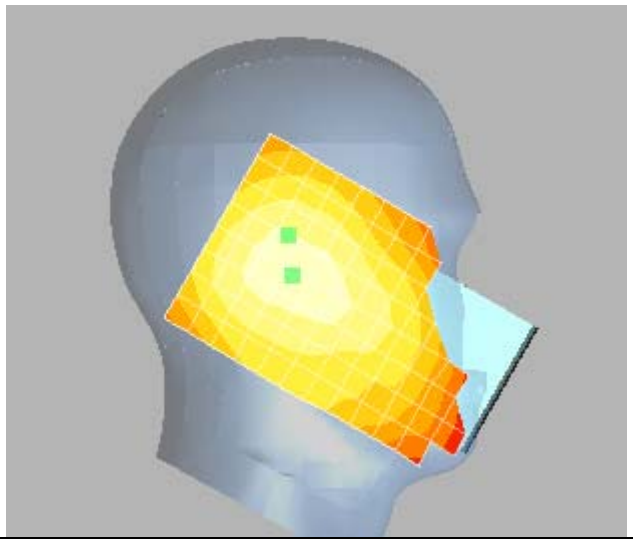
Wifi Max 1g SAR: 0.784 mW/g



WWAN Max 1g SAR: 0.690 mW/g



Combined



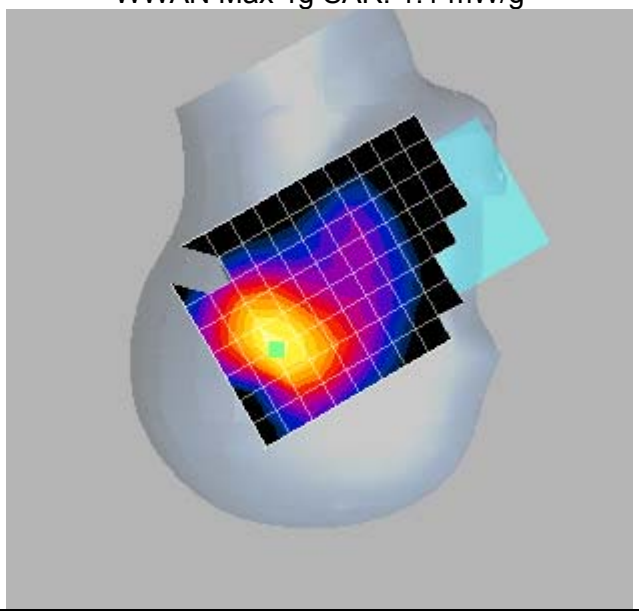
The sum of the 1g SAR = 1.474 mW/g.

Separation distances between peaks SAR in area scans = 1.5 cm

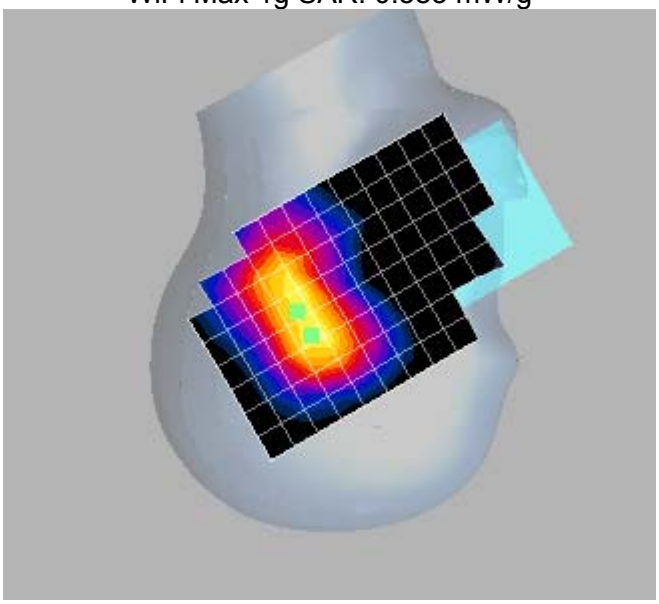
SAR to Peak location separation ratio: 0.982 (1.474 / 1.5), > 0.3

Separation distances between Peaks SAR in area scans for Head (RHS Tilt) position

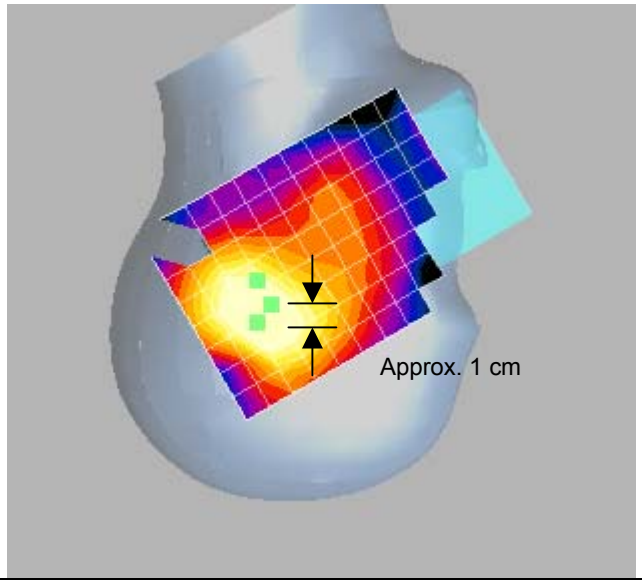
WWAN Max 1g SAR: 1.1 mW/g



WiFi Max 1g SAR: 0.383 mW/g



Combined



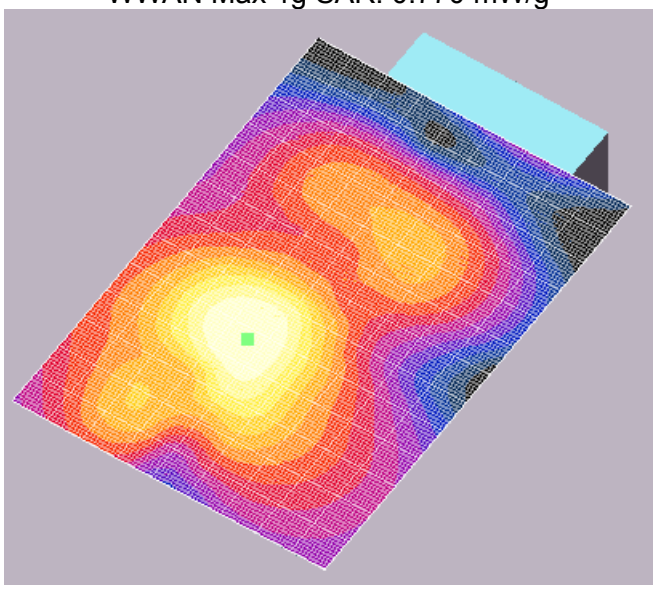
The sum of the 1g SAR = 1.483mW/g

Separation distances between peaks SAR in area scans = 1.0 cm

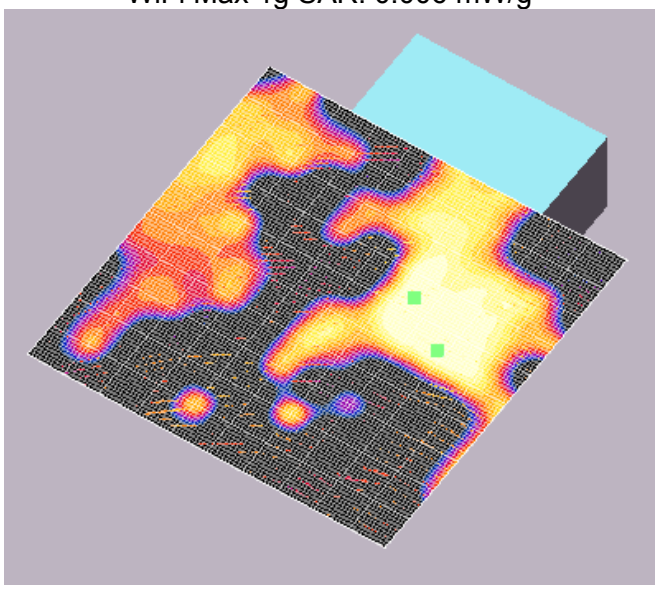
SAR to Peak location separation ratio: 1.483 (1.483 / 1.0), > 0.3

Separation distances between Peaks SAR in area scans for Body (LCD down) position

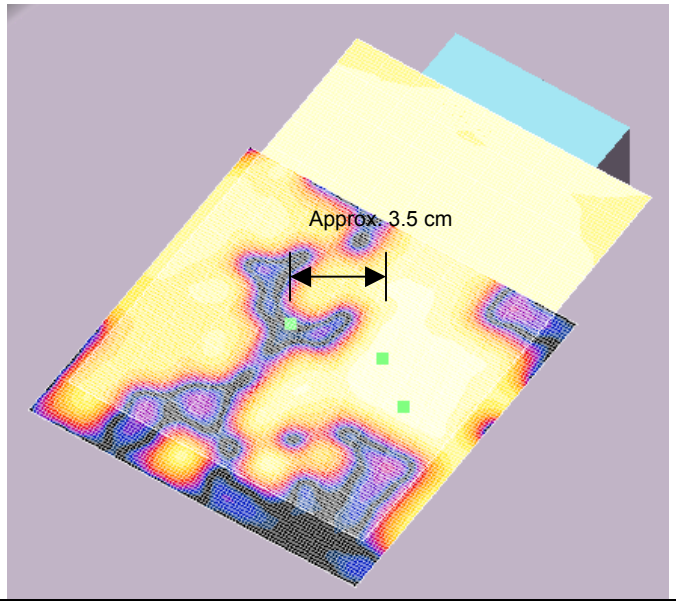
WWAN Max 1g SAR: 0.770 mW/g



WiFi Max 1g SAR: 0.006 mW/g



Combined



The sum of the 1g SAR = 0.776 mW/g

Separation distances between peaks SAR in area scans = 3.5cm

SAR to Peak location separation ratio: 0.221 (0.776 / 3.5), < 0.3

13. WORST-CASE SAR TEST PLOTS

WORST-CASE SAR PLOT for CDMA1900 **HEAD** POSITION

Date/Time: 7/17/2009 2:24:26 PM

Test Laboratory: Compliance Certification Services

CDMA PCS Band - RHS - CN4

DUT: Intermec; Type: CN4; Serial: 13390990002

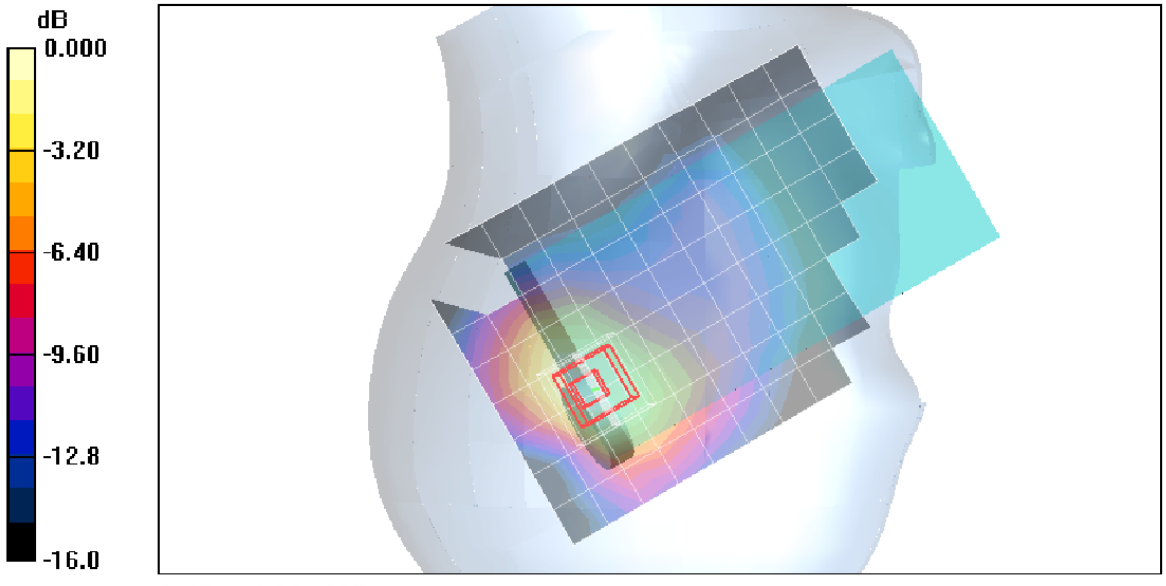
Communication System: CDMA; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Right Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(7.51, 7.51, 7.51); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 10/20/2008
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

R-Tilt - M-ch/Area Scan (9x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.26 mW/g

R-Tilt - M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 19.1 V/m; Power Drift = -0.056 dB
Peak SAR (extrapolated) = 1.77 W/kg
SAR(1 g) = 1.1 mW/g; SAR(10 g) = 0.643 mW/g
Maximum value of SAR (measured) = 1.32 mW/g



0 dB = 1.32mW/g

WORST-CASE SAR PLOT for CDMA1900 **BODY** POSITION

Date/Time: 7/17/2009 6:43:57 PM

Test Laboratory: Compliance Certification Services

CDMA1900 Body CN4

DUT: Intermec; Type: CN4; Serial: 13390990002

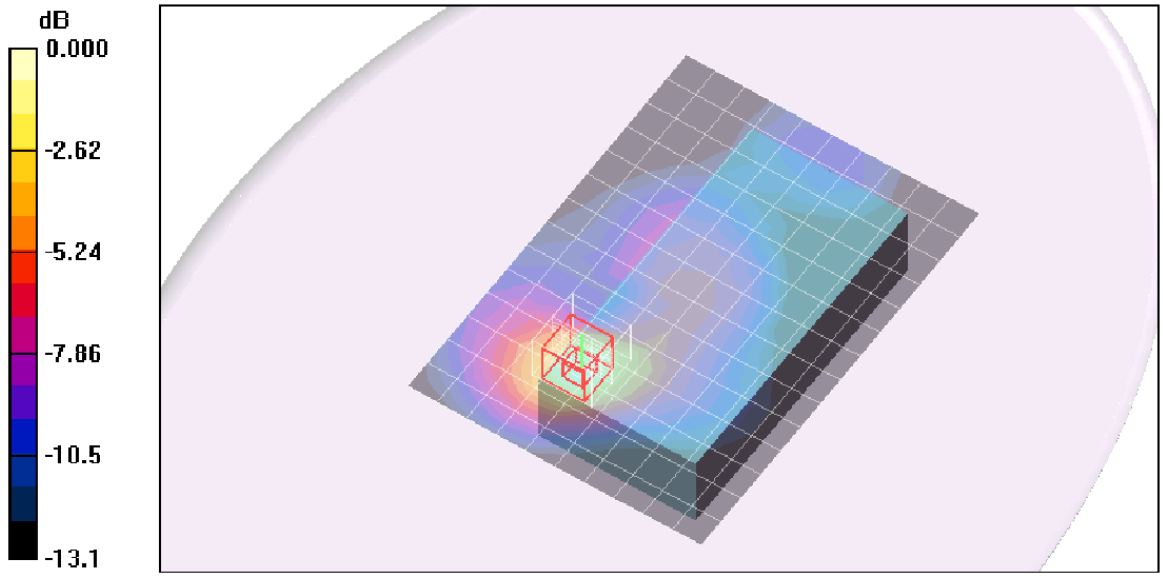
Communication System: CDMA; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.85, 6.85, 6.85); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 10/20/2008
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Face Down, M-ch/Area Scan (11x15x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.794 mW/g

Face Down, M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 11.3 V/m; Power Drift = 0.716 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.726 mW/g; SAR(10 g) = 0.427 mW/g
Maximum value of SAR (measured) = 0.886 mW/g



0 dB = 0.886mW/g

WORST-CASE SAR PLOT for CDMA850 - **HEAD** POSITION

Date/Time: 7/16/2009 10:58:04 AM

Test Laboratory: Compliance Certification Services

CDMA Cell Band - RHS - CN4

DUT: Intermec; Type: CN4; Serial: 13390990002

Communication System: CDMA; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 0.878 mho/m; ε_r = 43; ρ = 1000 kg/m^3
Phantom section: Right Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

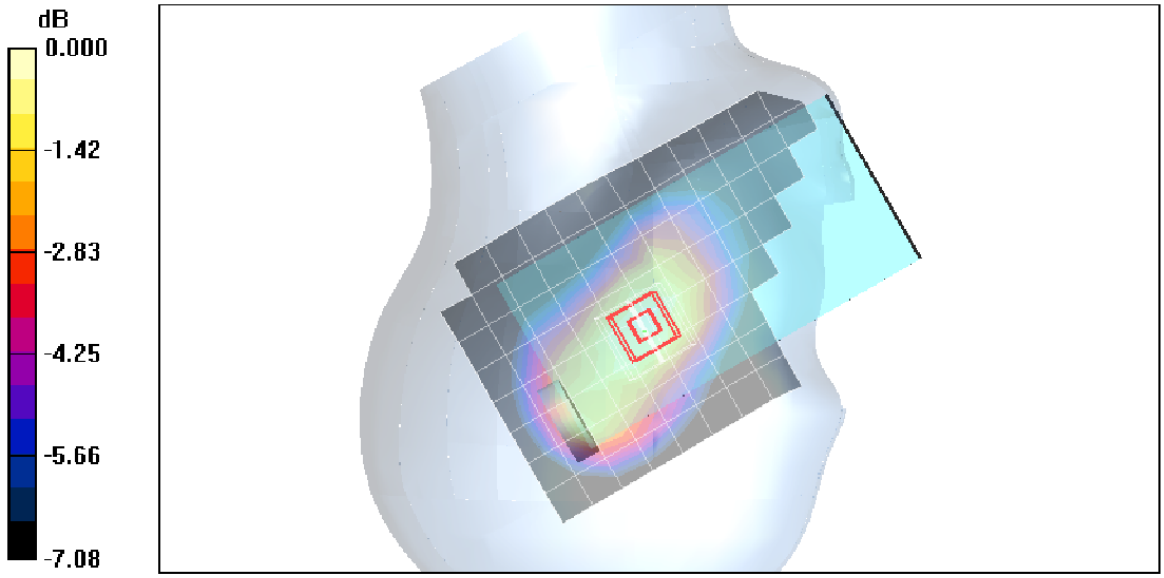
DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(8.72, 8.72, 8.72); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 10/20/2008
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

R-Touch - M-ch/Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.858 mW/g

R-Touch - M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 24.6 V/m; Power Drift = -0.045 dB
Peak SAR (extrapolated) = 1.04 W/kg
SAR(1 g) = 0.790 mW/g; SAR(10 g) = 0.580 mW/g

Maximum value of SAR (measured) = 0.878 mW/g



0 dB = 0.878mW/g

WORST-CASE SAR PLOT for CDMA850 - **BODY** POSITION

Date/Time: 7/20/2009 5:27:30 PM

Test Laboratory: Compliance Certification Services

CDMA850 Body CN4e with AB15 Battery

DUT: Intermec; Type: CN4e; Serial: 13390990075

Communication System: CDMA; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 836.52 MHz; σ = 0.998 mho/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(8.7, 8.7, 8.7); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 10/20/2008
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

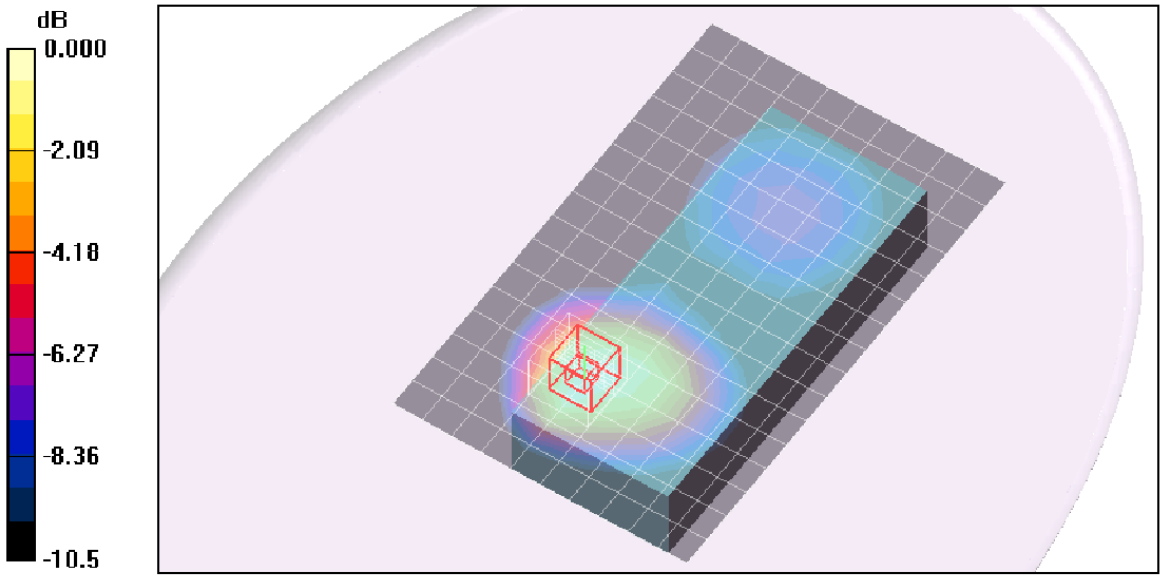
Face Down, M-ch/Area Scan (11x17x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.874 mW/g

Face Down, M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 16.1 V/m; Power Drift = 0.163 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.767 mW/g; SAR(10 g) = 0.516 mW/g

Maximum value of SAR (measured) = 0.877 mW/g



0 dB = 0.877mW/g

WORST-CASE SAR PLOT for WIFI - **HEAD** POSITION

Date/Time: 6/6/2009 6:02:55 PM

Test Laboratory: Compliance Certification Services

WiFi - LHS CN4

DUT: Intermec; Type: CN4; Serial: 03590990044

Communication System: 802.11bg; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.87 mho/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Left Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.81, 6.81, 6.81); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 10/20/2008
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

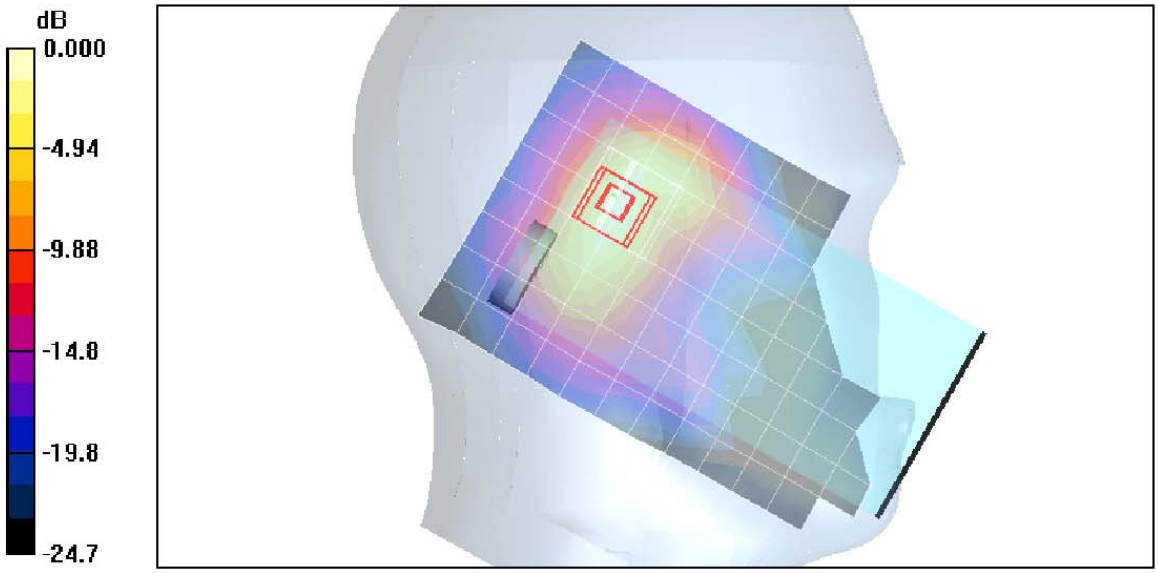
L-Touch - M-ch/Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.01 mW/g

L-Touch - M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 19.1 V/m; Power Drift = -0.123 dB
Peak SAR (extrapolated) = 2.00 W/kg
SAR(1 g) = 0.784 mW/g; SAR(10 g) = 0.319 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.04 mW/g



0 dB = 1.04mW/g

WORST-CASE SAR PLOT for WIFI - **BODY** POSITION

Date/Time: 6/8/2009 7:06:50 PM

Test Laboratory: Compliance Certification Services

WiFi Body CN4

DUT: Intermec; Type: CN4; Serial: 03590990040

Communication System: 802.11bg; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.9 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.48, 6.48, 6.48); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 10/20/2008
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

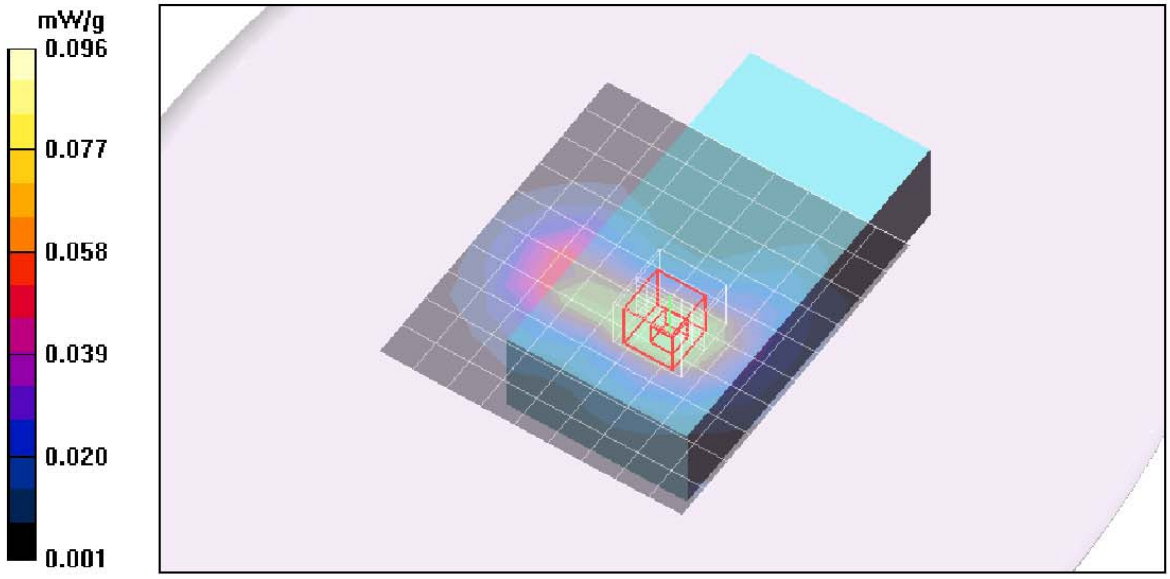
Face up, W/holster - M-ch/Area Scan (10x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.082 mW/g

Face up, W/holster - M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 4.19 V/m; Power Drift = 0.598 dB
Peak SAR (extrapolated) = 0.137 W/kg
SAR(1 g) = 0.078 mW/g; SAR(10 g) = 0.044 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.096 mW/g



14. ATTACHMENTS

No.	Contents	No. of page (s)
1	System Performance Check Plots	18
2-1	SAR Test Plots for CDMA 1900	19
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3	Certificate of E-Field Probe – EX3DV4 SN3686	10
4	Certificate of System Validation Dipole - D835V2 SN:4d002	9
5	Certificate of System Validation Dipole - D1900V2 SN:5d043	9
6	Certificate of System Validation Dipole - D2450V2 SN:748	6

15. TEST SETUP PHOTO

15.1. SETUP PHOTO FOR CN4

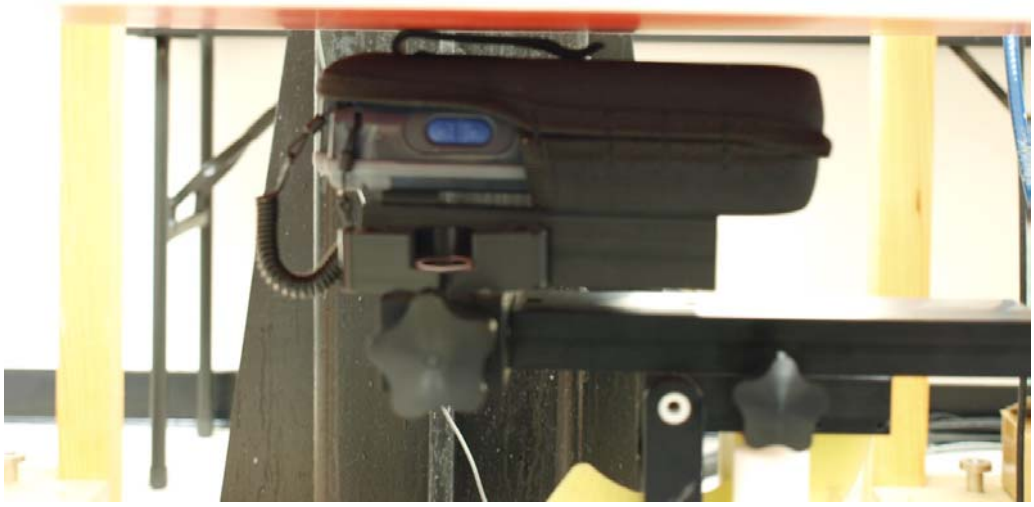
LEFT HAND SIDE TOUCH

LEFT HAND SIDE TTILT (15°)

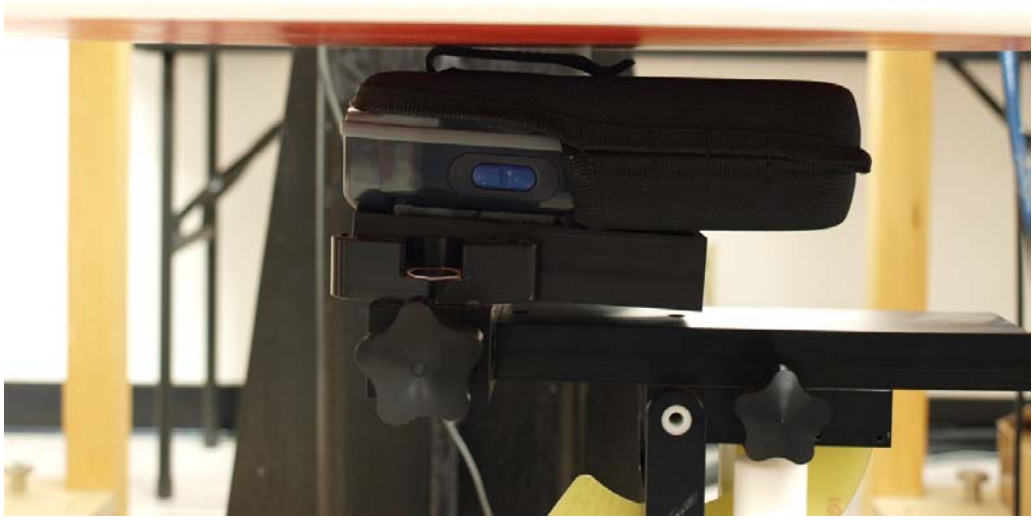
RIGHT HAND SIDE TOUCH

RIGHT HAND SIDE TILT (15°)

BODY – LCD DOWN w/ holster and belt clip



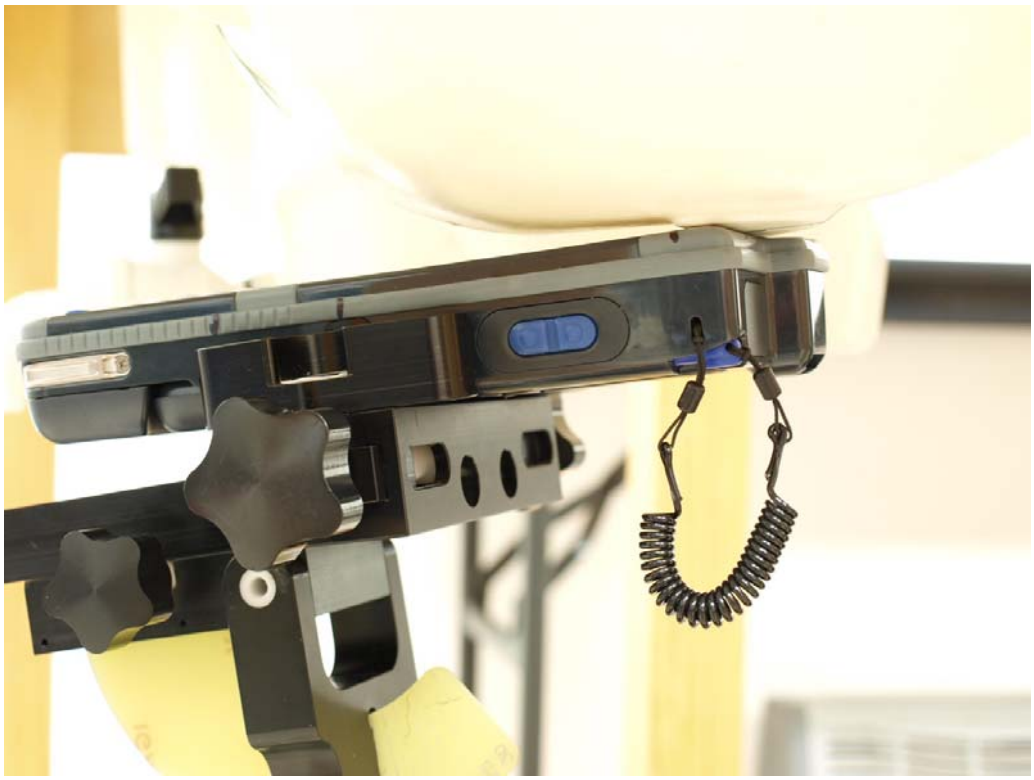
BODY – LCD UP w/ holster and belt clip



15.2. SETUP PHOTO FOR CN4e

LEFT HAND SIDE TOUCH

LEFT HAND SIDE TTILT (15°)

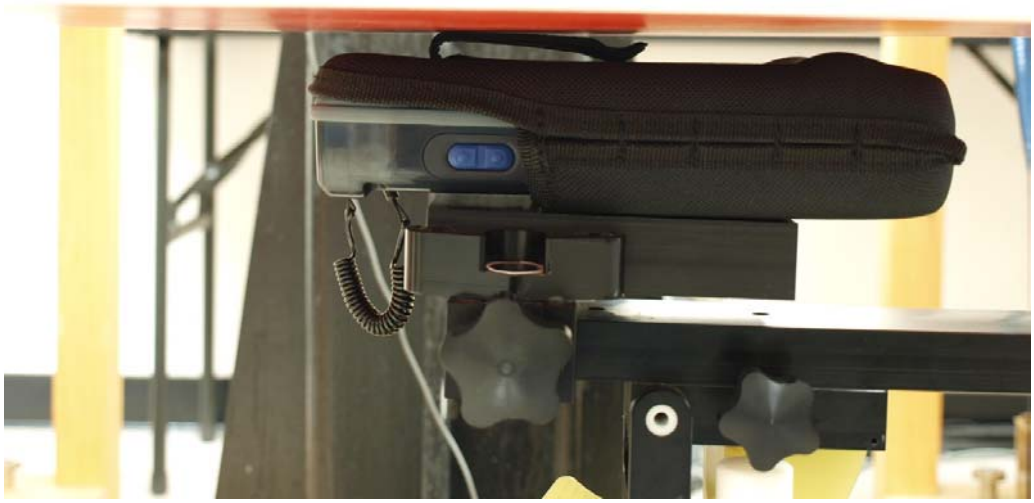


RIGHT HAND SIDE TOUCH

RIGHT HAND SIDE TILT (15°)

BODY – LCD DOWN w/ 2 cm Separation

BODY – LCD UP w/ 2 cm Separation



16. HOST DEVICE PHOTO

EXTERNAL – LCD UP CN4 Qwerty

EXTERNAL – LCD UP CN4e Qwerty

EXTERNAL – LCD UP CN4 Numeric

EXTERNAL – LCD UP CN4e Numeric

EXTERNAL – LCD DOWN CN4

EXTERNAL – LCD DOWN CN4e

Holster – Front

Holster – Back With Belt Clip

END OF REPORT