FCC OET BULLETIN 65 SUPPLEMENT C 01-01

SAR EVALUATION REPORT

For

Phone with 802.11b/g/n and Bluetooth

MODEL: P160UNA

FCC ID: O8F-BROU

REPORT NUMBER: 10U13357-10

ISSUE DATE: February 8, 2011

Prepared for

PALM, INC.
950 MAUDE AVENUE
SUNNYVALE, CA. 94085
UNITED STATES

Prepared by

COMPLIANCE CERTIFICATION SERVICES (UL CCS)
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	February 8, 2011	Initial Issue	--

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1. ATTESTATION OF TEST RESULTS

Applicant:	PALM, INC. 950 MAUDE AVENUE SUNNYVALE, CA. 94085, UNITED STATES
EUT description:	Phone with 802.11b/g/n and Bluetooth
Model number:	P160UNA
Device category:	Portable
Exposure category:	General Population/Uncontrolled Exposure
Date tested:	August 24, 2010 (WiFi) October 26 – 30 and December 8, 2010 (WWAN) January 27 – February 4, 2011 (Hot Spot)

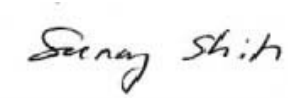
FCC / IC Rule Parts	Freq. range [MHz]	Highest 1-g SAR (mW/g)	Limit (mW/g)
22H / RSS-132	824 - 849	Head: 0.844 (LHS Touch open) Body: 0.372 (Face Down w/ 1.5 cm separation distance) Body: 0.776 (Face Down w/ 1.0 cm separation distance)	1.6
24E / RSS-133	1850 - 1910	Head: 1.380 (RHS Touch open) Body: 0.599 (Face Down w/ 1.5 cm separation distance) Body: 1.02 (Bottom edge w/ 1.0 cm separation distance)	
15.247 / RSS-102	2412 - 2462	Head: 0.198 (RHS Tilt closed) Body: 0.110 (Face Down w/ 1.5 cm separation distance) Body: 0.315 (Back side w/ 1.0 cm separation distance)	

Applicable Standards	Test Results
FCC OET Bulletin 65 Supplement C 01-01 IC RSS 102 Issue 4	Pass

Compliance Certification Services, Inc. (UL 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 UL 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.

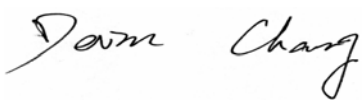
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL 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 (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released For UL CCS By:



Sunny Shih
Engineering Team Leader
Compliance Certification Services (UL CCS)

Tested By:



Devin Chang
EMC Engineer
Compliance Certification Services (UL CCS)

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C 01-01, IC RSS 102 Issue 4 and the following specific FCC Test Procedures.

- 648474 D01 SAR Handsets Multi Xmiter and Ant v01r05
- 648474 D02 SAR Polcy Handsts Multi Xmiter Ant v01r01
- KDB 941225 D01 SAR test for 3G devices v02
- KDB 941225 D02 Guidance PBA for 3GPP R6 HSPA v02r01
- KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE vo1
- KDB 248227 D01 SAR meas for 802 11abg v01r02
- Oct 2010 TCB Council Workshop – FCC Personal Hot Spot Presentation

3. FACILITIES AND ACCREDITATION

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

UL 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		
Dielectric Probe Kit	HP	85070C	N/A	N/A		
S-Parameter Network Analyzer	Agilent	E5071B	MY42100131	8	2	2011
Signal Generator	Agilent	883732B	US3440599	7	14	2012
E-Field Probe	SPEAG	EX3DV3	3531	2	23	2011
E-Field Probe	SPEAG	EX3DV4	3749	11	13	2011
Thermometer	ERTCO	639-1S	1718	7	19	2011
Data Acquisition Electronics	SPEAG	DAE3 V1	427	7	21	2011
Data Acquisition Electronics	SPEAG	DAE3 V4	1239	11	17	2011
System Validation Dipole	SPEAG	D835V2	4d002	4	23	2012
System Validation Dipole	SPEAG	D1900V2	5d043	11	24	2012
System Validation Dipole	SPEAG	D2450V2	706	4	19	2013
Power Meter	Giga-tronics	8651A	8651404	3	13	2012
Power Sensor	Giga-tronics	80701A	1834588	3	13	2012
Amplifier	Mini-Circuits	ZVE-8G	90606	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	SPEAG	H1900	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	M1900	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	H835	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	M835	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	H2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	M2450	N/A	Within 24 hrs of first test		

Note: Per KDB 450824 D02 requirements for dipole calibration, UL CCS has adopted three years calibration intervals. On annual basis, each measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole
2. System validation with specific dipole is within 10% of calibrated value.
3. Return-loss is within 20% of calibrated measurement (test data on file in UL CCS)
4. Impedance is within 5Ω of calibrated measurement (test data on file in UL CCS)

4.2. MEASUREMENT UNCERTAINTY

Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	5.50	Normal	1	1	5.50
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	1.00	Rectangular	1.732	1	0.58
Test Sample Related					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement (2450MHz Body)	3.17	Normal	1	0.64	2.03
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement (850MHz Head)	4.16	Normal	1	0.6	2.50
Combined Standard Uncertainty Uc(y) =					9.97
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.95	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.58	dB

Measurement uncertainty for 300 MHz to 3 GHz averaged over 10 gram

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	5.50	Normal	1	1	5.50
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	1.00	Rectangular	1.732	1	0.58
Test Sample Related					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.43	1.24
Liquid Conductivity - measurement (2450MHz Body)	3.17	Normal	1	0.43	1.36
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.49	1.41
Liquid Permittivity - measurement (850MHz Head)	4.16	Normal	1	0.49	2.04
Combined Standard Uncertainty Uc(y), % =					9.61
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.21	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.53	dB

5. EQUIPMENT UNDER TEST

Phone with 802.11b/g/n and Bluetooth
MODEL: P160UNA
Mobile phone capability: ☐ Class A[1] ☒ Class B[2] ☐ Class C[3]
GPRS Multi-slot class: ☒ Class 12 (only used in Canada) ☒ Class 10 ☐ Class 8

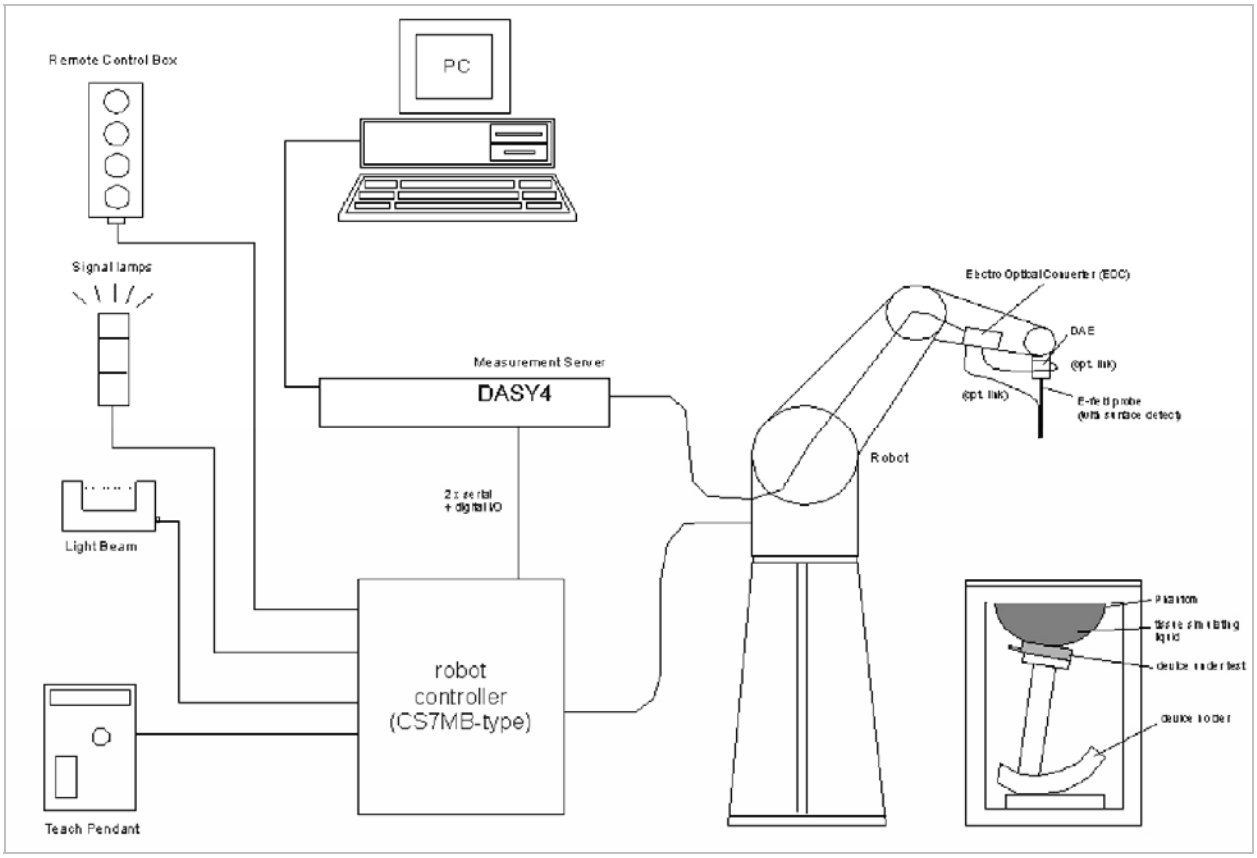
Normal operation:	Held to head (open and closed – by sliding) Worn on body (Facing-up and Facing-down) with 1.5 cm separation distance
Body Worn Accessory	Headset, part #: 180-10632-00
Battery option that could affect the SAR results:	

Battery 1	Brand Name	Palm	P/N: 157-10150-00
	Power Rating	3.7Vdc, 920 mAh	Type: Rechargeable Li-ion battery
Battery 2	Brand Name	Palm	P/N: 157-10151-00
	Power Rating	3.7Vdc, 920 mAh	Type: Rechargeable Li-ion battery
Audio adapter	Brand Name	Palm	P/N: 180-10815-00
Earphone	Brand Name	Palm	P/N: 180-10632-00

Antenna-to-antenna separation distances:	Refer to section 15, Antenna locations and separation distances. ○ 6.3 cm from WWAN antenna-to-WiFi/BT antenna ○ 0 cm from WiFi antenna-to-BT antenna (WiFi and Bluetooth shared same common antenna)
Simultaneous transmission:	○ WWAN can transmit simultaneously with WiFi ○ WWAN can transmit simultaneously with Bluetooth ○ WiFi can transmit simultaneously with Bluetooth
KDB 680160	KDB 680106 "Client Device Considerations" was considered and evaluation performed as applicable to this device. The inductive charger has been certified under FCC ID: O8F-TST1. IC: 3905A-TST1. EUT is working in charging mode with the inductive charger. SAR head position or body-worn position are not applicable due to it is not a portable device in this charging mode. The inductive backcover is not removable. For more information, please refer to this inductive charger FCC ID/ IC ID

[1] Class A mobile phones can be connected to both GPRS and GSM services simultaneously.
[2] Class B mobile phones can be attached to both GPRS and GSM services, using one service at a time.
[3] Class C mobile phones are attached to either GPRS or GSM voice service. You need to switch manually between services

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 validating 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. For frequencies in 300 MHz to just under 2 GHz, the measured conductivity and relative permittivity should be within ± 5% of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within ± 5% of the target values. The measured relative permittivity tolerance can be relaxed to no more than ± 10%.

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom

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 835 MHZ

Simulating Liquid Dielectric Parameters for Head 835 MHz Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	41.14	Relative Permittivity (ϵ_r):	41.137	41.5	-0.87	± 5
	e"	19.88	Conductivity (σ):	0.924	0.90	2.62	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 30%
October 27, 2010 02:30 PM

Frequency	e'	e"
800000000.	41.4201	19.5177
805000000.	41.3299	19.5302
810000000.	41.2655	19.5658
815000000.	41.2219	19.6189
820000000.	41.1906	19.6899
825000000.	41.1717	19.7661
830000000.	41.1575	19.8357
835000000.	**41.1372**	**19.8822**
840000000.	41.1207	19.9167
845000000.	41.0884	19.9346
850000000.	41.0312	19.9217
855000000.	40.9433	19.8750
860000000.	40.8061	19.8073
865000000.	40.6302	19.7129
870000000.	40.4192	19.6148
875000000.	40.2075	19.4996
880000000.	40.0030	19.3835
885000000.	39.8315	19.2776
890000000.	39.6926	19.1781
895000000.	39.6036	19.1079
900000000.	39.5522	19.0666
905000000.	39.5235	19.0559
910000000.	39.5151	19.0673
915000000.	39.5276	19.0903
920000000.	39.5604	19.1240
925000000.	39.6350	19.1630
930000000.	39.7338	19.2072
935000000.	39.8326	19.2408
940000000.	39.8984	19.2600
945000000.	39.9924	19.2550
950000000.	39.9866	19.2232

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 Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	43.23	Relative Permittivity (ϵ_r):	43.227	41.5	4.16	± 5
	e"	19.31	Conductivity (σ):	0.897	0.90	-0.35	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 38%
October 28, 2010 10:13 AM

Frequency	e'	e"
800000000.	43.6541	19.4074
805000000.	43.5909	19.3988
810000000.	43.5299	19.3770
815000000.	43.4669	19.3605
820000000.	43.4089	19.3483
825000000.	43.3490	19.3360
830000000.	43.2868	19.3220
835000000.	**43.2271**	**19.3077**
840000000.	43.1703	19.2932
845000000.	43.1133	19.2744
850000000.	43.0616	19.2594
855000000.	43.0164	19.2444
860000000.	42.9592	19.2287
865000000.	42.9097	19.2251
870000000.	42.8565	19.2118
875000000.	42.7952	19.2100
880000000.	42.7405	19.2028
885000000.	42.6826	19.1941
890000000.	42.6186	19.1866
895000000.	42.5539	19.1719
900000000.	42.4962	19.1590
905000000.	42.4317	19.1479
910000000.	42.3750	19.1406
915000000.	42.3171	19.1237
920000000.	42.2549	19.1137
925000000.	42.2018	19.0987
930000000.	42.1491	19.0837
935000000.	42.0886	19.0731
940000000.	42.0363	19.0631
945000000.	41.9831	19.0523
950000000.	41.9280	19.0410

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 Body 835 MHz Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	54.77	Relative Permittivity (ϵ_r):	54.775	55.2	-0.77	± 5
	e"	21.21	Conductivity (σ):	0.985	0.97	1.57	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 38%
October 28, 2010 10:37 AM

Frequency	e'	e"
800000000.	55.0986	21.4094
805000000.	55.0565	21.3835
810000000.	55.0202	21.3566
815000000.	54.9703	21.3248
820000000.	54.9251	21.3012
825000000.	54.8774	21.2668
830000000.	54.8318	21.2373
835000000.	**54.7745**	**21.2101**
840000000.	54.7242	21.1785
845000000.	54.6800	21.1427
850000000.	54.6359	21.1094
855000000.	54.5929	21.0803
860000000.	54.5489	21.0554
865000000.	54.5139	21.0379
870000000.	54.4667	21.0281
875000000.	54.4207	21.0157
880000000.	54.3768	21.0050
885000000.	54.3308	20.9927
890000000.	54.2838	20.9830
895000000.	54.2323	20.9713
900000000.	54.1805	20.9653
905000000.	54.1418	20.9533
910000000.	54.0983	20.9417
915000000.	54.0553	20.9244
920000000.	54.0130	20.9111
925000000.	53.9690	20.8954
930000000.	53.9275	20.8751
935000000.	53.8827	20.8591
940000000.	53.8360	20.8383
945000000.	53.7921	20.8212
950000000.	53.7463	20.7967

The conductivity (σ) can be given as:

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

where f = target f * 10^6

ε_0 = 8.854 * 10^{-12}

Simulating Liquid Dielectric Parameters for Body 835 MHz Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	53.44	Relative Permittivity (ϵ_r):	53.436	55.2	-3.20	± 5
	e"	21.20	Conductivity (σ):	0.985	0.97	1.53	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
February 03, 2011 09:01 AM

Frequency	e'	e"
800000000.	53.8007	21.3547
805000000.	53.7530	21.3324
810000000.	53.6960	21.3111
815000000.	53.6444	21.2867
820000000.	53.5873	21.2630
825000000.	53.5341	21.2449
830000000.	53.4851	21.2214
835000000.	**53.4355**	**21.2021**
840000000.	53.3816	21.1803
845000000.	53.3321	21.1617
850000000.	53.2886	21.1380
855000000.	53.2319	21.1213
860000000.	53.1856	21.1000
865000000.	53.1338	21.0796
870000000.	53.0833	21.0577
875000000.	53.0378	21.0410
880000000.	52.9995	21.0265
885000000.	52.9413	21.0036
890000000.	52.8984	20.9865
895000000.	52.8535	20.9697
900000000.	52.8032	20.9509
905000000.	52.7519	20.9306
910000000.	52.7010	20.9139
915000000.	52.6500	20.8967
920000000.	52.6019	20.8806
925000000.	52.5537	20.8620
930000000.	52.5093	20.8411
935000000.	52.4554	20.8291
940000000.	52.4111	20.8080
945000000.	52.3636	20.7944
950000000.	52.3119	20.7744

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 1900 MHz

Simulating Liquid Dielectric Parameters for Head 1900 MHz Measured by: Devin Chang

f (MHz)	Liquid Parameters		Measured Results		Target	Delta (%)	Limit (%)
1900	e'	39.019	Relative Permittivity (ε_r):	39.0191	40.0	-2.45	± 5
	e"	13.333	Conductivity (σ):	1.40925	1.40	0.66	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
October 26, 2010 08:55 AM

Frequency	e'	e"
1710000000.	39.8173	12.7378
1720000000.	39.7832	12.7690
1730000000.	39.7495	12.8020
1740000000.	39.7101	12.8371
1750000000.	39.6719	12.8748
1760000000.	39.6288	12.9141
1770000000.	39.5845	12.9530
1780000000.	39.5388	12.9904
1790000000.	39.4927	13.0286
1800000000.	39.4479	13.0607
1810000000.	39.4037	13.0944
1820000000.	39.3597	13.1225
1830000000.	39.3154	13.1498
1840000000.	39.2682	13.1763
1850000000.	39.2260	13.2028
1860000000.	39.1819	13.2249
1870000000.	39.1398	13.2501
1880000000.	39.0991	13.2762
1890000000.	39.0584	13.3061
1900000000.	**39.0191**	**13.3326**
1910000000.	38.9780	13.3604

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 Body 1900 MHz Measured by: Devin Chang

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	52.596	Relative Permittivity (ε_r):	52.5963	53.3	-1.32	± 5
	e"	14.162	Conductivity (σ):	1.49694	1.52	-1.52	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%
October 26, 2010 08:25 PM

Frequency	e'	e"
1710000000.	53.1933	13.5094
1720000000.	53.1773	13.5438
1730000000.	53.1387	13.5704
1740000000.	53.1000	13.6063
1750000000.	53.0658	13.6374
1760000000.	53.0195	13.6746
1770000000.	52.9962	13.7093
1780000000.	52.9669	13.7260
1790000000.	52.9258	13.7605
1800000000.	52.9193	13.7951
1810000000.	52.8690	13.8413
1820000000.	52.8478	13.8556
1830000000.	52.8021	13.9063
1840000000.	52.7673	13.9348
1850000000.	52.7429	13.9659
1860000000.	52.7111	14.0091
1870000000.	52.6872	14.0502
1880000000.	52.6562	14.0790
1890000000.	52.6167	14.1300
1900000000.	**52.5963**	**14.1622**
1910000000.	52.5538	14.2047

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 Measured by: David Lee

f (MHz)	Liquid Parameters		Measured Results		Target	Delta (%)	Limit (%)
1900	e'	39.329	Relative Permittivity (ε_r):	39.3292	40.0	-1.68	± 5
	e"	12.817	Conductivity (σ):	1.35476	1.40	-3.23	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
December 08, 2010 07:45 AM

Frequency	e'	e"
1710000000.	40.0498	12.3314
1720000000.	40.0284	12.3929
1730000000.	40.0123	12.4485
1740000000.	39.9887	12.4954
1750000000.	39.9569	12.5216
1760000000.	39.9147	12.5288
1770000000.	39.8591	12.5253
1780000000.	39.8027	12.5166
1790000000.	39.7397	12.5170
1800000000.	39.6883	12.5300
1810000000.	39.6431	12.5599
1820000000.	39.6097	12.6056
1830000000.	39.5868	12.6594
1840000000.	39.5686	12.7248
1850000000.	39.5461	12.7770
1860000000.	39.5202	12.8143
1870000000.	39.4841	12.8366
1880000000.	39.4359	12.8396
1890000000.	39.3826	12.8303
1900000000.	**39.3292**	**12.8171**
1910000000.	39.2809	12.8130

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 Body 1900 MHz Measured by: Devin Chang

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	53.902	Relative Permittivity (ε_r):	53.9016	53.3	1.13	± 5
	e"	14.064	Conductivity (σ):	1.48650	1.52	-2.20	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
January 26, 2011 11:06 PM

Frequency	e'	e"
1710000000.	54.2631	13.4907
1720000000.	54.2785	13.5374
1730000000.	54.3174	13.5821
1740000000.	54.3643	13.6250
1750000000.	54.3950	13.6580
1760000000.	54.3961	13.6843
1770000000.	54.3636	13.7022
1780000000.	54.2992	13.7287
1790000000.	54.2103	13.7487
1800000000.	54.1126	13.7773
1810000000.	54.0271	13.8107
1820000000.	53.9633	13.8516
1830000000.	53.9305	13.8991
1840000000.	53.9265	13.9436
1850000000.	53.9472	13.9843
1860000000.	53.9740	14.0178
1870000000.	53.9904	14.0392
1880000000.	53.9869	14.0533
1890000000.	53.9567	14.0583
1900000000.	**53.9016**	**14.0635**
1910000000.	53.8293	14.0766

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 Body 1900 MHz Measured by: David Lee

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	52.792	Relative Permittivity (ε_r):	52.7917	53.3	-0.95	± 5
	e"	14.744	Conductivity (σ):	1.55847	1.52	2.53	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%
February 03, 2011 10:04 AM

Frequency	e'	e"
1710000000.	53.5231	14.0622
1720000000.	53.4849	14.0923
1730000000.	53.4464	14.1268
1740000000.	53.4105	14.1618
1750000000.	53.3714	14.1935
1760000000.	53.3337	14.2331
1770000000.	53.2961	14.2686
1780000000.	53.2611	14.3067
1790000000.	53.2251	14.3482
1800000000.	53.1920	14.3875
1810000000.	53.1575	14.4256
1820000000.	53.1238	14.4665
1830000000.	53.0883	14.5029
1840000000.	53.0480	14.5390
1850000000.	53.0037	14.5762
1860000000.	52.9632	14.6103
1870000000.	52.9211	14.6452
1880000000.	52.8753	14.6799
1890000000.	52.8320	14.7119
1900000000.	**52.7917**	**14.7444**
1910000000.	52.7551	14.7726

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 Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	38.87	Relative Permittivity (ϵ_r):	38.874	39.2	-0.83	± 5
	e"	13.46	Conductivity (σ):	1.835	1.80	1.95	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%
August 24, 2010 08:48 AM

Frequency	e'	e"
2400000000.	39.0181	13.2555
2405000000.	38.9929	13.2907
2410000000.	38.9639	13.3044
2415000000.	38.9527	13.3338
2420000000.	38.9381	13.3559
2425000000.	38.9288	13.3771
2430000000.	38.9175	13.3922
2435000000.	38.9109	13.4014
2440000000.	38.9151	13.4322
2445000000.	38.8900	13.4542
2450000000.	**38.8739**	**13.4645**
2455000000.	38.8378	13.4777
2460000000.	38.8012	13.4858
2465000000.	38.7585	13.4845
2470000000.	38.7399	13.4721
2475000000.	38.7233	13.4812
2480000000.	38.7001	13.4874
2485000000.	38.6839	13.5053
2490000000.	38.6650	13.5210
2495000000.	38.6453	13.5381
2500000000.	38.6203	13.5865

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 Body 2450 MHz Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	51.61	Relative Permittivity (ϵ_r):	51.614	52.7	-2.06	± 5
	e"	14.76	Conductivity (σ):	2.012	1.95	3.17	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%
August 24, 2010 08:51 AM

Frequency	e'	e"
2400000000.	51.7347	14.5126
2405000000.	51.7142	14.5565
2410000000.	51.6864	14.5763
2415000000.	51.6803	14.6101
2420000000.	51.6685	14.6365
2425000000.	51.6642	14.6568
2430000000.	51.6620	14.6731
2435000000.	51.6541	14.7028
2440000000.	51.6405	14.7251
2445000000.	51.6289	14.7435
2450000000.	**51.6138**	**14.7600**
2455000000.	51.5714	14.7874
2460000000.	51.5195	14.7738
2465000000.	51.4988	14.7735
2470000000.	51.4741	14.7669
2475000000.	51.4550	14.7852
2480000000.	51.4308	14.7944
2485000000.	51.4195	14.8111
2490000000.	51.4028	14.8413
2495000000.	51.3699	14.8779
2500000000.	51.3486	14.9147

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 Parameter Check Result @ Body 2450 MHz Measured by: David Lee

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	51.64	Relative Permittivity (ϵ_r):	51.637	52.7	-2.02	± 5
	e"	14.25	Conductivity (σ):	1.942	1.95	-0.40	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 36%
January 26, 2011 08:41 PM

Frequency	e'	e"
2400000000.	51.8204	13.9785
2405000000.	51.7891	13.9908
2410000000.	51.7594	14.0055
2415000000.	51.7304	14.0263
2420000000.	51.7048	14.0504
2425000000.	51.6836	14.0792
2430000000.	51.6648	14.1066
2435000000.	51.6510	14.1399
2440000000.	51.6454	14.1786
2445000000.	51.6385	14.2149
2450000000.	**51.6365**	**14.2500**
2455000000.	51.6358	14.2859
2460000000.	51.6389	14.3211
2465000000.	51.6420	14.3497
2470000000.	51.6422	14.3767
2475000000.	51.6416	14.3994
2480000000.	51.6402	14.4184
2485000000.	51.6304	14.4305
2490000000.	51.6208	14.4452
2495000000.	51.6057	14.4551
2500000000.	51.5839	14.4608

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 Parameter Check Result @ Body 2450 MHz Measured by: David Lee

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	51.14	Relative Permittivity (ε_r):	51.136	52.7	-2.97	± 5
	e"	14.67	Conductivity (σ):	1.999	1.95	2.52	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 41%
February 01, 2011 03:57 PM

Frequency	e'	e"
2400000000.	51.4077	14.4426
2405000000.	51.3895	14.4387
2410000000.	51.3681	14.4374
2415000000.	51.3446	14.4453
2420000000.	51.3177	14.4563
2425000000.	51.2877	14.4753
2430000000.	51.2569	14.5042
2435000000.	51.2259	14.5386
2440000000.	51.1920	14.5773
2445000000.	51.1626	14.6213
2450000000.	**51.1357**	**14.6682**
2455000000.	51.1099	14.7175
2460000000.	51.0887	14.7655
2465000000.	51.0727	14.8072
2470000000.	51.0638	14.8466
2475000000.	51.0489	14.8794
2480000000.	51.0437	14.9050
2485000000.	51.0397	14.9232
2490000000.	51.0364	14.9315
2495000000.	51.0337	14.9363
2500000000.	51.0312	14.9339

The conductivity (σ) can be given as:

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

where f = target f * 10^6

ε_0 = 8.854 * 10^{-12}

9. SYSTEM VERIFICATION

The system performance check is performed prior to any usage of the system in order to verify SAR system measurement accuracy. 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 SN3531 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 100 mW
- The results are normalized to 1 W input power.

Reference SAR Values for HEAD & BODY-tissue from calibration certificate of SPEAG.

System validation dipole	Cal. certificate #	Cal. date	SAR Avg (mW/g)		
			Tissue:	Head	Body
D835V2	D835V2-4d002_Apr09	04/23/09	SAR_{1g}:	9.64	9.96
			SAR_{10g}:	6.28	6.56
D1900V2	D1900V2-5d043_Nov09	11/24/09	SAR_{1g}:	39.8	40.4
			SAR_{10g}:	20.7	21.4
D2450V2	D2450V2-706_Apr10	04/19/10	SAR_{1g}:	51.6	52.4
			SAR_{10g}:	24.4	24.5

9.1. SYSTEM CHECK RESULTS FOR D835V2

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Head			
D835V2	10/27/10	SAR_{1g}:	9.43	9.64	-2.18	±10
		SAR_{10g}:	6.24	6.28	-0.64	
D835V2	10/28/10	SAR_{1g}:	9.84	9.64	2.07	±10
		SAR_{10g}:	6.49	6.28	3.34	
System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D835V2	02/03/11	SAR_{1g}:	10.2	9.96	2.41	±10
		SAR_{10g}:	6.7	6.56	1.68	

9.2. SYSTEM CHECK RESULTS FOR D1900V2

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Head			
D1900V2	10/26/10	SAR_{1g}:	37.9	39.8	-4.77	±10
		SAR_{10g}:	20.1	20.7	-2.90	
D1900V2	12/08/10	SAR_{1g}:	37.9	39.8	-4.77	±10
		SAR_{10g}:	20.0	20.7	-3.38	
System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D1900V2	10/27/10	SAR_{1g}:	39.1	40.4	-3.22	±10
		SAR_{10g}:	20.9	21.4	-2.34	
D1900V2	01/26/11	SAR_{1g}:	38.2	40.4	-5.45	±10
		SAR_{10g}:	20.2	21.4	-5.61	
D1900V2	02/03/11	SAR_{1g}:	39.0	40.4	-3.47	±10
		SAR_{10g}:	20.3	21.4	-5.14	

9.3. SYSTEM CHECK RESULTS FOR D2450V2

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Head			
D2450V2	08/24/10	SAR_{1g}:	52.5	51.6	1.74	±10
		SAR_{10g}:	23.9	24.4	-2.05	
System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D2450V2	01/26/11	SAR_{1g}:	49.2	52.4	-6.11	±10
		SAR_{10g}:	22.7	24.5	-7.35	
System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D2450V2	02/01/11	SAR_{1g}:	52.2	52.4	-0.38	±10
		SAR_{10g}:	24.1	24.5	-1.63	

SYSTEM CHECK PLOT for D835V2

Date/Time: 10/27/2010 7:43:21 PM

Test Laboratory: Compliance Certification Services

System Performance Check - D835V2

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

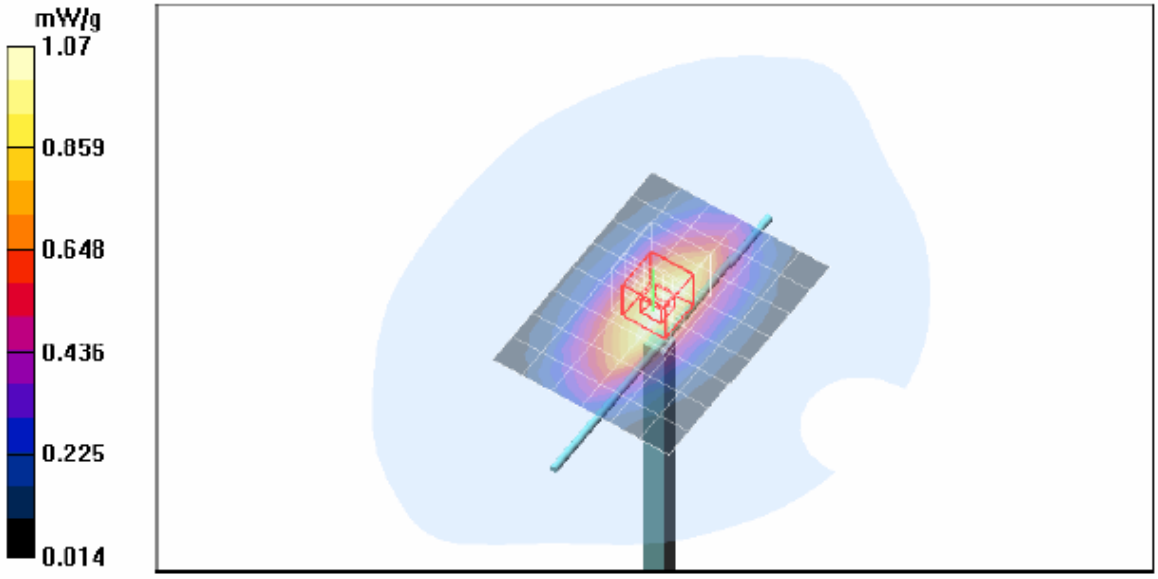
Communication System: CW 835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.924 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

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: EX3DV3 - SN3531; ConvF(10.13, 10.13, 10.13); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=100 mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.07 mW/g

d=15mm, Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 34.0 V/m; Power Drift = 0.069 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.943 mW/g; SAR(10 g) = 0.624 mW/g
Maximum value of SAR (measured) = 1.10 mW/g



Z-Axis PLOT for D835V2

Date/Time: 10/27/2010 8:01:18 PM

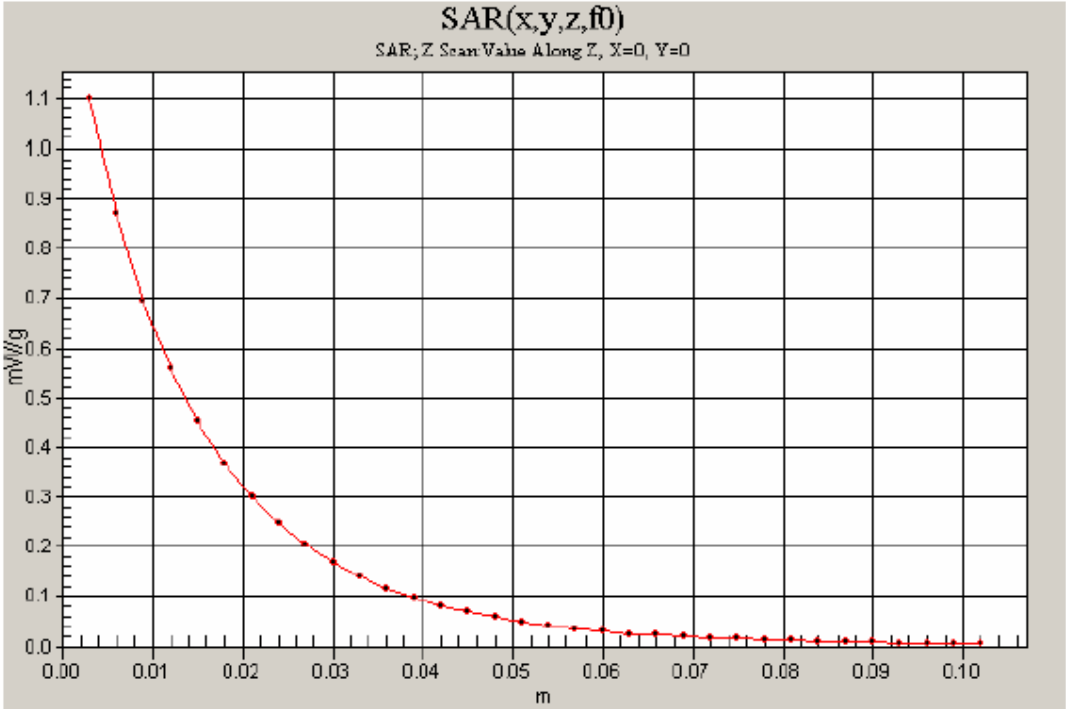
Test Laboratory: Compliance Certification Services

System Performance Check - D835V2

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

Communication System: CW 835; Frequency: 835 MHz;Duty Cycle: 1:1

d=15mm, Pin=100 mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 1.10 mW/g



SYSTEM CHECK PLOT for D835V2

Date/Time: 10/28/2010 9:42:22 AM

Test Laboratory: Compliance Certification Services

System Performance Check - D835V2

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

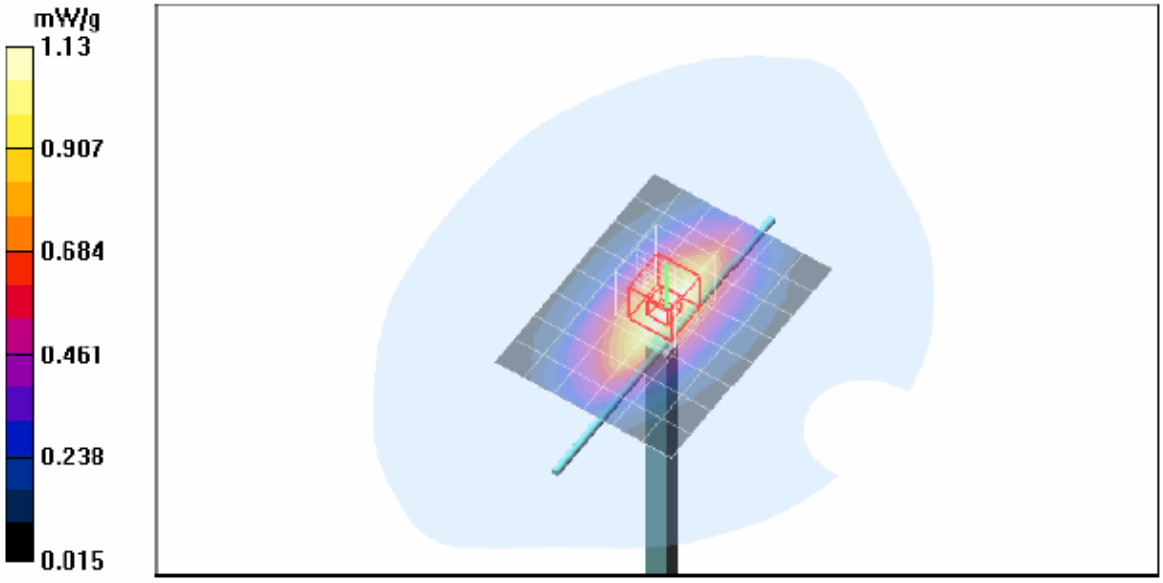
Communication System: CW 835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.897 mho/m; ε_r = 43.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

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: EX3DV3 - SN3531; ConvF(10.13, 10.13, 10.13); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=100 mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.13 mW/g

d=15mm, Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 35.7 V/m; Power Drift = 0.016 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.984 mW/g; SAR(10 g) = 0.649 mW/g
Maximum value of SAR (measured) = 1.15 mW/g



Z-Axis PLOT for D835V2

Date/Time: 10/28/2010 10:00:14 AM

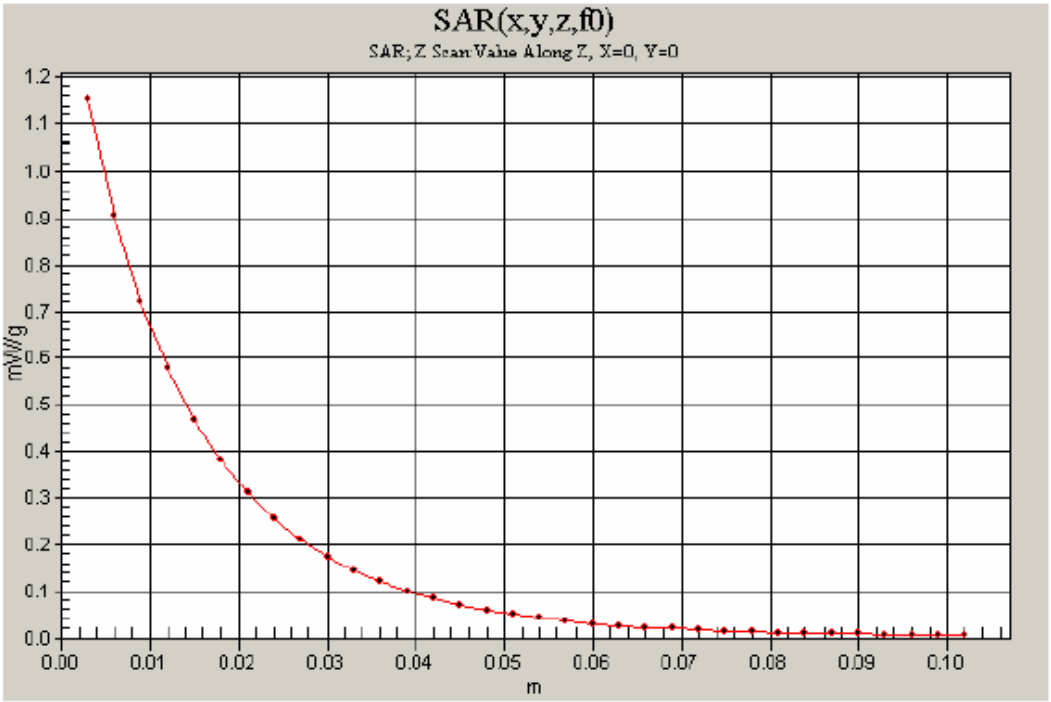
Test Laboratory: Compliance Certification Services

System Performance Check - D835V2

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

Communication System: CW 835; Frequency: 835 MHz;Duty Cycle: 1:1

d=15mm, Pin=100 mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 1.15 mW/g



SYSTEM CHECK PLOT for D835V2

Date/Time: 2/3/2011 9:11:16 AM

Test Laboratory: Compliance Certification Services (UL CCS)

System Performance Check - D835V2

DUT: D835V2; Type: D835V2; Serial: 4d002

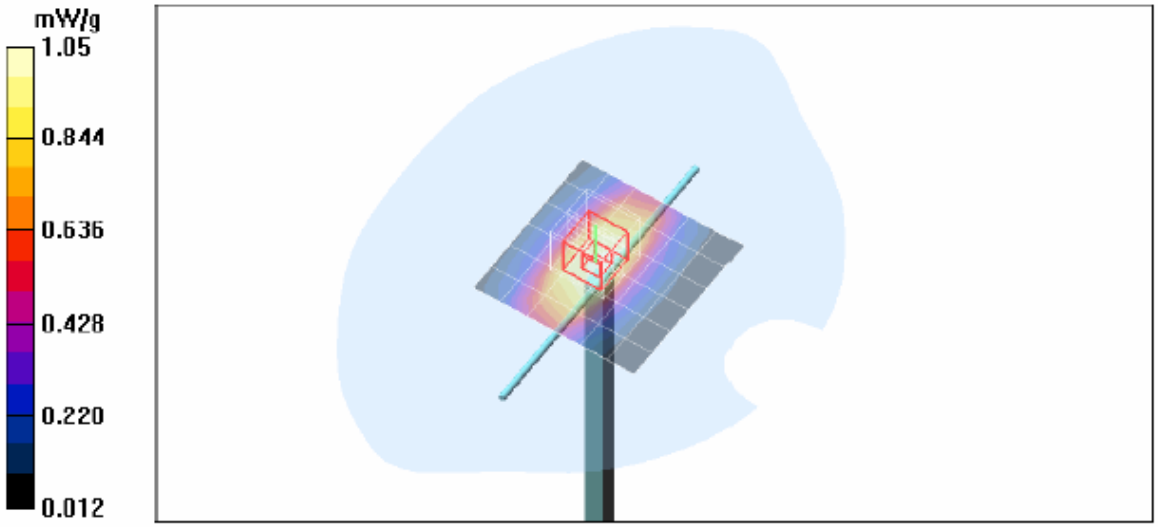
Communication System: System Check Signal - CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.985 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

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 - SN3749; ConvF(8.79, 8.79, 8.79); Calibrated: 12/13/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.05 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 34.9 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 1.54 W/kg
SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.667 mW/g
Maximum value of SAR (measured) = 1.19 mW/g



Z-Axis PLOT for D835V2

Date/Time: 2/3/2011 9:28:20 AM

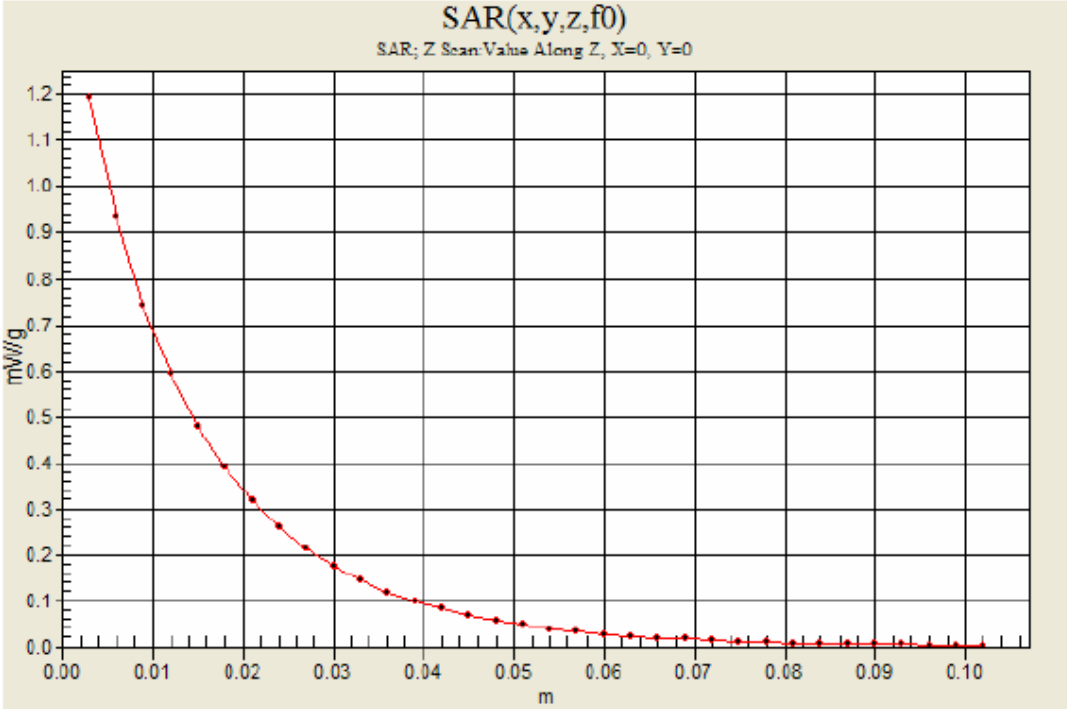
Test Laboratory: Compliance Certification Services (UL CCS)

System Performance Check - D835V2

DUT: D835V2; Type: D835V2; Serial: 4d002

Communication System: System Check Signal - CW; Frequency: 835 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 1.19 mW/g



SYSTEM CHECK PLOT for D1900V2

Date/Time: 10/26/2010 8:58:19 AM

Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: D1900V2; Type: D1900V2; Serial: 5d043

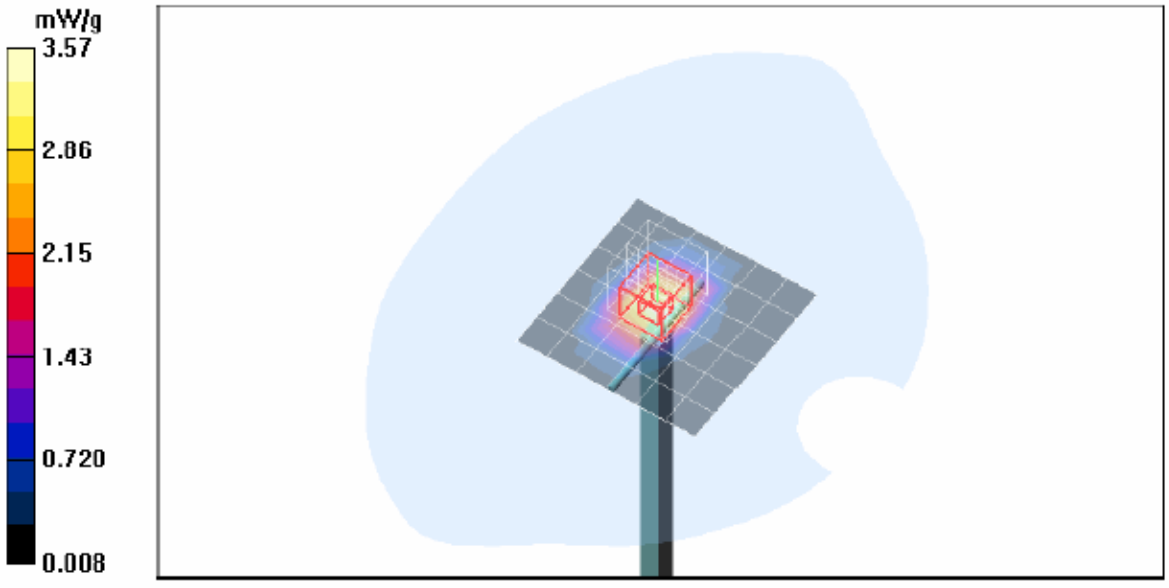
Communication System: CW 1900MHz; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section

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: EX3DV3 - SN3531; ConvF(8.64, 8.64, 8.64); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.57 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.0 V/m; Power Drift = 0.045 dB
Peak SAR (extrapolated) = 6.85 W/kg
SAR(1 g) = 3.79 mW/g; SAR(10 g) = 2.01 mW/g
Maximum value of SAR (measured) = 4.75 mW/g



Z-Axis PLOT for D1900V2

Date/Time: 10/26/2010 9:17:59 AM

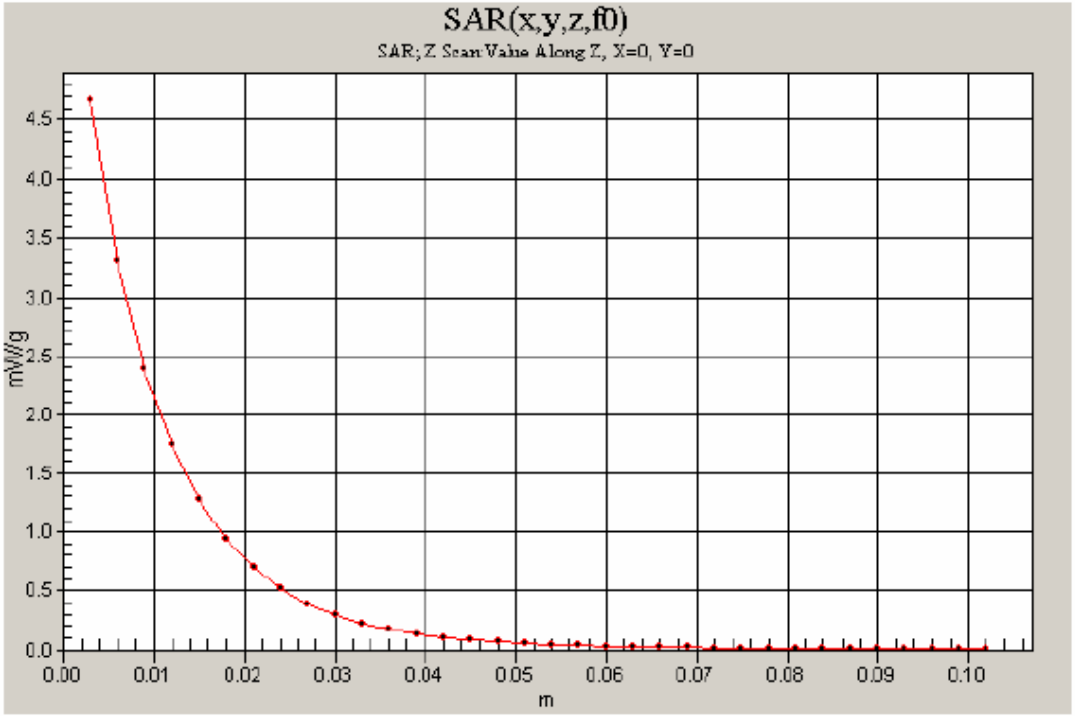
Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: D1900V2; Type: D1900V2; Serial: 5d043

Communication System: CW 1900MHz; Frequency: 1900 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 4.67 mW/g



SYSTEM CHECK PLOT for D1900V2

Date/Time: 10/27/2010 9:51:47 AM

Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: D1900V2; Type: D1900V2; Serial: 5d043

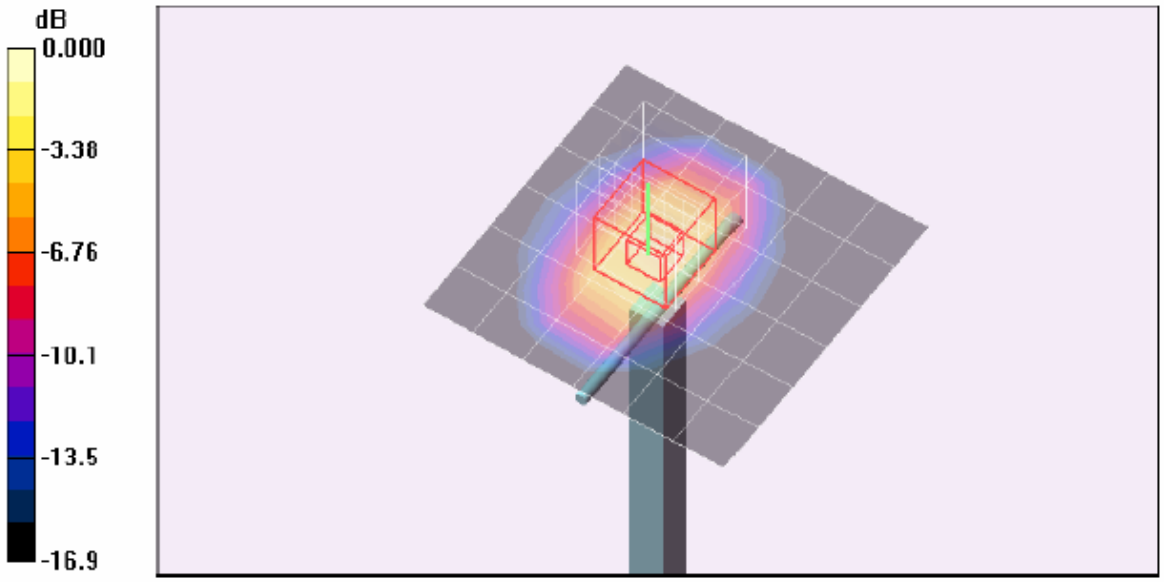
Communication System: CW 1900MHz; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.5 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

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: EX3DV3 - SN3531; ConvF(8.04, 8.04, 8.04); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.53 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.0 V/m; Power Drift = 0.070 dB
Peak SAR (extrapolated) = 6.90 W/kg
SAR(1 g) = 3.91 mW/g; SAR(10 g) = 2.09 mW/g
Maximum value of SAR (measured) = 4.91 mW/g



0 dB = 4.91mW/g

Z-Axis PLOT for D1900V2

Date/Time: 10/27/2010 10:08:56 AM

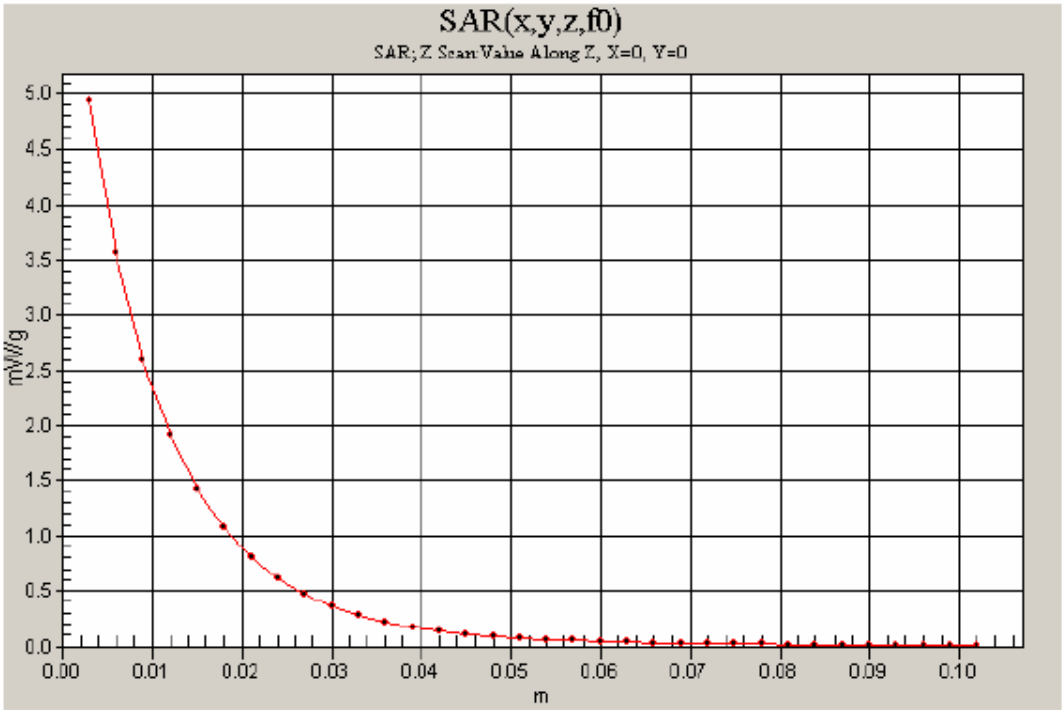
Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: D1900V2; Type: D1900V2; Serial: 5d043

Communication System: CW 1900MHz; Frequency: 1900 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 4.94 mW/g



SYSTEM CHECK PLOT for D1900V2

Date/Time: 12/8/2010 8:25:08 AM

Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: D1900V2; Type: D1900V2; Serial: 5d043

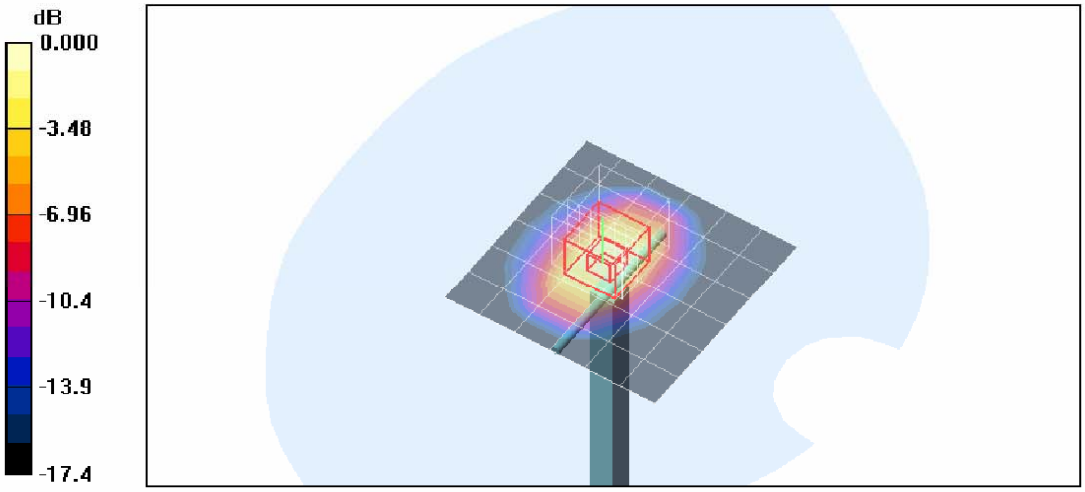
Communication System: CW 1900MHz; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.39 mho/m; ε_r = 40.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

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: EX3DV3 - SN3531; ConvF(8.64, 8.64, 8.64); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.59 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.7 V/m; Power Drift = 0.041 dB
Peak SAR (extrapolated) = 6.96 W/kg
SAR(1 g) = 3.79 mW/g; SAR(10 g) = 2 mW/g
Maximum value of SAR (measured) = 4.79 mW/g



0 dB = 4.79mW/g

Z-Axis PLOT for D1900V2

Date/Time: 12/8/2010 8:41:25 AM

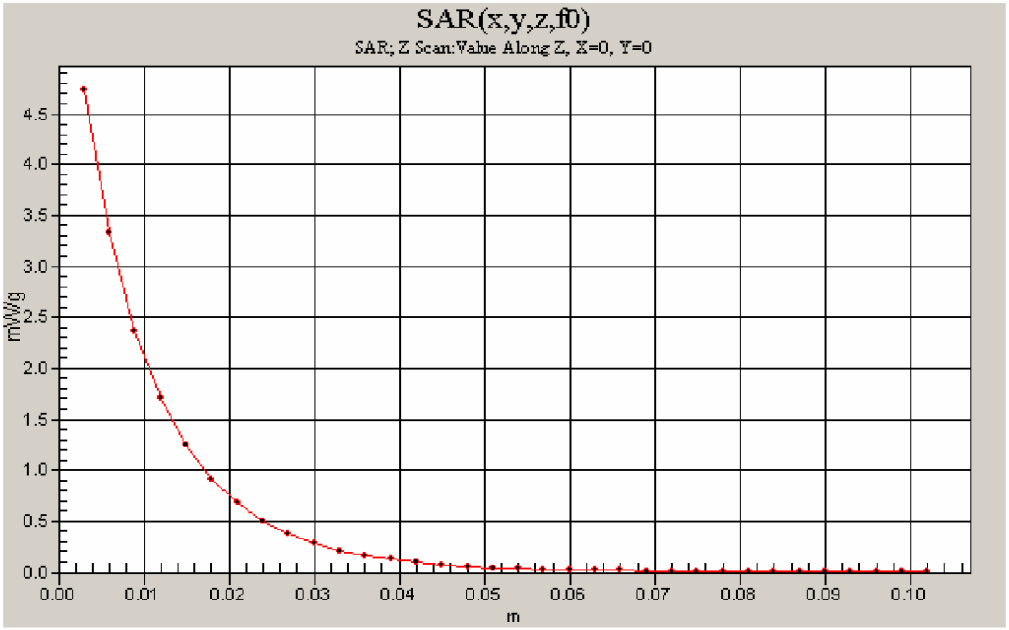
Test Laboratory: Compliance Certification Services

System Performance Check - D1900V2

DUT: D1900V2; Type: D1900V2; Serial: 5d043

Communication System: CW 1900MHz; Frequency: 1900 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 4.74 mW/g



SYSTEM CHECK PLOT for D1900V2

Date/Time: 1/26/2011 11:52:25 PM

Test Laboratory: Compliance Certification Services (UL CCS)

System Performance Check - D1900V2

DUT: Dipole; Type: D1900V2; Serial: 5d043

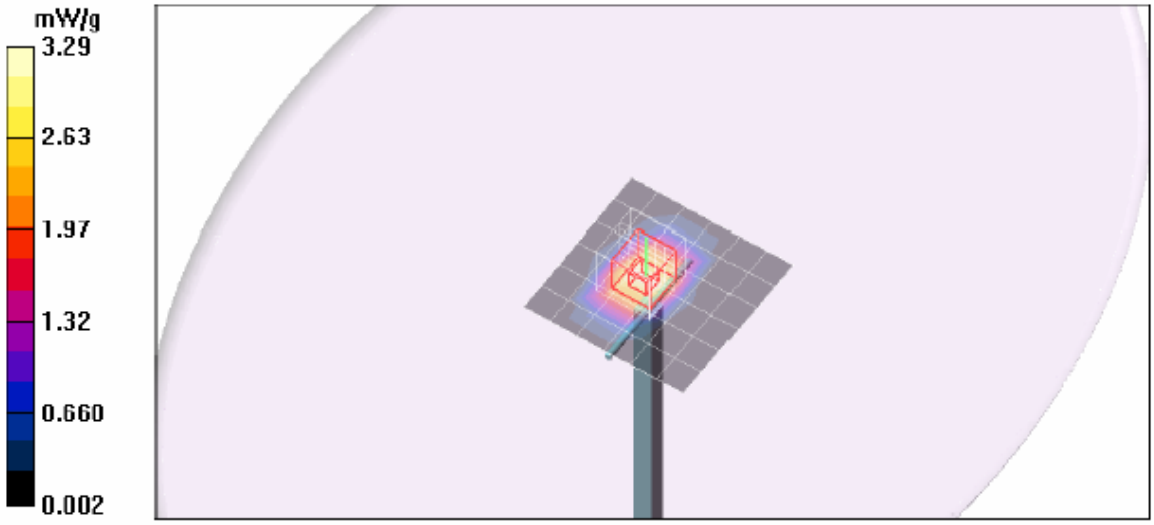
Communication System: System Check Signal - CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.49 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

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 - SN3749; ConvF(7.33, 7.33, 7.33); Calibrated: 12/13/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.29 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.8 V/m; Power Drift = 0.237 dB
Peak SAR (extrapolated) = 6.87 W/kg
SAR(1 g) = 3.82 mW/g; SAR(10 g) = 2.02 mW/g
Maximum value of SAR (measured) = 4.81 mW/g



Z-Axis PLOT for D1900V2

Date/Time: 1/27/2011 12:08:28 AM

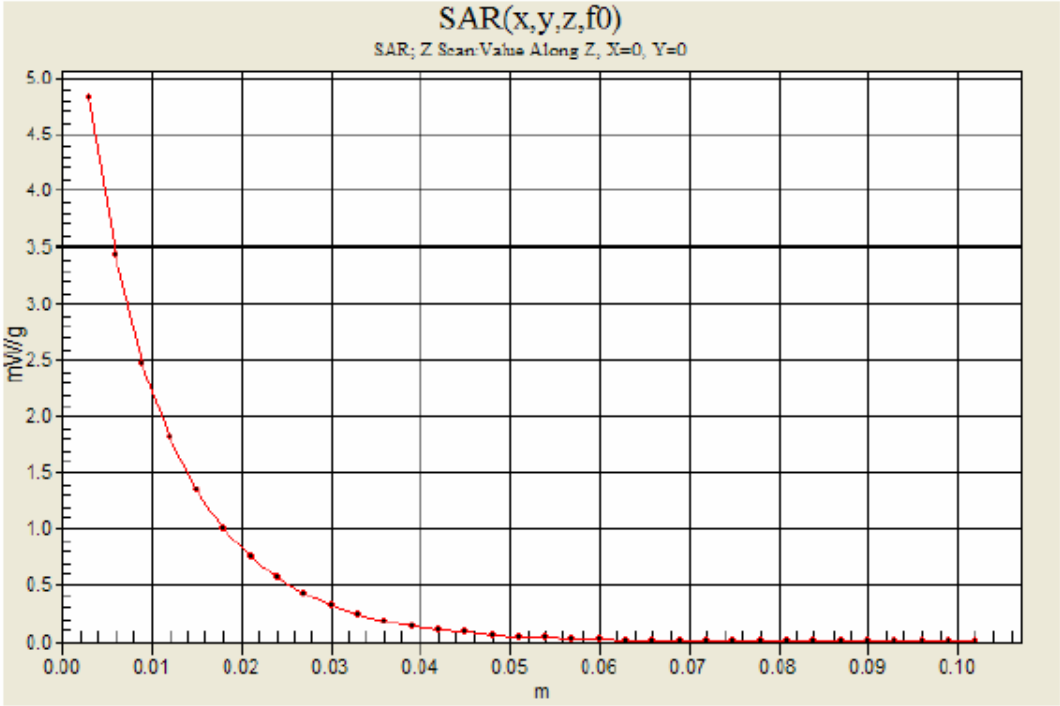
Test Laboratory: Compliance Certification Services (UL CCS)

System Performance Check - D1900V2

DUT: Dipole; Type: D1900V2; Serial: 5d043

Communication System: System Check Signal - CW; Frequency: 1900 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 4.83 mW/g



SYSTEM CHECK PLOT for D1900V2

Date/Time: 2/3/2011 10:34:27 AM

Test Laboratory: Compliance Certification Services (UL CCS)

System Performance Check - D1900V2

DUT: Dipole; Type: D1900V2; Serial: 5d043

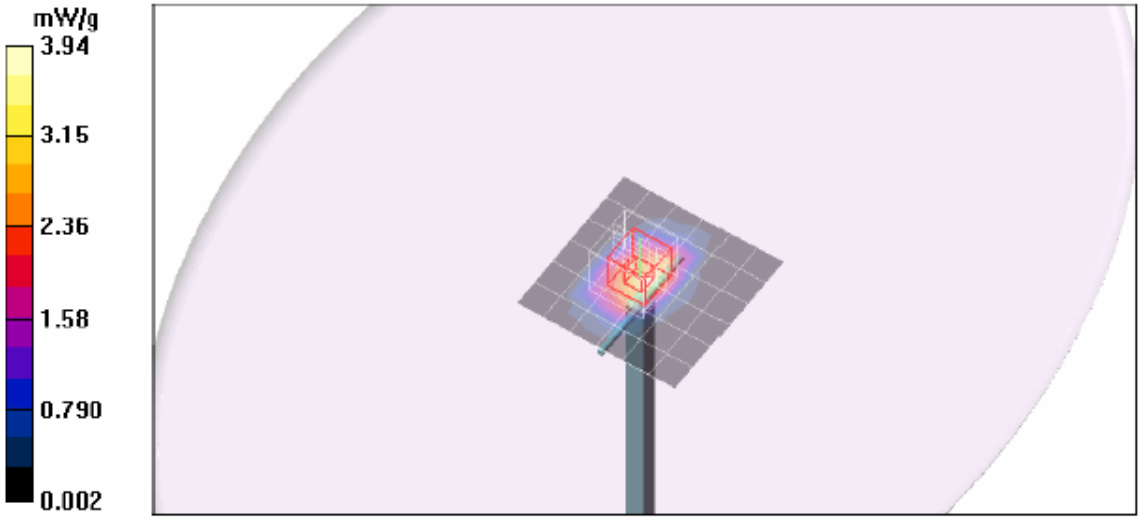
Communication System: System Check Signal - CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.49 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

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 - SN3749; ConvF(7.33, 7.33, 7.33); Calibrated: 12/13/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.94 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.2 V/m; Power Drift = -0.084 dB
Peak SAR (extrapolated) = 7.24 W/kg
SAR(1 g) = 3.9 mW/g; SAR(10 g) = 2.03 mW/g
Maximum value of SAR (measured) = 5.00 mW/g



Z-Axis PLOT for D1900V2

Date/Time: 2/3/2011 10:52:57 AM

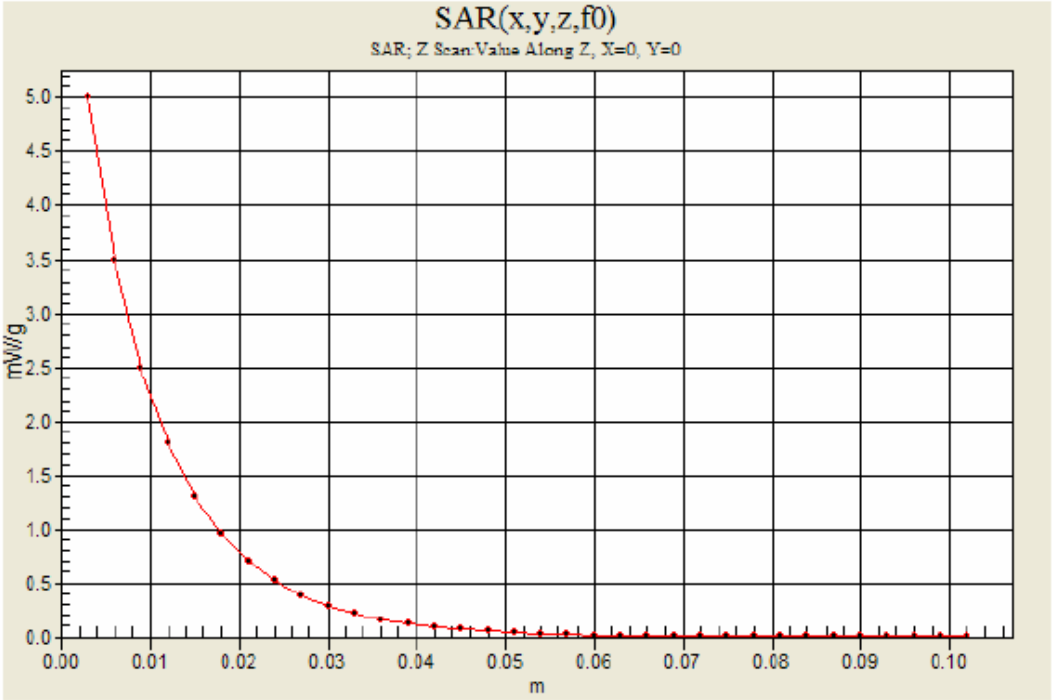
Test Laboratory: Compliance Certification Services (UL CCS)

System Performance Check - D1900V2

DUT: Dipole; Type: D1900V2; Serial: 5d043

Communication System: System Check Signal - CW; Frequency: 1900 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 5.01 mW/g



SYSTEM CHECK plot for D2450V2

Date/Time: 8/24/2010 4:06:22 PM

Test Laboratory: Compliance Certification Services

System Performance Check - D2450V2

DUT: Dipole ; Type: D2450V2; Serial: 706

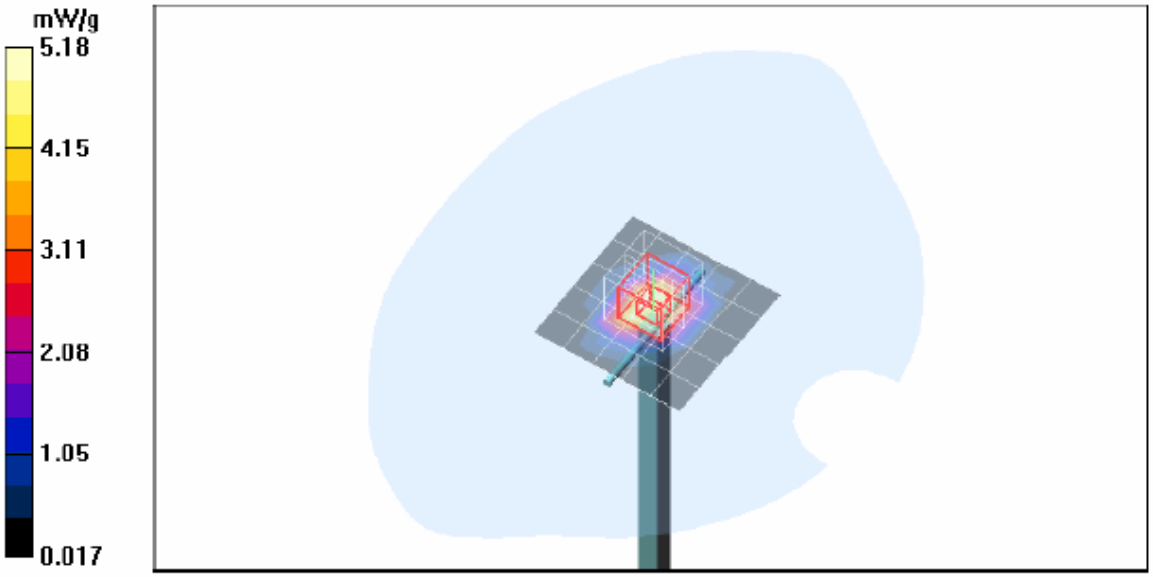
Communication System: System Check Signal - CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.84 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

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: EX3DV3 - SN3531; ConvF(7.6, 7.6, 7.6); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW/Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.18 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.3 V/m; Power Drift = -0.216 dB
Peak SAR (extrapolated) = 11.3 W/kg
SAR(1 g) = 5.25 mW/g; SAR(10 g) = 2.39 mW/g
Maximum value of SAR (measured) = 6.91 mW/g



Z-Axis Plot for D2450V2

Date/Time: 8/24/2010 4:21:47 PM

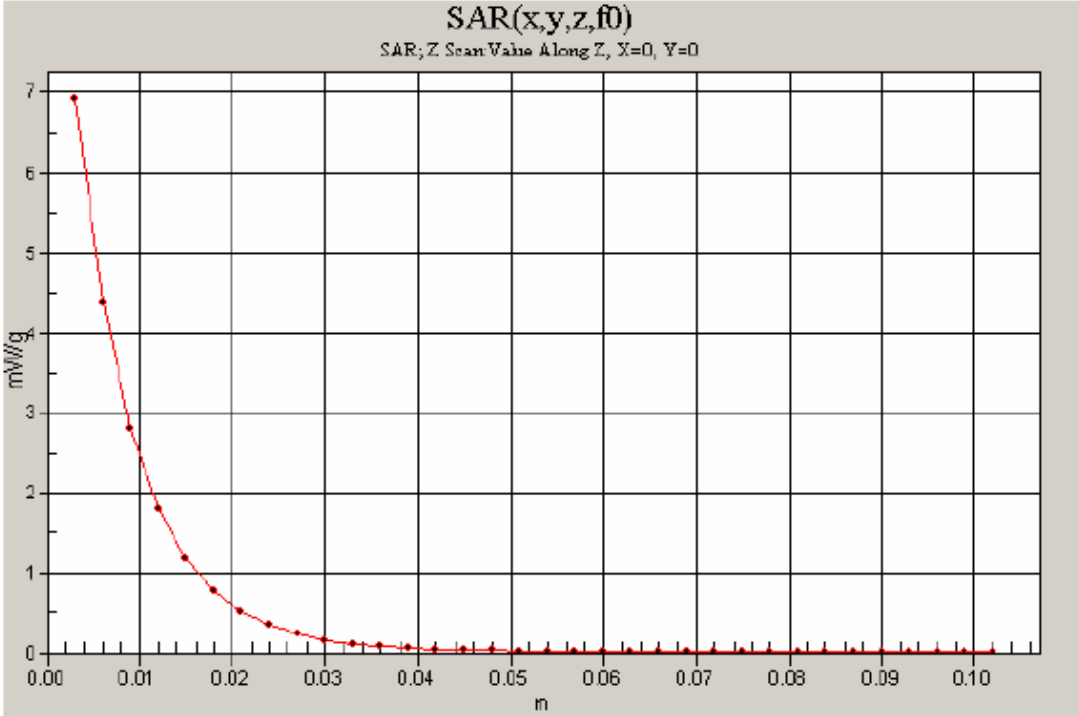
Test Laboratory: Compliance Certification Services

System Performance Check - D2450V2

DUT: Dipole ; Type: D2450V2; Serial: 706

Communication System: System Check Signal - CW; Frequency: 2450 MHz;Duty Cycle: 1:1

d=10mm, Pin=100mW/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 6.92 mW/g



SYSTEM CHECK plot for D2450V2

Date/Time: 1/26/2011 10:13:01 PM, Date/Time: 1/26/2011 10:16:35 PM

Test Laboratory: UL CCS

2.4 GHz Band 17-inch

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN: 706

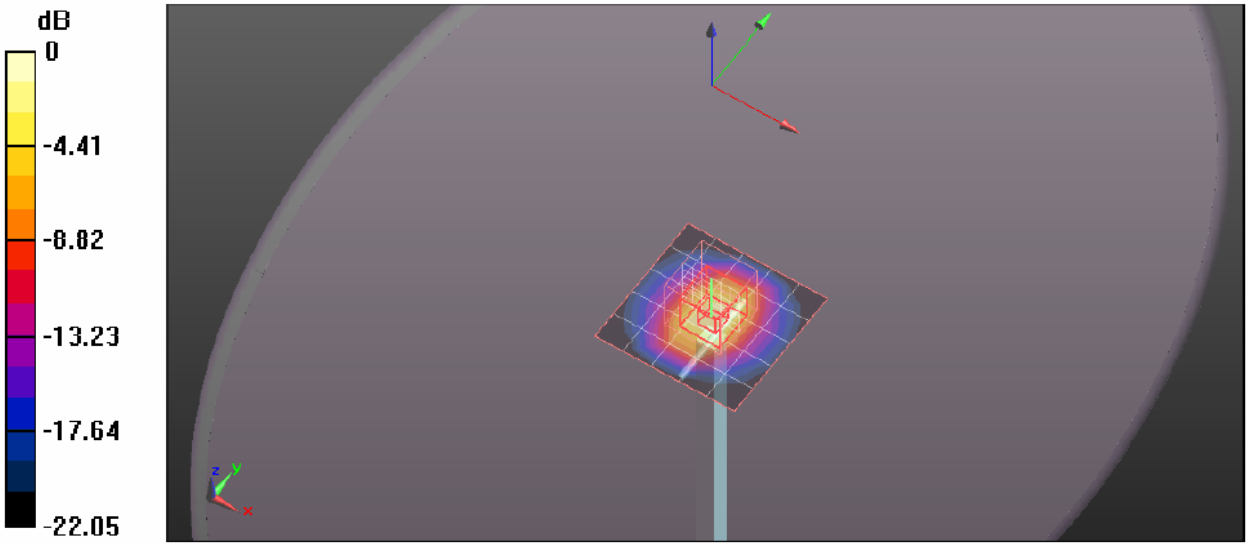
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.942 mho/m; ε_r = 51.636; ρ = 1000 kg/m^3
Phantom section: Flat Section

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

DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(7.58, 7.58, 7.58); Calibrated: 2/23/2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (1);SEMCAD X Version 14.4.2 (2595)

D2450V2 SN 706/Pin = 100 mW/Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 4.369 mW/g

D2450V2 SN 706/Pin = 100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.210 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 10.145 W/kg
SAR(1 g) = 4.92 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 7.532 mW/g



0 dB = 7.530mW/g

Z-Axis Plot for D2450V2

Date/Time: 1/26/2011 10:32:03 PM

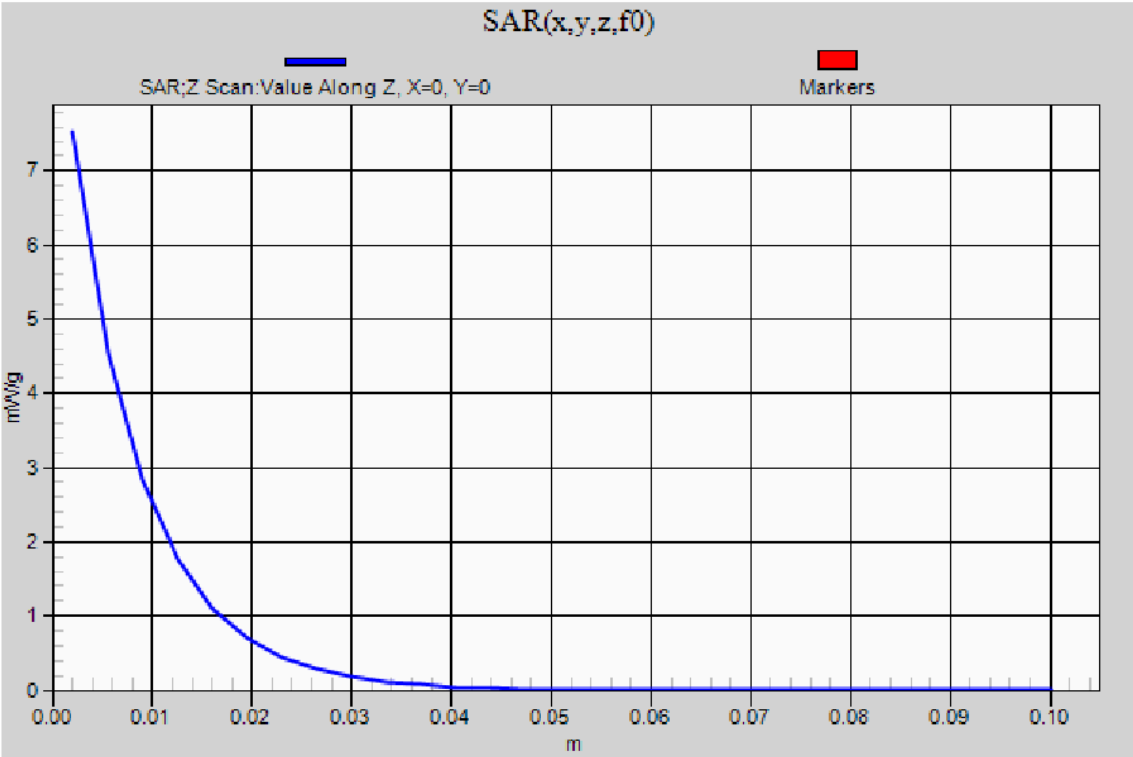
Test Laboratory: UL CCS

2.4 GHz Band 17-inch

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN: 706

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

D2450V2 SN 706/Pin = 100 mW/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm
Maximum value of SAR (measured) = 7.533 mW/g



SYSTEM CHECK plot for D2450V2

Date/Time: 2/1/2011 4:57:10 PM, Date/Time: 2/1/2011 5:00:42 PM

Test Laboratory: UL CCS

System Performance Check D2450V2 SN 706

DUT: D2450V2; Type: D2450V2; Serial: 706

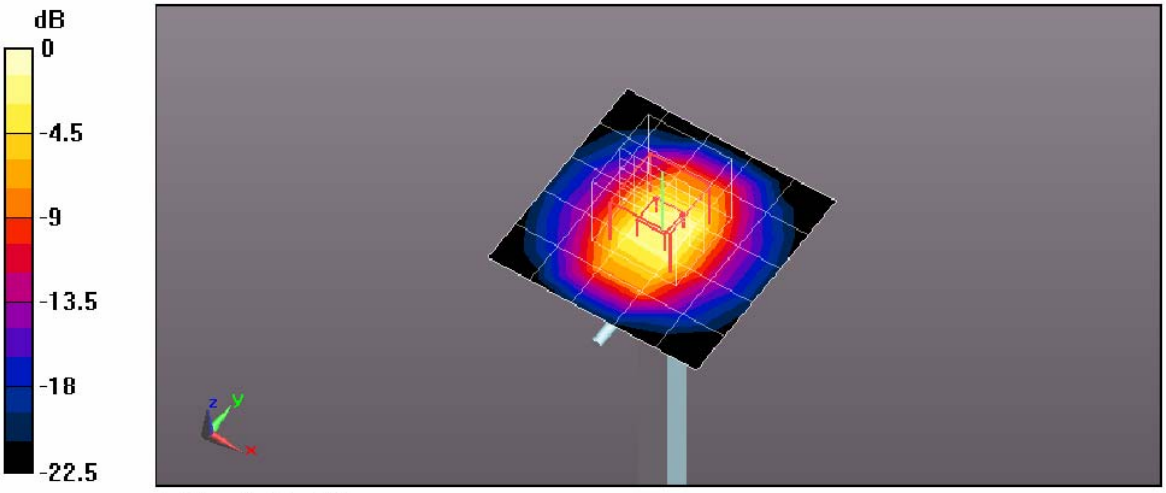
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

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

DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(7.58, 7.58, 7.58); Calibrated: 2/23/2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, V52.6 Build 1;Postprocessing SW: SEMCAD X, V14.2 Build 2Version 14.2.2 (1685) (Deployment Build)

D2450V2 SN 706/Pin=100 mW (EX-Probe)/Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 4.59 mW/g

D2450V2 SN 706/Pin=100 mW (EX-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 64 V/m; Power Drift = -0.00369 dB
Peak SAR (extrapolated) = 10.8 W/kg
SAR(1 g) = 5.22 mW/g; SAR(10 g) = 2.41 mW/g
Maximum value of SAR (measured) = 7.97 mW/g



0 dB = 7.97mW/g

Z-Axis Plot for D2450V2

Date/Time: 2/1/2011 5:29:10 PM

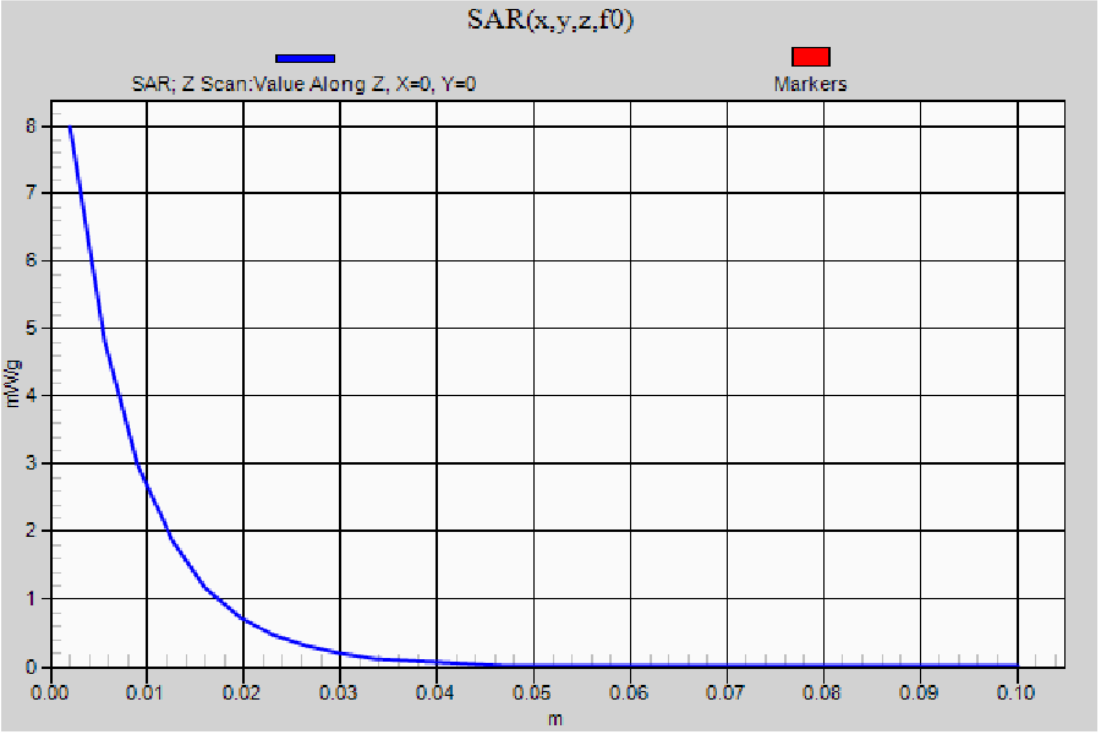
Test Laboratory: UL CCS

System Performance Check D2450V2 SN 706

DUT: D2450V2; Type: D2450V2; Serial: 706

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

D2450V2 SN 706/Pin=100 mW (EX-Probe)/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm
Maximum value of SAR (measured) = 8 mW/g



10. SAR MEASUREMENT PROCEDURE

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures ≥ 7 x 7 x 9 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

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.

11. RF OUTPUT POWER VERIFICATION

11.1. GSM

GSM (GMSK)

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)
GSM850	128	824.2	33.0
	190	836.6	33.1
	251	848.8	33.2
GSM1900	512	1850.2	30.4
	661	1880	30.4
	810	1909.8	30.2

GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slot	Frame Avg Pwr
GSM850	128	824.2	32.9	23.9	31.4	**25.4**
	190	836.6	33.0	24.0	31.2	**25.2**
	251	848.8	33.2	24.2	31.4	**25.4**
GSM1900	512	1850.2	30.2	21.2	30.4	**24.4**
	661	1880	30.2	21.2	30.4	**24.4**
	810	1909.8	30.2	21.2	30.3	**24.3**

EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slot	Frame Avg Pwr
GSM850	128	824.2	27.3	18.3	27.1	21.1
	190	836.6	27.3	18.3	27.1	21.1
	251	848.8	27.3	18.3	27.1	21.1
GSM1900	512	1850.2	24.7	15.7	24.5	18.5
	661	1880	24.8	15.8	24.7	18.7
	810	1909.8	24.7	15.7	24.5	18.5

Note: Worst-case mode for Multi-slot class

- Multi-slot class 10: 2 slot for GPRS850/1900

11.2. UMTS RELEASE 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

	Mode	Rel99
	Subtest	-
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

Results

Rel 99 (12.2kbps RMC)

Band	Mode	UL Ch No.	DL Ch No.	f (MHz)	Avg Tx Pwr (dBm)
UMTS850 (Band V)	Rel 99 12.2kbps RMC	4132	4357	826.4	23.4
		4183	4408	836.6	23.5
		4233	4458	846.6	23.4
UMTS1900 (Band II)	Rel 99 12.2kbps RMC	9262	9662	1852.4	22.9
		9400	9800	1880.0	22.8
		9538	9938	1907.6	22.7

11.3. UMTS HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121-1. A summary of these settings are illustrated below:

	Mode	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs =βhs/βc	30/15			

Results

Rel 6 HSDPA

Band	Mode	UL Ch No.	DL Ch No.	f (MHz)	Avg Tx Pwr (dBm)
UMTS850 (Band V)	Subtest 1	4132	4357	826.4	22.82
		4183	4408	836.6	22.97
		4233	4458	846.6	22.85
	Subtest 2	4132	4357	826.4	22.60
		4183	4408	836.6	22.71
		4233	4458	846.6	22.61
	Subtest 3	4132	4357	826.4	21.30
		4183	4408	836.0	21.42
		4233	4458	846.6	21.33
	Subtest 4	4132	4357	826.4	20.52
		4183	4408	836.4	20.74
		4233	4458	846.6	20.66
UMTS1900 (Band II)	Subtest 1	9262	9662	1852.4	22.31
		9400	9800	1880.0	22.20
		9538	9938	1907.6	22.19
	Subtest 2	9262	9662	1852.4	22.09
		9400	9800	1880.0	21.94
		9538	9938	1907.6	21.92
	Subtest 3	9262	9662	1852.4	20.77
		9400	9800	1880.0	20.70
		9538	9938	1907.6	20.67
	Subtest 4	9262	9662	1852.4	20.15
		9400	9800	1880.0	20.00
		9538	9938	1907.6	19.98

Note: KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.

11.4. UMTS Rel 6 HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121-1. A summary of these settings are illustrated below:

	Mode	Rel6 HSPA	Rel6 HSPA	Rel6 HSPA	Rel6 HSPA	Rel6 HSPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	15/15
	βec	209/225	12/15	30/15	2/15	24/15
	βc/βd	11/15	6/15	15/9	2/15	15/15
	βhs	22/15	12/15	30/15	4/15	30/15
	βed	1309/225	94/75	47/15 47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27	

Results

Rel 6 HSDPA/HSUPA

Band	Mode	UL Ch No.	DL Ch No.	f (MHz)	Avg Tx Pwr (dBm)
UMTS850 (Band V)	Subtest 1	4132	4357	826.4	23.3
		4182	4407	836.4	23.4
		4233	4458	846.6	23.2
	Subtest 2	4132	4357	826.4	21.4
		4182	4407	836.4	21.5
		4233	4458	846.6	21.3
	Subtest 3	4132	4357	826.4	22.2
		4182	4407	836.4	22.3
		4233	4458	846.6	22.1
	Subtest 4	4132	4357	826.4	21.3
		4182	4407	836.4	21.4
		4233	4458	846.6	21.4
	Subtest 5	4132	4357	826.4	23.3
		4182	4407	836.4	23.4
		4233	4458	846.6	23.3
UMTS1900 (Band II)	Subtest 1	9262	9662	1852.4	22.8
		9400	9800	1880.0	22.7
		9538	9938	1907.6	22.7
	Subtest 2	9262	9662	1852.4	21.2
		9400	9800	1880.0	21.3
		9538	9938	1907.6	21.1
	Subtest 3	9262	9662	1852.4	21.8
		9400	9800	1880.0	21.7
		9538	9938	1907.6	21.6
	Subtest 4	9262	9662	1852.4	21.2
		9400	9800	1880.0	21.3
		9538	9938	1907.6	21.2
	Subtest 5	9262	9662	1852.4	22.8
		9400	9800	1880.0	22.7
		9538	9938	1907.6	22.6

Note: KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

11.5. WIFI RF OUTPUT POWER

802.11b			
Channel #	Freq. (MHz)	Conducted Avg Power	
		(dBm)	(mW)
1	2412	17.2	52.5
6	2437	17.2	53.0
11	2462	16.9	48.4
802.11g			
1	2412	14.8	30.4
6	2437	15.7	37.2
11	2462	14.4	27.4
802.11n HT20			
1	2412	13.6	23.1
6	2437	13.7	23.3
11	2462	13.4	21.8

Note: Per KDB 248227, SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

11.6. BLUETOOTH RF OUTPUT POWER

GFSK

Channel #	Freq. (MHz)	Conducted Avg Power	
		(dBm)	(mW)
0	2402	4.58	2.9
39	2442	5.25	3.3
78	2480	5.15	3.3

8PSK

Channel #	Freq. (MHz)	Conducted Avg Power	
		(dBm)	(mW)
0	2402	1.54	1.4
39	2442	1.55	1.4
78	2480	1.02	1.3

Note: According to KDB 648474, Table 2, Unlicensed transmitters
When there is simultaneous transmission, Stand-alone SAR not required when

☒ Output ≤ 2□P_{Ref} (24 mW) and antenna is ≥ 5.0 cm from other antennas
☐ Output ≤ P_{Ref} (12 mW) and antenna is ≥ 2.5 cm from other antennas
☐ Output ≤ P_{Ref} (12 mW) and antenna is < 2.5 cm from other antennas, each with either output power ≤ P_{Ref} or 1-g SAR < 1.2 W/kg

12. SUMMARY OF SAR TEST RESULTS

12.1. GSM850

Left Hand Side (LHS)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM850	GSM	Touch (open)	128	824.2		
			190	836.6	0.690	0.516
			251	848.8		
		Tilt (15°C) (open)	128	824.2		
			190	836.6	0.333	0.239
			251	848.8		
GSM850	GSM	Touch (closed)	128	824.2		
			190	836.6	0.373	0.279
			251	848.8		
		Tilt (15°C) (closed)	128	824.2		
			190	836.6	0.152	0.115
			251	848.8		

Right Hand Side (RHS)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM850	GSM	Touch (open)	128	824.2		
			190	836.6	**0.753**	0.558
			251	848.8		
		Tilt (15°C) (open)	128	824.2		
			190	836.6	0.433	0.327
			251	848.8		
GSM850	GSM	Touch (closed)	128	824.2		
			190	836.6	0.428	0.319
			251	848.8		
		Tilt (15°C) (closed)	128	824.2		
			190	836.6	0.214	0.162
			251	848.8		

Body with 1.5 cm separation distance (Multi-slot class 10)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 2 slots	Face up	128	824.2		
			190	836.6	0.063	0.047
			251	848.8		
		Face down	128	824.2		
			190	836.6	0.169	0.117
			251	848.8		
		w/ headset	190	836.6	0.172	0.121

Body with 1.5 cm separation distance (Multi-slot class 12)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 4 slots	Face up	128	824.2		
			190	836.6	0.101	0.076
			251	848.8		
		Face down	128	824.2		
			190	836.6	0.262	0.183
			251	848.8		
		w/ headset	190	836.6	0.282	0.197

Notes: According to KDB 941225 D03 SAR Test Reduction GSM/GPRS/EDGE vo1, the following sections indicated below SAR test reduction requirements are applicable for this device to demonstrate RF exposure compliance.

1) Since the source-based time-averaged output power for EGPRS mode is lower than that in the GPRS mode, therefore Body SAR test reduction is applicable for this device.
2) Based on output power and time slots, the following worst-case mode for Multi-slot class time slots were chosen for Body SAR testing.
   - Multi-slot class 10: 2 slot
   - Multi-slot class 12: 4 slot

Body with 1.0 cm separation distance (Wireless routers incorporated in device)

Test position	Mode	Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Front side (Face up)	GPRS 2 slots	128	824.2		
		190	836.6	0.251	0.186
		251	848.8		
Back side (Face down)	GPRS 2 slots	128	824.2		
		190	836.6	**0.776**	0.476
		251	848.8		
Left edge	GPRS 2 slots	128	824.2		
		190	836.6	0.148	0.102
		251	848.8		
Right edge	GPRS 2 slots	128	824.2		
		190	836.6	0.266	0.181
		251	848.8		
Bottom edge	GPRS 2 slots	128	824.2		
		190	836.6	0.155	0.096
		251	848.8		

Note:
WWAN antenna is located at bottom edge; antenna-to-top edge distance is more than 2.5 cm. Based upon Oct. 2010 TCB council workshop - FCC presentation on personal hot spot SAR evaluation guideline, when the antenna-to-edge distance is greater than 2.5, such position does not need to be tested. Top Edge with 1 cm separation distance is excluded from SAR evaluation.

12.2. GSM1900

Left Hand Side (LHS)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM1900	GSM	Touch (open)	512	1850.2		
			661	1880.0	0.541	0.348
			810	1909.8		
		Tilt (15°C) (open)	512	1850.2		
			661	1880.0	0.323	0.200
			810	1909.8		
GSM1900	GSM	Touch (closed)	512	1850.2		
			661	1880.0	0.420	0.217
			810	1909.8		
		Tilt (15°C) (closed)	512	1850.2		
			661	1880.0	0.203	0.123
			810	1909.8		

Right Hand Side (RHS)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM1900	GSM	Touch (open)	512	1850.2		
			661	1880.0	**0.663**	0.406
			810	1909.8		
		Tilt (15°C) (open)	512	1850.2		
			661	1880.0	0.268	0.168
			810	1909.8		
GSM1900	GSM	Touch (closed)	512	1850.2		
			661	1880.0	0.429	0.222
			810	1909.8		
		Tilt (15°C) (closed)	512	1850.2		
			661	1880.0	0.260	0.151
			810	1909.8		

Body with 1.5 cm separation distance (Multi-slot class 10)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM1900	GPRS 2 slots	Face up	512	1850.2		
			661	1880.0	0.277	0.168
			810	1909.8		
		Face down	512	1850.2		
			661	1880.0	0.473	0.271
			810	1909.8		
		w/ headset	810	1909.8	0.466	0.263

Body with 1.5 cm separation distance (Multi-slot class 12)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM1900	GPRS 3 slots	Face up	512	1850.2		
			661	1880.0	0.343	0.214
			810	1909.8		
		Face down	512	1850.2		
			661	1880.0	**0.599**	0.360
			810	1909.8		
		w/ headset	810	1909.8	0.588	0.347

Notes: According to KDB 941225 D03. SAR Test Reduction GSM/GPRS/EDGE vo1, the following sections indicated below SAR test reduction requirements are applicable for this device to demonstrate RF exposure compliance.

1) Since the source-based time-averaged output power for EGPRS mode is lower than that in the GPRS mode, therefore Body SAR test reduction is applicable for this device.
2) Based on output power and time slots, the following worst-case mode for Multi-slot class time slots were chosen for Body SAR testing.
   - Multi-slot class 10: 2 slot
   - Multi-slot class 12: 3 slot

Body with 1.0 cm separation distance (Wireless routers incorporated in device)

Test position	Mode	Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Front side (Face up)	GPRS 2 slots	512	1850.2		
		661	1880.0	0.222	0.142
		810	1909.8		
Back side (Face down)	GPRS 2 slots	512	1850.2		
		661	1880.0	0.689	0.376
		810	1909.8		
Left edge	GPRS 2 slots	512	1850.2		
		661	1880.0	0.156	0.091
		810	1909.8		
Right edge	GPRS 2 slots	512	1850.2		
		661	1880.0	0.354	0.208
		810	1909.8		
Bottom edge	GPRS 2 slots	512	1850.2		
		661	1880.0	**0.697**	0.356
		810	1909.8		

Note:
WWAN antenna is located at bottom edge; antenna-to-top edge distance is more than 2.5 cm. Based upon Oct. 2010 TCB council workshop - FCC presentation on personal hot spot SAR evaluation guideline, when the antenna-to-edge distance is greater than 2.5, such position does not need to be tested. Top Edge with 1 cm separation distance is excluded from SAR evaluation.

12.3. UMTS BAND V

Left Hand Side (LHS)

Band	Mode	Test position	UL Ch No.	f (MHz)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	Touch (open)	4132	826.4	0.663	0.495
			4183	836.6	0.805	0.599
			4233	846.6	**0.844**	0.623
		Tilt (15°C) (open)	4132	826.4		
			4183	836.6	0.350	0.265
			4233	846.6		
		Touch (closed)	4132	826.4		
			4183	836.6	0.320	0.234
			4233	846.6		
		Tilt (15°C) (closed)	4132	826.4		
			4183	836.6	0.159	0.121
			4233	846.6		

Right Hand Side (RHS)

Band	Mode	Test position	UL Ch No.	f (MHz)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	Touch (open)	4132	826.4	0.653	0.489
			4183	836.6	0.814	0.608
			4233	846.6	0.815	0.606
		Tilt (15°C) (open)	4132	826.4		
			4183	836.6	0.326	0.244
			4233	846.6		
		Touch (closed)	4132	826.4		
			4183	836.6	0.302	0.266
			4233	846.6		
		Tilt (15°C) (closed)	4132	826.4		
			4183	836.6	0.158	0.119
			4233	846.6		

Body with 1.5 cm separation distance

Band	Mode	Test position	UL Ch No.	f (MHz)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	Face up	4132	826.4		
			4183	836.6	0.134	0.100
			4233	846.6		
		Face down	4132	826.4		
			4183	836.6	0.352	0.248
			4233	846.6		
		w/ headset	4233	846.6	**0.372**	0.262

Notes:

1) KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.
2) KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

Body with 1.0 cm separation distance (Wireless routers incorporated in device)

Test position	Mode	UL Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Front side (Face up)	R99 12.2kbps RMC	4132	826.4		
		4183	836.6	0.196	0.145
		4233	846.6		
Back side (Face down)	R99 12.2kbps RMC	4132	826.4		
		4183	836.6	0.630	0.394
		4233	846.6		
Left edge	R99 12.2kbps RMC	4132	826.4		
		4183	836.6	0.145	0.096
		4233	846.6		
Right edge	R99 12.2kbps RMC	4132	826.4		
		4183	836.6	0.180	0.123
		4233	846.6		
Bottom edge	R99 12.2kbps RMC	4132	826.4		
		4183	836.6	0.106	0.066
		4233	846.6		

Note:

WWAN antenna is located at bottom edge; antenna-to-top edge distance is more than 2.5 cm. Based upon Oct. 2010 TCB council workshop - FCC presentation on personal hot spot SAR evaluation guideline, when the antenna-to-edge distance is greater than 2.5, such position does not need to be tested. Top Edge with 1 cm separation distance is excluded from SAR evaluation.

12.4. UMTS BAND II

Left Hand Side (LHS)

Band	Mode	Test position	UL Ch No.	f (MHz)	SAR (mW/g)	
					1-g	10-g
Band II	R99 12.2kbps RMC	Touch (open)	9262	1850.2	1.080	0.702
			9400	1880.0	1.110	0.709
			9538	1907.6	1.040	0.665
		Tilt (15°C) (open)	9262	1850.2		
			9400	1880.0	0.563	0.341
			9538	1907.6		
		Touch (closed)	9262	1850.2	0.821	0.442
			9400	1880.0	0.851	0.433
			9538	1907.6	0.828	0.438
		Tilt (15°C) (closed)	9262	1850.2		
			9400	1880.0	0.346	0.208
			9538	1907.6		

Right Hand Side (RHS)

Band	Mode	Test position	UL Ch No.	f (MHz)	SAR (mW/g)	
					1-g	10-g
Band II	R99 12.2kbps RMC	Touch (open)	9262	1850.2	1.190	0.720
			9400	1880.0	**1.380**	0.825
			9538	1907.6	1.130	0.681
		Tilt (15°C) (open)	9262	1850.2		
			9400	1880.0	0.459	0.286
			9538	1907.6		
		Touch (closed)	9262	1850.2	0.912	0.483
			9400	1880.0	0.971	0.513
			9538	1907.6	0.949	0.507
		Tilt (15°C) (closed)	9262	1850.2		
			9400	1880.0	0.469	0.271
			9538	1907.6		

Body with 1.5 cm separation distance

Band	Mode	Test position	UL Ch No.	f (MHz)	SAR (mW/g)	
					1-g	10-g
Band II	R99 12.2kbps RMC	Face up	9262	1850.2		
			9400	1880.0	0.268	0.166
			9538	1907.6		
		Face down	9262	1850.2		
			9400	1880.0	**0.497**	0.293
			9538	1907.6		
		w/ headset	9400	1880.0	0.475	0.281

Notes:

1) KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.
2) KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

Body with 1.0 cm separation distance (Wireless routers incorporated in device)

Test position	Mode	UL Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Front side (Face up)	R99 12.2kbps RMC	9262	1850.2		
		9400	1880.0	0.314	0.185
		9538	1907.6		
Back side (Face down)	R99 12.2kbps RMC	9262	1850.2	0.754	0.410
		9400	1880.0	0.801	0.434
		9538	1907.6	0.906	0.487
Left edge	R99 12.2kbps RMC	9262	1850.2		
		9400	1880.0	0.172	0.098
		9538	1907.6		
Right edge	R99 12.2kbps RMC	9262	1850.2		
		9400	1880.0	0.385	0.228
		9538	1907.6		
Bottom edge	R99 12.2kbps RMC	9262	1850.2	0.858	0.441
		9400	1880.0	0.878	0.449
		9538	1907.6	**1.020**	0.520

Note:

WWAN antenna is located at bottom edge; antenna-to-top edge distance is more than 2.5 cm. Based upon Oct. 2010 TCB council workshop - FCC presentation on personal hot spot SAR evaluation guideline, when the antenna-to-edge distance is greater than 2.5, such position does not need to be tested. Top Edge with 1 cm separation distance is excluded from SAR evaluation.

12.5. WIFI

Left Hand Side (LHS)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
2.4 GHz	802.11b	Touch (open)	1	2412		
			6	2437	0.012	0.00607
			11	2462		
		Tilt (15°C) (open)	1	2412		
			6	2437	0.030	0.015
			11	2462		
		Touch (closed)	1	2412		
			6	2437	0.121	0.064
			11	2462		
		Tilt (15°C) (closed)	1	2412		
			6	2437	0.172	0.082
			11	2462		

Right Hand Side (RHS)

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
2.4 GHz	802.11b	Touch (open)	1	2412		
			6	2437	0.030	0.010
			11	2462		
		Tilt (15°C) (open)	1	2412		
			6	2437	0.027	0.013
			11	2462		
		Touch (closed)	1	2412		
			6	2437	0.129	0.069
			11	2462		
		Tilt (15°C) (closed)	1	2412		
			6	2437	**0.198**	0.098
			11	2462		

Body with 1.5 cm separation distance

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
2.4 GHz	802.11b	Face up	1	2412		
			6	2437	0.046	0.026
			11	2462		
		Face down	1	2412		
			6	2437	0.110	0.058
			11	2462		
		w/ headset	6	2437	0.089	0.048

Note: Per KDB 248227, SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dBm (0.25 dBm) higher than that measured on the corresponding 802.11b channels

Body with 1.0 cm separation distance (Wireless routers incorporated in device)

Test position	Mode	UL Ch No.	f (MHz)	SAR (mW/g)	
				1-g	10-g
Front side (Face up)	802.11b	1	2412		
		6	2437	0.106	0.057
		11	2462		
Back side (Face down)	802.11b	1	2412		
		6	2437	**0.315**	0.156
		11	2462		
Left edge	802.11b	1	2412		
		6	2437	0.157	0.074
		11	2462		
Right edge	802.11b	1	2412		
		6	2437	n/a	n/a
		11	2462		
Top edge	802.11b	1	2412		
		6	2437	0.129	0.066
		11	2462		
Bottom edge	802.11b	1	2412		
		6	2437	n/a	n/a
		11	2462		

Note:
WLAN antenna is located at Left top edge; antenna-to-bottom edge and right edge distance are more than 2.5 cm. Based upon Oct. 2010 TCB council workshop - FCC presentation on personal hot spot SAR evaluation guideline, when the antenna-to-edge distance is greater than 2.5, such position does not need to be tested. Bottom edge and Right edge with 1 cm separation distances are excluded from SAR evaluation.

13. WORST-CASE SAR TEST PLOTS

Worst-case Head SAR plot for part 22H

Date/Time: 10/27/2010 9:03:23 PM

Test Laboratory: Compliance Certification Services

UMTS band V_Left Hand Side_open

DUT: Palm; Type: N/A; Serial: N/A

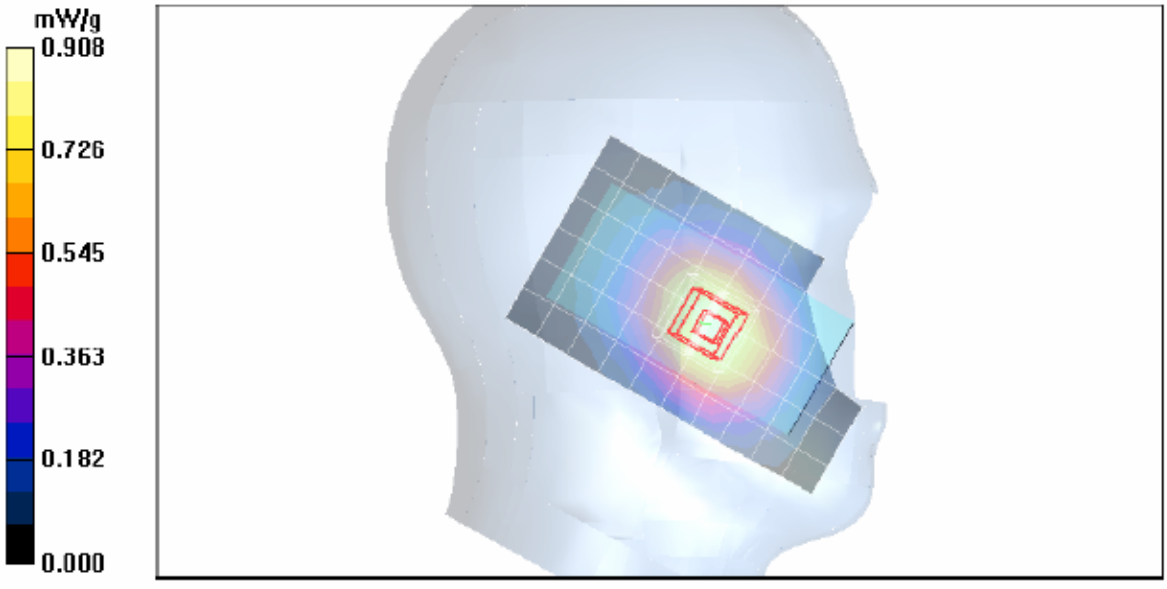
Communication System: UMTS850; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 846.6 MHz; σ = 0.939 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Left Section

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: EX3DV3 - SN3531; ConvF(10.13, 10.13, 10.13); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch_H-ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.908 mW/g

Touch_H-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 31.1 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.844 mW/g; SAR(10 g) = 0.623 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.929 mW/g



Worst-case Head SAR Z-axis plot for part 22H

Date/Time: 10/27/2010 9:28:35 PM

Test Laboratory: Compliance Certification Services

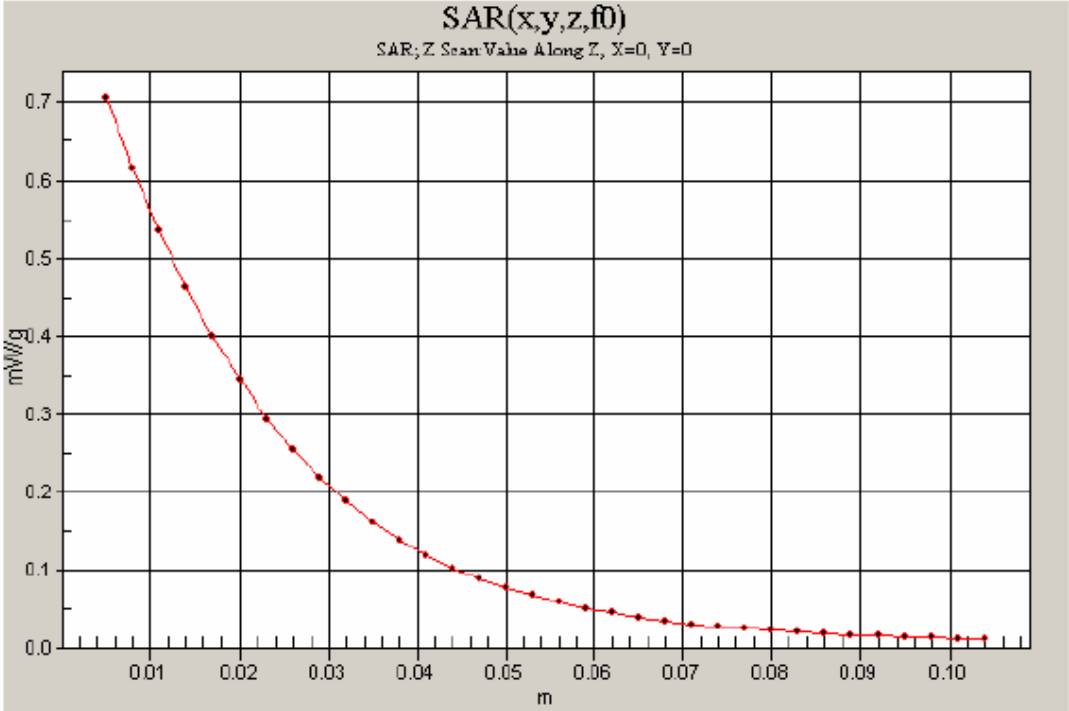
UMTS band V_Left Hand Side_open

DUT: Palm; Type: N/A; Serial: N/A

Communication System: UMTS850; Frequency: 846.6 MHz;Duty Cycle: 1:1

Touch_H-ch/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.704 mW/g



Worst-case Body SAR plot for part 22H

Date/Time: 2/3/2011 7:20:14 PM

Test Laboratory: Compliance Certification Services (UL CCS)

GSM850_Body_10mm

DUT: Palm; Type: N/A; Serial: N/A

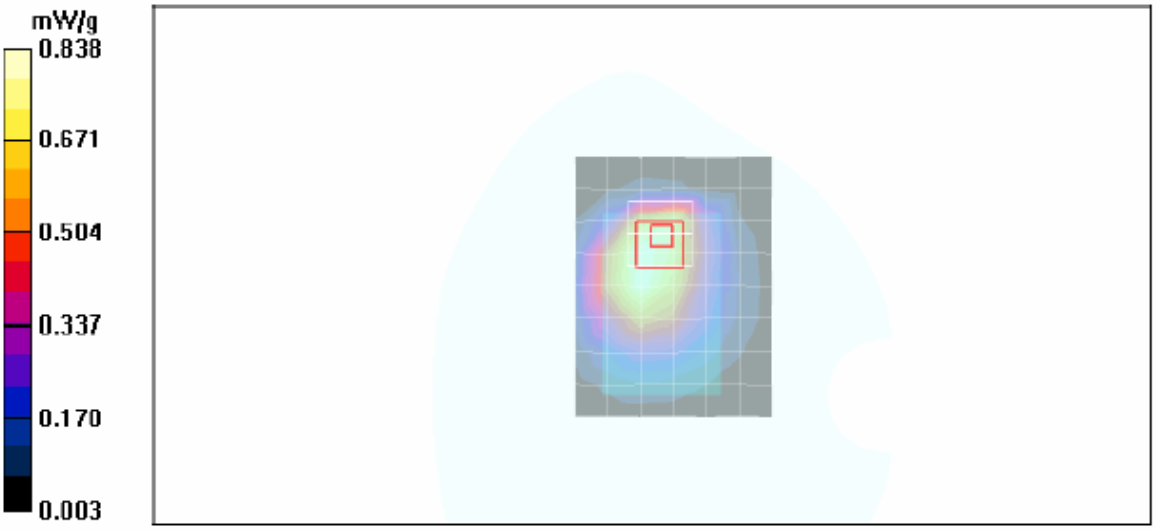
Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:4
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.986 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

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 - SN3749; ConvF(8.79, 8.79, 8.79); Calibrated: 12/13/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Back side_GPRS 2 slot_M-ch/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.838 mW/g

Back side_GPRS 2 slot_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 28.8 V/m; Power Drift = -0.187 dB
Peak SAR (extrapolated) = 1.33 W/kg
SAR(1 g) = 0.776 mW/g; SAR(10 g) = 0.476 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.956 mW/g



Worst-case Body SAR Z-axis plot for part 22H

Date/Time: 2/3/2011 7:39:41 PM

Test Laboratory: Compliance Certification Services (UL CCS)

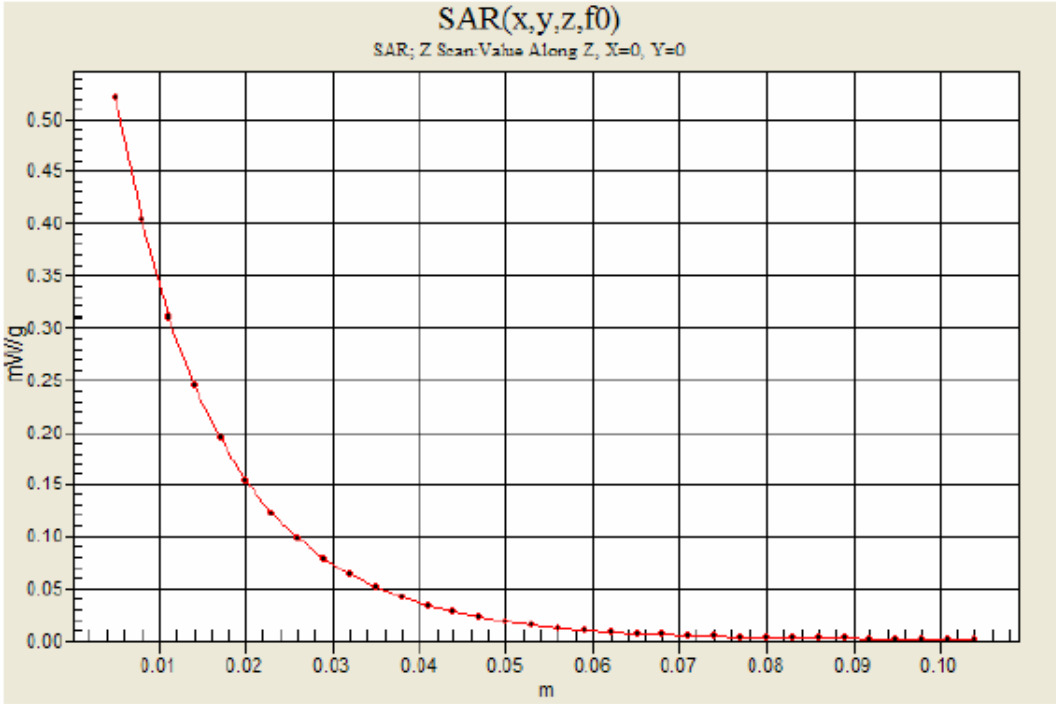
GSM850_Body_10mm

DUT: Palm; Type: N/A; Serial: N/A

Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:4

Back side_GPRS 2 slot_M-ch/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.521 mW/g



Worst-case Head SAR plot for part 24E

Date/Time: 12/8/2010 12:33:02 PM

Test Laboratory: Compliance Certification Services

UMTS band II_Right Hand Side_open

DUT: Palm; Type: N/A; Serial: N/A

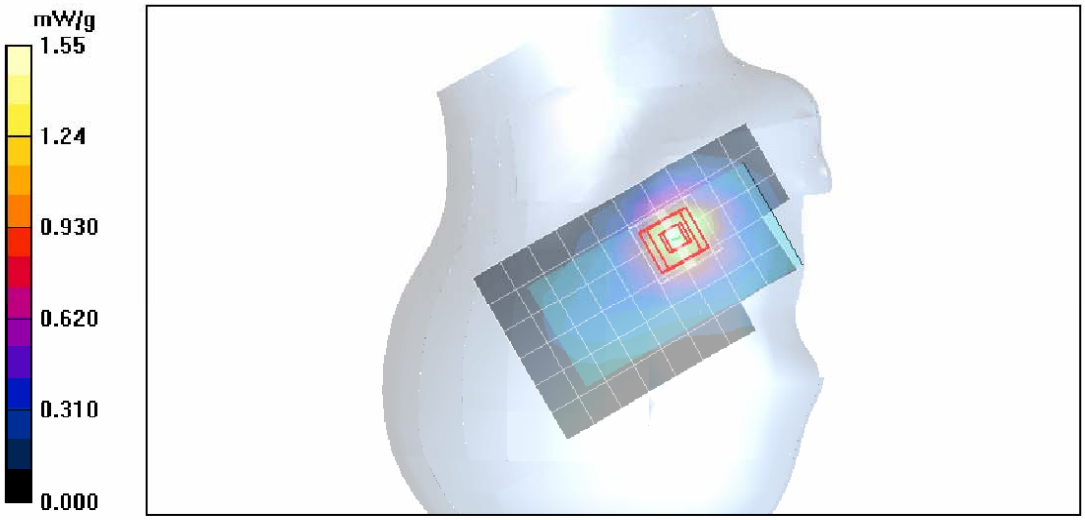
Communication System: UMTS Band II; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.34 mho/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Right Section

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: EX3DV3 - SN3531; ConvF(8.64, 8.64, 8.64); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch_M-ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.55 mW/g

Touch_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 34.7 V/m; Power Drift = -0.029 dB
Peak SAR (extrapolated) = 2.08 W/kg
SAR(1 g) = 1.38 mW/g; SAR(10 g) = 0.825 mW/g
Maximum value of SAR (measured) = 1.64 mW/g



Worst-case Head SAR Z-axis plot for part 24E

Date/Time: 12/8/2010 12:56:28 PM

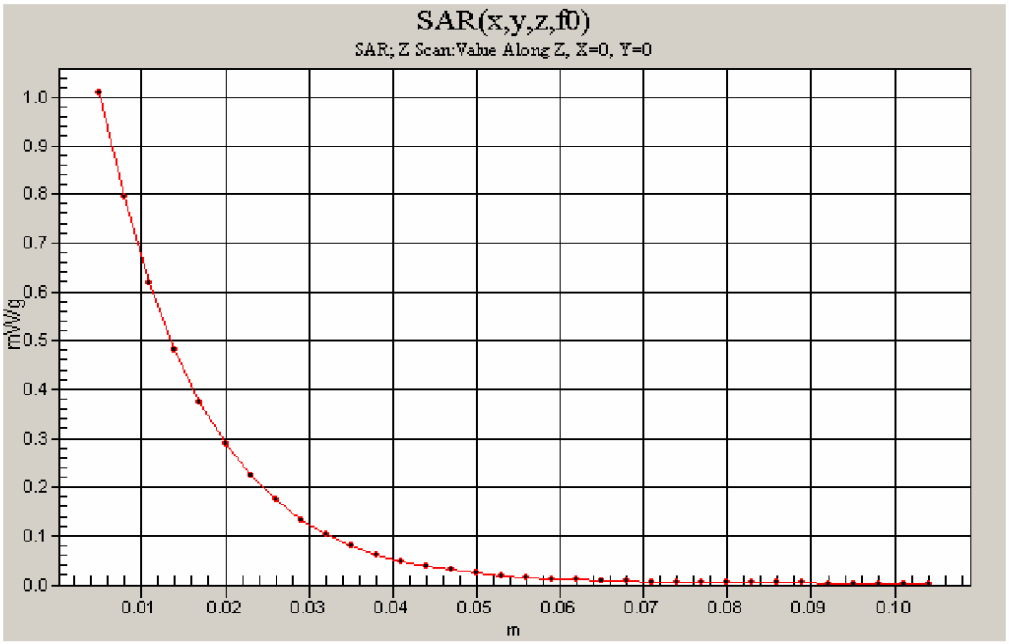
Test Laboratory: Compliance Certification Services

UMTS band II_Right Hand Side_open

DUT: Palm; Type: N/A; Serial: N/A

Communication System: UMTS Band II; Frequency: 1880 MHz;Duty Cycle: 1:1

Touch_M-ch/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm
Maximum value of SAR (measured) = 1.01 mW/g



Worst-case Body SAR plot for part 24E

Date/Time: 2/3/2011 4:02:13 PM

Test Laboratory: Compliance Certification Services (UL CCS)

UMTS band II_Body_10mm

DUT: Palm; Type: N/A; Serial: N/A

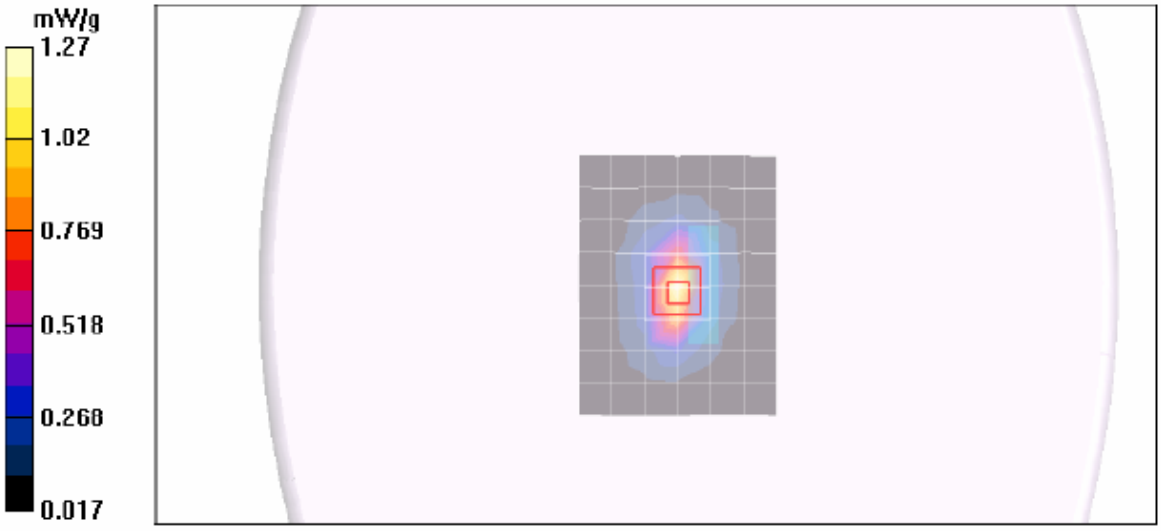
Communication System: UMTS Band II; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1907.6 MHz; σ = 1.57 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

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 - SN3749; ConvF(7.33, 7.33, 7.33); Calibrated: 12/13/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom edge_H-ch/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.27 mW/g

Bottom edge_H-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 28.7 V/m; Power Drift = -0.142 dB
Peak SAR (extrapolated) = 1.76 W/kg
SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.520 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.28 mW/g



Worst-case Body SAR Z-axis plot for part 24E

Date/Time: 2/3/2011 4:22:50 PM

Test Laboratory: Compliance Certification Services (UL CCS)

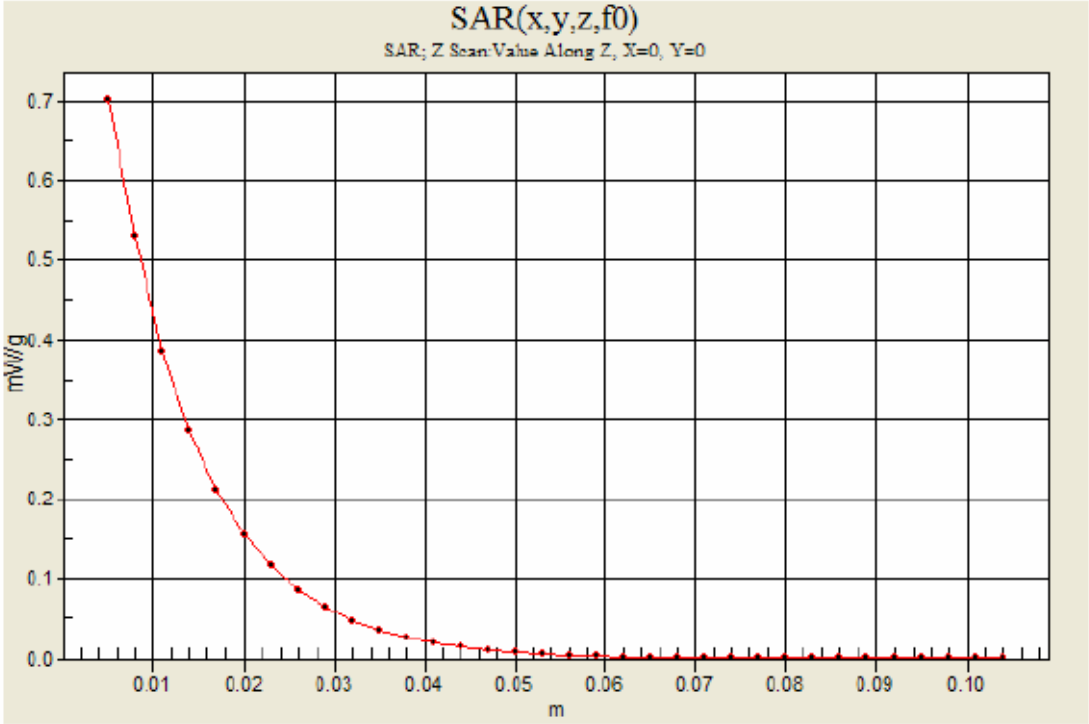
UMTS band II_Body_10mm

DUT: Palm; Type: N/A; Serial: N/A

Communication System: UMTS Band II; Frequency: 1907.6 MHz;Duty Cycle: 1:1

Bottom edge_H-ch/Z Scan (1x1x34): Measurement grid: dx=20mm, dy=20mm, dz=3mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.701 mW/g



Worst-case Head SAR plot for part 15 C

Date/Time: 8/24/2010 1:17:54 PM

Test Laboratory: Compliance Certification Services

WiFi_Right Hand Side_close

DUT: Palm; Type: N/A; Serial: N/A

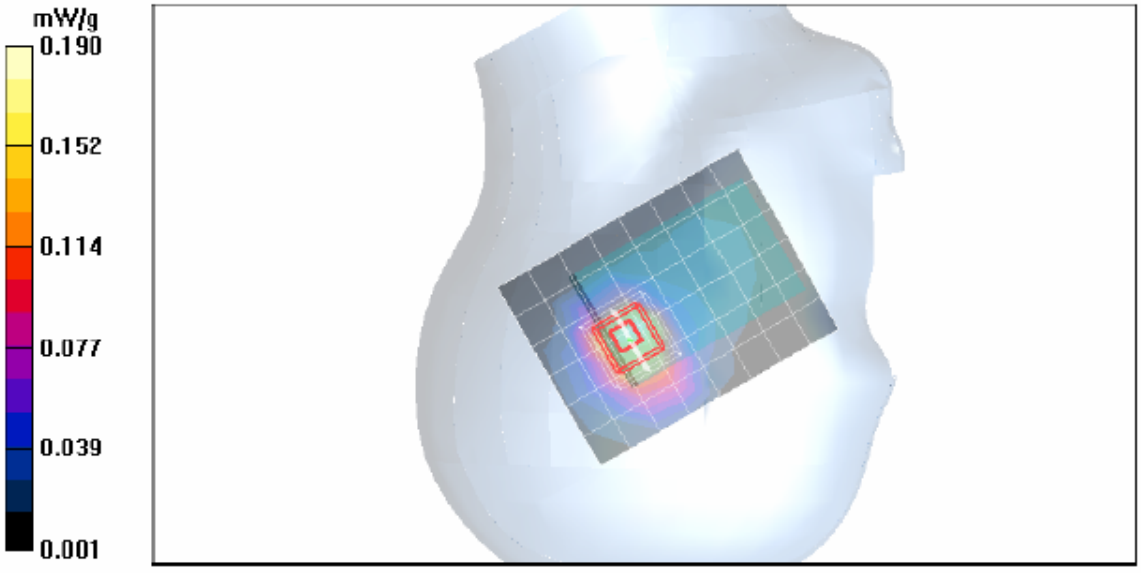
Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.82 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Right Section

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: EX3DV3 - SN3531; ConvF(7.6, 7.6, 7.6); Calibrated: 2/23/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: SAM 2 (Twin); Type: SAM 2; Serial: 1050
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt_M-ch/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.190 mW/g

Tilt_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 8.78 V/m; Power Drift = 0.150 dB
Peak SAR (extrapolated) = 0.377 W/kg
SAR(1 g) = 0.198 mW/g; SAR(10 g) = 0.098 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.255 mW/g



Worst-case Head SAR Z-axis plot for part 15 C

Date/Time: 8/24/2010 1:20:43 PM

Test Laboratory: Compliance Certification Services

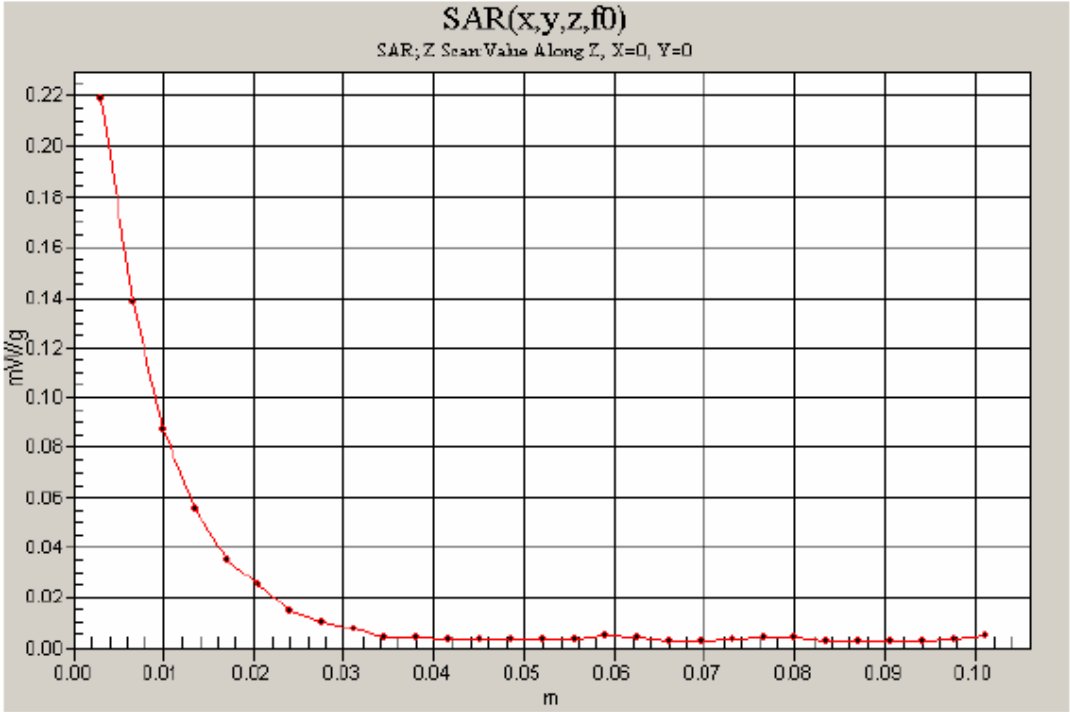
WiFi_Right Hand Side_close

DUT: Sierra Wireless; Type: NA; Serial: NA

Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz;Duty Cycle: 1:1

Tilt_M-ch/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.219 mW/g



Worst-case Body SAR plot for part 15 C

Date/Time: 1/27/2011 4:41:47 PM, Date/Time: 1/27/2011 4:49:04 PM

Test Laboratory: UL CCS

WiFi Hot Spot

DUT: Palm; Type: N/A; Serial: N/A

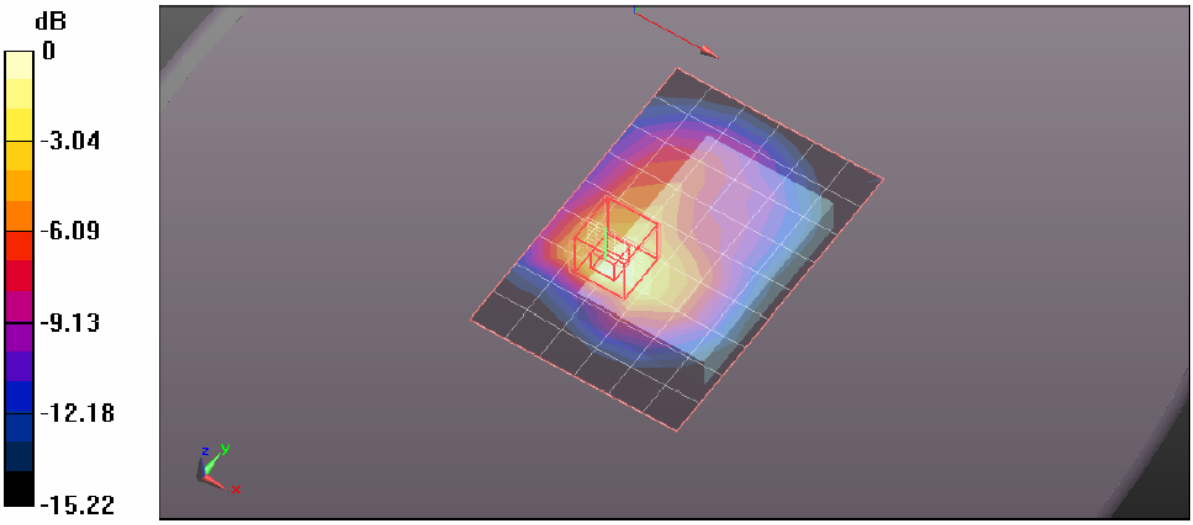
Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.919 mho/m; ε_r = 51.649; ρ = 1000 kg/m^3
Phantom section: Flat Section

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

DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV3 - SN3531; ConvF(7.58, 7.58, 7.58); Calibrated: 2/23/2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (1);SEMCAD X Version 14.4.2 (2595)

Back/802.11b_ch-6/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.405 mW/g

Back/802.11b_ch-6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 14.915 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.630 W/kg
SAR(1 g) = 0.315 mW/g; SAR(10 g) = 0.156 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.465 mW/g



0 dB = 0.470mW/g

Worst-case Body SAR Z-axis plot for part 15 C

Date/Time: 1/27/2011 5:07:31 PM

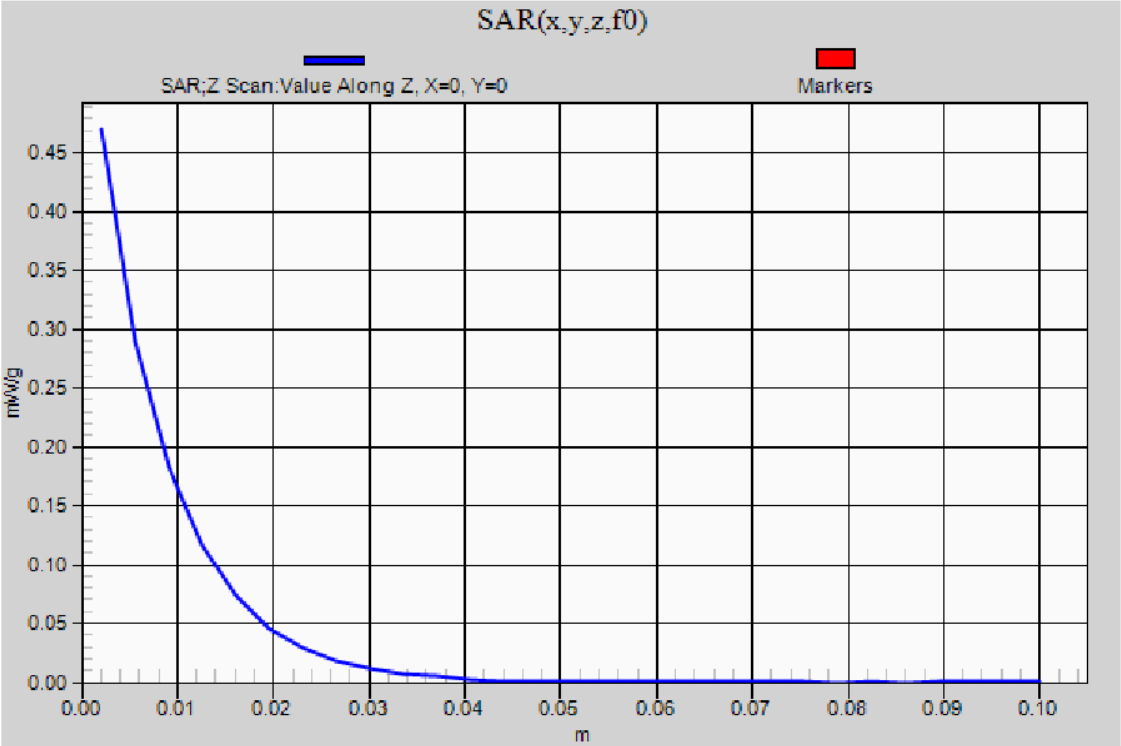
Test Laboratory: UL CCS

WiFi Hot Spot

DUT: Palm; Type: N/A; Serial: N/A

Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz;Duty Cycle: 1:1

Back/802.11b_ch-6/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.470 mW/g



14. KDB 648474 SIMULTANEOUS TRANSMISSION CONSIDERATION

SUMMARY OF SAR EVALUATION FOR A CELL PHONE WITH MULTIPLE TRANSMITTERS

Individual Transmitter	Stand-alone SAR
WWAN	Yes
WiFi	Yes
Bluetooth	Not required [average output is < 2 P_{Ref} (24 mW)]

SIMULTANEOUS TRANSMISSION

- WWAN can transmit simultaneously with WiFi
- WWAN can transmit simultaneously with Bluetooth
- WiFi can transmit simultaneously with Bluetooth (WiFi and Bluetooth shared same common antenna)

The sum of the stand-alone SAR and the SAR to peak location separation ratios

WWAN Cell Band (part 22H) + WiFi (part 15C)						
Tes position	Highest 1-g SAR (W/kg)			∑ 1g SAR (W/kg)	SAR to peak location	
	WWAN		WiFi 2.4G		Separation (cm)	Ratio
RHS Touch (open)	GPRS850	0.753	0.030	0.783	n/a	n/a
LHS Touch (open)	UMTS B V	0.844	0.012	0.856	n/a	n/a
Body (Face down)	GPRS850 (Class 10)	0.776	0.315	1.091	n/a	n/a
	UMTS B V	0.630	0.315	0.945	n/a	n/a
WWAM PCS Band (part 24E) + WiFi (part 15C)						
Tes position	Highest 1-g SAR (W/kg)			∑ 1g SAR (W/kg)	SAR to peak location	
	WWAN		WiFi 2.4G		Separation (cm)	Ratio
RHS Touch (open)	GPRS1900	0.663	0.030	0.693	n/a	n/a
	UMTS B II	**1.380**	0.030	**1.410**	n/a	n/a
Body (Face down)	GPRS1900 (Class 10)	0.697	0.315	1.012	n/a	n/a
	UMTS B II	1.020	0.315	1.335	n/a	n/a

CONCLUSIONS:

WWAN & WiFi: Simultaneous transmission SAR is not required for WWAN & WiFi because the sum of the 1-g SA is < 1.6 W/kg.
WWAN & Bluetooth: Simultaneous transmission SAR is not required for WWAN & Bluetooth because stand-alone SAR is not required for Bluetooth.
WiFi & Bluetooth: Simultaneous transmission SAR is not required for WiFi & Bluetooth because stand-alone SAR is not required for Bluetooth.

15. ATTACHMENTS

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