



FCC OET BULLETIN 65 SUPPLEMENT C

SAR EVALUATION REPORT

For

GSM850/1900MHz + 802.11bg + BT2.1+EDR

MODEL: P121UEU

FCC ID: O8F- PIXYW

REPORT NUMBER: 10U13098-5A

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Prepared for

PALM

**950 MAUDE AVENUE
SUNNYVALE, CA. 94085
UNITED STATES**

Prepared by

**COMPLIANCE CERTIFICATION SERVICES
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888**



NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	March 10, 2010	Initial Issue	--
--	March 15, 2010	Corrected typo on Section 4.1 from SPAEG to SPEAG	Sunny Shih

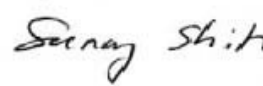
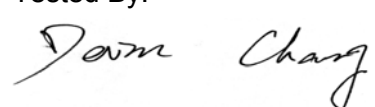
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	PALM 950 MAUDE AVENUE SUNNYVALE, CA. 94085, UNITED STATES		
EUT DESCRIPTION:	GSM850/1900MHz + 802.11bg + BT2.1+EDR		
MODEL NUMBER:	P121UEU		
DEVICE CATEGORY:	Portable		
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure		
DATE TESTED:	March 5 - 7, 2010		
FCC / IC Rule Parts	Frequency Range [MHz]	The Highest 1g SAR (mW/g)	Limit (mW/g)
22H	824 - 849	Head: 0.345 (LHS Touch); Body: 0.76 (Face up)	1.6
24E	1850 - 1910	Head: 0.602 (LHS Touch); Body: 0.71 (Face up)	
15.247	2400 – 2483.5	Head: 0.164 (RHS Touch); Body: 0.026 (Face down)	

Applicable Standards and Test Procedures	Test Results
FCC OET Bulletin 65 Supplement C and the following specific test procedures: ○ KDB 941225 D01 SAR test for 3G devices v02 ○ KDB 941225 D03 SAR Test Reduction GSM/GPRS/EDGE vo1 ○ KDB 648474 D01 SAR Handsets Multi Xmitter and Ant, v01r05 ○ KDB 248227 D01 SAR meas for 802 11abg v01r02	Pass
Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government	
Approved & Released For CCS By: 	Tested By: 
SUNNY SHIH ENGINEERING SUPERVISOR COMPLIANCE CERTIFICATION SERVICES	DEVIN CHANG EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C and the following specific Test Procedures.

- KDB 941225 D01 SAR test for 3G devices v02
- KDB 941225 D03 SAR Test Reduction GSM/GPRS/EDGE vo1
- KDB 648474 D01 SAR Handsets Multi Xmitter and Ant, v01r05
- KDB 248227 D01 SAR meas for 802 11 a b g v01r02

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date		
				MM	DD	Year
Robot - Six Axes	Stäubli	RX90BL	N/A			N/A
Robot Remote Control	Stäubli	CS7MB	3403-91535			N/A
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041			N/A
Probe Alignment Unit	SPEAG	LB (V2)	261			N/A
SAM Phantom (SAM1)	SPEAG	QD000P40CA	1185			N/A
SAM Phantom (SAM2)	SPEAG	QD000P40CA	1050			N/A
Oval Flat Phantom (ELI 4.0)	SPEAG	QD OVA001 B	1003			N/A
Electronic Probe kit	HP	85070C	N/A			N/A
S-Parameter Network Analyzer	Agilent	8753ES-6	MY40001647	11	22	2010
Signal Generator	Agilent	8753ES-6	MY40001647	11	22	2010
E-Field Probe	SPEAG	EX3DV4	3686	3	23	2010
Thermometer	ERTCO	639-1S	1718	5	1	2010
Data Acquisition Electronics	SPEAG	DAE3 V1	500	9	15	2010
System Validation Dipole	SPEAG	D835V2	4d002	4	23	2011
System Validation Dipole	SPEAG	D1900V2	5d043	11	24	2011
System Validation Dipole	SPEAG	D2450V2	748	4	14	2010
ESG Vector Signal Generator	Agilent	E4438C	US44271090	9	17	2010
Amplifier	Mini-Circuits	ZVE-8G	90606			N/A
Amplifier	Mini-Circuits	ZHL-42W	D072701-5			N/A
Simulating Liquid	CCS	H1900	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	H835	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	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		

4.2. MEASUREMENT UNCERTAINTY

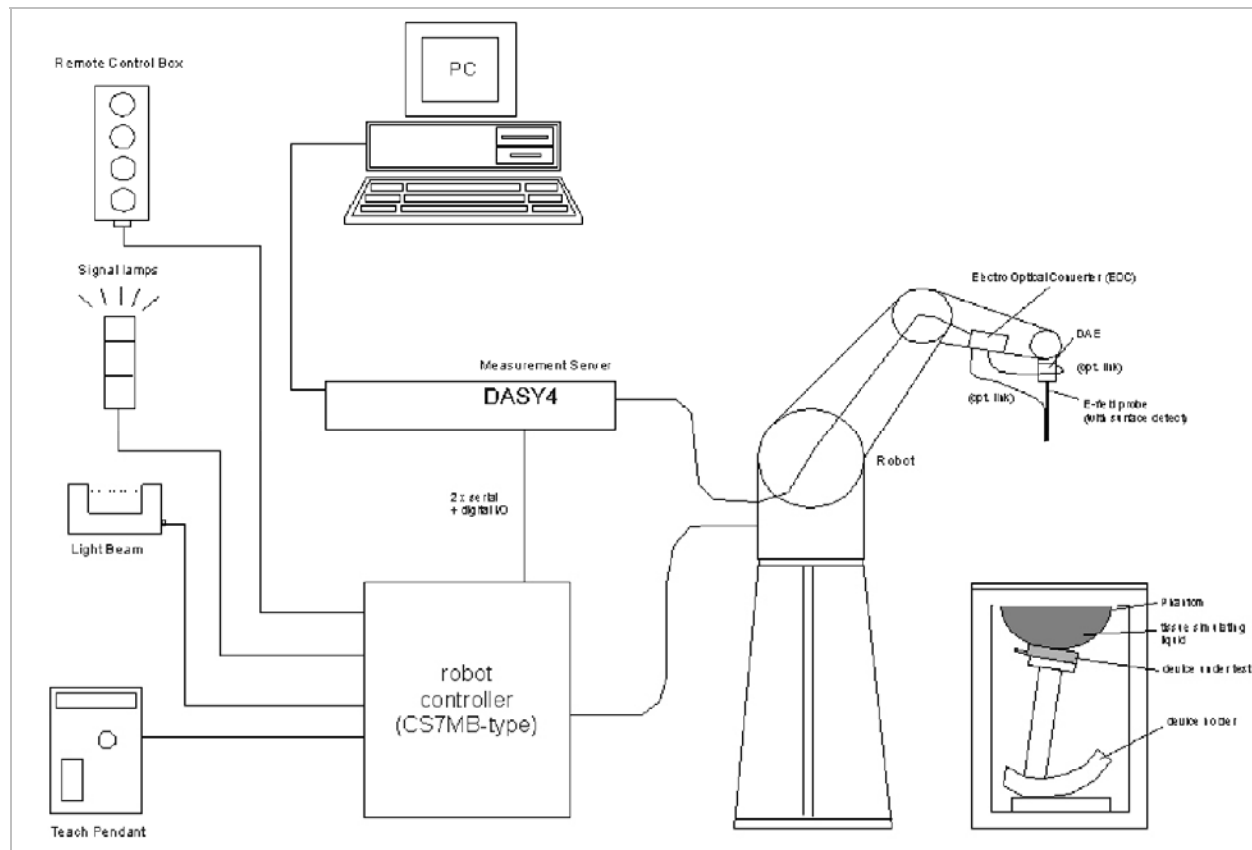
Measurement uncertainty for 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	5.90	N	1	1	1	5.90	5.90
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	0.30	N	1	1	1	0.30	0.30
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	3.00	R	1.732	1	1	1.73	1.73
RF Ambient Conditions - Reflections	3.00	R	1.732	1	1	1.73	1.73
Probe Positioner Mechanical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	1.00	R	1.732	1	1	0.58	0.58
Test sample Related							
Test Sample Positioning	2.90	N	1	1	1	2.90	2.90
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	2.50	N	1	0.64	0.43	1.60	1.08
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	2.50	N	1	0.6	0.49	1.50	1.23
Combined Standard Uncertainty	RSS					10.95	10.72
Expanded Uncertainty (95% Confidence Interval)	K=2					21.90	21.43
Notesfor table							
1. Tol. - tolerance in influence quaitity							
2. N - Nomal							
3. R - Rectangular							
4. Div. - Divisor used to obtain standard uncertainty							
5. Ci - is te sensitivity coeffident							

5. EQUIPMENT UNDER TEST

GSM850/1900MHz + 802.11bg + BT2.1+EDR	
Mobile phone capability:	Class B
GPRS Multi-slot class:	Class 12 (4 up slots)
Normal operation:	Held to head Worn on body (LCD facing-up; LCD facing-down) with 15 mm separation distance.
Body Worn Accessory	Headset
Other radio modules in host:	Bluetooth & 802.11b/g
Co-located Tx:	WWAN can transmit simultaneously with Bluetooth and WiFi
Antenna-to-antenna distance	BT/WiFi antenna-to-WWAN antenna: 7 (cm) BT & WiFi share the same antenna

6. SYSTEM SPECIFICATIONS



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

7. LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. For frequencies in 300 MHz to just under 2 GHz, the measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within $\pm 5\%$ of the target values. The measured relative permittivity tolerance can be relaxed to no more than $\pm 10\%$.

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1800 – 2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
3000	38.5	2.4	52	2.73
5800	35.3	5.27	48.2	6

(ϵ_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m³)

7.1. LIQUID CHECK RESULTS FOR 835 MHZ

Simulating Liquid Dielectric Parameters for Head 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40%

Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	43.04	Relative Permittivity (ϵ_r):	43.038	41.5	3.71	± 5
	e''	19.02	Conductivity (σ):	0.883	0.90	-1.86	± 5

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C

March 06, 2010 12:02 PM

Frequency	e'	e''
790000000.	43.6070	19.2150
795000000.	43.5739	19.2101
800000000.	43.5015	19.1997
805000000.	43.4318	19.1719
810000000.	43.3800	19.1332
815000000.	43.3378	19.0954
820000000.	43.2773	19.0822
825000000.	43.1877	19.0357
830000000.	43.0968	19.0030
835000000.	43.0381	19.0153
840000000.	42.9855	18.9803
845000000.	42.9072	18.9891
850000000.	42.8389	18.9697
855000000.	42.7695	18.9836
860000000.	42.7161	18.9749
865000000.	42.6326	18.9874
870000000.	42.5775	18.9881
875000000.	42.5148	19.0242
880000000.	42.4876	19.0292
885000000.	42.3999	19.0565
890000000.	42.3344	19.0587
895000000.	42.2996	19.0478
900000000.	42.2752	19.0406
905000000.	42.2150	18.9946
910000000.	42.1597	18.9665
915000000.	42.1784	18.9293
920000000.	42.0888	18.8903
925000000.	42.0967	18.8699
930000000.	42.0534	18.8534

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters for Body 835 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40%

Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	56.19	Relative Permittivity (ϵ_r):	56.194	55.2	1.80	± 5
	e''	21.60	Conductivity (σ):	1.004	0.97	3.46	± 5

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C

March 06, 2010 12:06 PM

Frequency	e'	e''
790000000.	56.6380	21.9452
795000000.	56.5911	21.9189
800000000.	56.5580	21.8809
805000000.	56.5044	21.8543
810000000.	56.4620	21.7853
815000000.	56.4180	21.7546
820000000.	56.3687	21.6860
825000000.	56.3028	21.6272
830000000.	56.2397	21.6131
835000000.	56.1942	21.6035
840000000.	56.1438	21.5743
845000000.	56.0905	21.5292
850000000.	56.0022	21.4997
855000000.	55.9451	21.5073
860000000.	55.9097	21.5030
865000000.	55.8657	21.5127
870000000.	55.8064	21.5003
875000000.	55.7459	21.5066
880000000.	55.7116	21.5249
885000000.	55.6595	21.5403
890000000.	55.6001	21.5251
895000000.	55.5746	21.4907
900000000.	55.5777	21.4660
905000000.	55.5269	21.4296
910000000.	55.5086	21.3875
915000000.	55.5026	21.3211
920000000.	55.4546	21.2844
925000000.	55.4404	21.2451
930000000.	55.4171	21.2459

The conductivity (σ) can be given as:

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

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

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

7.2. LIQUID CHECK RESULTS FOR 1900 MHZ

Simulating Liquid Dielectric Parameters for Head 1900 MHz

Room Ambient Temperature = 24°C; Relative humidity = 35% Measured by: Devin Chang

f (MHz)	Liquid Parameters		Measured Results		Target	Delta (%)	Limit (%)
1900	e'	41.322	Relative Permittivity (ϵ_r):	41.3217	40.0	3.30	± 5
	e''	12.998	Conductivity (σ):	1.37391	1.40	-1.86	± 5

Liquid Check

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

March 05, 2010 08:26 PM

Frequency	e'	e''
1710000000.	41.8468	12.5849
1720000000.	41.8117	12.6750
1730000000.	41.8089	12.7472
1740000000.	41.7540	12.7984
1750000000.	41.7480	12.7693
1760000000.	41.7468	12.7069
1770000000.	41.7668	12.6448
1780000000.	41.7638	12.6367
1790000000.	41.6974	12.6668
1800000000.	41.6291	12.7141
1810000000.	41.5528	12.8077
1820000000.	41.4528	12.9370
1830000000.	41.3331	13.0229
1840000000.	41.2391	13.0498
1850000000.	41.2330	13.0230
1860000000.	41.3075	12.9713
1870000000.	41.3953	12.9606
1880000000.	41.4329	12.9737
1890000000.	41.3935	13.0012
1900000000.	41.3217	12.9983
1910000000.	41.2333	13.0427

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters for Body 1900 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	55.017	Relative Permittivity (ϵ_r):	55.0174	53.3	3.22	± 5
	e"	14.222	Conductivity (σ):	1.50325	1.52	-1.10	± 5

Liquid Check

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

March 05, 2010 08:29 PM

Frequency	e'	e"
1710000000.	55.3903	13.7937
1720000000.	55.3592	13.8840
1730000000.	55.3687	13.9596
1740000000.	55.3302	13.9811
1750000000.	55.3398	13.9271
1760000000.	55.3519	13.8619
1770000000.	55.3807	13.8265
1780000000.	55.3842	13.8287
1790000000.	55.3077	13.8710
1800000000.	55.2421	13.9493
1810000000.	55.1554	14.0533
1820000000.	55.0548	14.1680
1830000000.	54.9551	14.2586
1840000000.	54.8990	14.2728
1850000000.	54.9114	14.2303
1860000000.	55.0067	14.1706
1870000000.	55.1123	14.1757
1880000000.	55.1406	14.1953
1890000000.	55.0905	14.2153
1900000000.	55.0174	14.2219
1910000000.	54.9179	14.2780

The conductivity (σ) can be given as:

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

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

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

7.3. LIQUID CHECK RESULTS FOR 2450 MHZ

Simulating Liquid Dielectric Parameters for Head 2450 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40%

Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	38.61	Relative Permittivity (ϵ_r):	38.608	39.2	-1.51	± 5
	e''	13.38	Conductivity (σ):	1.823	1.80	1.28	± 5

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C

March 05, 2010 11:09 AM

Frequency	e'	e''
2400000000.	38.8001	13.1984
2405000000.	38.7621	13.2033
2410000000.	38.7345	13.2364
2415000000.	38.7125	13.2328
2420000000.	38.6821	13.2610
2425000000.	38.6768	13.2744
2430000000.	38.6581	13.2908
2435000000.	38.6372	13.3278
2440000000.	38.6258	13.3380
2445000000.	38.6152	13.3532
2450000000.	38.6084	13.3755
2455000000.	38.5952	13.4062
2460000000.	38.5910	13.4075
2465000000.	38.5848	13.4295
2470000000.	38.5574	13.4442
2475000000.	38.5487	13.4549
2480000000.	38.5395	13.4695
2485000000.	38.5390	13.4815
2490000000.	38.5256	13.5081
2495000000.	38.4938	13.5207
2500000000.	38.4729	13.5279

The conductivity (σ) can be given as:

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

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

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

Simulating Liquid Dielectric Parameters for Body 2450 MHz

Room Ambient Temperature = 24°C; Relative humidity = 40%

Measured by: Devin Chang

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	52.50	Relative Permittivity (ϵ_r):	52.498	52.7	-0.38	± 5
	e''	14.60	Conductivity (σ):	1.990	1.95	2.03	± 5

Liquid Check

Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C

March 05, 2010 11:12 AM

Frequency	e'	e''
2400000000.	52.6485	14.3452
2405000000.	52.6155	14.3692
2410000000.	52.5956	14.4008
2415000000.	52.5747	14.3975
2420000000.	52.5573	14.4411
2425000000.	52.5398	14.4525
2430000000.	52.5209	14.4790
2435000000.	52.5231	14.5049
2440000000.	52.5296	14.5210
2445000000.	52.5134	14.5594
2450000000.	52.4975	14.5977
2455000000.	52.4962	14.6233
2460000000.	52.4915	14.6246
2465000000.	52.4776	14.6492
2470000000.	52.4616	14.6681
2475000000.	52.4530	14.6807
2480000000.	52.4333	14.7045
2485000000.	52.4334	14.7133
2490000000.	52.4237	14.7362
2495000000.	52.3884	14.7554
2500000000.	52.3655	14.7611

The conductivity (σ) can be given as:

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

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

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

8. SYSTEM CHECK

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 $\pm 10\%$.

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 EX3DV4 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 $\pm 3\%$.
- The results are normalized to 1 W input power.

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

Certificate no: D835V2-4d002_Apr09, Cal Due on April 2011.

f (MHz)	Head Tissue		Body Tissue	
	SAR _{1g}	SAR _{10g}	SAR _{1g}	SAR _{10g}
835	9.64	6.28	9.96	6.56

Certificate no: D1900V2-5d043_Nov09, Cal Due on Nov. 2011

f (MHz)	Head Tissue		Body Tissue	
	SAR _{1g}	SAR _{10g}	SAR _{1g}	SAR _{10g}
1900	39.8	20.7	40.4	21.4

Certificate no: D2450V2-748_April 14, 2008, Cal Due on April 2010

f (MHz)	Head Tissue		Body Tissue	
	SAR _{1g}	SAR _{10g}	SAR _{1g}	SAR _{10g}
2450			50.8	23.7

8.1. SYSTEM CHECK RESULTS FOR D835V2

System Validation Dipole: D835V2 SN:4d002

Date: March 6, 2010

Ambient Temperature = 25°C; Relative humidity = 40%

Measured by: Devin Chang

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Head	835	100	1g SAR:	9.94	9.64	3.11	±10
			10g SAR:	6.51	6.28	3.66	

8.2. SYSTEM CHECK RESULTS FOR D1900V2

System Validation Dipole: D1900V2 SN: 5d043

Date: March 5, 2010

Ambient Temperature = 24°C; Relative humidity = 35%

Measured by: Devin Chang

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Head	1900	100	1g SAR:	39.2	39.8	-1.51	±10
			10g SAR:	20.3	20.7	-1.93	

8.3. SYSTEM CHECK RESULTS FOR D2450V2

System Validation Dipole: D2450V2 SN: 748

Date: March 5, 2010

Ambient Temperature = 24°C; Relative humidity = 40%

Measured by: Devin Chang

Medium	CW Signal (MHz)	Forward power (mW)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
Body	2450	100	1g SAR:	51.1	50.8	0.59	±10
			10g SAR:	23.4	23.7	-1.27	

9. OUTPUT POWER VERIFICATION

9.1. GSM

GSM (GMSK)

Band	Ch No.	Frequency	Tx Conducted Power (dBm) (Avg burst Pwr)	
			Average	Peak
GSM850	128	824.2	32.9	
	190	836.6	32.8	
	251	848.8	32.8	
GSM1900	512	1850.2	29.9	
	661	1880	30.2	
	810	1909.8	30.1	

GPRS (GMSK) - Coding Scheme: MCS4

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)							
			1 slot	Frame Avg Pwr	2 slot	Frame Avg Pwr	3 slot	Frame Avg Pwr	4 slot	Frame Avg Pwr
GSM850	128	824.2	32.90	23.90	31.50	25.50	29.90	25.64	27.50	24.50
	190	836.6	32.80	23.80	31.30	25.30	29.90	25.64	27.40	24.40
	251	848.8	32.80	23.80	31.30	25.30	29.80	25.54	27.40	24.40
GSM1900	512	1850.2	29.80	20.80	29.80	23.80	29.70	25.44	28.10	25.10
	661	1880	30.20	21.20	30.10	24.10	30.00	25.74	28.40	25.40
	810	1909.8	30.10	21.10	30.00	24.00	30.00	25.74	28.50	25.50

EGPRS (8PSK) - Coding Scheme: MCS9

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)							
			1 slot	Frame Avg Pwr	2 slot	Frame Avg Pwr	3 slot	Frame Avg Pwr	4 slot	Frame Avg Pwr
GSM850	128	824.2	27.80	18.80	27.70	21.70	27.70	23.44	27.20	24.20
	190	836.6	27.80	18.80	27.70	21.70	27.60	23.34	27.20	24.20
	251	848.8	27.70	18.70	27.70	21.70	27.60	23.34	27.10	24.10
GSM1900	512	1850.2	26.60	23.60	26.50	20.50	26.40	22.14	26.40	23.40
	661	1880	26.90	23.90	26.80	20.80	26.70	22.44	26.70	23.70
	810	1909.8	27.00	24.00	27.00	21.00	26.80	22.54	26.80	23.80

Notes:

1. KDB941225 D03 SAR Test Reduction GSMGPRSEDGE – SAR is not required for EGPRS mode when the burst average power is lower than GPRS mode.
2. 3 time slot mode were chosen for Body SAR due to the highest Frame average power.

9.2. WIFI RF OUTPUT POWER

802.11b

Channel	Frequency (MHz)	Power (dBm)
Low	2412	12.10
Middle	2437	12.50
High	2462	12.00

802.11g

Channel	Frequency (MHz)	Power (dBm)
Low	2412	11.50
Middle	2437	11.60
High	2462	11.30

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

10. SUMMARY OF TEST RESULTS

Note: Non-inductive back cover is used for all SAR testing. Additional SAR testing with inductive back cover is performed at worst-case test configurations.

10.1. GSM850

10.1.1. LEFT HAND SIDE

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM850	GSM	Touch	128	824.2		
			190	836.6	0.345	0.252
			251	848.8		
		w/ inductive cover	190	836.6	0.342	0.249
			128	824.2		
			190	836.6	0.141	0.105
			251	848.8		
		Tilt (15°C)	128	824.2		
			190	836.6	0.141	0.105
			251	848.8		

10.1.2. RIGHT HAND SIDE

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM850	GSM	Touch	128	824.2		
			190	836.6	0.270	0.199
			251	848.8		
		Tilt (15°C)	128	824.2		
			190	836.6	0.143	0.107
			251	848.8		
			128	824.2		
			190	836.6		
			251	848.8		

10.1.3. BODY

Band	Mode	Seperation distance (cm)	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
						1-g	10-g
GSM850	GPRS 3 slots	1.5	Face up	128	824.2		
				190	836.6	0.677	0.499
				251	848.8		
			Face down	128	824.2		
				190	836.6	0.663	0.482
				251	848.8		

10.1.4. BODY WITH INDUCTIVE BACK COVER

Band	Mode	Seperation distance (cm)	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
						1-g	10-g
GSM850	GPRS 3 slots	1.5	Face up	128	824.2		
				190	836.6	0.760	0.560
				251	848.8		
			w/ headset	190	836.6	0.334	0.244
			Face down	128	824.2		
				190	836.6	0.697	0.509
				251	848.8		
			w/ headset	190	836.6	0.320	0.230

Notes:

1. KDB941225 D03 SAR Test Reduction GSMGPRSEDGE – SAR is not required for EGPRS mode when the burst average power is lower than GPRS mode.
2. 3 time slot mode were chosen for Body SAR due to the highest Frame average power

10.2. GSM1900

10.2.1. LEFT HAND SIDE

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM1900	GSM	Touch	512	1850.2		
			661	1880.0	0.602	0.361
			810	1909.8		
		w/ inductive cover	661	1880.0	0.573	0.344
			512	1850.2		
			661	1880.0	0.204	0.132
		Tilt (15°C)	810	1909.8		

10.2.2. RIGHT HAND SIDE

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM1900	GSM	Touch	512	1850.2		
			661	1880.0	0.464	0.290
			810	1909.8		
		Tilt (15°C)	512	1850.2		
			661	1880.0	0.233	0.144
			810	1909.8		

10.2.3. BODY

Band	Mode	Seperation distance (cm)	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
						1-g	10-g
GSM1900	GPRS 3 slots	1.5	Face up	512	1850.2		
				661	1880.0	0.679	0.434
				810	1909.8		
			Face down	512	1850.2		
				661	1880.0	0.672	0.415
				810	1909.8		

10.2.4. BODY WITH INDUCTIVE BACK COVER

Band	Mode	Seperation distance (cm)	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
						1-g	10-g
GSM1900	GPRS 3 slots	1.5	Face up	512	1850.2		
				661	1880.0	0.710	0.454
				810	1909.8		
			w/ headset	661	1880.0	0.704	0.438
			Face down	512	1850.2		
				661	1880.0	0.608	0.381
				810	1909.8		
			w/ headset	661	1880.0	0.622	0.384

Notes:

1. KDB941225 D03 SAR Test Reduction GSMGPRSEDGE – SAR is not required for EGPRS mode when the burst average power is lower than GPRS mode.
2. 3 time slot mode were chosen for Body SAR due to the highest Frame average power

10.3. WIFI

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

10.3.1. LEFT HAND SIDE

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
2.4 GHz	802.11b	Touch	1	2412		
			6	2437	0.082	0.023
			11	2462		
		Tilt (15°C)	1	2412		
			6	2437	0.061	0.031
			11	2462		

10.3.2. RIGHT HAND SIDE

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
2.4 GHz	802.11b	Touch	1	2412		
			6	2437	0.164	0.075
			11	2462		
		Co-Tx w/ BT	6	2437	0.151	0.610
		w/ inductive cover	6	2437	0.125	0.060
		Tilt (15°C)	1	2412		
			6	2437	0.080	0.038
			11	2462		

10.3.3. BODY WORN

Band	Mode	Seperation distance (cm)	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
						1-g	10-g
2.4 GHz	802.11b	1.5	Face up	1	2412		
				6	2437	0.014	0.00784
				11	2462		
			Face down	1	2412		
				6	2437	0.026	0.014
				11	2462		
			w/ headset	6	2437	0.021	0.011
			w/ Co-Tx w/ BT	6	2437	0.020	0.00613
			w/ inductive cover	6	2437	0.017	0.00701

11. KDB 648474 SIMULTANEOUS TRANSMISSION CONSIDERATION

Bluetooth Antenna Transmitter

Since the output power of Bluetooth transmitter is less than 60/f(GHz) and its antenna is separate more than 5.0 (cm) from WWAN antenna, stand-alone SAR evaluation is not required.

Simultaneous Transmission:

WWAN – BT: Since stand-alone SAR evaluation is not required for Bluetooth antenna and its antenna is more than 5.0 (cm) from other antennas, simultaneous transmission SAR evaluation is not required.

WWAN – WLAN: Since the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmission antennas, simultaneous transmission SAR evaluation is not required.

12. WORST-CASE SAR TEST PLOTS

Worst-case HEAD SAR Plot for Part 22

Date/Time: 3/6/2010 4:51:00 PM

Test Laboratory: Compliance Certification Services

GSM835_Left Hand Side_Touch

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

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.884$ mho/m; $\epsilon_r = 43$; $\rho = 1000$ kg/m³

Phantom section: Left Section

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

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(8.72, 8.72, 8.72); Calibrated: 3/23/2009
- 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

Touch_M-ch/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.356 mW/g

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

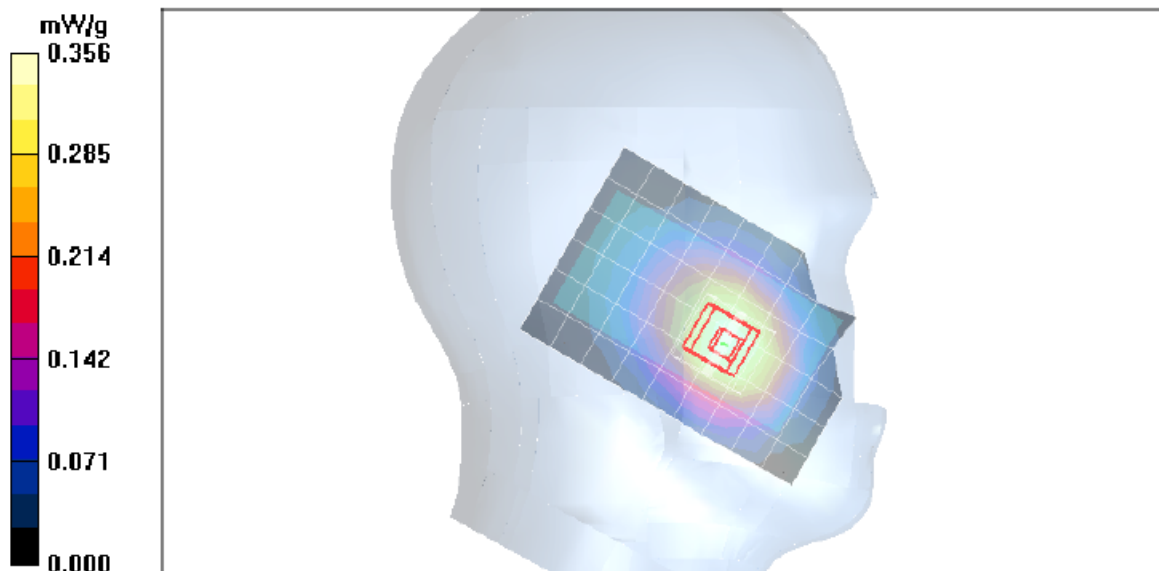
Reference Value = 20.2 V/m; Power Drift = 0.076 dB

Peak SAR (extrapolated) = 0.448 W/kg

SAR(1 g) = 0.345 mW/g; SAR(10 g) = 0.252 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.386 mW/g



Worst-case HEAD SAR Plot for Part 24

Date/Time: 3/5/2010 9:05:39 PM

Test Laboratory: Compliance Certification Services

GSM1900_Left Hand Side_Touch

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

Communication System: DCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.36 \text{ mho/m}$; $\epsilon_r = 41.4$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section

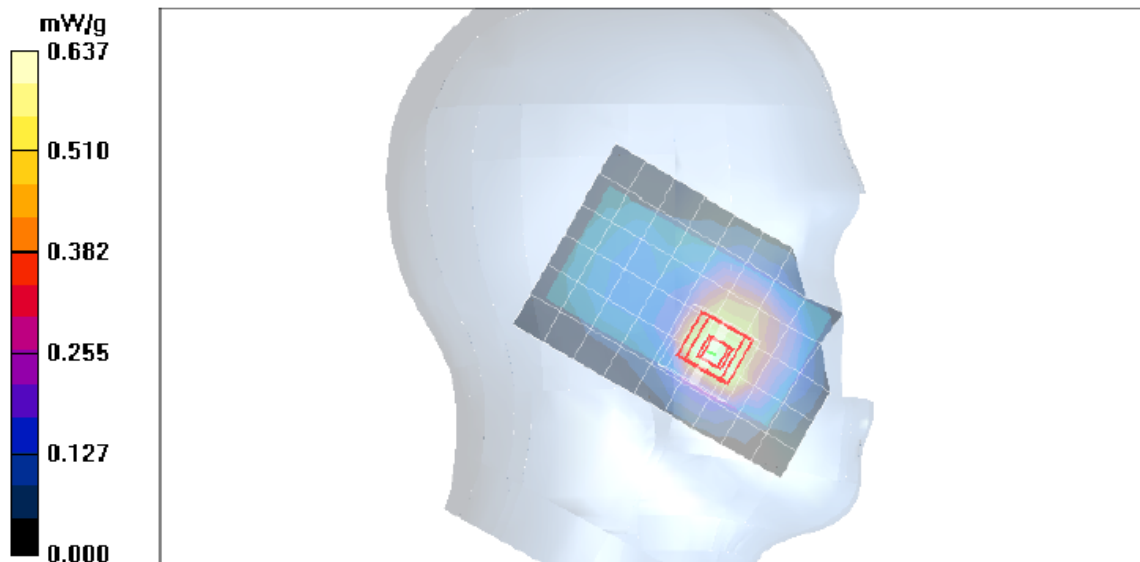
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(7.51, 7.51, 7.51); Calibrated: 3/23/2009
- 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

Touch_M-ch/Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (measured) = 0.637 mW/g

Touch_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=3\text{mm}$
Reference Value = 8.06 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 0.873 W/kg
SAR(1 g) = 0.602 mW/g; SAR(10 g) = 0.361 mW/g
Maximum value of SAR (measured) = 0.709 mW/g



Worst-case HEAD SAR Plot for Part 15 C

Date/Time: 3/5/2010 4:26:23 PM

Test Laboratory: Compliance Certification Services

WiFi_Right Hand Side_Touch

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

Communication System: 802.11bg; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

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

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.81, 6.81, 6.81); Calibrated: 3/23/2009
- 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

Touch_M-ch/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.195 mW/g

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

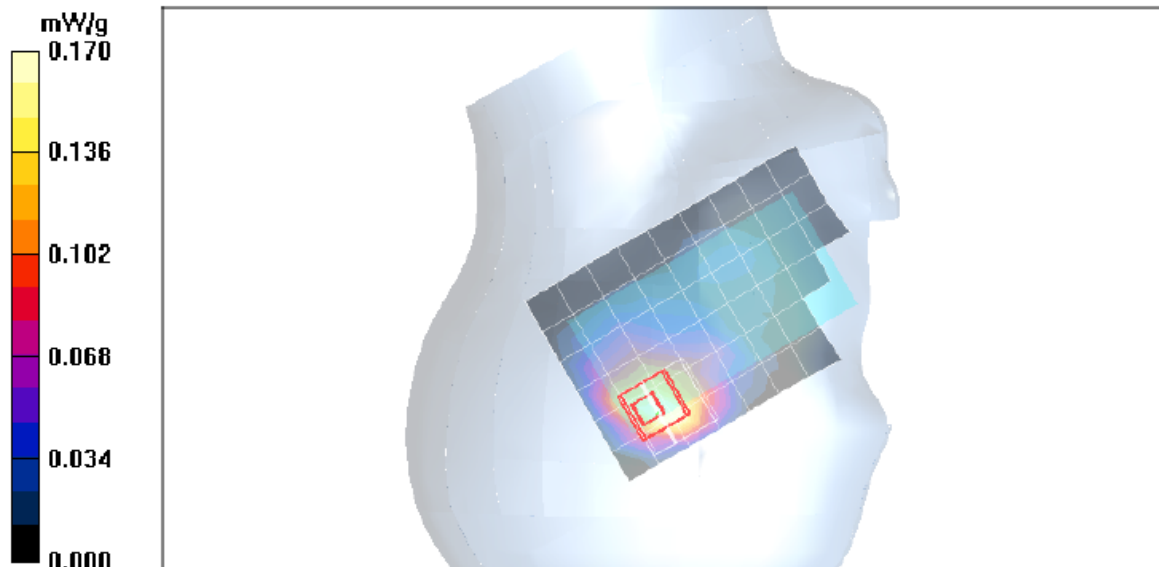
Reference Value = 10.1 V/m; Power Drift = 0.095 dB

Peak SAR (extrapolated) = 0.405 W/kg

SAR(1 g) = 0.164 mW/g; SAR(10 g) = 0.075 mW/g

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.217 mW/g



Worst-case BODY SAR plot for Part 22

Date/Time: 3/6/2010 6:28:18 PM

Test Laboratory: Compliance Certification Services

GSM835_Body with inductive cover

DUT: Palm; Type: NA; Serial: NA

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:2.67

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 56.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(8.7, 8.7, 8.7); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Face up_3 slots M-ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.890 mW/g

Face up_3 slots M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

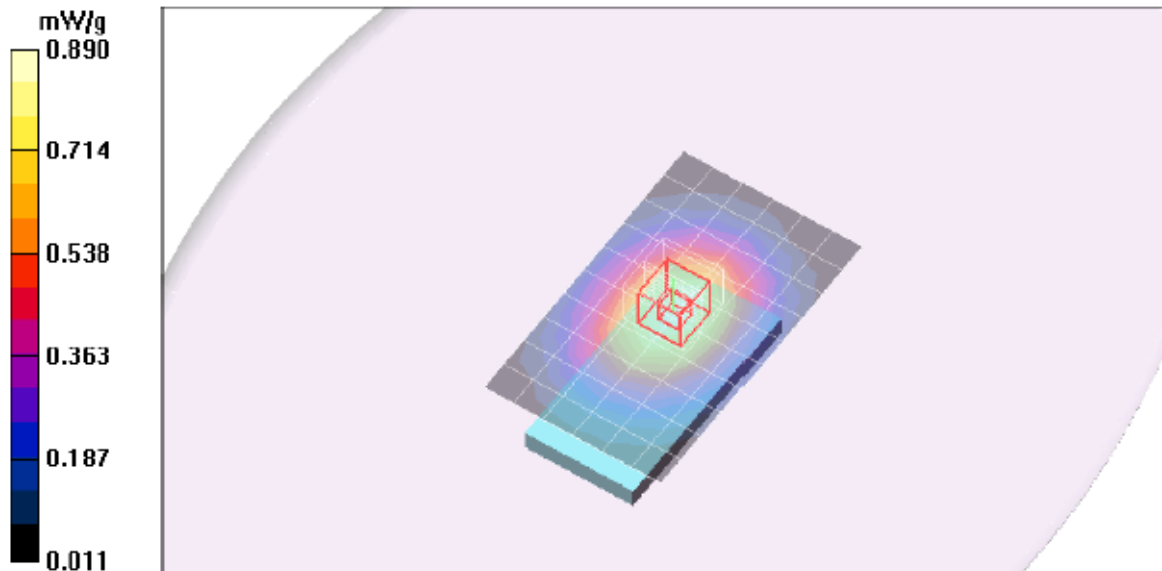
Reference Value = 29.8 V/m; Power Drift = -0.196 dB

Peak SAR (extrapolated) = 0.993 W/kg

SAR(1 g) = 0.760 mW/g; SAR(10 g) = 0.560 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.843 mW/g



Worst-case BODY SAR plot for Part 24

Date/Time: 3/6/2010 12:08:23 AM

Test Laboratory: Compliance Certification Services

GPRS1900_Body with inductive cover

DUT: Palm; Type: NA; Serial: NA

Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.67
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 55.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

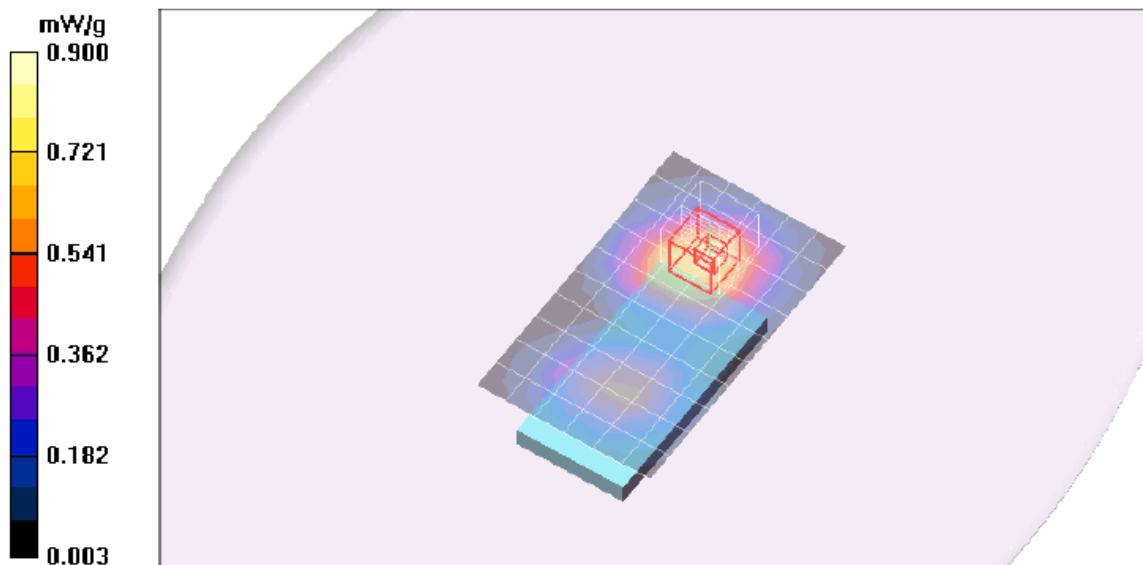
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.85, 6.85, 6.85); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Face up_3 slots M-ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.793 mW/g

Face up_3 slots M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 10.7 V/m; Power Drift = -0.272 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.710 mW/g; SAR(10 g) = 0.454 mW/g
Maximum value of SAR (measured) = 0.843 mW/g



Worst-case BODY SAR plot for Part 15 C

Date/Time: 3/5/2010 1:21:58 PM

Test Laboratory: Compliance Certification Services

WiFi_Body

DUT: Palm; Type: NA; Serial: NA

Communication System: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.97$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.48, 6.48, 6.48); Calibrated: 3/23/2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn500; Calibrated: 9/15/2009
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1003
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Face down_M-ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.029 mW/g

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

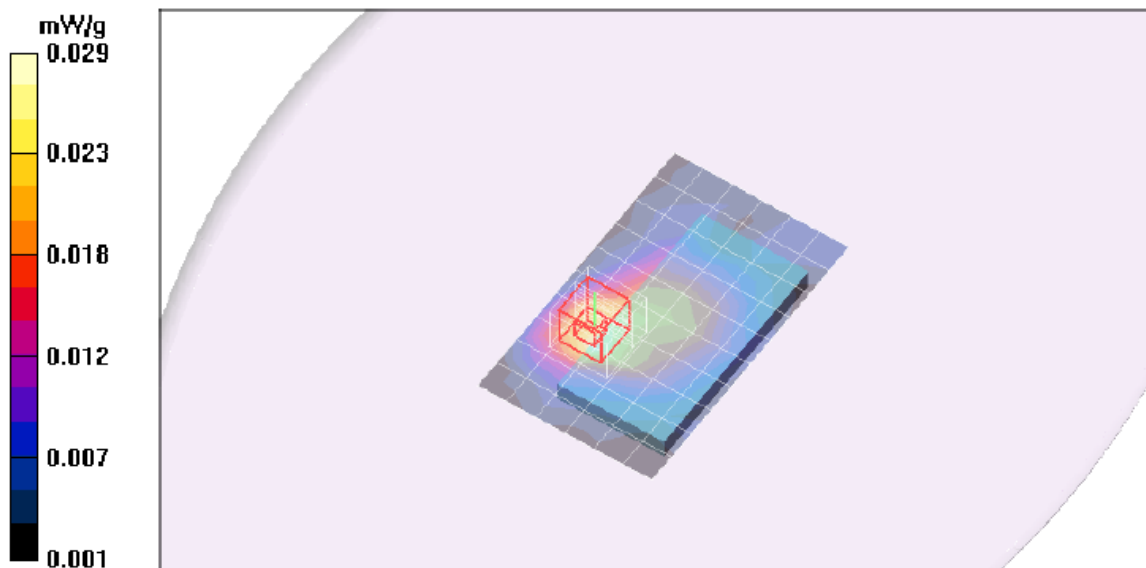
Reference Value = 3.71 V/m; Power Drift = 0.443 dB

Peak SAR (extrapolated) = 0.053 W/kg

SAR(1 g) = 0.026 mW/g; SAR(10 g) = 0.014 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.032 mW/g



13. ATTACHMENTS

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3	Certificate of E-Field Probe – EX3DV4 SN3686	10
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