FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE STD 1528:2003
SAR EVALUATION REPORT

For

850/1900 GSM/GPRS PHONE WITH BLUETOOTH AND WLAN

MODEL: GT-C3222W

FCC ID: A3LGTC3222W

REPORT NUMBER: 11I13659-2A

ISSUE DATE: February 16, 2011

Prepared for

SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

Prepared by

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

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	February 10, 2011	Initial Issue	--
A	February 16, 2011	Updated model number from “GT-3222W” to “GT-C3222W”	Sunny Shih

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1. ATTESTATION OF TEST RESULTS

Applicant:	SAMSUNG ELECTRONICS CO., LTD. 416, MAETAN 3-DONG, YEONGTONG-GU SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA
EUT description:	850/1900 GSM/GPRS PHONE WITH BLUETOOTH AND WLAN
Model number:	GT-C3222W
Device category:	Portable
Exposure category:	General Population/Uncontrolled Exposure
Date tested:	February 4 - 6, 2011

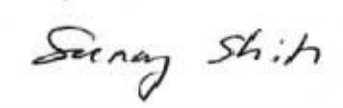
FCC / IC Rule Parts	Freq. Band [MHz]	Highest 1-g SAR (mW/g)	Limit (mW/g)
22H / RSS-132	824 - 849	Head: 0.821 (LHS Touch) Body: 1.190 (Face Down)	1.6
24E / RSS-133	1850 - 1910	Head: 1.130 (LHS Touch) Body: 0.613 (Face Down)	
15.247 / RSS-102	2412 - 2462	Body: 0.065 (Face Up)	

Applicable Standards	Test Results
- FCC OET Bulletin 65 Supplement C 01-01, - IEEE Std 1528:2003, - 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.

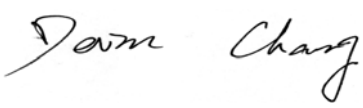
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this 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
Associate RF 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, IEEE 1528:2003 and the following specific FCC Test Procedures.

- 648474 D01 SAR Handsets Multi Xmiter and Ant v01r05
- 648474 D02 SAR Policy Handsets Multi Xmiter Ant v01r01
- KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE vo1
- KDB 248227 D01 SAR meas for 802 11abg v01r02

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
S-Parameter Network Analyzer	Agilent	E5071B	MY42100131	8	2	2011
Signal Generator	Agilent	883732B	US3440599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3749	11	13	2011
E-Field Probe	SPEAG	EX3DV4	3531	2	23	2011
Data Acquisition Electronics	SPEAG	DAE3 V1	427	7	21	2011
Data Acquisition Electronics	SPEAG	DAE4	1239	11	11	2011
Thermometer	ERTCO	639-1S	1718	7	19	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
Wireless comunication test set	Agilent	E5515C (8960)	GB46160222	6	17	2012
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	CCS	M1900	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	H900	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M900	N/A	Within 24 hrs of first test		

Note: Per KDB 450824 D02 requirements for dipole calibration, UL CCS has adopted two 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 10 gram

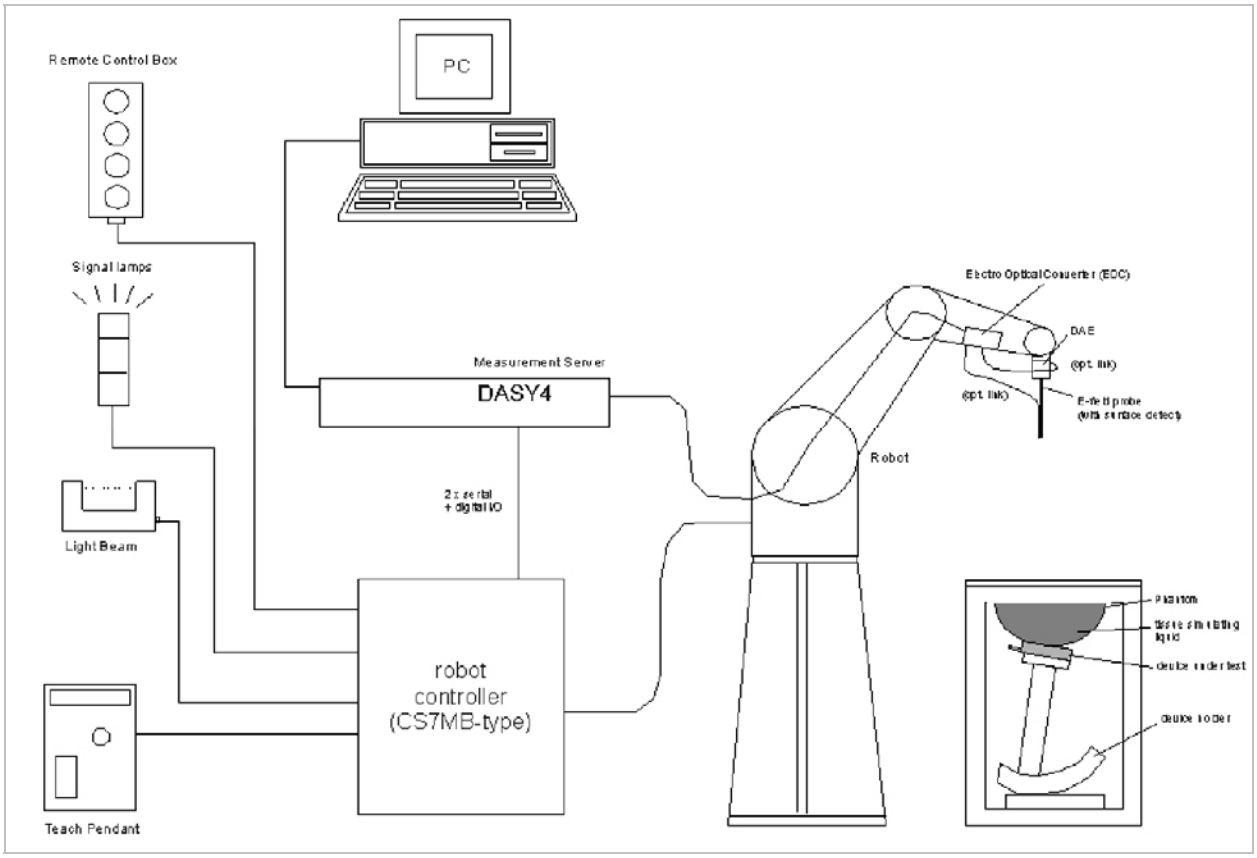
Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	5.50	Normal	1	1	5.50
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	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 @ Head 1900 MHz	3.05	Normal	1	0.43	1.31
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.49	1.41
Liquid Permittivity - measurement uncertainty @ 835 MHz	2.27	Normal	1	0.49	1.11
Combined Standard Uncertainty Uc(y), % =					9.44
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				18.89	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.50	dB

5. EQUIPMENT UNDER TEST

850/1900 GSM/GPRS PHONE WITH BLUETOOTH AND WLAN MODEL: GT-C3222W Mobile phone capability: ☐ Class A[1] ☒ Class B[2] ☐ Class C[3] GPRS Multi-slot class: ☐ Class 12 ☒ Class 10 ☐ Class 8	
Normal operation:	Held to head Worn on body (Facing-up and Facing-down) with 1.5 cm separation distance
Body Worn Accessory	Headset
Antenna-to-antenna separation distances:	Refer to section 16, Antenna locations and separation distances.
Simultaneous transmission:	○ WWAN can transmit simultaneously with WiFi ○ WWAN can transmit simultaneously with Bluetooth ○ WiFi can transmit simultaneously with Bluetooth

[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: Sunny Shih

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	42.23	Relative Permittivity (ϵ_r):	42.233	41.5	1.77	± 5
	e"	19.24	Conductivity (σ):	0.894	0.90	-0.70	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C
February 06, 2011 10:49 PM

Frequency	e'	e"
800000000.	42.6621	19.3368
805000000.	42.5971	19.3242
810000000.	42.5405	19.3131
815000000.	42.4742	19.2985
820000000.	42.4138	19.2835
825000000.	42.3513	19.2705
830000000.	42.2905	19.2550
835000000.	**42.2334**	**19.2401**
840000000.	42.1768	19.2207
845000000.	42.1163	19.2065
850000000.	42.0590	19.1912
855000000.	42.0032	19.1775
860000000.	41.9449	19.1652
865000000.	41.8875	19.1504
870000000.	41.8294	19.1388
875000000.	41.7651	19.1228
880000000.	41.7117	19.1162
885000000.	41.6538	19.1006
890000000.	41.5922	19.0854
895000000.	41.5291	19.0755
900000000.	41.4714	19.0610
905000000.	41.4204	19.0459
910000000.	41.3586	19.0371
915000000.	41.3012	19.0250
920000000.	41.2455	19.0137
925000000.	41.1898	18.9993
930000000.	41.1360	18.9871
935000000.	41.0849	18.9685
940000000.	41.0287	18.9561
945000000.	40.9780	18.9488
950000000.	40.9299	18.9354

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: Sunny Shih

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	56.45	Relative Permittivity (ϵ_r):	56.452	55.2	2.27	± 5
	e"	21.27	Conductivity (σ):	0.988	0.97	1.87	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
February 6, 2011 12:45 PM

Frequency	e'	e"
750000000.	57.2955	21.6840
755000000.	57.2677	21.6884
760000000.	57.2182	21.6654
765000000.	57.2005	21.6456
770000000.	57.1272	21.6259
775000000.	57.0934	21.6243
780000000.	57.0323	21.5851
785000000.	56.9634	21.5553
790000000.	56.9347	21.5098
795000000.	56.8838	21.4996
800000000.	56.8415	21.4852
805000000.	56.7813	21.4344
810000000.	56.7600	21.4279
815000000.	56.6817	21.3558
820000000.	56.6550	21.3345
825000000.	56.5789	21.3040
830000000.	56.5409	21.2986
835000000.	**56.4518**	**21.2719**
840000000.	56.4329	21.2386
845000000.	56.3760	21.1998
850000000.	56.3245	21.1765
855000000.	56.3040	21.1898
860000000.	56.2607	21.1447
865000000.	56.1887	21.1253
870000000.	56.1658	21.0961
875000000.	56.1135	21.0754
880000000.	56.0905	21.0954
885000000.	56.0339	21.0777
890000000.	55.9679	21.0792
895000000.	55.9599	21.0427
900000000.	55.9184	21.0218

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: David Lee

f (MHz)	Liquid Parameters		Measured Results		Target	Delta (%)	Limit (%)
1900	e'	39.827	Relative Permittivity (ϵ_r):	39.8268	40.0	-0.43	± 5
	e"	13.649	Conductivity (σ):	1.44265	1.40	3.05	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
February 04, 2011 10:04 AM

Frequency	e'	e"
1710000000.	40.6689	13.0414
1720000000.	40.6136	13.0689
1730000000.	40.5542	13.0951
1740000000.	40.5051	13.1330
1750000000.	40.4612	13.1720
1760000000.	40.4277	13.2093
1770000000.	40.4021	13.2492
1780000000.	40.3824	13.2844
1790000000.	40.3508	13.3184
1800000000.	40.3178	13.3496
1810000000.	40.2693	13.3802
1820000000.	40.2101	13.4098
1830000000.	40.1431	13.4370
1840000000.	40.0746	13.4658
1850000000.	40.0130	13.4956
1860000000.	39.9620	13.5272
1870000000.	39.9201	13.5580
1880000000.	39.8867	13.5921
1890000000.	39.8567	13.6216
1900000000.	**39.8268**	**13.6486**
1910000000.	39.7898	13.6705

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'	51.747	Relative Permittivity (ϵ_r):	51.7470	53.3	-2.91	± 5
	e"	14.089	Conductivity (σ):	1.48919	1.52	-2.03	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
February 04, 2011 08:47 AM

Frequency	e'	e''
1710000000.	52.3984	13.4233
1720000000.	52.3632	13.4516
1730000000.	52.3302	13.4788
1740000000.	52.3040	13.5143
1750000000.	52.2771	13.5480
1760000000.	52.2478	13.5868
1770000000.	52.2195	13.6245
1780000000.	52.1934	13.6647
1790000000.	52.1594	13.7034
1800000000.	52.1270	13.7423
1810000000.	52.0912	13.7791
1820000000.	52.0541	13.8181
1830000000.	52.0140	13.8521
1840000000.	51.9702	13.8897
1850000000.	51.9307	13.9215
1860000000.	51.8915	13.9561
1870000000.	51.8541	13.9903
1880000000.	51.8164	14.0246
1890000000.	51.7791	14.0565
1900000000.	**51.7470**	**14.0889**
1910000000.	51.7120	14.1175

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 Parameter Check Result @ Body 2450 MHz Measured by: Sunny Shih

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
2450	e'	51.26	Relative Permittivity (ϵ_r):	51.257	52.7	-2.74	± 5
	e"	14.55	Conductivity (σ):	1.984	1.95	1.73	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 41%
February 05, 2011 07:11 AM

Frequency	e'	e"
2400000000.	51.4349	14.3660
2405000000.	51.4156	14.3875
2410000000.	51.3985	14.4096
2415000000.	51.3830	14.4269
2420000000.	51.3637	14.4437
2425000000.	51.3472	14.4618
2430000000.	51.3301	14.4809
2435000000.	51.3116	14.4993
2440000000.	51.2936	14.5175
2445000000.	51.2736	14.5348
2450000000.	**51.2572**	**14.5541**
2455000000.	51.2373	14.5727
2460000000.	51.2218	14.5895
2465000000.	51.2007	14.6104
2470000000.	51.1848	14.6269
2475000000.	51.1655	14.6459
2480000000.	51.1473	14.6626
2485000000.	51.1293	14.6816
2490000000.	51.1105	14.7000
2495000000.	51.0941	14.7197
2500000000.	51.0791	14.7396

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

9. SYSTEM 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	02/06/11	SAR_{1g}:	9.21	9.64	-4.46	±10
		SAR_{10g}:	6.06	6.28	-3.50	

9.2. SYSTEM CHECK RESULTS FOR D1900V2

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D1900V2	02/04/11	SAR_{1g}:	39.7	40.4	-1.73	±10
		SAR_{10g}:	20.5	21.4	-4.21	

9.3. SYSTEM CHECK RESULTS FOR D2450V2

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D2450V2	02/05/11	SAR_{1g}:	53.0	52.4	1.15	±10
		SAR_{10g}:	24.5	24.5	0.00	

SYSTEM CHECK PLOT for D835V2

Date/Time: 2/6/2011 12:46:39 PM, Date/Time: 2/6/2011 12:52:34 PM

Test Laboratory: UL CCS

Cell band

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN: 4d002

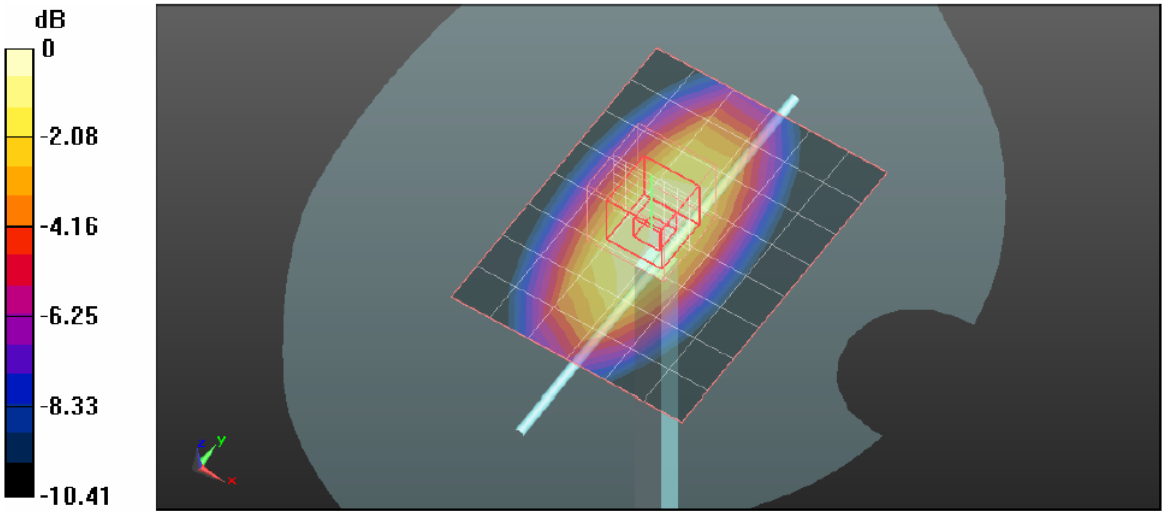
Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.894 mho/m; ε_r = 42.233; ρ = 1000 kg/m^3
Phantom section: Flat Section

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(10.13, 10.13, 10.13); Calibrated: 2/23/2010
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: SAM with CRP; Type: SAM; Serial: 1602
- Measurement SW: DASY52, Version 52.6 (1);SEMCAD X Version 14.4.2 (2595)

System Check D835V2 SN 4d002/Pin=100 mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.034 mW/g

System Check D835V2 SN 4d002/Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 35.631 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.378 W/kg
SAR(1 g) = 0.921 mW/g; SAR(10 g) = 0.606 mW/g
Maximum value of SAR (measured) = 1.120 mW/g



0 dB = 1.120mW/g

Z-Axis PLOT for D835V2

Date/Time: 2/6/2011 1:07:29 PM

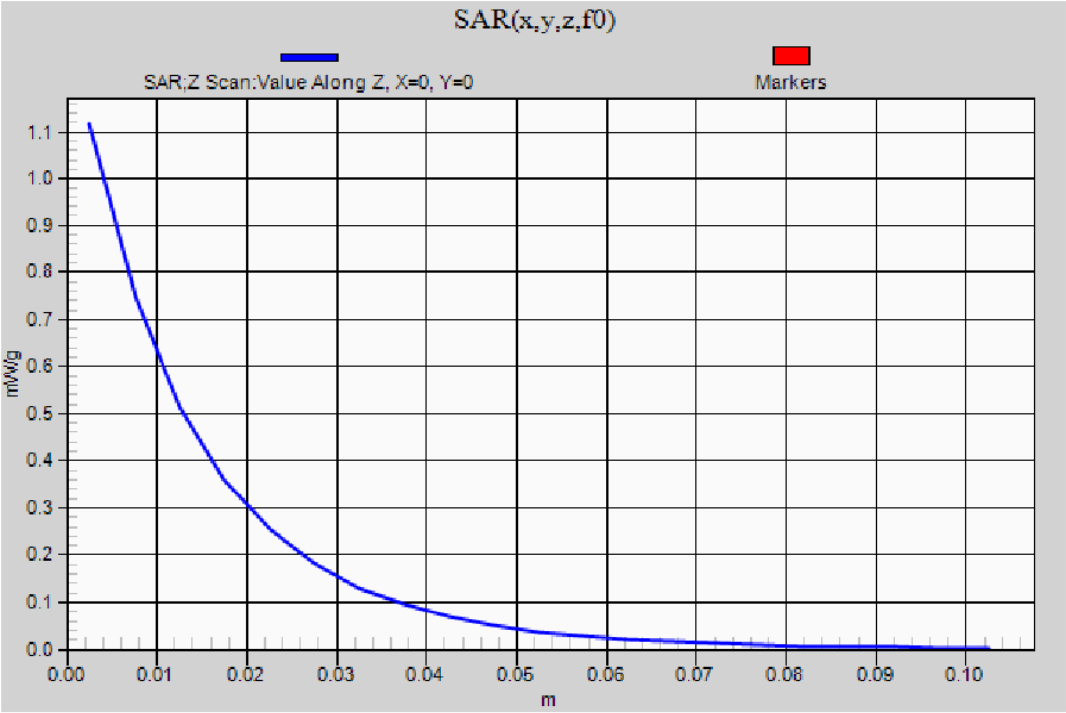
Test Laboratory: UL CCS

Cell band

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN: 4d002

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

System Check D835V2 SN 4d002/Pin=100 mW/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.117 mW/g



SYSTEM CHECK PLOT for D1900V2

Date/Time: 2/4/2011 9:24:57 AM

Test Laboratory: Compliance Certification Services (UL CCS)

System Performance Check - D1900V2

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

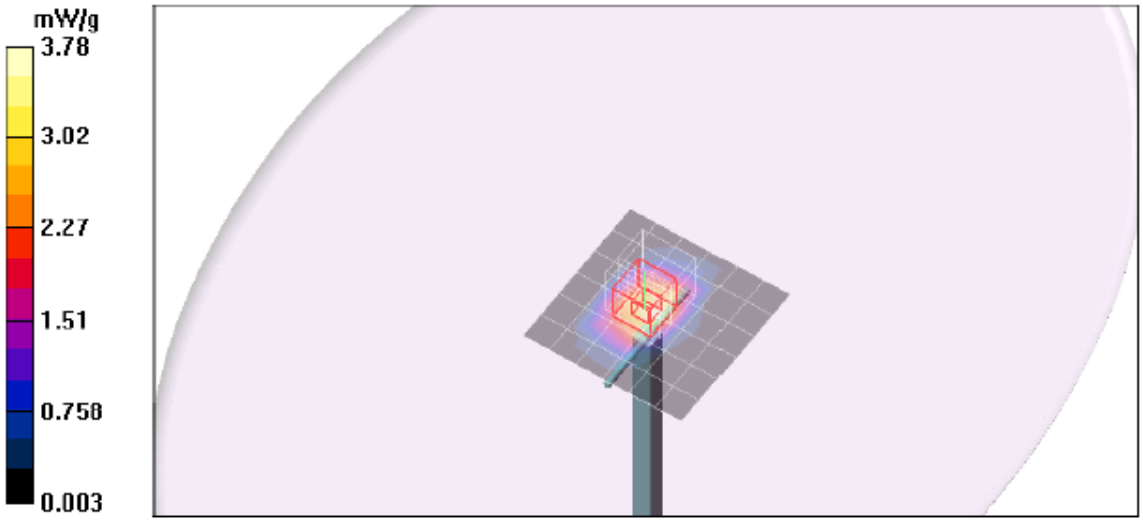
Communication System: System Check Signal - CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.49 mho/m; ε_r = 51.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

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) = 3.78 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.3 V/m; Power Drift = -0.002 dB
Peak SAR (extrapolated) = 7.38 W/kg
SAR(1 g) = 3.97 mW/g; SAR(10 g) = 2.05 mW/g
Maximum value of SAR (measured) = 5.06 mW/g



Z-Axis PLOT for D1900V2

Date/Time: 2/4/2011 9:40:45 AM

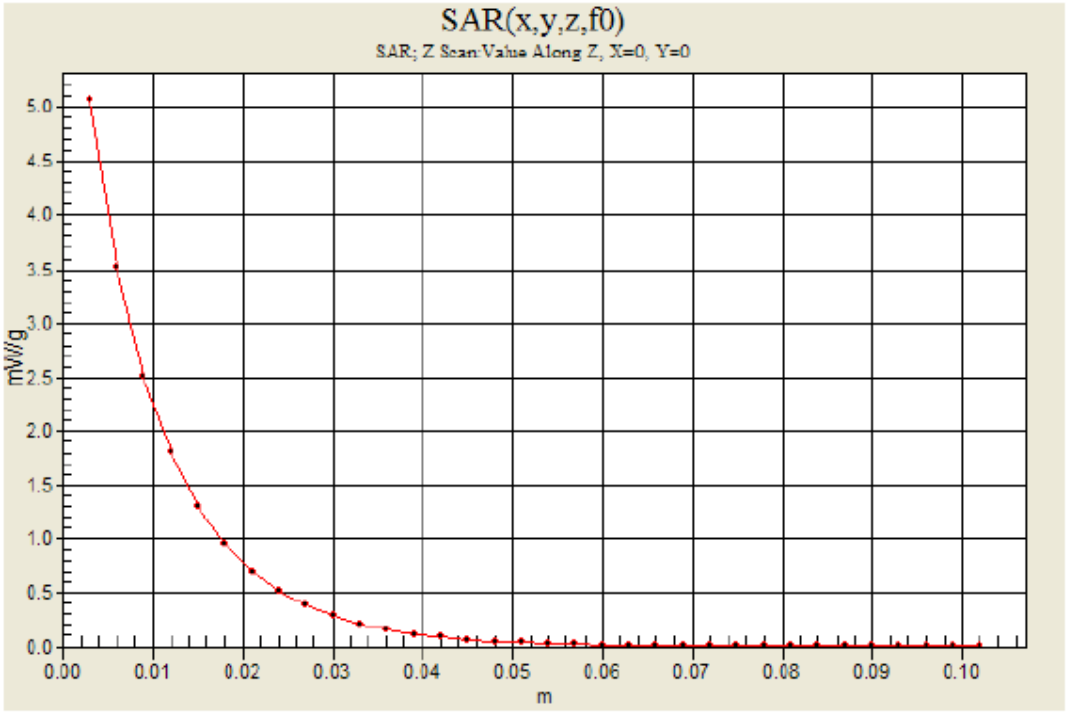
Test Laboratory: Compliance Certification Services (UL CCS)

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) = 5.07 mW/g



SYSTEM CHECK plot for D2450V2

Date/Time: 2/5/2011 7:51:01 AM, Date/Time: 2/5/2011 7:54:35 AM

Test Laboratory: UL CCS

System Performance Check

DUT: D2450V2; Type: D2450V2; Serial: 706

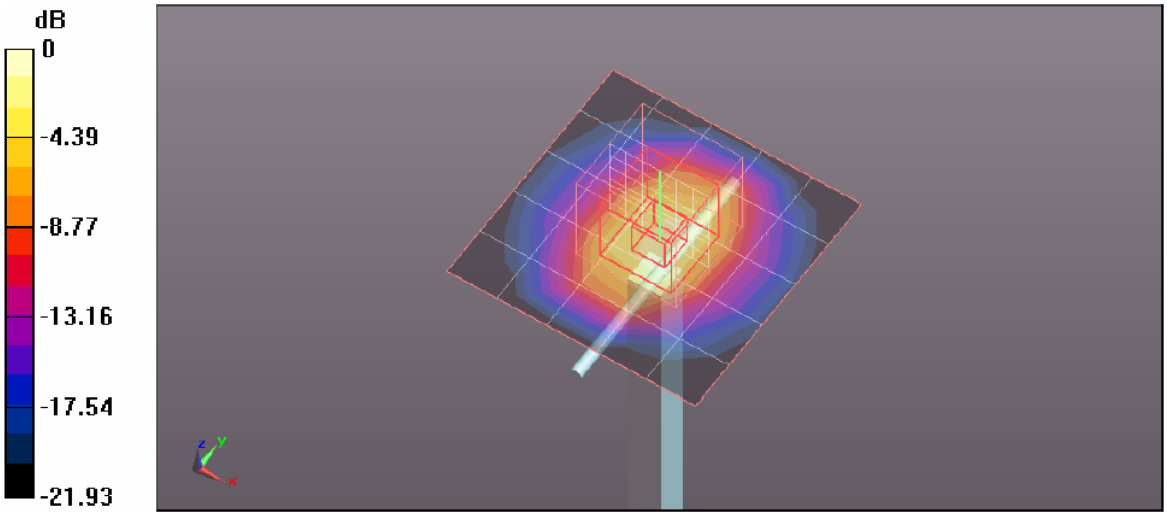
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.984 mho/m; ε_r = 51.257; ρ = 1000 kg/m^3
Phantom section: Flat Section

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 (EX-Probe)/Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.539 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 = 64.074 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 10.888 W/kg
SAR(1 g) = 5.3 mW/g; SAR(10 g) = 2.45 mW/g
Maximum value of SAR (measured) = 8.110 mW/g



0 dB = 8.110mW/g

Z-Axis Plot for D2450V2

Date/Time: 2/5/2011 8:12:00 AM

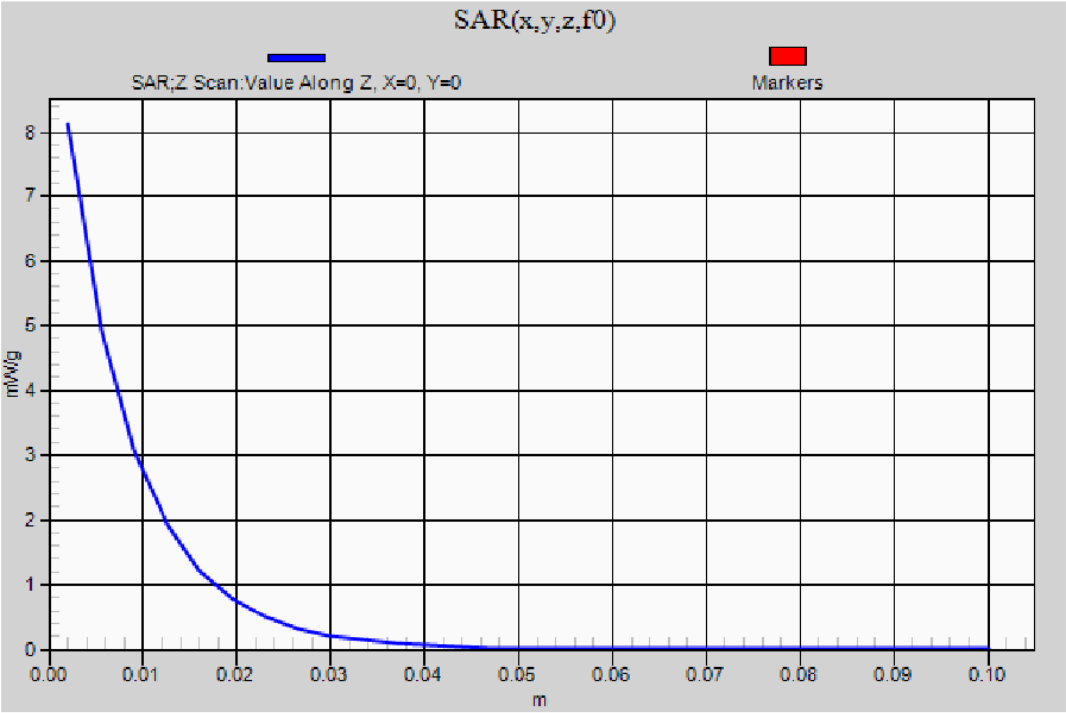
Test Laboratory: UL CCS

System Performance Check

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) = 8.119 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. GSM850 and GSM1900

GSM (GMSK)

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)
GSM850	128	824.2	32.5
	190	836.6	32.5
	251	848.8	32.7
GSM1900	512	1850.2	29.7
	661	1880	29.7
	810	1909.8	30.0

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	32.5	23.5	32.5	26.5
	190	836.6	32.5	23.5	32.5	26.5
	251	848.8	32.7	23.7	32.7	26.7
GSM1900	512	1850.2	29.7	20.7	29.7	23.7
	661	1880	29.7	20.7	29.7	23.7
	810	1909.8	30.0	21.0	29.9	23.9

Note: Worst-case mode for Multi-slot class

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

11.2. WIFI RF OUTPUT POWER

802.11b			
Channel #	Freq. (MHz)	Conducted Avg Power	
		(dBm)	(mW)
1	2412	15.89	38.8
6	2437	15.72	37.3
11	2462	15.68	37.0
802.11g			
1	2412	11.64	14.6
6	2437	11.65	14.6
11	2462	11.59	14.4

Note: Per 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.

11.3. BLUETOOTH RF OUTPUT POWER

GFSK

Channel #	Freq. (MHz)	Conducted Avg Power	
		(dBm)	(mW)
0	2402	0.42	1.1
39	2442	0.51	1.1
78	2480	0.21	1.0

8PSK

Channel #	Freq. (MHz)	Conducted Avg Power	
		(dBm)	(mW)
0	2402	-4.07	0.4
39	2442	-3.88	0.4
78	2480	-4.30	0.4

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

☐ Output ≤ $2 \cdot P_{Ref}$ (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	128	824.2	0.801	0.592
			190	836.6	**0.821**	0.606
			251	848.8	0.817	0.604
		Tilt (15°C)	128	824.2		
			190	836.6	0.427	0.320
			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	128	824.2		
			190	836.6	0.697	0.516
			251	848.8		
		Tilt (15°C)	128	824.2		
			190	836.6	0.367	0.277
			251	848.8		

Body with 1.5 cm separation distance

Band	Mode	Test position	Ch No.	Freq. (MHz)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 2 slots	Face up	128	824.2	0.839	0.614
			190	836.6	0.947	0.678
			251	848.8	0.971	0.712
		Face down	128	824.2	1.070	0.768
			190	836.6	1.170	0.841
			251	848.8	**1.190**	0.834
		w/ headset	251	848.8	0.870	0.627

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 slot, GPRS850 2 time slots was chosen for Body SAR testing.

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	512	1850.2	**1.130**	0.688
			661	1880.0	0.840	0.509
			810	1909.8	0.675	0.405
		Tilt (15°C)	512	1850.2		
			661	1880.0	0.133	0.075
			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	512	1850.2		
			661	1880.0	0.563	0.361
			810	1909.8		
		Tilt (15°C)	512	1850.2		
			661	1880.0	0.201	0.112
			810	1909.8		

Body with 1.5 cm separation distance

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	0.507	0.320
			810	1909.8		
		Face down	512	1850.2		
			661	1880.0	**0.613**	0.375
			810	1909.8		
		w/ headset	810	1909.8	0.549	0.330

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 slot, GPRS1900 2 time slots was chosen for Body SAR testing.

12.3. WIFI

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	**0.065**	**0.034**
			11	2462		
		w/ headset	6	2437	0.031	0.015
		Face down	1	2412		
			6	2437	0.031	0.014
			11	2462		

Note: Per KDB 248227, SAR is not required for 802.11g 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.

13. WORST-CASE SAR TEST PLOTS

Worst-case Head SAR plot for part 22H

Date/Time: 2/6/2011 11:38:19 PM

Test Laboratory: UL CCS

GSM850_Left Hand Side_Middle_Channel

DUT: Samsung; Type: NA; Serial: NA

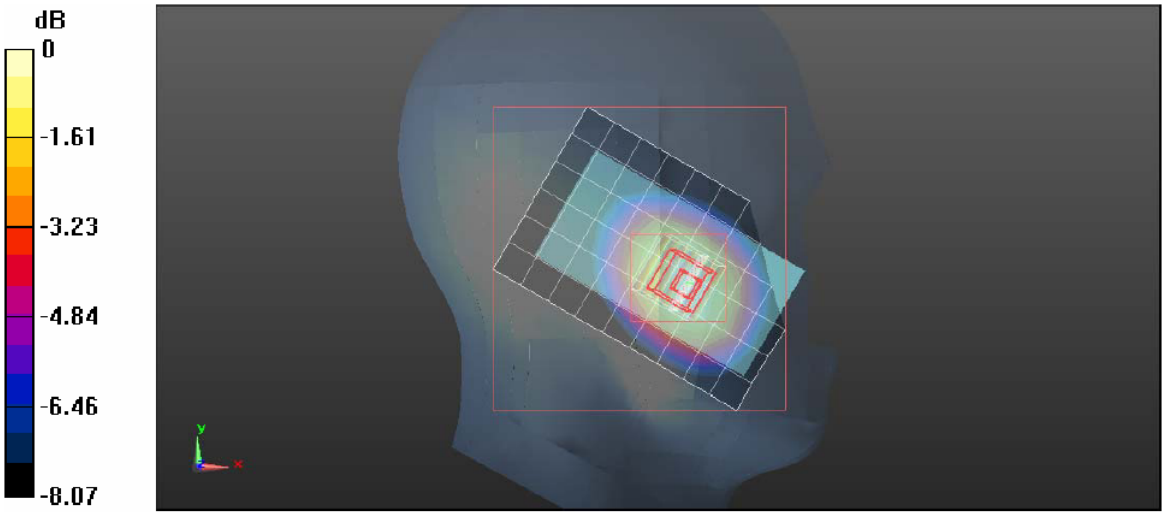
Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:8.00018
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.895 mho/m; ε_r = 42.215; ρ = 1000 kg/m^3
Phantom section: Left Section

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(10.13, 10.13, 10.13); Calibrated: 2/23/2010
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: SAM with CRP; Type: SAM; Serial: 1602
- Measurement SW: DASY52, Version 52.6 (1);SEMCAD X Version 14.4.2 (2595)

LHS/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) = 0.879 mW/g

LHS/Touch_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 31.488 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.051 W/kg
SAR(1 g) = 0.821 mW/g; SAR(10 g) = 0.606 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.932 mW/g



0 dB = 0.930mW/g

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

Date/Time: 2/6/2011 11:56:28 PM

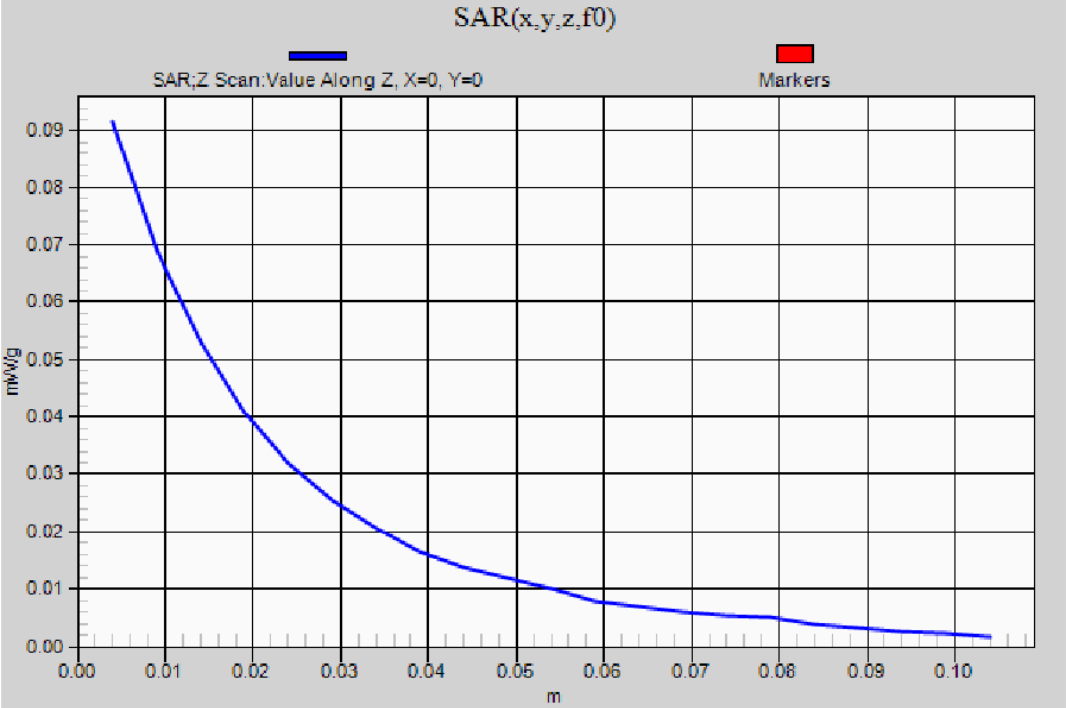
Test Laboratory: UL CCS

GSM850_Left Hand Side_Middle_Channel

DUT: Samsung; Type: NA; Serial: NA

Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:8.00018

LHS/Touch_M-ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.092 mW/g



Worst-case Body SAR plot for part 22H

Date/Time: 2/6/2011 8:46:17 PM

Test Laboratory: UL CCS

GSM850_Body_High_Channel

DUT: Samsung; Type: NA; Serial: NA

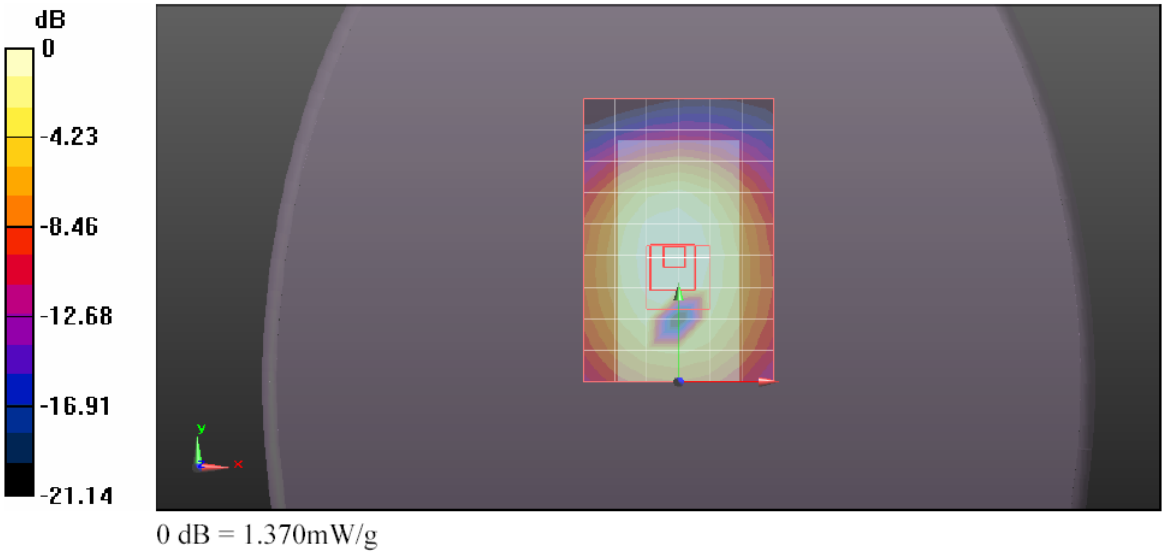
Communication System: GPRS Class 10; Frequency: 848.8 MHz;Duty Cycle: 1:4.00037
Medium parameters used (interpolated): f = 848.8 MHz; σ = 1 mho/m; ε_r = 56.337; ρ = 1000 kg/m^3
Phantom section: Flat Section

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(10.18, 10.18, 10.18); Calibrated: 2/23/2010
- Sensor-Surface: 2.5mm (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)

Face Down_H-ch/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.383 mW/g

Face Down_H-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 37.344 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 3.055 W/kg
SAR(1 g) = 1.19 mW/g; SAR(10 g) = 0.834 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.367 mW/g



0 dB = 1.370mW/g

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

Date/Time: 2/6/2011 9:04:20 PM

Test Laboratory: UL CCS

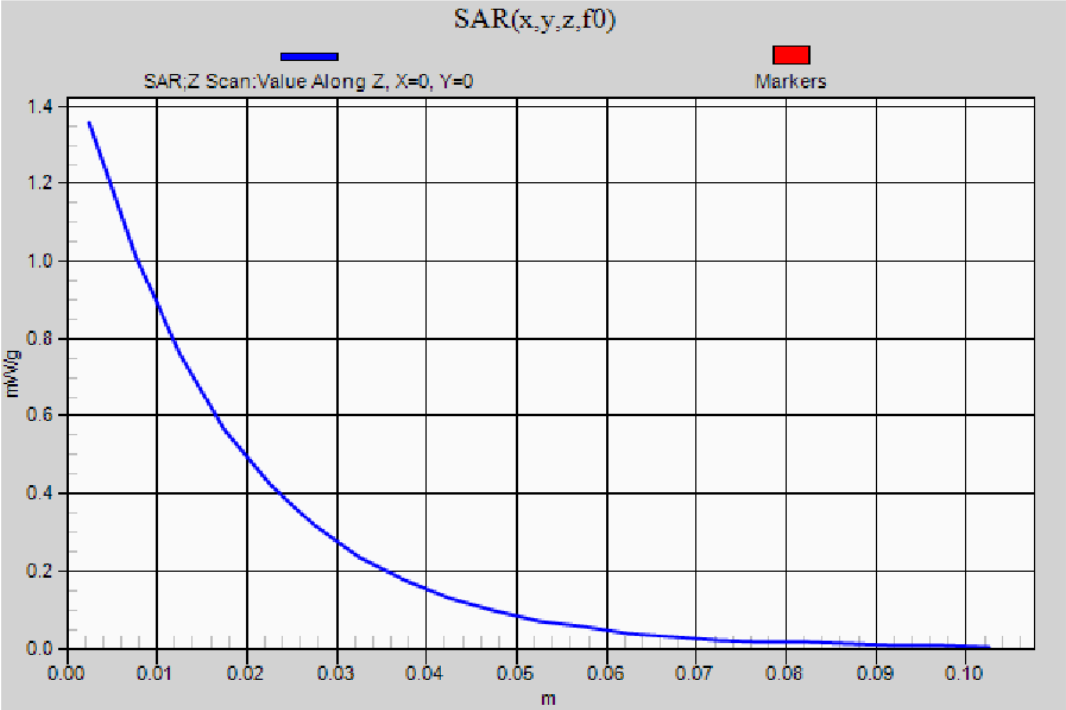
GSM850_Body_High_Channel

DUT: Samsung; Type: NA; Serial: NA

Communication System: GPRS Class 10; Frequency: 848.8 MHz;Duty Cycle: 1:4.00037

Face Down_H-ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.357 mW/g



Worst-case Head SAR plot for part 24E

Date/Time: 2/4/2011 11:50:53 AM

Test Laboratory: Compliance Certification Services (UL CCS)

GSM1900_Left Hand Side

DUT: Samsung; Type: NA; Serial: NA

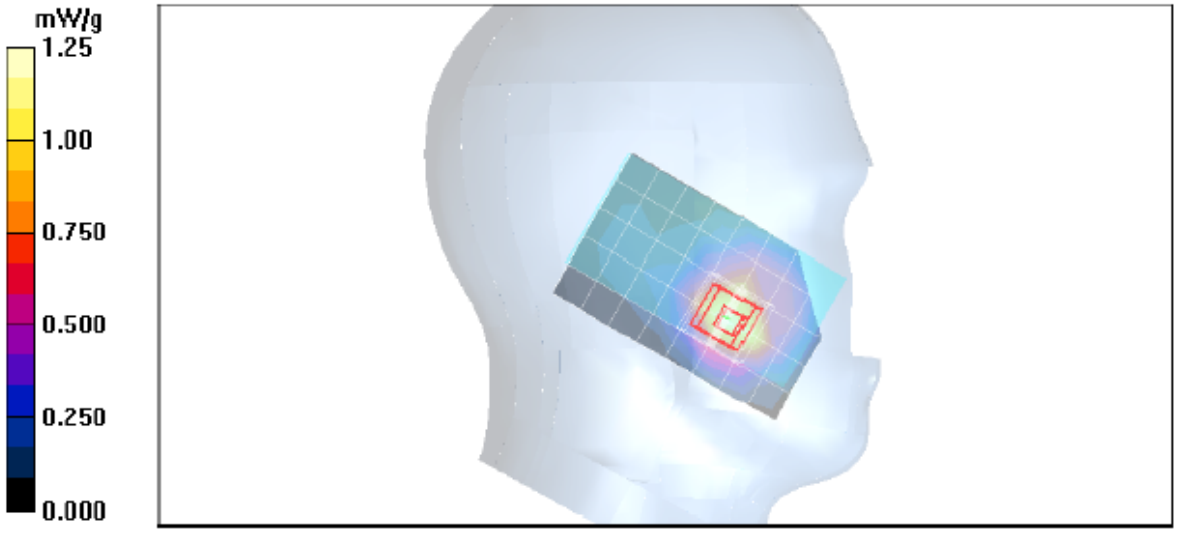
Communication System: PCS1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.39 mho/m; ε_r = 40; ρ = 1000 kg/m^3
Phantom section: Left Section

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

DASY4 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3749; ConvF(7.36, 7.36, 7.36); 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

Touch_L-ch/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.25 mW/g

Touch_L-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 30.6 V/m; Power Drift = -0.015 dB
Peak SAR (extrapolated) = 1.66 W/kg
SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.688 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.33 mW/g



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

Date/Time: 2/4/2011 12:11:36 PM

Test Laboratory: Compliance Certification Services (UL CCS)

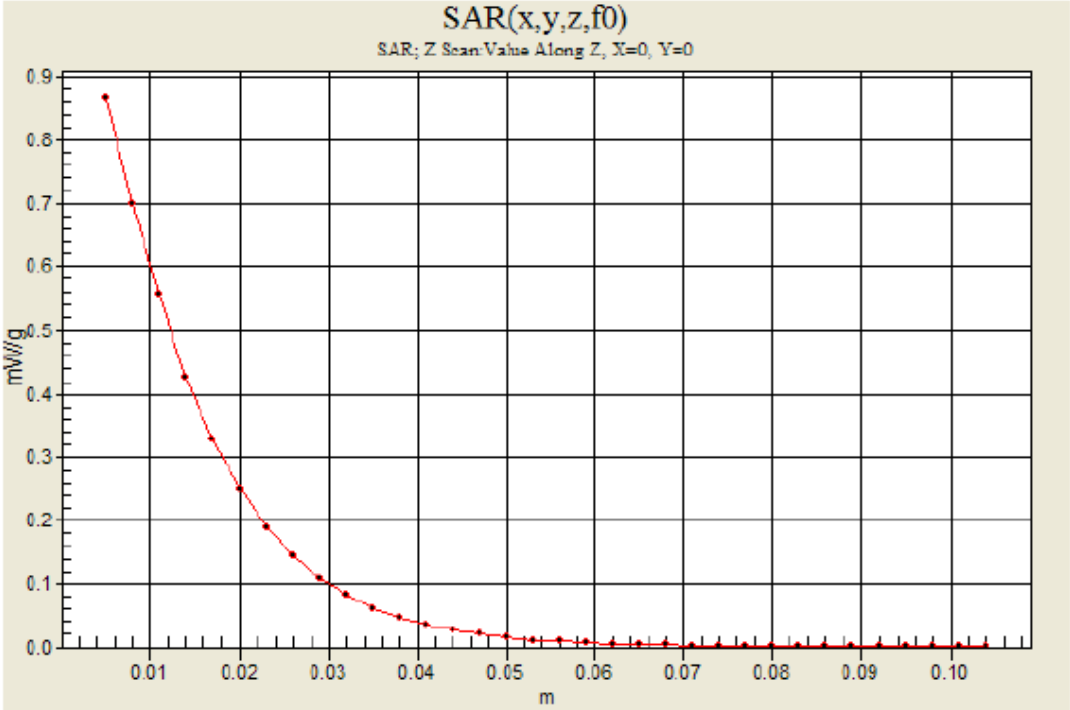
GSM1900_Left Hand Side

DUT: Samsung; Type: NA; Serial: NA

Communication System: PCS1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8

Touch_L-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) = 0.867 mW/g



Worst-case Body SAR plot for part 24E

Date/Time: 2/4/2011 2:02:04 PM

Test Laboratory: Compliance Certification Services (UL CCS)

GSM1900_Body

DUT: Samsung; Type: NA; Serial: NA

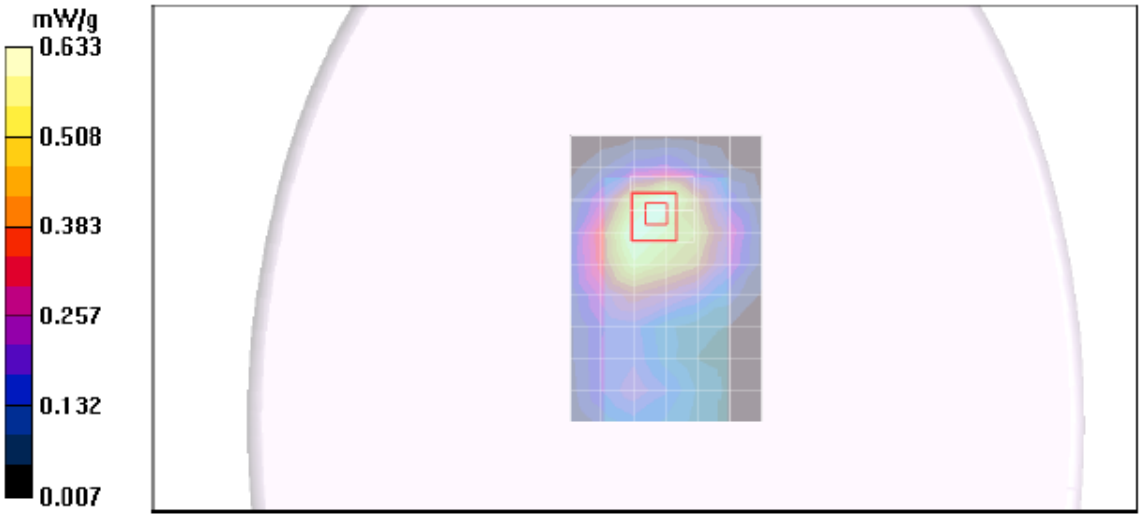
Communication System: PCS1900; Frequency: 1880 MHz;Duty Cycle: 1:4
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

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: DAE not calibrated
- 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 (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.633 mW/g

Face down_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 9.49 V/m; Power Drift = 0.180 dB
Peak SAR (extrapolated) = 0.947 W/kg
SAR(1 g) = 0.613 mW/g; SAR(10 g) = 0.375 mW/g
Maximum value of SAR (measured) = 0.721 mW/g



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

Date/Time: 2/4/2011 2:23:27 PM

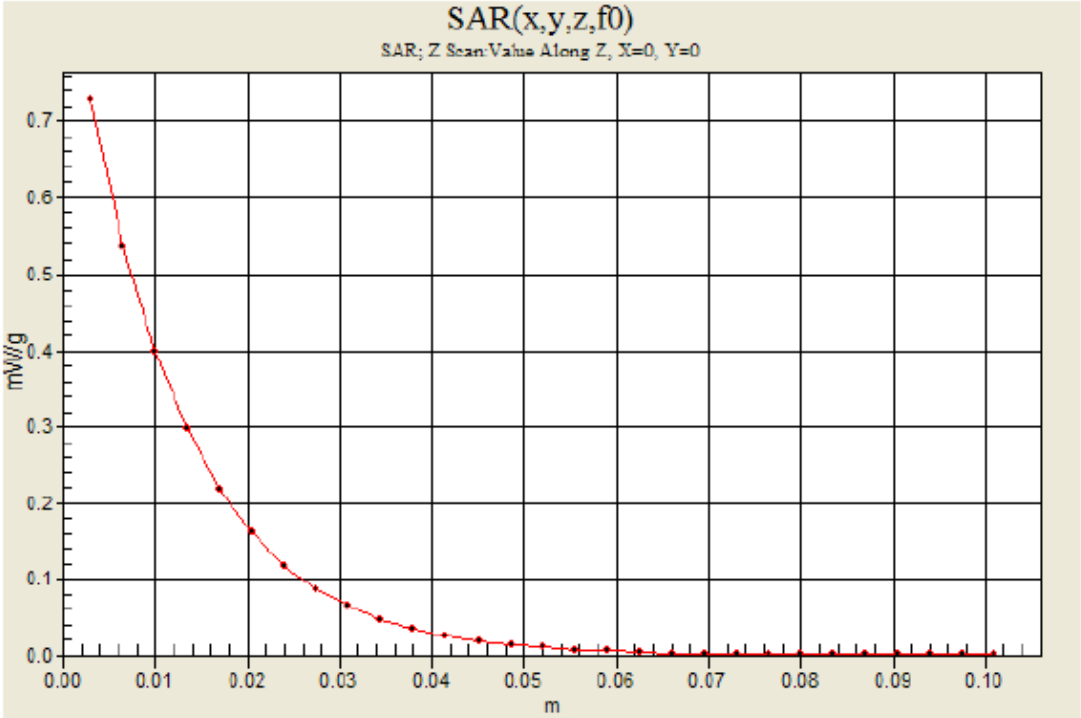
Test Laboratory: Compliance Certification Services (UL CCS)

GSM1900_Body

DUT: Samsung; Type: NA; Serial: NA

Communication System: PCS1900; Frequency: 1880 MHz;Duty Cycle: 1:4

Face down_M-ch/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm
Maximum value of SAR (measured) = 0.729 mW/g



Worst-case Body SAR plot for part 15 C

Date/Time: 2/5/2011 12:51:06 PM, Date/Time: 2/5/2011 12:58:44 PM, Date/Time: 2/5/2011 1:26:37 PM

Test Laboratory: UL CCS

Body worn

DUT: Samsung; Type: NA; Serial: NA

Communication System: 802.11b/g 2.4GHz; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.916 mho/m; ε_r = 51.132; ρ = 1000 kg/m^3
Phantom section: Flat Section

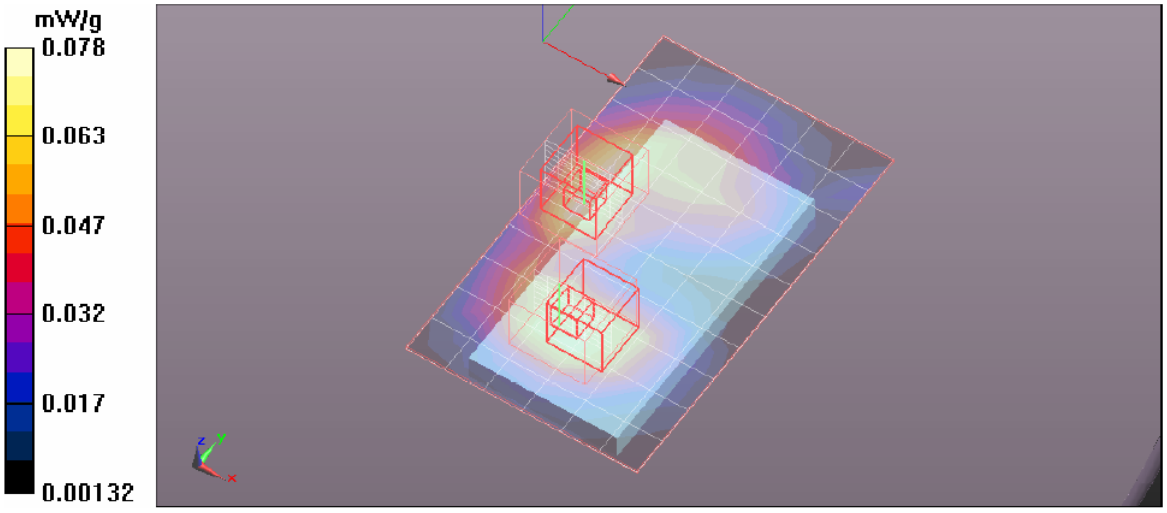
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

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: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- Measurement SW: DASY52, Version 52.6 (1);SEMCAD X Version 14.4.2 (2595)

Face up/11b_M-ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.078 mW/g

Face up/11b_M-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 6.344 V/m; Power Drift = 0.0061 dB
Peak SAR (extrapolated) = 0.122 W/kg
SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.034 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.086 mW/g

Face up/11b_M-ch/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 6.344 V/m; Power Drift = 0.0061 dB
Peak SAR (extrapolated) = 0.161 W/kg
SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.028 mW/g
Info: Interpolated medium parameters used for SAR evaluation.



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

Date/Time: 2/5/2011 1:47:25 PM

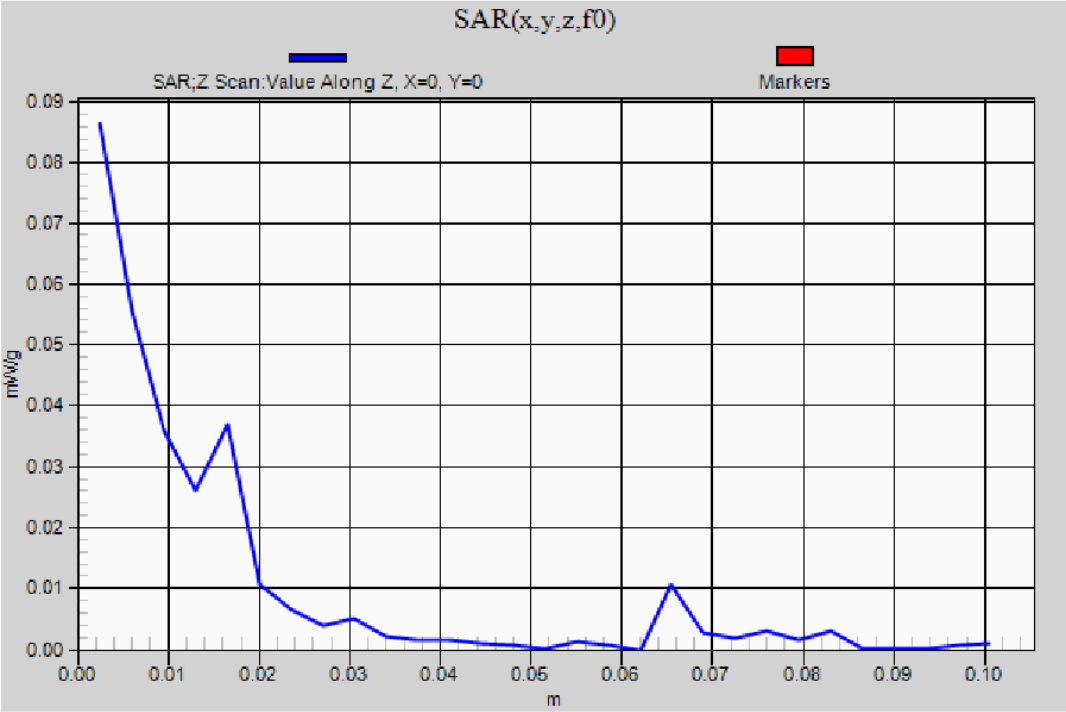
Test Laboratory: UL CCS

Body worn

DUT: Samsung; Type: NA; Serial: NA

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

Face up/11b_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) = 0.086 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 < P_{Ref} (12 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 + WiFi (Highset 1g SAR for WWAN vs WiFi)						
Tes position	Highest 1-g SAR (W/kg)			∑ 1g SAR (W/kg)	SAR to peak location	
	WWAN		WiFi 2.4G		Separation (cm)	Ratio
Body (Face Down w/ 1.5 cm)	GPRS850	1.190	0.065	1.255	n/a	n/a
	GPRS1900	0.613				
WiFi + WWAN (Highset 1g SAR for WiFi vs WWAN)						
Tes position	Highest 1-g SAR (W/kg)			∑ 1g SAR (W/kg)	SAR to peak location	
	WiFi 2.4G	WWAN			Separation (cm)	Ratio
Body (Face up) w/ 1.5 cm	0.065	GSM850	0.971	1.036	n/a	n/a
		GSM1900	0.507	0.572	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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