FCC OET BULLETIN 65 SUPPLEMENT C
IEEE STD 1528:2003
RSS-102 Issue 4, March 2010

SAR EVALUATION REPORT

For

USB Modem

MODEL: AIRCARD 313U

FCC ID: N7NAC313U

IC: 2417C-AC313U

REPORT NUMBER: 10U13530-1D

ISSUE DATE: June 2, 2011

Prepared for

SIERRA WIRELESS INC.
13811 WIRELESS WAY
RICHMOND, BC, V6V 3A4, CANADA

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	February 1, 2011	Initial issue	--
A	February 7, 2011	Updated setup photos with 1.0 cm separation distance.	Sunny Shih
B	March 18, 2011	Revised based on FCC review comments, includes the following. • Added note "w/ 5 mm separation distance from EUT-to-flat phantom" into each test configuration. • Added 700 MHz and 1700 MHz tissue ingredients in section 6. • Added note "GPRS Multi-slot class 10 for GPRS mode and class 12 for EGPRS mode" in section 11.1 • Added additional data (impedance & return loss) to qualify for extended calibration interval for dipole "D835V2 SN 4d002" • Updated power table in section 10.5	Sunny Shih
C	May 12, 2011	Revised based on FCC review comments, includes the following. • Additional SAR tests for LTE 16QAM and UMTS band V • Updated measuring equipment table in section 4.1	Sunny Shih
C1	May 13, 2011	Added IC rule part "RSS-139" in section 1.	Sunny Shih
D	June 2, 2011	Additional tested with 50% RB for LTE portion	Sunny Shih

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1. ATTESTATION OF TEST RESULTS

Applicant:	Sierra Wireless Inc. 13811 Wireless Way Richmond, BC, V6V 3A4, Canada		
EUT description:	USB Modem		
Model number:	AIRCARD 313U		
Device category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	November 30 - December 16, 2010 April 22-26, 2011 (Additional SAR tests for LTE 16QAM and UMTS band V) May 26 - June 2, 2011		
FCC / IC Rule Parts	Freq. Range [MHz]	The Highest 1g SAR (w/ 5 mm separation distance from EUT-to-flat phantom)	Limit (mW/g)
22H/RSS-132	824 - 849	1.02 mW/g (USB Horizontal-down)	1.6
24E/RSS-133	1850 - 1910	1.55 mW/g (USB Horizontal-down)	
27/RSS-139 (Band 17)	706.5 - 713.5	0.325 mW/g (USB Horizontal-down)	
27/RSS-139 (Band 4)	1712.5 - 1752.5	1.52 mW/g (USB Horizontal-down)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, RSS-102 Issue 4, March 2010 IEEE STD 1528:2003			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 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, IEEE STD 1528:2003, RSS-102 Issue 4, March 2010 and the following specific FCC Test Procedures.

- KDB 447498 D01 Mobile Portable RF Exposure v04
- KDB 447498 D02 SAR Procedures for Dongle Xmtr v02
- KDB 941225 D01 SAR test for 3G devices v02
- KDB 941225 D05 SAR for LTE Devices v01

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	E5071B	MY42100131	8	2	2011
E-Field Probe	SPEAG	EX3DV3	3531	2	23	2011
E-Field Probe	SPEAG	EX3DV3	3508	2	19	2011
E-Field Probe	SPEAG	EX3DV4	3749	12	13	2011
E-Field Probe	SPEAG	EX3DV4	3751	12	13	2011
Thermometer	ERTCO	639-1S	1718	4	30	2011
Data Acquisition Electronics	SPEAG	DAE3 V1	427	7	21	2011
System Validation Dipole	SPEAG	D750V3	1011	2	8	2011
System Validation Dipole	SPEAG	D835V2*	4d002	4	23	2010
System Validation Dipole	SPEAG	D750V3	1019	12	16	2011
System Validation Dipole	SPEAG	D835V2	4d002	4	4	2011
System Validation Dipole	SPEAG	D1800V2*	294	11	24	2011
System Validation Dipole	SPEAG	D1900V2*	5d043	11	24	2011
Radio Communication Tester	R&S	CMU200	106291	8	27	2011
Radio Communication Tester	R&S	CMW500	102607	10	21	2011
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	M750	N/A	Within 24 hrs of first test		

Notes:

*: Per KDB 450824 D02 requirements for dipole calibration, 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 are included in the attachment files for each of Dipole)
4. Impedance is within 5Ω of calibrated measurement (test data are included in the attachment files for each of Dipole)

4.2. MEASUREMENT UNCERTAINTY

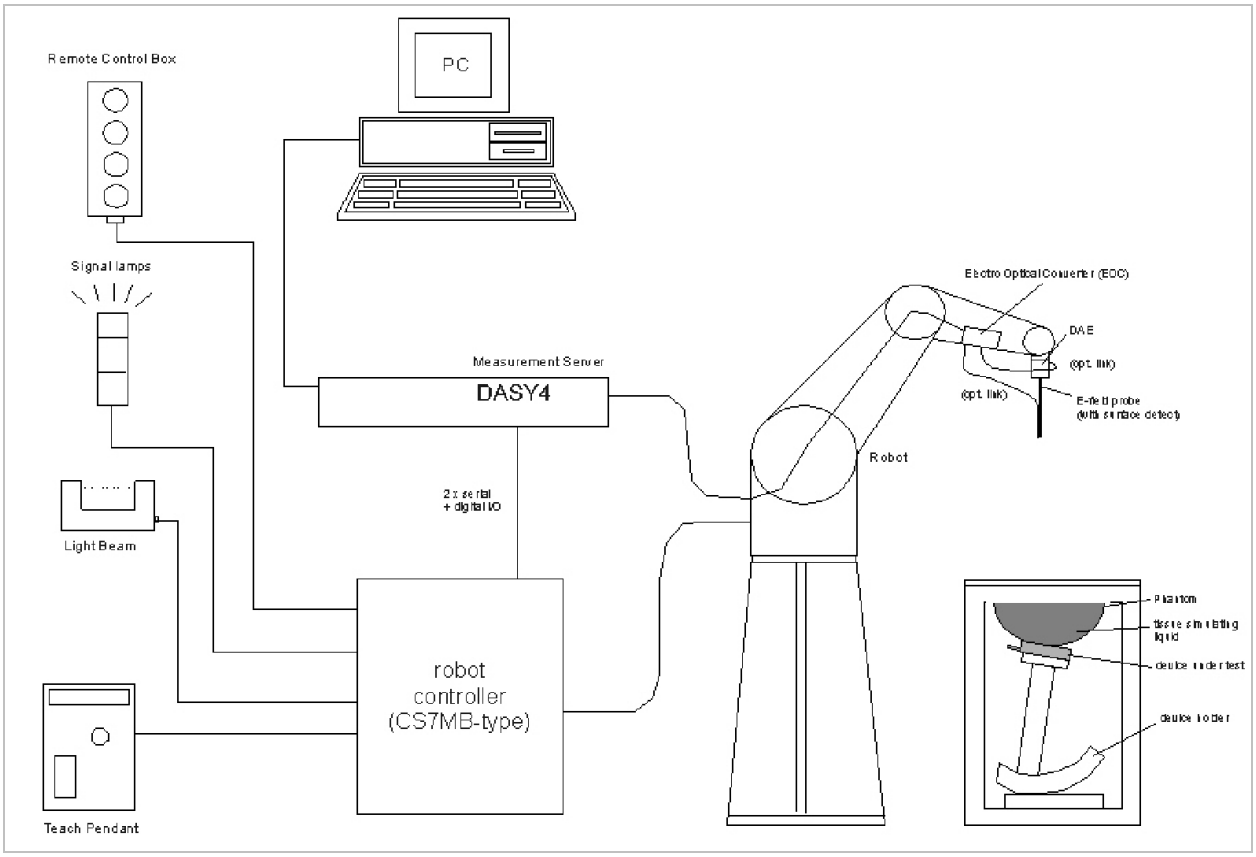
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

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 (1730MHz Body)	3.80	Normal	1	0.64	2.43
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement (1900MHz Body)	-1.75	Normal	1	0.6	-1.05
Combined Standard Uncertainty Uc(y) =					9.80
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				19.61	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.56	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 (1730MHz Body)	3.80	Normal	1	0.43	1.63
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.49	1.41
Liquid Permittivity - measurement (1900MHz Body)	-1.75	Normal	1	0.49	-0.86
Combined Standard Uncertainty Uc(y), % =					9.47
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				18.94	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.51	dB

5. 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.

6. 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

MSL/HSL750 (Body and Head liquids for 700 – 800 MHz)

Item	Head Tissue Simulation Liquids HSL750 Muscle (body) Tissue Simulation Liquids HSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H^2O	Water, 35 – 58%
Sucrese	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethel-cellulsoe	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1-0.7%

MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

Item	Head Tissue Simulation Liquids HSL1750 Muscle (body) Tissue Simulation Liquids HSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H^2O	Water, 52 – 75%
C8H18O3	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

7. TISSUE DIELECTRIC PARAMETERS

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 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

The body tissue parameters that have not been specified in IEEE Std 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Std 1528.

Target Frequency (MHz)	Body	
	Dielectric Constant	Conductivity (S/m)
150	61.9	0.8
300	58.2	0.92
450	56.7	0.94
750	55.5	0.96
835	55.2	0.97
900	55	1.05
915	55	1.06
1450	54	1.3
1610	53.8	1.4
1730	53.5	1.47
1800 – 2000	53.3	1.52
2450	52.7	1.95

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

7.1. TISSUE PARAMETERS CHECK RESULTS

Simulating Liquid Dielectric Parameters for Body 1900 MHz Measured by: David Lee

f (MHz)	Muscle Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1900	e'	52.398	Relative Permittivity (ϵ_r):	52.3981	53.3	-1.69	± 5
	e''	14.667	Conductivity (σ):	1.55034	1.52	2.00	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
November 30, 2010 09:41 AM

Frequency	e'	e''
1710000000.	53.3920	14.0388
1720000000.	53.3750	14.0583
1730000000.	53.3161	14.0777
1740000000.	53.2162	14.1074
1750000000.	53.0985	14.1428
1760000000.	52.9826	14.1847
1770000000.	52.8883	14.2271
1780000000.	52.8369	14.2785
1790000000.	52.8280	14.3277
1800000000.	52.8564	14.3717
1810000000.	52.9028	14.4059
1820000000.	52.9462	14.4350
1830000000.	52.9607	14.4551
1840000000.	52.9347	14.4727
1850000000.	52.8647	14.4916
1860000000.	52.7590	14.5137
1870000000.	52.6387	14.5399
1880000000.	52.5248	14.5793
1890000000.	52.4381	14.6234
1900000000.	**52.3981**	**14.6674**
1910000000.	52.4040	14.7125

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: David Lee

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
835	e'	55.01	Relative Permittivity (ϵ_r):	55.008	55.2	-0.35	± 5
	e''	21.44	Conductivity (σ):	0.996	0.97	2.68	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%
December 01, 2010 10:47 AM

Frequency	e'	e''
800000000.	55.3546	21.5511
805000000.	55.2966	21.5380
810000000.	55.2536	21.5263
815000000.	55.2017	21.5279
820000000.	55.1498	21.5044
825000000.	55.1013	21.4905
830000000.	55.0510	21.4700
835000000.	**55.0084**	**21.4404**
840000000.	54.9598	21.4162
845000000.	54.9201	21.3850
850000000.	54.8754	21.3490
855000000.	54.8369	21.3217
860000000.	54.7992	21.2801
865000000.	54.7484	21.2478
870000000.	54.7004	21.2208
875000000.	54.6605	21.1867
880000000.	54.6125	21.1594
885000000.	54.5627	21.1407
890000000.	54.5128	21.1225
895000000.	54.4583	21.1067
900000000.	54.4022	21.0928
905000000.	54.3484	21.0887
910000000.	54.2987	21.0832
915000000.	54.2449	21.0789
920000000.	54.1898	21.0756
925000000.	54.1329	21.0659
930000000.	54.0881	21.0642
935000000.	54.0349	21.0539
940000000.	53.9954	21.0435
945000000.	53.9488	21.0268
950000000.	53.9102	21.0107

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 1730 MHz Measured by: David Lee

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1730	e'	53.0	Relative Permittivity (ϵ_r):	52.973	53.5	-0.97	± 5
	e''	15.7	Conductivity (σ):	1.510	1.47	2.75	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
December 03, 2010 08:11 AM

Frequency	e'	e''
1710000000.	53.0698	15.6465
1720000000.	53.0189	15.6687
1730000000.	**52.9725**	**15.6940**
1740000000.	52.9266	15.7233
1750000000.	52.8824	15.7521
1760000000.	52.8468	15.7784
1770000000.	52.8161	15.7984
1780000000.	52.7904	15.8113
1790000000.	52.7665	15.8252
1800000000.	52.7366	15.8343
1810000000.	52.6996	15.8473
1820000000.	52.6570	15.8614
1830000000.	52.6110	15.8794
1840000000.	52.5616	15.9028
1850000000.	52.5191	15.9237
1860000000.	52.4777	15.9485
1870000000.	52.4415	15.9669
1880000000.	52.4122	15.9815
1890000000.	52.3875	15.9945
1900000000.	52.3652	16.0039
1910000000.	52.3441	16.0088

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 1730 MHz Measured by: David Lee

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1730	e'	52.68	Relative Permittivity (ϵ_r):	52.681	53.5	-1.51	± 5
	e''	15.65	Conductivity (σ):	1.506	1.47	2.45	± 5
1800	e'	52.50	Relative Permittivity (ϵ_r):	52.500	53.3	-1.50	± 5
	e''	15.76	Conductivity (σ):	1.578	1.52	3.80	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
December 06, 2010 06:15 AM

Frequency	e'	e''
1710000000.	52.7055	15.5158
1720000000.	52.6804	15.5748
1730000000.	**52.6808**	**15.6485**
1740000000.	52.6950	15.7239
1750000000.	52.7142	15.7824
1760000000.	52.7225	15.8221
1770000000.	52.7023	15.8278
1780000000.	52.6597	15.8151
1790000000.	52.5870	15.7876
1800000000.	**52.5003**	**15.7567**
1810000000.	52.4103	15.7441
1820000000.	52.3313	15.7539
1830000000.	52.2731	15.7881
1840000000.	52.2417	15.8456
1850000000.	52.2398	15.9175
1860000000.	52.2562	15.9886
1870000000.	52.2720	16.0417
1880000000.	52.2814	16.0669
1890000000.	52.2704	16.0691
1900000000.	52.2293	16.0480
1910000000.	52.1637	16.0174

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 1730 MHz Measured by: David Lee

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
1730	e'	54.07	Relative Permittivity (ϵ_r):	54.067	53.5	1.08	± 5
	e''	15.56	Conductivity (σ):	1.497	1.47	1.85	± 5
1800	e'	53.89	Relative Permittivity (ϵ_r):	53.887	53.3	1.10	± 5
	e''	15.67	Conductivity (σ):	1.569	1.52	3.20	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
December 07, 2010 06:18 AM

Frequency	e'	e''
1710000000.	54.0755	15.4137
1720000000.	54.0562	15.4774
1730000000.	**54.0674**	**15.5568**
1740000000.	54.0866	15.6419
1750000000.	54.1089	15.7088
1760000000.	54.1192	15.7536
1770000000.	54.0963	15.7610
1780000000.	54.0475	15.7424
1790000000.	53.9703	15.7042
1800000000.	**53.8872**	**15.6657**
1810000000.	53.8055	15.6423
1820000000.	53.7400	15.6520
1830000000.	53.6990	15.6962
1840000000.	53.6899	15.7738
1850000000.	53.7062	15.8704
1860000000.	53.7266	15.9609
1870000000.	53.7479	16.0228
1880000000.	53.7510	16.0560
1890000000.	53.7375	16.0497
1900000000.	53.6932	16.0247
1910000000.	53.6269	15.9882

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'	52.369	Relative Permittivity (ϵ_r):	52.3687	53.3	-1.75	± 5
	e''	13.844	Conductivity (σ):	1.46331	1.52	-3.73	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
December 07, 2010 12:29 PM

Frequency	e'	e''
1710000000.	53.1918	13.4023
1720000000.	53.1627	13.4265
1730000000.	53.1072	13.4345
1740000000.	53.0253	13.4353
1750000000.	52.9310	13.4316
1760000000.	52.8445	13.4360
1770000000.	52.7749	13.4567
1780000000.	52.7386	13.4902
1790000000.	52.7342	13.5466
1800000000.	52.7542	13.6078
1810000000.	52.7832	13.6706
1820000000.	52.8033	13.7221
1830000000.	52.8036	13.7605
1840000000.	52.7730	13.7826
1850000000.	52.7097	13.7905
1860000000.	52.6260	13.7864
1870000000.	52.5331	13.7831
1880000000.	52.4485	13.7860
1890000000.	52.3924	13.8092
1900000000.	**52.3687**	**13.8441**
1910000000.	52.3788	13.8959

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 750 MHz Measured by: David Lee

f (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit (%)
710	e'	55.28	Relative Permittivity (ϵ_r):	55.275	55.7	-0.76	± 5
	e''	23.99	Conductivity (σ):	0.948	0.960	-1.30	± 5
750	e'	54.75	Relative Permittivity (ϵ_r):	54.747	55.5	-1.43	± 5
	e''	23.66	Conductivity (σ):	0.987	0.963	2.53	± 5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 35%
December 16, 2010 08:22 AM

Frequency	e'	e''
680000000.	55.5592	24.4010
685000000.	55.5177	24.3264
690000000.	55.4756	24.2505
695000000.	55.4393	24.1751
700000000.	55.3935	24.1116
705000000.	55.3378	24.0430
710000000.	**55.2752**	**23.9891**
715000000.	55.2112	23.9401
720000000.	55.1445	23.8906
725000000.	55.0782	23.8510
730000000.	55.0106	23.8061
735000000.	54.9406	23.7729
740000000.	54.8723	23.7348
745000000.	54.8069	23.6994
750000000.	**54.7474**	**23.6636**
755000000.	54.6917	23.6271
760000000.	54.6352	23.5919
765000000.	54.5877	23.5505
770000000.	54.5448	23.5059
775000000.	54.5119	23.4620
780000000.	54.4715	23.4194

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/20/2011	Body 835	e'	53.8357	Relative Permittivity (ϵ_r):	53.84	55.20	-2.47	5
		e''	21.0818	Conductivity (σ):	0.98	0.97	0.91	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 35%
April 20, 2011 10:29 AM

Frequency	e'	e''
800000000.	54.1095	21.2734
805000000.	54.0617	21.2404
810000000.	54.0111	21.2092
815000000.	53.9710	21.1747
820000000.	53.9291	21.1435
825000000.	53.8904	21.1177
830000000.	53.8611	21.0928
835000000.	**53.8357**	**21.0818**
840000000.	53.7976	21.0728
845000000.	53.7578	21.0700
850000000.	53.7146	21.0618
855000000.	53.6588	21.0563
860000000.	53.6079	21.0417
865000000.	53.5595	21.0275
870000000.	53.5054	21.0081
875000000.	53.4504	20.9908
880000000.	53.4035	20.9694
885000000.	53.3482	20.9488
890000000.	53.3012	20.9242
895000000.	53.2519	20.9052
900000000.	53.2016	20.8856
905000000.	53.1522	20.8582
910000000.	53.1057	20.8414
915000000.	53.0513	20.8260
920000000.	53.0086	20.8044
925000000.	52.9584	20.7821
930000000.	52.9123	20.7659
935000000.	52.8656	20.7478
940000000.	52.8220	20.7289
945000000.	52.7764	20.7145
950000000.	52.7293	20.6995

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/22/2011	Body 750	e'	55.6745	Relative Permittivity (ϵ_r):	55.67	55.55	0.23	5
		e''	22.8846	Conductivity (σ):	0.95	0.96	-0.91	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
April 22, 2011 08:51 AM

Frequency	e'	e''
680000000.	56.4719	23.6192
685000000.	56.4171	23.5608
690000000.	56.3666	23.5075
695000000.	56.3135	23.4506
700000000.	56.2446	23.3891
705000000.	56.1919	23.3379
710000000.	56.1361	23.2777
715000000.	56.0700	23.2211
720000000.	56.0044	23.1691
725000000.	55.9501	23.1164
730000000.	55.8957	23.0653
735000000.	55.8386	23.0158
740000000.	55.7792	22.9707
745000000.	55.7259	22.9285
750000000.	**55.6745**	**22.8846**
755000000.	55.6315	22.8425
760000000.	55.5872	22.8097
765000000.	55.5412	22.7669
770000000.	55.5032	22.7295
775000000.	55.4624	22.6916
780000000.	55.4297	22.6565

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/24/2011	Body 1730	e'	52.7225	Relative Permittivity (ϵ_r):	52.72	53.49	-1.44	5
		e''	15.4988	Conductivity (σ):	1.49	1.47	1.16	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
April 24, 2011 11:29 AM

Frequency	e'	e''
1710000000.	52.7777	15.4727
1720000000.	52.7498	15.4842
1730000000.	**52.7225**	**15.4988**
1740000000.	52.6922	15.5106
1750000000.	52.6665	15.5323
1760000000.	52.6378	15.5589
1770000000.	52.6089	15.5859
1780000000.	52.5818	15.6104
1790000000.	52.5486	15.6385
1800000000.	52.5186	15.6666
1810000000.	52.4858	15.6904
1820000000.	52.4499	15.7145
1830000000.	52.4158	15.7383
1840000000.	52.3787	15.7632
1850000000.	52.3420	15.7824
1860000000.	52.3026	15.8042
1870000000.	52.2638	15.8276
1880000000.	52.2246	15.8494
1890000000.	52.1894	15.8729
1900000000.	52.1504	15.8971
1910000000.	52.1137	15.9203

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/25/2011	Body 1730	e'	53.4310	Relative Permittivity (ϵ_r):	53.43	53.49	-0.11	5
		e''	15.6827	Conductivity (σ):	1.51	1.47	2.36	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 40%
April 25, 2011 08:45 AM

Frequency	e'	e''
1710000000.	53.4991	15.6560
1720000000.	53.4638	15.6686
1730000000.	**53.4310**	**15.6827**
1740000000.	53.3994	15.7007
1750000000.	53.3701	15.7149
1760000000.	53.3437	15.7304
1770000000.	53.3167	15.7478
1780000000.	53.2845	15.7690
1790000000.	53.2585	15.7936
1800000000.	53.2285	15.8108
1810000000.	53.1950	15.8339
1820000000.	53.1593	15.8544
1830000000.	53.1213	15.8814
1840000000.	53.0870	15.9054
1850000000.	53.0505	15.9280
1860000000.	53.0155	15.9532
1870000000.	52.9827	15.9748
1880000000.	52.9489	15.9971
1890000000.	52.9167	16.0160
1900000000.	52.8813	16.0386
1910000000.	52.8501	16.0606

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
04/26/2011	Body 1730	e'	53.3186	Relative Permittivity (ϵ_r):	53.32	53.49	-0.32	5
		e''	15.2053	Conductivity (σ):	1.46	1.47	-0.76	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 38%
April 26, 2011 07:32 AM

Frequency	e'	e''
1710000000.	53.3958	15.1589
1720000000.	53.3574	15.1815
1730000000.	53.3186	15.2053
1740000000.	53.2846	15.2278
1750000000.	53.2501	15.2548
1760000000.	53.2245	15.2756
1770000000.	53.1970	15.2986
1780000000.	53.1725	15.3206
1790000000.	53.1419	15.3363
1800000000.	**53.1090**	**15.3548**
1810000000.	53.0704	15.3702
1820000000.	53.0269	15.3879
1830000000.	52.9793	15.4049
1840000000.	52.9356	15.4195
1850000000.	52.8986	15.4386
1860000000.	52.8671	15.4560
1870000000.	52.8387	15.4730
1880000000.	52.8163	15.4889
1890000000.	52.7963	15.5076
1900000000.	52.7731	15.5237
1910000000.	52.7430	15.5394

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Measured by: Hung Thai

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
05/31/2011	Body 750	e'	55.7444	Relative Permittivity (ϵ_r):	55.74	55.55	0.36	5
		e''	22.8882	Conductivity (σ):	0.95	0.96	-0.89	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
May 31, 2011 09:32 AM

Frequency	e'	e''
680000000.	56.4544	23.5718
685000000.	56.4026	23.5192
690000000.	56.3495	23.4701
695000000.	56.2957	23.4177
700000000.	56.2420	23.3621
705000000.	56.1914	23.3143
710000000.	56.1330	23.2619
715000000.	56.0861	23.2125
720000000.	56.0337	23.1712
725000000.	55.9888	23.1209
730000000.	55.9299	23.0687
735000000.	55.8879	23.0272
740000000.	55.8390	22.9804
745000000.	55.7890	22.9305
750000000.	**55.7444**	**22.8882**
755000000.	55.7004	22.8466
760000000.	55.6561	22.7960
765000000.	55.6158	22.7458
770000000.	55.5775	22.7057
775000000.	55.5349	22.6773
780000000.	55.4901	22.6403

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Measured by: Hung Thai

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
06/01/2011	Body 750	e'	55.4250	Relative Permittivity (ϵ_r):	55.43	55.55	-0.22	5
		e''	22.8315	Conductivity (σ):	0.95	0.96	-1.14	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 39%
June 01, 2011 08:18 AM

Frequency	e'	e''
680000000.	56.1286	23.5275
685000000.	56.0792	23.4769
690000000.	56.0310	23.4165
695000000.	55.9768	23.3723
700000000.	55.9256	23.3092
705000000.	55.8718	23.2575
710000000.	55.8223	23.2030
715000000.	55.7690	23.1677
720000000.	55.7195	23.1147
725000000.	55.6667	23.0590
730000000.	55.6194	23.0111
735000000.	55.5671	22.9652
740000000.	55.5195	22.9242
745000000.	55.4772	22.8778
750000000.	**55.4250**	**22.8315**
755000000.	55.3770	22.7790
760000000.	55.3328	22.7349
765000000.	55.2857	22.6944
770000000.	55.2392	22.6472
775000000.	55.1906	22.6038
780000000.	55.1537	22.5628

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. 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 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
D750V3	D750V3-1011_Feb10	2/8/10	1g SAR:		8.96
			10g SAR:		5.92
D750V3	D750V3-1019_Dec16	12/16/10	1g SAR:	8.16	8.64
			10g SAR:	5.32	5.72
D835V2	D835V2-4d002_Apr09	4/23/09	1g SAR:	9.64	9.96
			10g SAR:	6.28	6.56
D835V2	D835V2-4d002_Apr11	4/4/11	1g SAR:	9.36	10.2
			10g SAR:	6.12	6.68
D1800V2	D1800V2-294_Nov09	11/24/09	1g SAR:	39.6	37.7
			10g SAR:	20.9	20.0
D1900V2	D1900V2-5d043_Nov09	11/24/09	1g SAR:	39.8	40.4
			10g SAR:	20.7	21.4

8.1. SYSTEM VERIFICATION RESULTS

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D1900V2	11/30/10	1g SAR:	40.0	40.4	-0.99	±10
		10g SAR:	20.8	21.4	-2.80	
D835V2	12/01/10	1g SAR:	10.1	9.96	1.41	±10
		10g SAR:	6.65	6.56	1.37	
D1800V2	12/03/10	1g SAR:	40.1	37.7	6.37	±10
		10g SAR:	20.9	20.0	4.50	
D1800V2	12/06/10	1g SAR:	39.6	37.7	5.04	±10
		10g SAR:	20.8	20.0	4.00	
D1800V2	12/07/10	1g SAR:	39.7	37.7	5.31	±10
		10g SAR:	20.8	20.0	4.00	
D1900V2	12/07/10	1g SAR:	40.7	40.4	0.74	±10
		10g SAR:	21.6	21.4	0.93	
D750V3	12/16/10	1g SAR:	8.77	8.96	-2.12	±10
		10g SAR:	5.76	5.92	-2.70	
D835V2	04/20/11	1g SAR:	10.2	10.2	0.00	±10
		10g SAR:	6.73	6.68	0.75	
D750V2	04/22/11	1g SAR:	8.49	8.64	-1.74	±10
		10g SAR:	5.64	5.72	-1.40	
D1800V2	04/24/11	1g SAR:	40.1	37.7	6.37	±10
		10g SAR:	20.9	20.0	4.50	
D1800V2	04/25/11	1g SAR:	39.5	37.7	4.77	±10
		10g SAR:	20.5	20.0	2.50	
D1800V2	04/26/11	1g SAR:	38.6	37.7	2.39	±10
		10g SAR:	20.2	20.0	1.00	
D750V2	05/31/11	1g SAR:	8.48	8.64	-1.85	±10
		10g SAR:	5.63	5.72	-1.57	
D750V2	06/01/11	1g SAR:	8.38	8.64	-3.01	±10
		10g SAR:	5.56	5.72	-2.80	

8.2. System Verification for D1800V2 at 1800 & 1750 MHz

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
D1800V2	D1800V2-294_Nov09	11/24/09	1g SAR:	39.6	37.7
			10g SAR:	20.9	20.0

8.2.1. System Verification Results

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D1800V2 **f=1800MHz**	05/12/10	1g SAR:	39.0	37.7	3.45	±10
		10g SAR:	20.3	20.0	1.50	
D1800V2 **f=1800MHz**	05/26/11	1g SAR:	37.6	37.7	-0.27	±10
		10g SAR:	19.5	20.0	-2.50	
D1800V2 **f=1800MHz**	05/27/11	1g SAR:	37.2	37.7	-1.33	±10
		10g SAR:	19.3	20.0	-3.50	

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
		Tissue:	Body			
D1800V2 **f=1750MHz**	05/12/10	1g SAR:	35.9	37.7	-4.77	±15
		10g SAR:	18.8	20.0	-6.00	
D1800V2 **f=1750MHz**	05/26/11	1g SAR:	35.2	37.7	-6.63	±15
		10g SAR:	18.4	20.0	-8.00	
D1800V2 **f=1750MHz**	05/27/11	1g SAR:	35.6	37.7	-5.57	±15
		10g SAR:	18.6	20.0	-7.00	

Note: According to KDB 450824, the alternative system verification method A. The measurement SAR should be within 15% of the manufacture calibrated target at the offset frequency.

Tissue Parameters Check Results

Measured by: David Lee

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
5/12/2011	Body 1750	e'	52.2140	Relative Permittivity (ε_r):	52.21	53.44	-2.30	5
		e''	15.7097	Conductivity (σ):	1.53	1.49	2.86	5
5/12/2011	Body 1800	e'	52.2140	Relative Permittivity (ε_r):	52.21	53.30	-2.04	5
		e''	15.7097	Conductivity (σ):	1.57	1.52	3.44	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
May 12, 2011 07:30 PM

Frequency	e'	e''
1710000000.	52.5152	15.5411
1720000000.	52.4824	15.5538
1730000000.	52.4466	15.5674
1740000000.	52.4114	15.5873
1750000000.	**52.3845**	**15.6025**
1760000000.	52.3504	15.6231
1770000000.	52.3169	15.6479
1780000000.	52.2827	15.6670
1790000000.	52.2486	15.6891
1800000000.	**52.2140**	**15.7097**
1810000000.	52.1762	15.7303
1820000000.	52.1357	15.7511
1830000000.	52.0989	15.7677
1840000000.	52.0562	15.7872
1850000000.	52.0190	15.8049
1860000000.	51.9845	15.8232
1870000000.	51.9512	15.8422
1880000000.	51.9207	15.8595
1890000000.	51.8897	15.8796
1900000000.	51.8583	15.8955
1910000000.	51.8297	15.9124

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Measured by: Hung Thai

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
05/26/2011	Body 1730	e'	54.4423	Relative Permittivity (ϵ_r):	54.44	53.49	1.78	5
		e''	15.7558	Conductivity (σ):	1.52	1.47	2.83	5
05/26/2011	Body 1750	e'	54.3560	Relative Permittivity (ϵ_r):	54.36	53.44	1.71	5
		e''	15.7981	Conductivity (σ):	1.54	1.49	3.44	5
05/26/2011	Body 1800	e'	54.1646	Relative Permittivity (ϵ_r):	54.16	53.30	1.62	5
		e''	15.8975	Conductivity (σ):	1.59	1.52	4.68	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
May 26, 2011 04:46 PM

Frequency	e'	e''
1710000000.	54.5277	15.7130
1720000000.	54.4840	15.7349
1730000000.	**54.4423**	**15.7558**
1740000000.	54.3999	15.7831
1750000000.	**54.3560**	**15.7981**
1760000000.	54.3164	15.8218
1770000000.	54.2787	15.8420
1780000000.	54.2391	15.8621
1790000000.	54.2020	15.8796
1800000000.	**54.1646**	**15.8975**
1810000000.	54.1319	15.9171
1820000000.	54.0955	15.9321
1830000000.	54.0602	15.9484
1840000000.	54.0262	15.9649
1850000000.	53.9866	15.9771
1860000000.	53.9560	15.9961
1870000000.	53.9242	16.0095
1880000000.	53.8978	16.0259
1890000000.	53.8687	16.0421
1900000000.	53.8470	16.0594
1910000000.	53.8232	16.0770

The conductivity (σ) can be given as:

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

where f = target f * 10^6

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

Measured by: Hung Thai

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
05/27/2011	Body 1730	e'	53.6454	Relative Permittivity (ϵ_r):	53.65	53.49	0.29	5
		e''	15.5666	Conductivity (σ):	1.50	1.47	1.60	5
05/27/2011	Body 1750	e'	53.5791	Relative Permittivity (ϵ_r):	53.58	53.44	0.26	5
		e''	15.6254	Conductivity (σ):	1.52	1.49	2.31	5
05/27/2011	Body 1800	e'	53.4071	Relative Permittivity (ϵ_r):	53.41	53.30	0.20	5
		e''	15.7435	Conductivity (σ):	1.58	1.52	3.66	5

Liquid Check
Ambient temperature: 24 deg. C; Liquid temperature: 23 deg. C; Relative humidity = 42%
May 27, 2011 08:40 AM

Frequency	e'	e''
1710000000.	53.6990	15.5137
1720000000.	53.6733	15.5398
1730000000.	**53.6454**	**15.5666**
1740000000.	53.6107	15.5954
1750000000.	**53.5791**	**15.6254**
1760000000.	53.5448	15.6490
1770000000.	53.5063	15.6750
1780000000.	53.4743	15.6975
1790000000.	53.4391	15.7177
1800000000.	**53.4071**	**15.7435**
1810000000.	53.3790	15.7665
1820000000.	53.3499	15.7905
1830000000.	53.3212	15.8144
1840000000.	53.2901	15.8395
1850000000.	53.2586	15.8689
1860000000.	53.2226	15.8923
1870000000.	53.1896	15.9175
1880000000.	53.1545	15.9446
1890000000.	53.1227	15.9700
1900000000.	53.0909	15.9951
1910000000.	53.0594	16.0215

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. SAR MEASUREMENT PROCEDURES

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.

10. RF OUTPUT POWER VERIFICATION

10.1. GSM

GPRS Multi-slot class: 10

GPRS (GMSK) - Coding Scheme: MCS1

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	**2 slots**	Frame Avg Pwr
GSM850	128	824.2	32.3	23.3	31.6	**25.6**
	190	836.6	32.4	23.4	32.1	**26.1**
	251	848.8	32.1	23.1	31.3	**25.3**
GSM1900	512	1850.2	29.4	20.4	27.2	**21.2**
	661	1880	29.5	20.5	27.1	**21.1**
	810	1909.8	29.3	20.3	27.2	**21.2**

EGPRS Multi-slot class: 12

EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)				Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr	3 slots	Frame Avg Pwr	4 slots	Frame Avg Pwr
GSM850	128	824.2	26.7	17.7	26.7	20.7	26.4	22.1	26.3	23.3
	190	836.6	26.3	17.3	26.2	20.2	26.6	22.3	26.2	23.2
	251	848.8	26.3	17.3	26.4	20.4	26.1	21.9	26.1	23.1
GSM1900	512	1850.2	25.1	16.1	25.1	19.1	24.7	20.4	23.5	20.5
	661	1880	25.3	16.3	25.0	19.0	24.6	20.3	23.3	20.3
	810	1909.8	25.1	16.1	25.1	19.1	24.5	20.3	23.3	20.3

Note: According to KDB 941225 D03 SAR Test Reduction GSM/GPRS/EDGE vo1, noted in the following sections indicated below may be considered to determine SAR test reduction requirements for devices operating in GSM/GPRS/EDGE modes 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 above and time slots, the following worst-case configurations were chosen for Body SAR testing.
    a. GPRS850 2 time slots
    b. GPRS1900 2 time slots

10.2. 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). RMC 12.2 kbps is used for this testing.

	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	23.30
		4182	4407	836.4	23.12
		4233	4458	846.6	23.32
UMTS1900 (Band II)	Rel 99 12.2kbps RMC	9262	9662	1852.4	22.95
		9400	9800	1880.0	22.90
		9538	9938	1907.6	22.95

10.3. UMTS HSDPA

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

	Mode	Rel5 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 5 HSDPA

Band	Mode	UL Ch No.	DL Ch No.	f (MHz)	Avg Tx Pwr (dBm)
UMTS850 (Band V)	Subtest 1	4132	4357	826.4	23.10
		4182	4407	836.4	23.01
		4233	4458	846.6	23.07
	Subtest 2	4132	4357	826.4	22.87
		4182	4407	836.4	22.73
		4233	4458	846.6	22.84
	Subtest 3	4132	4357	826.4	22.32
		4182	4407	836.4	22.40
		4233	4458	846.6	22.31
	Subtest 4	4132	4357	826.4	22.19
		4182	4407	836.4	22.23
		4233	4458	846.6	22.26
UMTS1900 (Band II)	Subtest 1	9262	9662	1852.4	22.87
		9400	9800	1880.0	22.80
		9538	9938	1907.6	22.83
	Subtest 2	9262	9662	1852.4	22.51
		9400	9800	1880.0	22.48
		9538	9938	1907.6	22.67
	Subtest 3	9262	9662	1852.4	21.98
		9400	9800	1880.0	21.98
		9538	9938	1907.6	21.83
	Subtest 4	9262	9662	1852.4	21.92
		9400	9800	1880.0	21.86
		9538	9938	1907.6	21.88

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.

10.4. UMTS Rel 6 HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2B 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	

Note: There is no specific HSPA MPR implementation. However, the HSDAP/HSUPA power never exceeds Release 99 power. Discrepancies between the measured output power Vs MPR values in above table are to be expected due to the temperature compensation for power output which is applied to all output power levels.

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	22.33
		4182	4407	836.4	22.19
		4233	4458	846.6	22.01
	Subtest 2	4132	4357	826.4	20.95
		4182	4407	836.4	20.78
		4233	4458	846.6	20.80
	Subtest 3	4132	4357	826.4	21.28
		4182	4407	836.4	21.66
		4233	4458	846.6	21.64
	Subtest 4	4132	4357	826.4	21.58
		4182	4407	836.4	22.06
		4233	4458	846.6	22.01
	Subtest 5	4132	4357	826.4	21.10
		4182	4407	836.4	22.38
		4233	4458	846.6	22.24
UMTS1900 (Band II)	Subtest 1	9262	9662	1852.4	22.10
		9400	9800	1880.0	22.18
		9538	9938	1907.6	22.19
	Subtest 2	9262	9662	1852.4	20.57
		9400	9800	1880.0	20.19
		9538	9938	1907.6	20.25
	Subtest 3	9262	9662	1852.4	21.54
		9400	9800	1880.0	21.46
		9538	9938	1907.6	21.78
	Subtest 4	9262	9662	1852.4	21.55
		9400	9800	1880.0	21.43
		9538	9938	1907.6	21.97
	Subtest 5	9262	9662	1852.4	22.10
		9400	9800	1880.0	21.25
		9538	9938	1907.6	21.78

Note: KDB 941225 D01, Body SAR is not required for device 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.

10.5. LTE

According to 3GPP 36.521, V9.1.0., the output power level for Power Class 3 LTE is to be 23.0 dBm ± 2.7 dB.

Max. Power Reduction (MPR) is allowed due to higher order modulation and transmits bandwidth configurations. These MPR levels reduce the lower limit of each output power by the either 1 or 2 dB. The limits for these power levels can be found in Table 6.2.3.5-1 (UE Power Class Test Requirements) of 3GPP 36.521. The highlighted columns represent the bandwidths supported by AirCard 313U.

Mouldation	Channel Bandwidth/Transmission Bandwidth Configuration (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	**5.0 MHz**	**10 MHz**	15 MHz	20 MHz	
QPSK	> 5	> 4	**> 8**	**> 12**	> 16	> 18	≤ 1
16QAM	≤ 5	≤ 4	**≤ 8**	**≤ 12**	≤ 16	≤ 18	≤ 1
16QAM	> 5	> 4	**> 8**	**> 12**	> 16	> 18	≤ 2

Output power for LTE Band 17

Freq. (MHz)	UL Channel	BW (MHz)	RB Size	RB Offset	Modulation	MPR (dB)	Max Avg Power (dBm)
706.5	23755	5 (L)	1	0	QPSK	0	23.56
			1	24	QPSK	0	23.44
			12	6	QPSK	1	22.69
			25	0	QPSK	1	22.43
			1	0	16-QAM	1	22.75
			1	24	16-QAM	1	22.28
			12	6	16-QAM	2	21.14
			25	0	16-QAM	2	21.22
710.0	23790	5 (M)	1	0	QPSK	0	23.42
			1	24	QPSK	0	23.55
			12	6	QPSK	1	22.77
			25	0	QPSK	1	22.28
			1	0	16-QAM	1	22.45
			1	24	16-QAM	1	22.04
			12	6	16-QAM	2	21.05
			25	0	16-QAM	2	21.44
710.0	23790	10	1	0	QPSK	0	23.46
			1	49	QPSK	0	23.5
			25	12	QPSK	1	22.3
			50	0	QPSK	1	22.23
			1	0	16-QAM	1	22.43
			1	49	16-QAM	1	22.15
			25	12	16-QAM	2	21.12
			50	0	16-QAM	2	21.38
713.5	23825	5 (H)	1	0	QPSK	0	23.78
			1	24	QPSK	0	23.62
			12	6	QPSK	1	22.78
			25	0	QPSK	1	22.46
			1	0	16-QAM	1	22.75
			1	24	16-QAM	1	22.28
			12	6	16-QAM	2	21.78
			25	0	16-QAM	2	21.85

Output power for LTE Band 4

Freq. (MHz)	UL Channel	BW (MHz)	RB Size	RB Offset	Modulation	MPR (dB)	Max Avg Power (dBm)
1712.5	19975	5 (L)	1	0	QPSK	0	23.55
			1	24	QPSK	0	23.52
			12	6	QPSK	1	22.78
			25	0	QPSK	1	22.42
			1	0	16-QAM	1	22.61
			1	24	16-QAM	1	22.32
			12	6	16-QAM	2	21.79
			25	0	16-QAM	2	21.85
1715.1	20001	10 (L)	1	0	QPSK	0	23.58
			1	49	QPSK	0	23.32
			25	12	QPSK	1	22.44
			50	0	QPSK	1	22.43
			1	0	16-QAM	1	22.37
			1	49	16-QAM	1	22.62
			25	12	16-QAM	1	21.48
			50	0	16-QAM	2	21.51
1732.5	20175	5 (M)	1	0	QPSK	0	23.42
			1	24	QPSK	0	23.47
			12	6	QPSK	1	22.85
			25	0	QPSK	1	22.28
			1	0	16-QAM	1	22.33
			1	24	16-QAM	1	22.14
			12	6	16-QAM	2	21.05
			25	0	16-QAM	2	21.44
1732.5	20175	10 (M)	1	0	QPSK	0	23.4
			1	49	QPSK	0	23.42
			25	12	QPSK	1	22.44
			50	0	QPSK	1	22.31
			1	0	16-QAM	1	22.16
			1	49	16-QAM	1	22.08
			25	12	16-QAM	1	21.11
			50	0	16-QAM	2	21.30
1750.0	20350	10 (H)	1	0	QPSK	0	23.38
			1	49	QPSK	0	23.43
			25	12	QPSK	1	22.60
			50	0	QPSK	1	22.33
			1	0	16-QAM	1	22.46
			1	49	16-QAM	1	22.65
			25	12	16-QAM	1	21.23
			50	0	16-QAM	2	21.19
1752.5	20375	5 (H)	1	0	QPSK	0	23.44
			1	24	QPSK	0	23.49
			12	6	QPSK	1	22.74
			25	0	QPSK	1	22.44
			1	0	16-QAM	1	22.65
			1	24	16-QAM	1	22.80
			12	6	16-QAM	2	21.19
			25	0	16-QAM	2	21.22

11. SUMMARY OF TEST RESULTS

11.1. HORIZONTAL-UP / 180

w/ 5 mm separation distance from EUT-to-flat phantom

(A)
Horizontal-Up

Inserted into laptop (connected to Lenovo laptop, T60)

GSM

Band	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 2 slots	128	824.2	31.60		
		190	836.6	32.10	0.484	0.344
		251	848.8	31.30		
GSM1900	GPRS 2 slots	512	1850.2	27.20	0.757	0.391
		661	1880.0	27.10	0.985	0.506
		810	1909.8	27.20	0.916	0.538

UMTS

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	4132	826.4	23.30		
		4182	836.4	23.12	0.351	0.217
		4233	846.6	23.32		
Band II	R99 12.2kbps RMC	9262	1850.2	22.95	1.100	0.574
		9400	1880.0	22.90	1.060	0.544
		9538	1907.6	22.95	0.913	0.540

LTE BAND 17

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	49	23.50	0.095	0.065
	23790	710.0		0	23.46	0.187	0.126
16QAM	23790	710.0	1	49	22.15	0.099	0.069
	23790	710.0		0	22.43	0.144	0.100
QPSK	23790	710.0	25	12	22.30	0.086	0.063
16QAM	23790	710.0	25	12	21.12	0.086	0.063
5 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	24	23.55	0.108	0.074
	23790	710.0		0	23.42	0.168	0.113
16QAM	23790	710.0	1	24	22.04	0.106	0.073
	23790	710.0		0	22.45	0.114	0.078
QPSK	23790	710.0	12	6	22.77	0.086	0.064
16QAM	23790	710.0	12	6	21.05	0.085	0.063

LTE BAND 4

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB SIze	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	20001	1715.1	1	49	23.32	1.030	0.592
	20175	1732.5			23.42	0.862	0.444
	20350	1750.0			23.43	1.020	0.526
	20001	1715.1		0	23.58	1.090	0.627
	20175	1732.5			23.40	0.814	0.471
	20350	1750.0			23.38	0.740	0.432
16QAM	20001	1715.1	1	49	22.62	0.763	0.444
	20175	1732.5			22.08	0.800	0.465
	20350	1750.0			22.65	0.813	0.474
	20001	1715.1		0	22.37	0.799	0.463
	20175	1732.5			22.16	0.865	0.504
	20350	1750.0			22.46	0.630	0.366
QPSK	20175	1732.5	25	12	22.44	0.451	0.265
16QAM	20175	1732.5	25	12	21.11	0.451	0.264
5 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	19975	1712.5	1	24	23.52	1.010	0.581
	20175	1732.5			23.47	0.830	0.473
	20375	1752.5			23.49	1.020	0.532
	19975	1712.5		0	23.55	1.070	0.610
	20175	1732.5			23.42	0.777	0.453
	20375	1752.5			23.44	0.760	0.445
16QAM	20175	1732.5	1	24	22.14	0.596	0.348
	20175	1732.5		0	22.33	0.635	0.370
QPSK	20175	1732.5	12	6	22.85	0.415	0.245
16QAM	20175	1732.5	12	6	21.05	0.417	0.246

11.2. HORIZONTAL-DOWN / 180° (Worst-case test confi guration)

w/ 5 mm separation distance from EUT-to-flat phantom

(B)
Horizontal-Down

With short USB cable (connected to Lenovo laptop, T60)

GSM

Band	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 2 slots	128	824.2	31.60	0.984	0.575
		190	836.6	32.10	**1.020**	0.593
		251	848.8	31.30	1.020	0.588
GSM1900	GPRS 2 slots	512	1850.2	27.20	0.704	0.423
		661	1880.0	27.10	0.836	0.493
		810	1909.8	27.20	1.360	0.771

UMTS

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	4132	826.4	23.30		
		4182	836.4	23.12	0.648	0.351
		4233	846.6	23.32		
Band II	R99 12.2kbps RMC	9262	1850.2	22.95	1.120	0.661
		9400	1880.0	22.90	1.500	0.868
		9538	1907.6	22.95	**1.550**	0.875

LTE BAND 17

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	f (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	49	23.50	0.196	0.111
	23790	710.0		0	23.46	**0.325**	0.184
16QAM	23790	710.0	1	49	22.15	0.189	0.116
	23790	710.0		0	22.43	0.286	0.172
QPSK	23790	710.0	25	12	22.30	0.236	0.139
16QAM	23790	710.0	25	12	21.12	0.233	0.137
5 MHz Channel Bandwidth							
Modulation	UL Ch No.	f (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	24	23.55	0.231	0.134
	23790	710.0		0	23.42	0.288	0.165
16QAM	23790	710.0	1	24	22.04	0.216	0.129
	23790	710.0		0	22.45	0.276	0.165
QPSK	23790	710.0	12	6	22.77	0.163	0.098
16QAM	23790	710.0	12	6	21.05	0.162	0.098

LTE BAND 4

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	20001	1715.1	1	49	22.32	1.380	0.786
	20175	1732.5			23.42	1.240	0.705
	20350	1750.0			23.43	1.440	0.824
	20001	1715.1		0	23.58	1.400	0.802
	20175	1732.5			23.40	1.280	0.739
	20350	1750.0			23.38	1.440	0.806
16QAM	20001	1715.1	1	49	22.62	1.200	0.676
	20175	1732.5			22.08	1.120	0.642
	20350	1750.0			22.65	1.110	0.639
	20001	1715.1		0	22.37	1.200	0.686
	20175	1732.5			22.16	1.180	0.678
	20350	1750.0			22.46	1.090	0.630
QPSK	19975	1712.5	25	12	22.44	0.884	0.514
	20175	1732.5			22.44	0.803	0.464
	20375	1752.5			22.60	0.857	0.491
16QAM	19975	1712.5		12	21.48	0.884	0.514
	20175	1732.5			21.11	0.802	0.462
	20375	1752.5			21.23	0.859	0.491

5 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	19975	1712.5	1	24	23.52	1.430	0.818
	20175	1732.5			23.47	1.330	0.754
	20375	1752.5			23.49	**1.520**	0.851
	19975	1712.5		0	23.55	1.490	0.855
	20175	1732.5			23.42	1.360	0.777
	20375	1752.5			23.44	1.420	0.806
16QAM	19975	1712.5	1	24	22.32	1.140	0.646
	20175	1732.5			22.14	1.320	0.758
	20375	1752.5			22.80	1.160	0.665
	19975	1712.5		0	22.61	1.150	0.657
	20175	1732.5			22.33	1.060	0.594
	20375	1752.5			22.65	1.140	0.654
QPSK	19975	1712.5	12	6	22.78	0.883	0.515
	20175	1732.5			22.85	1.020	0.586
	20375	1752.5			22.74	0.833	0.479
16QAM	19975	1712.5		6	21.79	0.888	0.518
	20175	1732.5			21.05	0.966	0.557
	20375	1752.5			21.19	0.831	0.477

11.3. VERTICAL-FRONT / 180°

w/ 5 mm separation distance from EUT-to-flat phantom

(C)
Vertical-Front

With short USB cable (connected to Lenovo laptop, T60)

GSM

Band	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 2 slots	128	824.2	31.60		
		190	836.6	32.10	0.432	0.264
		251	848.8	31.30		
GSM1900	GPRS 2 slots	512	1850.2	27.20		
		661	1880.0	27.10	0.445	0.249
		810	1909.8	27.20	0.536	0.300

UMTS

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	4132	826.4	23.30		
		4182	836.4	23.12	0.376	0.198
		4233	846.6	23.32		
Band II	R99 12.2kbps RMC	9262	1850.2	22.95		
		9400	1880.0	22.90	0.556	0.314
		9538	1907.6	22.95		

LTE BAND 17

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	49	23.50	0.106	0.055
	23790	710.0		0	23.46	0.186	0.095
16QAM	23790	710.0	1	49	22.15	0.149	0.086
	23790	710.0		0	22.43	0.184	0.106
QPSK	23790	710.0	25	12	22.30	0.091	0.053
16QAM	23790	710.0	25	12	21.12	0.090	0.053
5 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	24	23.55	0.119	0.062
	23790	710.0		0	23.42	0.157	0.081
16QAM	23790	710.0	1	24	22.04	0.143	0.082
	23790	710.0		0	22.45	0.182	0.104
QPSK	23790	710.0	12	6	22.77	0.092	0.054
16QAM	23790	710.0	12	6	21.05	0.090	0.054

LTE BAND 4

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	f (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	20175	1732.5	1	49	23.40	0.761	0.429
	20175	1732.5		0	22.42	0.756	0.428
16QAM	20175	1732.5	1	49	22.08	0.704	0.390
	20175	1732.5		0	22.16	0.731	0.406
QPSK	20175	1732.5	25	12	22.44	0.560	0.316
16QAM	20175	1732.5	25	12	21.11	0.562	0.318
5 MHz Channel Bandwidth							
Modulation	UL Ch No.	f (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	19975	1712.5	1	24	23.52	0.748	0.421
	20175	1732.5			23.47	0.876	0.497
	20375	1752.5			23.42	0.864	0.487
	20175	1732.5		0	23.55	0.746	0.422
16QAM	20175	1732.5	1	24	22.14	0.664	0.370
	20175	1732.5		0	22.33	0.680	0.379
QPSK	20175	1732.5	12	6	22.85	0.556	0.313
16QAM	20175	1732.5	12	6	21.05	0.548	0.309

11.4. VERTICAL-BACK / 180°

w/ 5 mm separation distance from EUT-to-flat phantom

(D)
Vertical-Back

Inserted into laptop (connected to Lenovo laptop, T60)

GSM

Band	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 2 slots	128	824.2	31.60		
		190	836.6	32.10	0.589	0.357
		251	848.8	31.30		
GSM1900	GPRS 2 slots	512	1850.2	27.20		
		661	1880.0	27.10	0.116	0.072
		810	1909.8	27.20		

UMTS

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	4132	826.4	23.30		
		4182	836.4	23.12	0.426	0.253
		4233	846.6	23.32		
Band II	R99 12.2kbps RMC	9262	1850.2	22.95		
		9400	1880.0	22.90	0.150	0.091
		9538	1907.6	22.95		

LTE BAND 17

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	49	23.50	0.0097	0.0068
	23790	710.0		0	23.46	0.023	0.016
16QAM	23790	710.0	1	49	22.15	0.016	0.011
	23790	710.0		0	22.43	0.023	0.017
QPSK	23790	710.0	25	12	22.30	0.012	0.00923
16QAM	23790	710.0	25	12	21.12	0.012	0.00925
5 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	24	23.55	0.014	0.00889
	23790	710.0		0	23.42	0.020	0.014
16QAM	23790	710.0	1	24	22.04	0.016	0.011
	23790	710.0		0	22.45	0.022	0.016
QPSK	23790	710.0	12	6	22.77	0.013	0.00949
16QAM	23790	710.0	12	6	21.05	0.013	0.00988

LTE BAND 4

10 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	20175	1732.5	1	49	23.42	0.112	0.066
16QAM	20175	1732.5	1	49	22.08	0.128	0.075
QPSK	20175	1732.5	1	0	23.40	0.119	0.071
16QAM	20175	1732.5	1	0	22.16	0.117	0.071
QPSK	20175	1732.5	25	12	22.44	0.085	0.051
16QAM	20175	1732.5	25	12	21.11	0.084	0.050
5 MHz Channel Bandwidth							
Modulation	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	20175	1732.5	1	24	23.47	0.089	0.053
16QAM	20175	1732.5	1	24	22.14	0.099	0.059
QPSK	20175	1732.5	1	0	23.42	0.116	0.069
16QAM	20175	1732.5	1	0	22.33	0.116	0.069
QPSK	20175	1732.5	12	6	22.85	0.086	0.050
16QAM	20175	1732.5	12	6	21.05	0.084	0.049

11.5. TIP

w/ 5 mm separation distance from EUT-to-flat phantom

Inserted into laptop (connected to Lenovo laptop, T60)

GSM

Band	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
GSM850	GPRS 2 slots	128	824.2	31.60		
		190	836.6	32.10	0.207	0.130
		251	848.8	31.30		
GSM1900	GPRS 2 slots	512	1850.2	27.20	0.409	0.223
		661	1880.0	27.10	0.644	0.357
		810	1909.8	27.20	1.250	0.674

UMTS

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)	
					1-g	10-g
Band V	R99 12.2kbps RMC	4132	826.4	23.30		
		4182	836.4	23.12	0.090	0.056
		4233	846.6	23.32		
Band II	R99 12.2kbps RMC	9262	1850.2	22.95	0.768	0.412
		9400	1880.0	22.90	0.874	0.463
		9538	1907.6	22.95	1.360	0.730

LTE BAND 17

10 MHz Channel Bandwidth

Band	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	49	23.50	0.00829	0.00557
	23790	710.0		0	23.46	0.016	0.011
16QAM	23790	710.0	1	49	22.15	0.013	0.00932
	23790	710.0		0	22.43	0.016	0.012
QPSK	23790	710.0	25	12	22.30	0.00994	0.00702
16QAM	23790	710.0	25	12	21.12	0.00971	0.00697

5 MHz Channel Bandwidth

Band	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	23790	710.0	1	24	23.55	0.00974	0.00655
	23790	710.0		0	23.42	0.014	0.00927
16QAM	23790	710.0	1	24	22.04	0.013	0.00896
	23790	710.0		0	22.45	0.017	0.012
QPSK	23790	710.0	12	6	22.77	0.0078	0.00562
16QAM	23790	710.0	12	6	21.05	0.00762	0.00555

LTE BAND 4

10 MHz Channel Bandwidth							
Band	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	20001	1715.1	1	49	23.32	1.190	0.634
	20175	1732.5			23.42	0.885	0.478
	20350	1750.0			23.43	0.819	0.440
	20001	1715.1		0	23.58	1.260	0.680
	20175	1732.5			23.40	1.010	0.571
	20350	1750.0			23.38	0.801	0.454
16QAM	20001	1715.1	1	49	22.62	0.986	0.554
	20175	1732.5			22.08	0.716	0.404
	20350	1750.0			22.65	0.679	0.383
	20001	1715.1		0	22.37	1.040	0.586
	20175	1732.5			22.16	0.829	0.468
	20350	1750.0			22.46	0.681	0.385
QPSK	20175	1732.5	25	12	22.44	0.696	0.384
16QAM	20175	1732.5	25	12	21.11	0.697	0.384
5 MHz Channel Bandwidth							
Band	UL Ch No.	Freq. (MHz)	RB Size	RB Offset	Avg Pwr (dBm)	SAR (mW/g)	
						1-g	10-g
QPSK	19975	1712.5	1	24	23.52	1.160	0.629
	20175	1732.5			23.47	0.930	0.500
	20375	1752.5			23.49	0.889	0.478
	19975	1712.5		0	23.55	1.270	0.688
	20175	1732.5			23.42	0.976	0.546
	20375	1752.5			23.44	0.817	0.460
16QAM	19975	1712.5	1	24	22.32	0.947	0.530
	20175	1732.5			22.14	0.881	0.499
	20375	1752.5			22.80	0.639	0.361
	19975	1712.5		0	22.61	1.000	0.561
	20175	1732.5			22.33	0.793	0.447
	20375	1752.5			22.65	0.661	0.375
QPSK	20175	1732.5	12	6	22.85	0.671	0.372
16QAM	20175	1732.5	12	6	21.05	0.675	0.372

12. WORST-CASE SAR TEST PLOTS

WORST-CASE SAR PLOT for Part 22H

Date/Time: 12/1/2010 5:13:47 PM

Test Laboratory: Compliance Certification Services

Cell 850_Horizontal Down

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

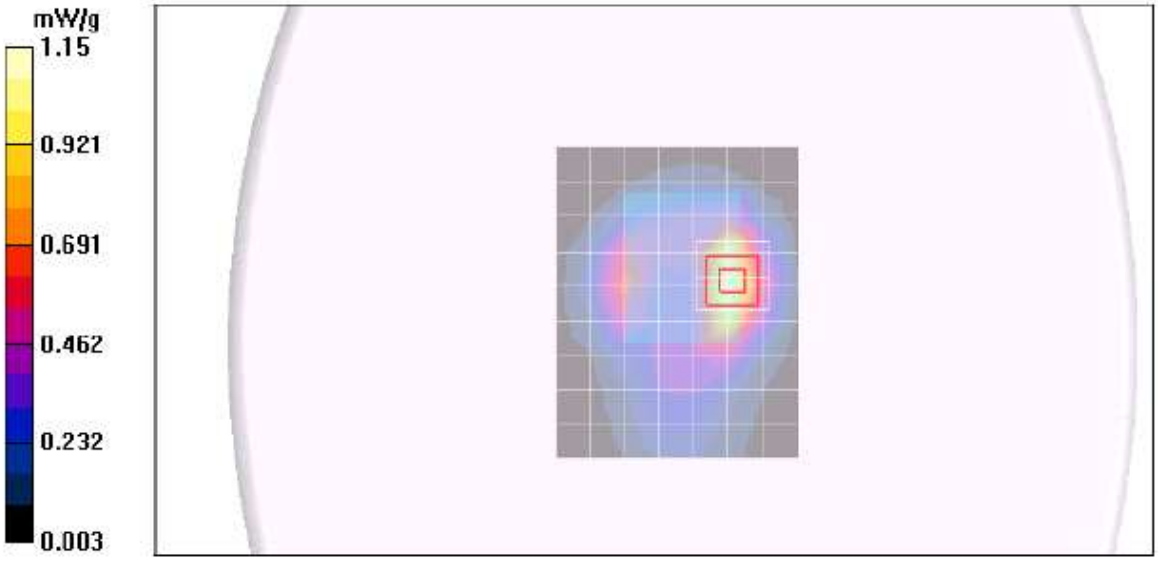
Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:4
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.998 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 23.0 deg. C; Liquid Temperature: 22.0 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(10.18, 10.18, 10.18); 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:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid-ch_2 slot/Area Scan (8x10x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.15 mW/g

Mid-ch_2 slot/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 33.9 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 1.81 W/kg
SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.593 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.26 mW/g



WORST-CASE SAR PLOT for Part 22H - Z plot

Date/Time: 12/1/2010 5:37:02 PM

Test Laboratory: Compliance Certification Services

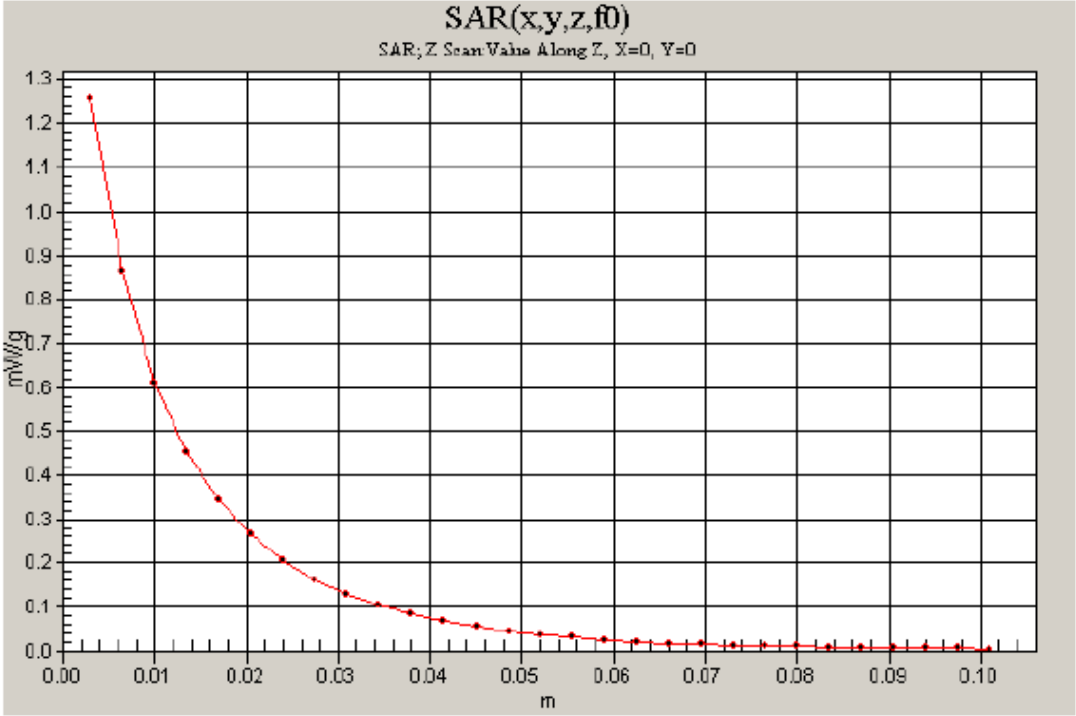
Cell 850_Horizontal Down

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

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

Mid-ch_2 slot/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) = 1.26 mW/g



WORST-CASE SAR PLOT for Part 24E

Date/Time: 11/30/2010 11:01:54 AM

Test Laboratory: Compliance Certification Services

UMTS BAND II_Horizontal Down

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

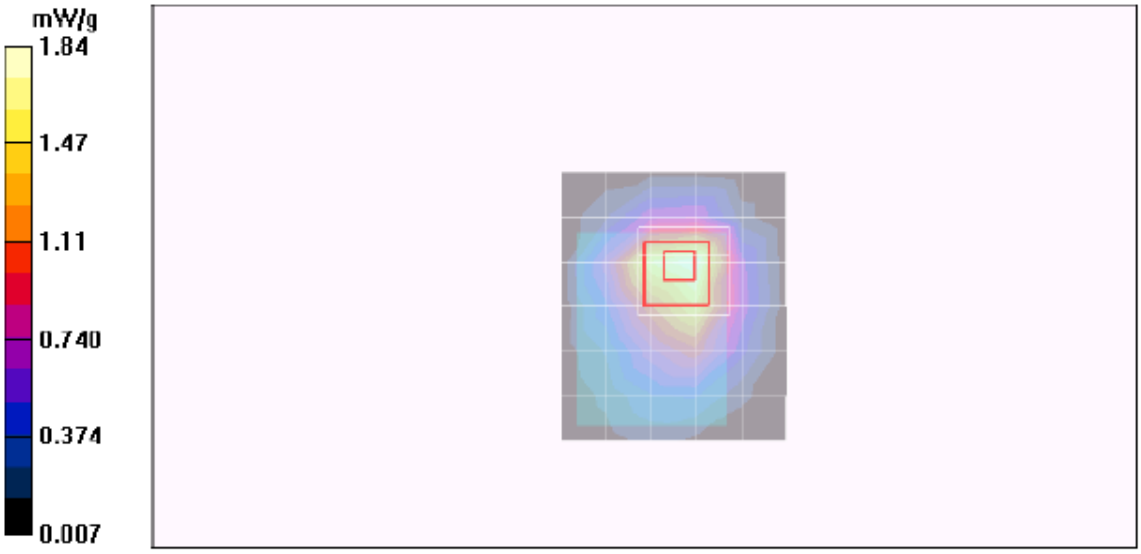
Communication System: UMTS Band II; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1907.6 MHz; σ = 1.56 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

Room Ambient Temperature: 23.0 deg. C; Liquid Temperature: 22.0 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:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

High-ch/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.84 mW/g

High-ch/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 34.1 V/m; Power Drift = 0.224 dB
Peak SAR (extrapolated) = 2.81 W/kg
SAR(1 g) = 1.55 mW/g; SAR(10 g) = 0.875 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.93 mW/g



WORST-CASE SAR PLOT for Part 24E – Z plot

Date/Time: 11/30/2010 11:23:52 AM

Test Laboratory: Compliance Certification Services

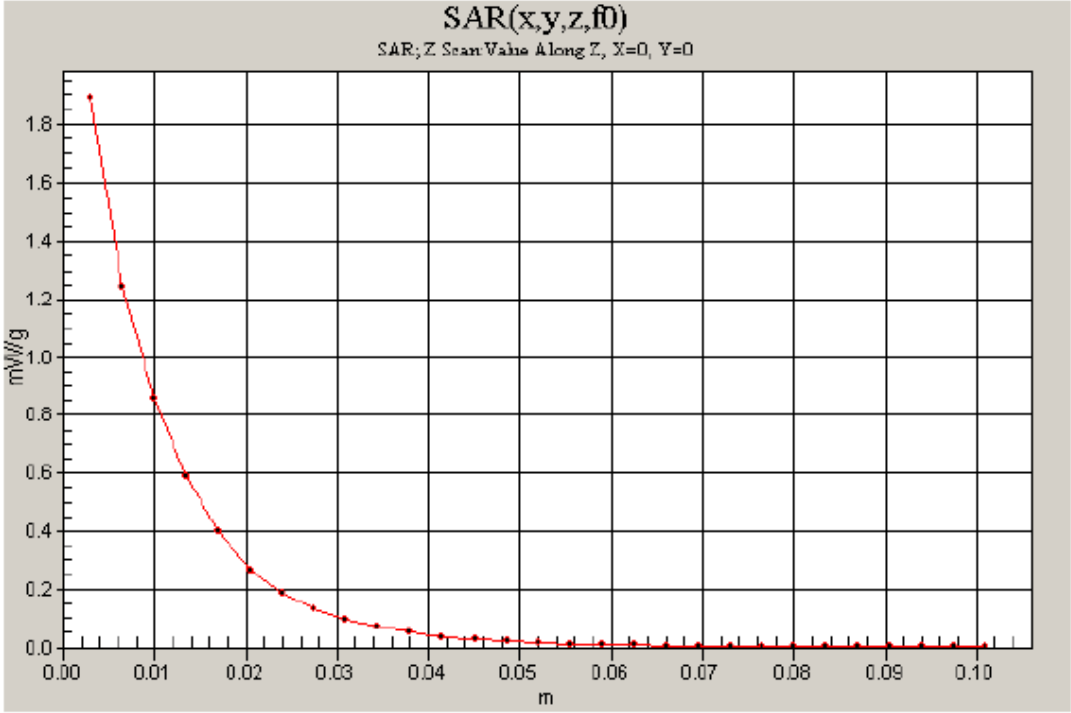
UMTS BAND II_Horizontal Down

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

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

High-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) = 1.89 mW/g



WORST-CASE SAR PLOT for Part 27 (Band 17)

Date/Time: 12/16/2010 4:48:51 PM

Test Laboratory: Compliance Certification Services

LTE Band 17_Horizontal Down_10MHz

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

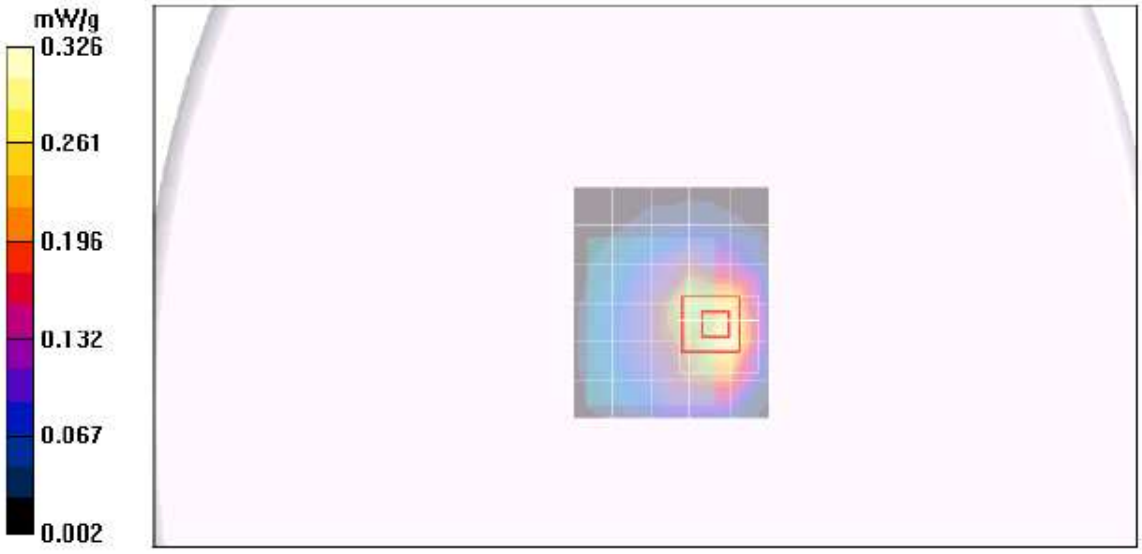
Communication System: LTE Band 17; Frequency: 710 MHz;Duty Cycle: 1:1
Medium parameters used: f = 710 MHz; σ = 0.948 mho/m; ε_r = 55.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

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 - SN3508; ConvF(10.46, 10.46, 10.46); Calibrated: 2/19/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn427; Calibrated: 7/21/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid-ch (QPSK_RB=1_Low)/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.326 mW/g

Mid-ch (QPSK_RB=1_Low)/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 18.7 V/m; Power Drift = 0.153 dB
Peak SAR (extrapolated) = 0.614 W/kg
SAR(1 g) = 0.325 mW/g; SAR(10 g) = 0.184 mW/g
Maximum value of SAR (measured) = 0.403 mW/g



Z-Axis Plot

Date/Time: 12/16/2010 5:07:53 PM

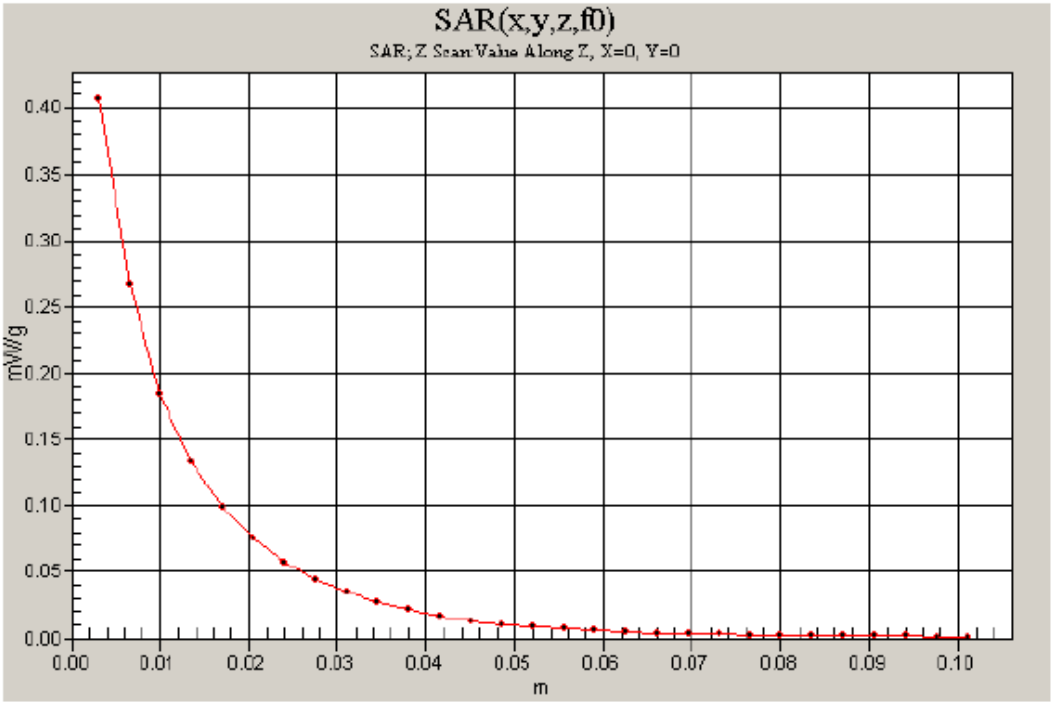
Test Laboratory: Compliance Certification Services

LTE Band 17_Horizontal Down_10MHz

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

Communication System: LTE Band 17; Frequency: 710 MHz;Duty Cycle: 1:1

Mid-ch (QPSK_RB=1_Low)/Z Scan (1x1x29): Measurement grid: dx=20mm, dy=20mm, dz=3.5mm
Maximum value of SAR (measured) = 0.407 mW/g



WORST-CASE SAR PLOT for Part 27 (Band 4)

Date/Time: 12/3/2010 7:55:51 PM

Test Laboratory: Compliance Certification Services (UL CCS)

LTE Band 4_Horizontal Down_5MHz

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

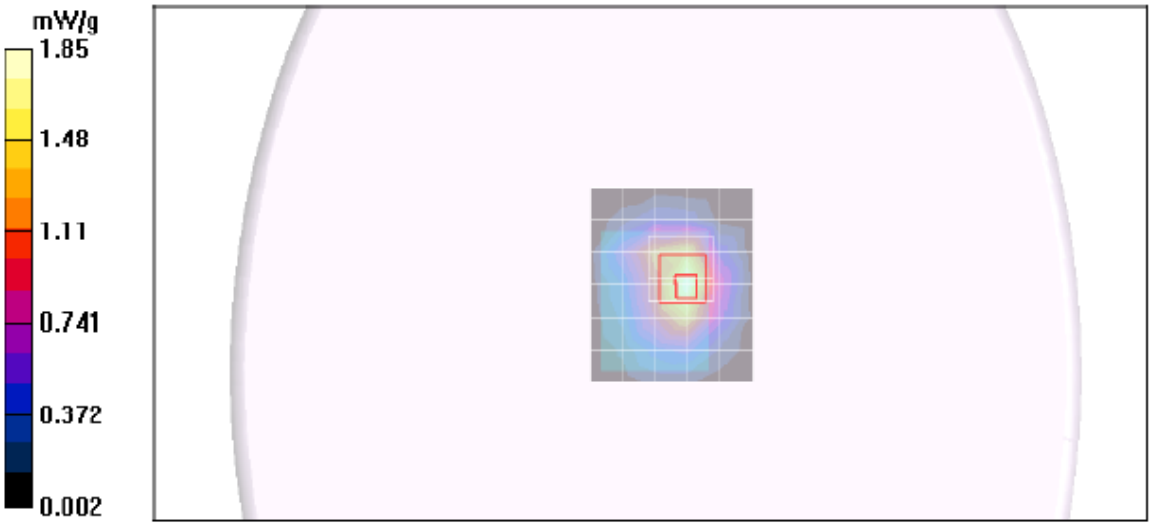
Communication System: LTE Band 4; Frequency: 1752.5 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1752.5 MHz; σ = 1.54 mho/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

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(8.51, 8.51, 8.51); 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:XXXX
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

High-ch (QPSK_RB=1_High)/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.85 mW/g

High-ch (QPSK_RB=1_High)/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 34.8 V/m; Power Drift = -0.079 dB
Peak SAR (extrapolated) = 2.56 W/kg
SAR(1 g) = 1.52 mW/g; SAR(10 g) = 0.851 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.81 mW/g



Z-Axis Plot

Date/Time: 12/3/2010 8:15:37 PM

Test Laboratory: Compliance Certification Services (UL CCS)

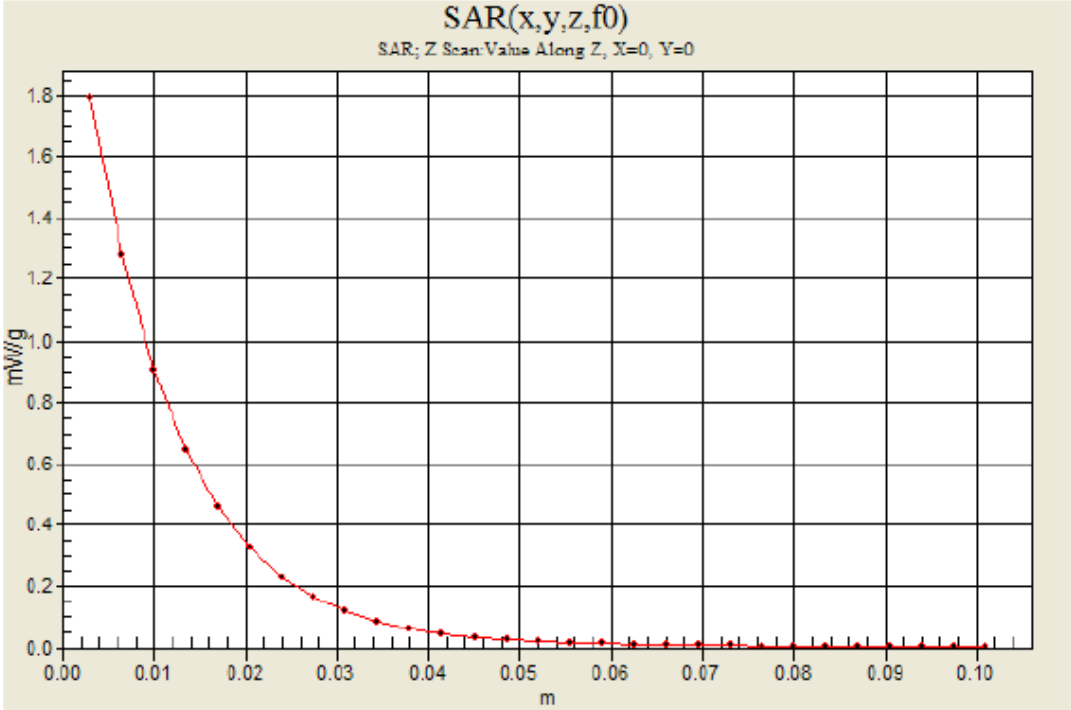
LTE Band 4_Horizontal Down_5MHz

DUT: Sierra Wireless; Type: AC313U; Serial: Unit # 2

Communication System: LTE Band 4; Frequency: 1752.5 MHz;Duty Cycle: 1:1

High-ch (QPSK_RB=1_High)/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) = 1.79 mW/g



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