SAR Test Report

Project Number:	**2373706**
Report Number:	**2733706EMC05** **Revision Level: 1**
Client:	**Sonim Technologies Inc.**
Equipment Under Test:	**Cellular/PCS CDMA/EvDO Phone with Bluetooth**
Model Name:	**Sonim XP Strike**
Model Number:	**Sonim XP3410-A-R1 (C21F010AA)**
Hardware Version:	**A**
Applicable Standards:	**CFR §2.1093; FCC OET Bulleting 65 Supplement C 01-01**
	IEEE STD 1528: 2003
	FCC KDB Publication 941225 D01
Report issued on:	**29 August 2012**
Test Result:	**Compliant**

Tested by: _____
Fabian Nica, Engineering Technician

Reviewed by: _____
David Schramm, EMC Manager

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Table of Contents

1 GENERAL INFORMATION

1.1 CLIENT INFORMATION

Name: Sonim Technologies Inc.
Address: 1875 S. Grant Street, Suite 200
City, State, Zip, Country: San Mateo, CA 94402, USA

1.2 TEST LABORATORY

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

1.3 GENERAL INFORMATION OF EUT

Marketing Name: Sonim XP Strike
Model: Sonim XP3410-A-R1 (C21F010AA)
Serial Number: A1000012926688
Build Version: B2.5
Firmware Version: XP3410_0200B00_0150T
FCC ID: WYPC21F010AA
Rated Voltage: 3.8 VDC Internal Battery

Sample Received Date: 10 August 2012
Dates of testing: 15 August to 24 August 2012

1.4 EQUIPMENT UNDER TEST

EUT	Sonim XP Strike			
Normal operation:	Held to head, Worn on body (LCD facing-up; LCD facing-down) with 25 mm separation distance			
Body Worn Accessory	Headset			
Device category:	Portable			
Exposure category:	General Population/Uncontrolled Exposure			
Frequency Range (MHz)	Modulation	Test Position	Highest 1-g SAR (W/kg)	Limit (W/kg)
817 - 824	CDMA	Head: LHS Touch	1.36	1.6
	CDMA	Body: Front Side	0.499	
824 - 849	CDMA	Head: RHS Touch	1.39	
	CDMA	Body: Front Side	0.428	
1850 1910	CDMA	Head: LHS Touch	1.17	
	CDMA	Body: Back Side	0.444	

1.5 BANDS TESTED

Tx Frequency Bands:	Cellular (SMR): 817 - 824MHz Cellular: 824 - 849MHz PCS:1850 – 1910 MHz Bluetooth: 2402 – 2480 MHz
Air Interfaces:	CDMA 1xRTT, EV-DO Rev.0, EV-DO Rev. A Bluetooth 4.0 + LE
Uplink Modulations:	CDMA Modes: QPSK Bluetooth: DQPSK, 8DPSK, GFSK

1.6 TEST METHODOLOGY

Testing was performed in accordance with the FCC OET Bulleting 65 Supplement C 01-01, IEEE STD 1528: 2003, IC RSS 102 Issue 4, as well as FCC KDB Publication 941225 D01 “SAR Measurement Procedures for 3G Devices” v02, October 2007.

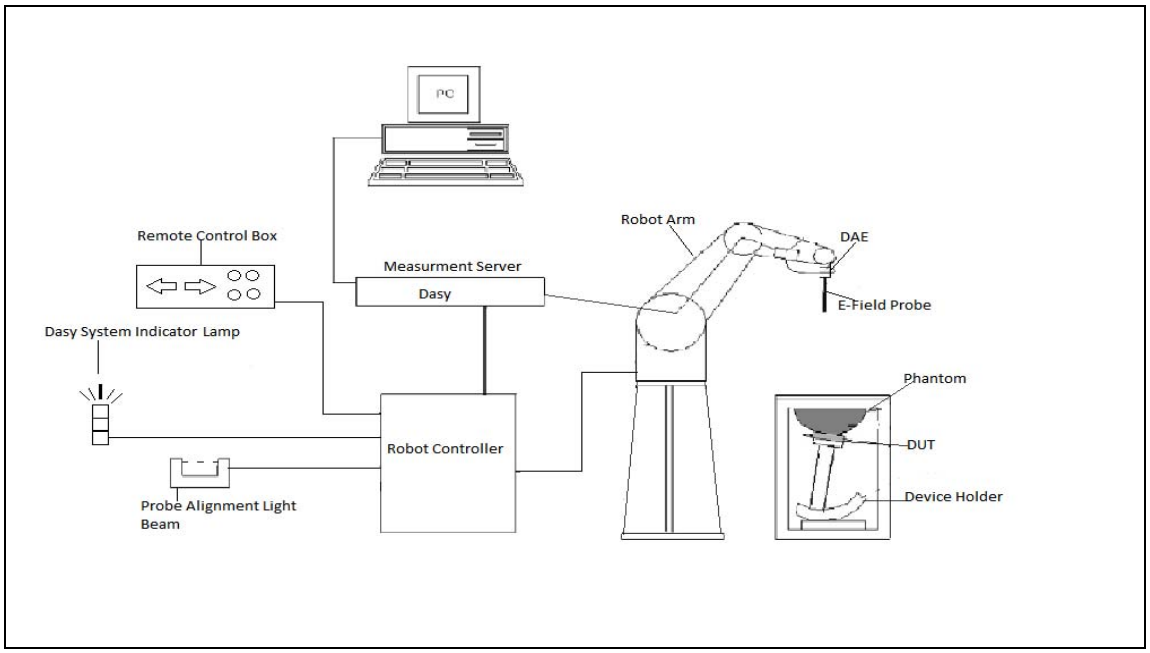
Output power verification was determined with the reverse channel set to maximum power and with power control bits in the “All up” condition.

2 TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial Number	Cal Due Date
Dasy5 Controller	SP1D	Stäubli	S-1188	NA
Probe Alignment Light Beam	LB5/80	Speag	SEUKS030AA	NA
Data Acquisition Electronics	DAE4	Speag	1287	NA
Phantom	Twin Sam	Speag	1665	NA
Oval Phantom	ELI5	Speag	1146	NA
System Validation Dipole	D1900V2	Speag	5d144	26 Sep 2012
System Validation Dipole	D835V2	Speag	4d123	26 Sep 2012
E-Field Probe	ES3DV3	Speag	3272	16 May 2013
E-Field Probe	EX3DV4	Speag	3812	21 Mar 2013
Head Simulating Liquid	HSL900V2	Speag	110815-2	Prior to testing
Device Holder	SD 00 HO1 HA	Speag	NA	NA
Electrical Parameter Network Analyzer	E5062A	Agilent	MY44102097	10 Aug 2013
Power Meter	E4419B	Agilent	G839511059	13 Aug 2013
Power Meter	E4419B	Agilent	G839511059	13 Aug 2013
Signal Generator	SMB100A	Rohde & Schwarz	104999	22 May 2013
Wideband Radio Communication Tester	CMW 500	Rohde & Schwarz	111428	28 Sep 2012
Thermometer	87	Fluke	17130391	10 Aug 2013
Dielectric Probe Kit	85070E	Agilent	MY44300638	NA
PC	HP Compaq 8000 Elite	HP	CZC1231RWS	NA

Note: The calibration period equipment is 1 year.

2.1 TEST SYSTEM BLOCK DIAGRAM



The Dasy5 SAR test system consists of:

- 1 Stäubli Robot and system controller cabinet
- 1 Electro Optical Converter mounted on robots arm
- Robot stand
- Robot remote controller
- Light beam for E-field probe alignment
- DASY5 measurement server
- SAM Twin Phantom
- Hand-Held/ Laptop device holder
- HP PC with DASY5 software
- Data Acquisition Electronics(DAE)
- System validation dipole kit
- Head/Body simulating liquid
- E-field probe
- Warning lamps

3 LIQUID PARAMETERS CHECK

The tissue dielectric parameters shall be measured at the beginning of the test or within 24 hours of the first SAR test. All dielectric parameters should be within the tolerance values shown in Table 1. For frequencies in 300 MHz to just under 3 GHz, the measured conductivity and relative permittivity should be within ±5% of the target values in table 1. The measured permittivity tolerances can be relaxed to no more than the ±10%. All efforts should be made to obtain the target values as closely as possible.

The head tissue dielectric parameters recommended by the IEEE1528-2003 Standard have been incorporated in Table 1.

Table 3-1

Target dielectric properties of tissue equivalent material in the 300-3000 MHz frequency range

Frequency (MHz)	Head		Body	
	Relative permittivity (ε_r)	Conductivity(σ) (S/m)	Relative permittivity (ε_r)	Conductivity(σ) (S/m)
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55	1.05
1450	40.5	1.20	54	1.3
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52	2.73

Table 3-2

Tissue Verification

Tissue Verification TARGET & MEASURED								
Date	Tissue Type	Measured Frequency (MHz)	Measured Dielectric Constant, ε	Measured Condcutivity, σ S/m	Target Dielectric Constant, ε	Target Condcutivity, σ S/m	% deviation, σ	% deviation, ε
8/15/2012	835H	820	41.3	0.90	41.5	0.9	-0.5%	0.0%
8/15/2012	835H	835	41.0	0.91	41.5	0.9	-1.2%	1.6%
8/15/2012	835H	848	40.8	0.93	41.5	0.9	-1.6%	3.3%
8/16/2012	835H	820	40.9	0.89	41.5	0.9	-1.4%	-1.1%
8/16/2012	835H	835	40.7	0.91	41.5	0.9	-1.9%	1.1%
8/16/2012	835H	848	40.5	0.92	41.5	0.9	-2.4%	2.2%
8/17/2012	1900B	1850	53.3	1.47	53.3	1.52	-0.1%	-3.3%
8/17/2012	1900B	1880	52.9	1.50	53.3	1.52	-0.7%	-1.3%
8/17/2012	1900B	1910	52.9	1.54	53.3	1.52	-0.7%	1.3%
8/18/2012	1900H	1850	39.0	1.37	40.0	1.4	-2.5%	-2.1%
8/18/2012	1900H	1880	38.8	1.41	40.0	1.4	-3.1%	0.7%
8/18/2012	1900H	1910	38.9	1.44	40.0	1.4	-2.9%	2.9%
8/18/2012	1900B	1850	53.6	1.53	53.3	1.52	0.5%	0.7%
8/18/2012	1900B	1880	53.4	1.56	53.3	1.52	0.3%	2.6%
8/18/2012	1900B	1910	53.4	1.58	53.3	1.52	0.1%	3.9%
8/20/2012	835B	820	55.2	0.94	55.2	0.97	-0.1%	-3.1%
8/20/2012	835B	835	55.0	0.96	55.2	0.97	-0.4%	-1.2%
8/20/2012	835B	848	54.9	0.97	55.2	0.97	-0.6%	0.0%
8/21/2012	835B	820	54.8	0.94	55.2	0.97	-0.8%	-3.1%
8/21/2012	835B	835	54.6	0.96	55.2	0.97	-1.1%	-1.5%
8/21/2012	835B	848	54.4	0.97	55.2	0.97	-1.4%	0.0%
8/23/2012	835B	820	55.1	0.95	55.2	0.97	-0.1%	-2.6%
8/23/2012	835B	835	54.9	0.96	55.2	0.97	-0.5%	-1.1%
8/23/2012	835B	848	54.8	0.97	55.2	0.97	-0.7%	0.1%
8/24/2012	835B	820	54.5	0.93	55.2	0.97	-1.3%	-4.1%
8/24/2012	835B	835	54.3	0.94	55.2	0.97	-1.6%	-3.1%
8/24/2012	835B	848	54.2	0.96	55.2	0.97	-1.9%	-1.0%
8/24/2012	1900B	1850	53.7	1.46	53.3	1.52	0.8%	-3.9%
8/24/2012	1900B	1880	53.0	1.49	53.3	1.52	-0.6%	-2.0%
8/24/2012	1900B	1910	52.9	1.52	53.3	1.52	-0.8%	0.0%

4 SAR MEASUREMENT SYSTEM VERIFICATION

The system performance verification verifies the system operates within the ±10% limit. Each performance check is performed prior to any SAR testing to measure accuracy.

4.1 PERFORMANCE CHECK MEASUREMENT CONDITIONS

- Measurements are performed in the flat section of the SAM phantom
- Phantom is filled with Head or Body simulating liquids
- DASY5 system parameters are tested using a Isotropic E-field probe ES3DV3
- The dipole is mounted on an extendable tripod that is positioned below the flat phantom center. The dipole is oriented parallel with the body's axis. The standard measuring distance is 10 mm above 1 GHz or 15 mm below 1 GHz from the dipole to the simulating liquids surface.
- A grid spacing of 15 mm is aligned with the dipole
- 7x7x7 cube is selected for a zoom scan
- A 4 mm distance is set between the probe and phantom surface
- Dipole input power(forward power) is set to 100 mW
- Results are normalized to 1 W input power

4.2 SAR REFERENCE VALUES FOR HEAD AND BODY CALIBRATION

Numerical reference and flat phantom

Frequency (MHz)	1g SAR	10g SAR
300	3.0	2.0
450	4.9	3.3
835	9.5	6.2
900	10.8	6.9
1450	29.0	16.0
1800	38.1	19.8
1900	39.7	20.5
2000	41.1	21.1
2450	52.4	24.0
3000	63.8	25.7

SAR values (W/kg) for dipole *(IEEE1528-2003 Table 7)*

System Verification TARGET & MEASURED										
Date	Ambient Temp (°C)	Liquid Temp (°C)	Input Power (W)	Tissue Frequency (MHz)	Dipole SN	Tissue Type	Measured SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	1W Normalized SAR_{10} (W/kg)	Deviation (%)
8/15/2012	25.1	24.1	0.100	835	4d123	Head	0.979	9.53	9.79	2.7%
8/17/2012	24.2	23	0.100	1900	5d144	Head	3.77	39.40	37.70	-4.3%

5 SAR MEASUREMENT PROCEDURE

- Area Scan is used for a fast scan in two dimension to find the area of high field values before any finer measurement around the hotspot. The routines implemented in the DASY5 software can find the maximum locations.
- Zoom Scan is used to assess the peak spatial values within a cubic averaging volume containing 1g and 10g of simulated tissue. The scan measures a 7x7x7 area within the cube. Once measurement is done the values are displayed within the job's label.
- Power Drift will measure the field at the same location as the most recent power reference measurement within the same procedure and settings. The Power Drift Measurement gives the field difference in dB.
- Z- Scan measure points along a straight vertical line. The lines run along the z-axis of a one dimensial grid. To get a reasonable extrapolation the extrapolated distance should not be larger than the step size in z direction.

5.1 HEAD SAR CONFIGURATION

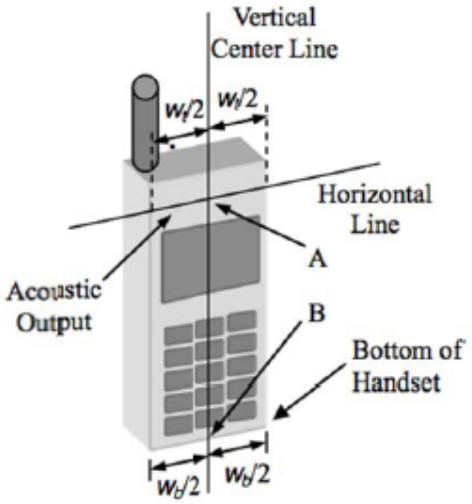
5.1.1 SAM SPECIFICATIONS

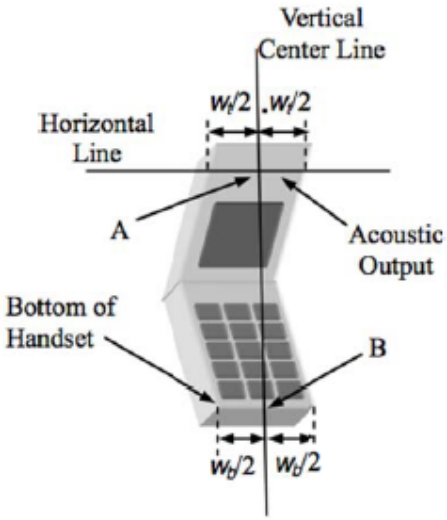
The Specific Anthropomorphic Mannequin (SAM) phantom corresponds to specifications defined in IEEE 1528 and IEC 62209-1. It allows dosimetric evaluation of the left, right, hand phone usage as well as body mounted usage at the flat region of the phantom

5.1.2 HANDSET REFERENCE POINTS

In order to identify reference points on the handset, define two imaginary lines on the handset

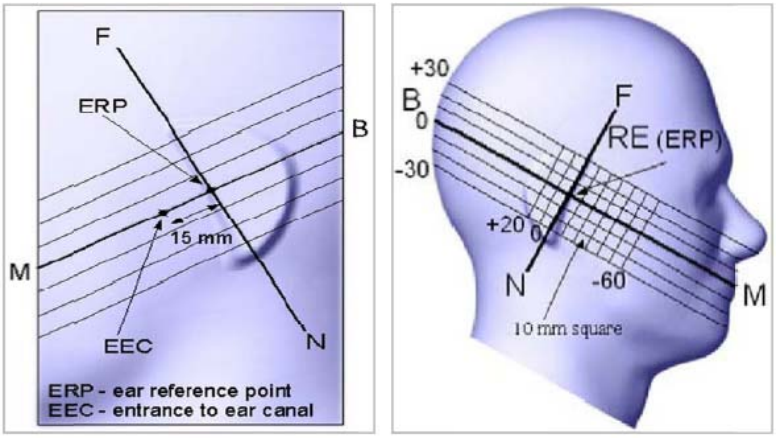
- The vertical centreline passes through two points on the front side of the handset. The midpoint of the width at the acoustic output and the midpoint of the width of the bottom of handset.
- The horizontal line is perpendicular to the vertical centreline and passes through the center of the acoustic output.
- The two lines intersect at point A.


Vertical
Center Line
$w_f/2$
$w_f/2$
Horizontal
Line
A
Acoustic
Output
B
Bottom of
Handset
$w_b/2$
$w_b/2$


Vertical
Center Line
$w_f/2$
$w_f/2$
Horizontal
Line
A
Acoustic
Output
Bottom of
Handset
B
$w_b/2$
$w_b/2$

5.1.3 EAR REFERENCE

This category includes most wireless handsets. The handset should have its earpieces located within the upper part of the device or along the centerline. The handset should be positioned with the earpiece region pressed against the ear spacer of the phantom.



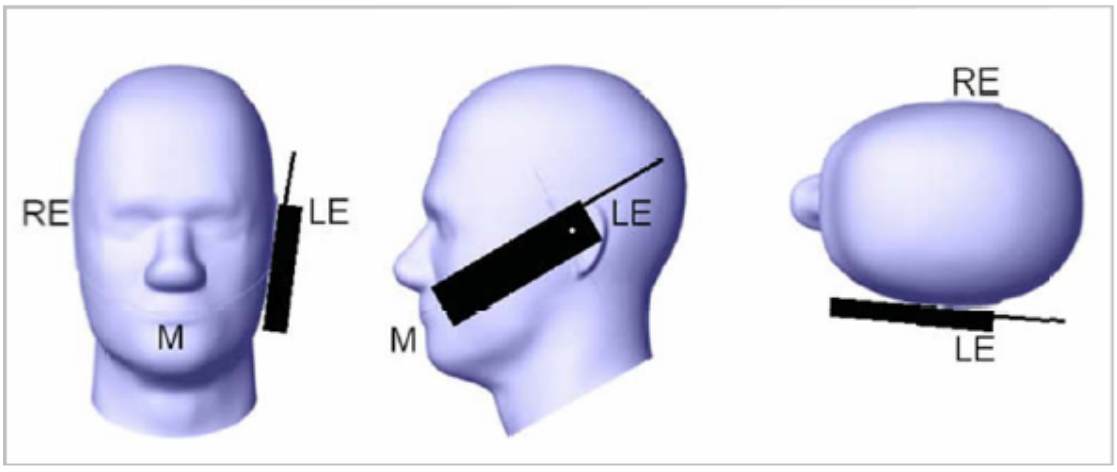
5.1.4 CHEEK POSITIONS

The device is attached toward the mouth part of the phantom by pivoting against the ear reference point

The test position is established when:

- Any point on the display, keypad or mouthpiece portion of the EUT is in contact with the phantom

Cheek / Touch Position

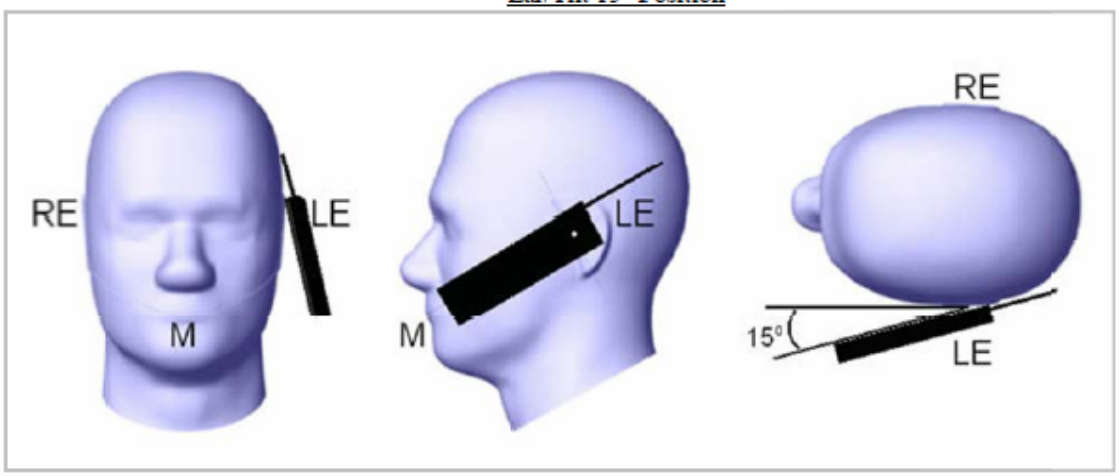


5.1.5 TILT POSITION

The test position is established when:

- Repeat the cheek touch position setup
- While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
- Rotate the handset around the horizontal line by 15°
- While maintain the orientation of the handset move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear.
- The tilt position is obtained when the contact point is on the pinna and the antenna is at the back of the phantoms head.

Ear/Tilt 15° Position



6 CONDUCTED OUTPUT POWER VERIFICATION

Band	Ch. No.	f (MHz)	SO55 RC1 (dBm)	SO55 RC3 (dBm)	1x EvDO Rev 0 dBm	1x EvDO Rev A dBm
Cellular	564	820.1	24.84	24.97	24.91	24.96
	1013	824.7	24.91	24.90	24.92	24.91
	384	836.52	24.82	24.80	25.18	25.20
	777	848.71	24.82	24.79	24.93	25.03
PCS Band	25	1850.25	24.80	24.90	24.55	24.86
	600	1880	25.11	25.11	25.12	25.12
	1175	1908.75	24.85	24.91	25.01	24.93

7 SAR MEASUREMENT RESULTS

Table 7.1

FCC Part 90S Head SAR results

Measurement Results								
Frequency		Mode	Type	Conducted Power dBm	Power Drift dB	Side	Test Position	SAR (1g) W/kg
MHz	Ch							
820.10	564	CDMA	RC3/SO55	24.97	0.14	Left	Tilt	0.935
820.10	564	CDMA	RC3/SO55	24.97	-0.12	Left	Touch	1.36
820.10	564	CDMA	RC3/SO55	24.97	-0.10	Right	Tilt	0.732
820.10	564	CDMA	RC3/SO55	24.97	-0.34	Right	Touch	1.23
820.10	564	CDMA	EvDO RevA	24.96	-0.20	Right	Touch	1.28

Table 7.2

FCC Part 22H Head SAR results

Measurement Results								
Frequency		Mode	Type	Conducted Power dBm	Power Drift dB	Side	Test Position	SAR (1g) W/kg
MHz	Ch							
824.70	1013	CDMA	RC3/SO55	24.91	0.16	Left	Touch	1.29
824.70	1013	CDMA	RC3/SO55	24.91	-0.01	Right	Touch	1.24
836.52	384	CDMA	RC3/SO55	24.80	0.14	Left	Tilt	0.912
836.52	384	CDMA	RC3/SO55	24.80	-0.10	Left	Touch	1.36
836.52	384	CDMA	RC3/SO55	24.80	-0.13	Right	Tilt	0.775
836.52	384	CDMA	RC3/SO55	24.80	0.20	Right	Touch	1.29
848.31	777	CDMA	RC3/SO55	24.79	0.04	Left	Touch	1.36
848.31	777	CDMA	RC3/SO55	24.79	-0.64	Right	Touch	1.28
836.52	384	CDMA	EvDO RevA	25.20	-0.06	Right	Touch	1.39

Table 7.3

FCC Part 24E SAR results

Measurement Results								
Frequency		Mode	Type	Conducted Power dBm	Power Drift dB	Side	Test Position	SAR (1g) W/kg
MHz	Ch							
1851.25	25	CDMA	RC3/SO55	24.90	0.25	Left	Tilt	0.356
1851.25	25	CDMA	RC3/SO55	24.90	-0.47	Left	Touch	1.04
1851.25	25	CDMA	RC3/SO55	24.90	-0.47	Right	Touch	1.12
1880.00	600	CDMA	RC3/SO55	25.11	-0.29	Left	Touch	1.09
1880.00	600	CDMA	RC3/SO55	25.11	0.27	Right	Tilt	0.62
1880.00	600	CDMA	RC3/SO55	25.11	-0.02	Right	Touch	1.16
1908.75	1175	CDMA	RC3/SO55	24.91	-0.05	Left	Touch	0.888
1908.75	1175	CDMA	RC3/SO55	24.91	-0.05	Right	Touch	0.965
1851.25	25	CDMA	EvDO	24.86	0.00	Left	Touch	1.17

Table 7.4

FCC Part 90S, Part 22H and Part 24E Body SAR results

Measurement Results								
Frequency		Mode	Type	Conducted Power dBm	Power Drift dB	Side	Test Position	SAR (1g) W/kg
MHz	Ch							
820.10	564	CDMA	RC3/SO55	24.97	0.04	Back	2.5 cm	0.374
836.52	384	CDMA	RC3/SO55	24.80	0.22	Back	2.5 cm	0.325
1880.00	600	CDMA	RC3/SO55	25.11	-0.08	Back	2.5 cm	0.444
820.10	564	CDMA	RC3/SO55	24.97	-0.02	Front	2.5 cm	0.499
836.52	384	CDMA	RC3/SO55	24.80	-0.01	Front	2.5 cm	0.428
1880.00	600	CDMA	RC3/SO55	25.11	0.02	Front	2.5 cm	0.192

8 UNCERTAINTY BUDGET 0.3 – 3 GHZ RANGE

Uncertainty Budget for System Validation								
Error Description	Uncert. Value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±5.5%	N	√3	1	1	±5.5%	±5.5%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Modulation Response	±2.4%	R	√3	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	√3	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	∞
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	∞
Power Drift	±5%	R	√3	1	1	±2.9%	±2.9%	∞
Power Scaling	±0%	R	√3	1	1	±0%	±0%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
Liquid Conductivity(target)	±5.0%	R	√3	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity(meas.)	±2.5%	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Permittivity(target)	±5.0%	R	√3	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity(meas.)	±2.5%	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±10.7%	±10.5%	
Expaanded STD Uncertainty						±21.4%	±21.0%	

9 REVISION HISTORY

Revision Level	Description of changes	Revision Date
0	Initial release	27 Aug 2012
1	Added hardware “A” to cover page. On page 3, converted “Hardware Version” to “Build Version”. Updated the customer’s suite number. Added the Revision History section.	29 Aug 2012