SAR Compliance Test Report

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Statement of Compliance: RIM Testing Services declares under its sole responsibility that the product to which this declaration relates, is in conformity with the appropriate RF exposure standards, recommendations and guidelines. It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices.

Device Category: This BlackBerry® Smartphone is a portable device, designed to be used in direct contact with the user's head, hand and to be carried in approved accessories when carried on the user's body.

RF exposure environment: This device has been shown to be in compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in OET Bulletin 65 Supplement C (Edition 01-01), FCC 96-326, IEEE Std. C95.1-1999, Health Canada's Safety Code 6, as reproduced in RSS-102 issue 2-2005 and has been tested in accordance with the measurement procedures specified in OET Bulletin 65 Supplement C (Edition 01-01), ANSI/IEEE Std. C95.3-1991, IEEE 1528-2003, IEC 62209-1-2005, DASY4 manual which follows draft IEC 62209 – Part 2 and Health Canada's Safety Code 6.

Tested and documented by:	**Signatures**	**Date**
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1.0 OPERATING CONFIGURATIONS AND TEST CONDITIONS

1.1 Picture of Device

Please refer to Appendix E.

Figure 1. BlackBerry Smartphone

1.2 Antenna description

Type	Internal fixed antenna
Location	Back bottom centre
Configuration	Internal fixed antenna

Table 1. Antenna description

1.3 Device description

Device Model	RCD21IN			
FCC ID	L6ARCD20IN			
PIN	40245A0B (iDEN/BT) (Rev 2), 40245A36 (Wifi) (Rev 2)			
Prototype or Production Unit	Production			
Mode(s) of Operation	PSTN (Phone) / Data-Mode iDEN 800 TDMA 16-QAM 64-QAM, QPSK	PSTN (Phone) / Data-Mode iDEN 900 TDMA 16-QAM 64-QAM, QPSK	Push-To-Talk mode TDMA 16-QAM 64-QAM, QPSK	Bluetooth
Maximum nominal conducted RF Output Power (dBm)	27.50	27.50	27.50	5.33
Tolerance in Power Setting on centre channel (dB)	±0.3	±0.3B	±0.3 dB	N/A
Duty Cycle	2:6	2:6	1:6	N/A
Tx Frequency Range (MHz)	806.0125 – 824.9875MHz	896.0188 – 900.9812 MHz	806.0125 – 824.9875MHz 896.0188 – 900.9812 MHz	2402-2483
Mode(s) of Operation	802.11b	802.11g		
Maximum nominal conducted RF Output Power (dBm)	18.00	17.00		
Tolerance in Power Setting on centre channel (dB)	± 0.50	± 0.50		
Duty Cycle	1:1	1:1		
Tx Frequency Range (MHz)	2412-2462	2412-2462		

Table 2. Test device description

1.4 Body worn accessories (holsters)

The device has been tested with the following holsters which contain metal components and the separation distance between the device and the user's body is listed in the table below. The holsters are designed with the intended device orientation being with the LCD facing the belt clip. Proper positioning is vital for protection of the LCD display, and to help maximize the battery life of the device. The device can also be placed in the holster with the backside facing the belt clip. Body SAR measurements were carried out with the worst-case configuration front LCD side and backside towards the belt clip.

Holster	Model / Part Number	Separation (mm)
Leather Swivel Holster	HDW-20959-001	21
Plastic Swivel Holster	ASY-20412-001	20
Rugged Holster	HDW-20961-001	21

Table 3: Body worn holster

Please refer to Appendix E.
Figure 2. Body-worn holster

1.5 Headset

The device was tested with and without the following headset model numbers.

1) HDW-13019-001

1.6 Battery

The device was tested with the following Lithium Ion Battery pack.

1) BAT-11005-001

1.7 Procedure used to establish test signal

The device was put into test mode for SAR measurements by using proprietary test software to initiate a call, set modulation, duty cycle, maximum power and frequency for iDEN and 802.11b/g. A Rohde & Schwarz CBT Bluetooth Tester was used to establish a connection with the EUT's Bluetooth radio. Worst case SAR was evaluated with Bluetooth on.

1.8 Highlights of the FCC OET SAR Measurement Requirements for 3-6 GHz and Measurement Procedures for 802.11 b/g Transmitter

- Maintained dielectric parameter uncertainty as close to ± 5.0% of the target value as possible.
- Liquid depth from SAM ERP or flat phantom was kept at 15 cm.
- Probe Requirement for 3 – 6 GHz SAR testing specs are outlined below:

Probe tip to sensor center	1.0 mm
Probe tip diameter is	2.5 mm
Probe calibration uncertainty	< 15 % for f = 2.45 to < 6.0 GHz
Probe calibration range	± 100 MHz

Table 4: Probe specification requirements

- Frequency Channel Configuration: 802.11 b/g modes are tested on "default test channels" 1, 6 and 11.
- For each frequency band, testing at higher rates and higher modulations is not required when the maximum average output power for each of these configurations is less than ¼ dB higher than those measured at the lowest data rate.
- SAR is not required for 802.11g channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11b channels.
- SAR test was conducted on each "default test channel" and each band with the worst case modulation that resulted in maximum duty cycle of 99.5 %.
- Conducted power measurements:

802.11b @ 1Mbps		802.11g @ 6Mbps	
Chan	**Cond. Power (dBm)**	**Chan**	**Cond. Power (dBm)**
1	18.00	1	13.50
6	17.90	6	16.70
11	18.05	11	13.70

Table 5: 802.11 b/g channel vs. conducted power

		802.11g			802.11b
Data Rate (Mbps)	**Mod.**	**Channel 6 Cond. Power (dBm)**	**Data Rate (Mbps)**	**Mod.**	**Channel 6 Cond. Power (dBm)**
6	BPSK	16.70	1	BPSK	17.90
9	BPSK	16.50	2	DQPSK	17.80
12	QPSK	14.85	5.5	CCK	17.65
18	QPSK	14.55	11	CCK	17.50
24	16-QAM	13.20			
36	16-QAM	12.80			
48	64-QAM	10.90			
54	64-QAM	10.80			

Table 6: 802.11 b/g modulation type/data rate vs. conducted power

1.9 Highlights of the FCC OET SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas

Unlicensed Transmitters
When there is simultaneous transmission –
Stand-alone SAR not required when
- output ≤ 2·PRef and antenna is > 5.0 cm from other antennas
- output ≤ PRef and antenna is > 2.5 cm from other antennas
- the other antenna(s), which are < 2.5 cm away, has an output ≤ PRef OR max 1g SAR < 1.2 W/kg

Otherwise stand-alone SAR is required
- test SAR on highest output channel for each wireless mode and exposure condition
- if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedure

Simultaneous Transmission SAR not required:
Unlicensed only
- when stand-alone 1-g SAR is not required and antenna is > 5 cm from other antennas
- when the other antenna(s), which are < 2.5 cm away, has an output ≤ PRef OR max 1g SAR < 1.2 W/kg

Licensed & Unlicensed
- when the sum of the 1-g SAR is < 1.6 W/kg for a pair or all simultaneous transmitting antennas.
- when SAR to antenna separation ratio of simultaneous transmitting antenna pair is < 0.3

Simultaneous Transmission SAR required:
Licensed & Unlicensed
- antenna pairs with SAR to antenna separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in standalone configuration for each wireless mode and exposure condition.

	2.45	5.15 - 5.35	5.47 - 5.85	GHz
P_{Ref}	12	6	5	mW
Device output power should be rounded to the nearest mW to compare with values specified in this table.				

Table 7 – Output Power Thresholds for Unlicensed Transmitters

Mode	Configuration	Highest 1 g SAR (W/kg)
BT	**Head-Left-Touch**	0.0002
	Body-Holster -Back	0.0008
802.11b/g	**Head-Left-Touch**	0.13
	Body-Holster -Back	0.15
iDEN 800/ iDEN 900	**Head-Left-Touch**	1.10
	Body-Holster -Back	0.75

Table 8 – Highest SAR values for same configuration

The sum of 1-g SAR values is < 1.6 W/kg for a pair or all simultaneous transmitting antennas , therefore Simultaneous Transmission SAR is not required.

2.0 DESCRIPTION OF THE TEST EQUIPMENT

2.1 SAR measurement system

SAR measurements were performed using a Dosimetric Assessment System (DASY4), an automated SAR measurement system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich, Switzerland.

The DASY 4 system for performing compliance tests consists of the following items:
· A standard high precision 6-axis robot (Stäubli RX family) with controller 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 DAE module that performs the signal amplification, signal multiplexing, A/D 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 Electro-optical coupler (EOC).
· A unit to operate the optical surface detector that is connected to the EOC.
· The EOC performs the conversion from an optical signal into the digital electric signal of the DAE. The EOC is connected to the PC plug-in card.
· The functions of the PC plug-in card based on a DSP is to perform the time critical tasks such as signal filtering, surveillance of the robot operation fast movement interrupts.
· A computer operating Windows 2000.
· DASY 4 software version 4.7.
· Remote control 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 mobile phones.
· Tissue simulating liquid mixed according to the given recipes (see section 6.1).
· System validation dipoles allowing for the validation of proper functioning of the system.

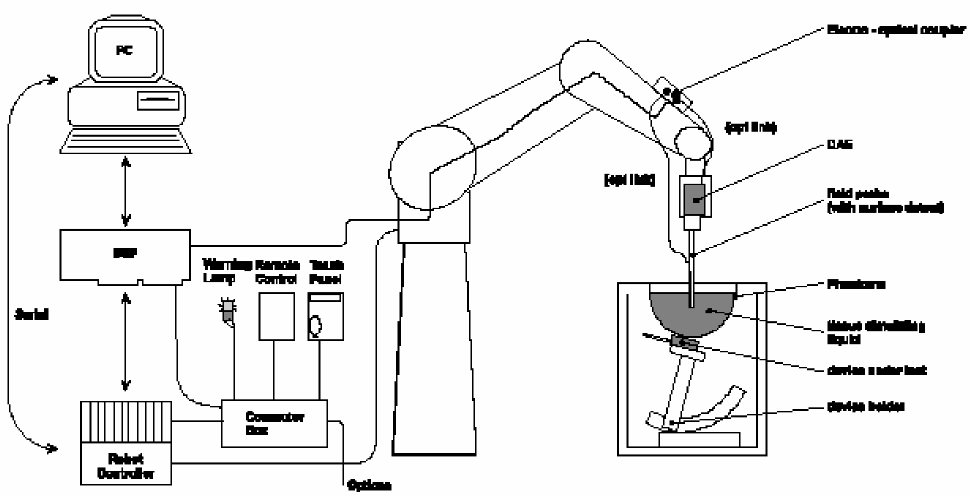

Figure 3. System Description

2.1.1 Equipment List

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date
SCHMID & Partner Engineering AG	E-field probe	ET3DV6	1642	01/18/2009
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE3)	DAE3 V1	472	03/05/2009
SCHMID & Partner Engineering AG	Dipole Validation Kit	D835V2	446	01/08/2009
SCHMID & Partner Engineering AG	Dipole Validation Kit	D900V2	133	01/08/2009
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2450V2	747	11/07/2009
Agilent Technologies	Signal generator	8648C	4037U03155	09/20/2009
Agilent Technologies	Power meter	E4419B	GB40202821	09/19/2009
Agilent Technologies	Power sensor	8481A	MY41095417	12/19/2008
Amplifier Research	Amplifier	5S1G4M3	300986	CNR
Agilent Technologies	Network analyzer	8753ES	US39174857	12/19/2008
Agilent Technologies	Power meter	N1911A	MY45100905	04/22/2009
Agilent Technologies	Power sensor	N1912A	SG45240281	05/05/2009
Rohde & Schwarz	CBT Bluetooth Tester	CBT35	100370	12/06/2008
Giga-tronics	Power meter	8541C	1837762	01/17/2009
Giga-tronics	Power sensor	80401A	1835838	01/17/2009

Table 9. Equipment list

2.2 Description of the test setup

Before SAR measurements are conducted, the device and the DASY equipment are setup as follows:

2.2.1 Device and base station simulator setup

• Power up the device.
• Turn on the base station simulator and set the radio channel and power to the appropriate values.
• Connect an antenna to the RF IN/OUT of the communication test set and place it close to the device.

2.2.2 DASY setup

- Turn the computer on and log on to Windows 2000.
- Start the DASY4 software by clicking on the icon located on the Windows desktop.
- Mount the DAE unit and the probe. Turn on the DAE unit.
- Turn the Robot Controller on by turning the main power switch to the horizontal position
- Align the probe by clicking the 'Align probe in light beam' button.
- Open a file and configure the proper parameters - probe, medium, communications system etc.
- Establish a connection between the device and the communications test instrument. Place the device on the stand and adjust it under the phantom.
- Start SAR measurements.

3.0 ELECTRIC FIELD PROBE CALIBRATION

3.1 Probe Specifications

SAR measurements were conducted using the dosimetric probe ET3DV6, designed by Schmid & Partner Engineering AG for the measurement of SAR. The probe is constructed using the thin film technique, with printed resistive lines on ceramic substrates. It has a symmetrical design with triangular core, built-in optical fibre for the surface detection system and built-in shielding against static discharge. The probe is sensitive to E-fields and thus incorporates three small dipoles arranged so that the overall response is close to isotropic. The table below summarizes the technical data for the probe.

Property	Data
Probe model EX3DV6	
Frequency range	30 MHz – 3 GHz
Linearity	±0.1 dB
Directivity (rotation around probe axis)	≤ ±0.2 dB
Directivity (rotation normal to probe axis)	±0.4 dB
Dynamic Range	5 mW/kg – 100 W/kg
Probe positioning repeatability	±0.2 mm
Spatial resolution	< 0.125 mm^3

Table 10. Probe specifications

3.2 Probe calibration and measurement uncertainty

The probe ET3DV6 was calibrated with an accuracy better than ±10% . The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe were tested. The probe calibration parameters are shown on Appendix D.

4.0 SAR MEASUREMENT SYSTEM VERIFICATION

Prior to conducting SAR measurements, the system was validated using the dipole validation kit and the flat section of the SAM phantom. A power level of 1.0W was applied to the dipole antenna. The verification results are in the table below with a comparison to reference values. Printouts are shown in Appendix A. All the measured parameters are within the allowed tolerances.

4.1 System accuracy verification for head adjacent use

f (MHz)	Limits / Measured	SAR (W/kg) 1 g / 10 g	Dielectric Parameters		Liquid Temp (°C)
			ε_r	σ [S/m]	
835	Measured (09/23/2008)	8.97 / 5.91	41.30	0.87	23.1
	Measured (10/15/2008)	8.90 / 5.87	40.72	0.86	23.1
	Recommended Limits	9.30 / 6.00	41.50	0.90	N/A
900	Measured (09/24/2008)	9.91 / 6.43	39.97	0.93	22.0
	Recommended Limits	10.40 / 6.70	41.50	0.97	N/A
2450	Measured (09/29/2008)	58.30 / 26.60	37.28	1.94	23.1
	Measured (10/06/2008)	57.10 / 25.90	37.38	1.96	22.1
	Measured (10/21/2008)	56.20 / 25.70	37.42	1.94	23.5
	Recommended Limits	53.20 / 24.80	39.2	1.80	N/A

Table 11. System accuracy (validation for head adjacent use)

5.0 PHANTOM DESCRIPTION

The SAM Twin Phantom, manufactured by SPEAG, was used during the SAR measurements. The phantom is made of a fibreglass shell integrated with a wooden table.

The SAM Twin Phantom is a fibreglass shell phantom with 2 mm shell thickness. It has three measurement areas:
Left side head
Right side head
Flat phantom

The phantom table dimensions are: 100x50x85 cm (LxWxH). The table is intended for use with freestanding robots.

The bottom shelf contains three pair of bolts for locking the device holder in place. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is
necessary if two phantoms are used (e.g., for different solutions).

A white cover is provided to top the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible; however the optical surface detector does not work properly at the cover surface. Place a sheet of white paper on the cover when using optical surface detection.

Liquid depth of ≥ 15 cm is maintained in the phantom for all the measurements.

Figure 4. SAM Twin Phantom

6.0 TISSUE DIELECTRIC PROPERTIES

6.1 Composition of tissue simulant

The composition of the brain and muscle simulating liquids for 800-900 MHz and 1800-1900 MHz are shown in the table below.

INGREDIENT	MIXTURE 800–900MHz		MIXTURE 1800–1900MHz		MIXTURE 2450 MHz	
	Brain %	**Muscle %**	**Brain %**	**Muscle %**	**Brain %**	**Muscle %**
Water	40.29	65.45	55.24	69.91	55.0	68.75
Sugar	57.90	34.31	0	0	0	0
Salt	1.38	0.62	0.31	0.13	0	0
HEC	0.24	0	0	0	0	0
Bactericide	0.18	0.10	0	0	0	0
DGBE	0	0	44.45	29.96	40.0	31.25
Triton X-100	0	0	0	0	5.0	0

Table 12. Tissue simulant recipe

6.1.1 Equipment

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date
Pyrex, England	Graduated Cylinder	N/A	N/A	N/A
Pyrex, USA	Beaker	N/A	N/A	N/A
Acculab	Weight Scale	V1-1200	018WB2003	N/A
Control Company	Digital Thermometer	15-077-21	51129471	05/12/2009
IKA Works Inc.	Hot Plate	RC Basic	3.107433	N/A

Table 13. Tissue simulant preparation equipment

6.1.2 Preparation procedure

800-900 MHz liquids

- Fill the container with **water**. Begin heating and stirring.
- Add the Cellulose, the preservative substance and the salt. After several hours, the liquid will become more transparent again. The container must be covered to prevent evaporation.
- Add Sugar. Stir it well until the sugar is sufficiently dissolved.
- Keep the liquid hot but below the boiling point for at least an hour. The container must be covered to prevent evaporation.
- Remove the container from, and turn the hotplate off and allow the liquid to cool off to room temperature prior to performing dielectric measurements.

1800-2450 MHz liquid

- Fill the container with water and place it on hotplate. Begin heating and stirring.
- Add the salt, Glycol/Triton X-100. The container must be covered to prevent evaporation.
- Keep the liquid hot enough to dissolve sugar for at least an hour. The container must be covered to prevent evaporation.
- Remove the container from, and turn the hotplate off and allow the liquid to cool off to room temperature prior to performing dielectric measurements.

6.2 Electrical parameters of the tissue simulating liquid

The tissue dielectric parameters shall be measured before a batch can be used for SAR measurements to ensure that the simulated tissue was properly made and will simulate the desired human characteristic. Limits and measured electrical parameters are shown in the table below.
Recommended limits are adopted from IEEE P1528-2003:
" Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", DASY 4 manual and from FCC Tissue Dielectric Properties web page at http://www.fcc.gov/fcc-bin/dielec.sh

f (MHz)	Tissue Type	Limits / Measured	Dielectric Parameters		Liquid Temp (°C)
			ε_r	σ [S/m]	
835	Head	Measured (09/23/2008)	41.30	0.87	23.1
		Measured (10/15/2008)	40.72	0.86	23.1
		Recommended Limits	41.50	0.90	N/A
	Muscle	Measured (09/23/2008)	52.95	0.95	22.5
		Measured (10/15/2008)	52.93	0.94	22.8
		Recommended Limits	55.20	0.97	N/A
900	Head	Measured (09/24/2008)	39.97	0.93	22.9
		Recommended Limits	41.50	0.97	N/A
	Muscle	Measured (09/24/2008)	52.56	1.02	22.1
		Recommended Limits	55.00	1.05	N/A
2450	Head	Measured (09/29/2008)	37.28	1.94	23.1
		Measured (10/06/2008)	37.38	1.96	22.1
		Measured (10/21/2008)	37.42	1.94	23.5
		Recommended Limits	39.20	1.80	N/A
	Muscle	Measured (09/29/2008)	50.14	2.00	23.1
		Measured (10/06/2008)	50.07	2.05	22.6
		Measured (10/21/2008)	50.10	2.07	22.9
		Recommended Limits	52.70	1.95	N/A

Table 14. Electrical parameters of tissue simulating liquid

6.2.1 Equipment

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date
Agilent Technologies	Network Analyzer	8753ES	US39174857	12/19/2008
Agilent Technologies	Dielectric probe kit	HP 85070C	US9936135	CNR
Dell	PC using GPIB card	GX110	347	N/A
Control Company	Digital Thermometer	15-077-21	51129471	05/12/2009

Table 15. Equipment required for electrical parameter measurements

6.2.2 Test Configuration

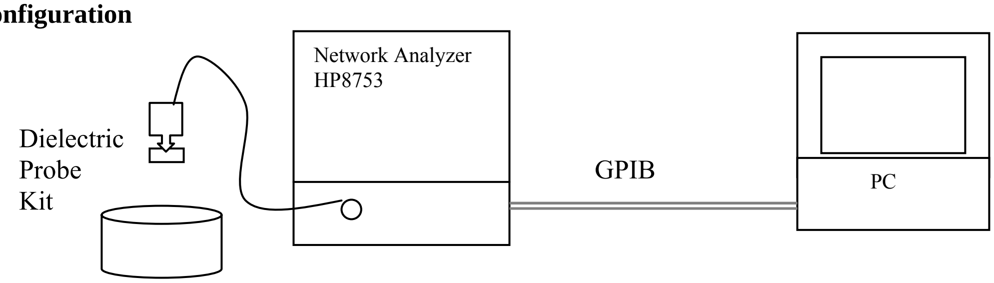

Figure 5. Test configuration

6.2.3 Procedure

1. Turn NWA on and allow at least 30 minutes for warm up.
2. Mount dielectric probe kit so that interconnecting cable to NWA will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature (±1°).
4. Set water temperature in HP-Software (Calibration Setup).
5. Perform calibration.
6. Relative permittivity $\varepsilon r = \varepsilon'$ and conductivity can be calculated from ε''
   $\sigma = \omega\, \varepsilon_0\, \varepsilon''$
7. Measure liquid shortly after calibration.
8. Stir the liquid to be measured. Take a sample (~50ml) with a syringe from the center of the liquid container.
9. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
10. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
11. Perform measurements.
12. Adjust medium parameters in DASY4 for the frequencies necessary for the measurements ('Setup Config', select medium (e.g. Head 835 MHz) and press 'Option'-button.
13. Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 835 MHz).

Sample calculation for 835 MHz head tissue dielectric parameters using data from Table 16.
Relative permittivity $\varepsilon r = \varepsilon' = 41.30$
Conductivity $\sigma = \omega\, \varepsilon_0\, \varepsilon'' = (2\pi \times 835 \times 10^6)(8.854 \times 10^{-12})(18.66) = 0.87$ S/m

Title

SubTitle

September 23, 2008 09:01 AM

Frequency	e'	e''
800.000000 MHz	41.7343	18.6544
805.000000 MHz	41.6815	18.6652
810.000000 MHz	41.6397	18.6730
815.000000 MHz	41.6027	18.6367
820.000000 MHz	41.5217	18.6502
825.000000 MHz	41.4302	18.6402
830.000000 MHz	41.3780	18.6722
835.000000 MHz	41.3035	18.6580
840.000000 MHz	41.2468	18.6287
845.000000 MHz	41.1798	18.6339
850.000000 MHz	41.1181	18.6170
855.000000 MHz	41.0804	18.5732
860.000000 MHz	40.9941	18.5896
865.000000 MHz	40.9292	18.5695
870.000000 MHz	40.8525	18.5583
875.000000 MHz	40.7650	18.5404
880.000000 MHz	40.7263	18.5490
885.000000 MHz	40.6712	18.5324
890.000000 MHz	40.5978	18.5015
895.000000 MHz	40.5894	18.4867
900.000000 MHz	40.5692	18.4804

Head

Title

SubTitle

September 23, 2008 09:15 AM

Frequency	e'	e''
800.000000 MHz	53.3195	20.4323
805.000000 MHz	53.2713	20.4420
810.000000 MHz	53.1976	20.4550
815.000000 MHz	53.1662	20.4254
820.000000 MHz	53.1228	20.4223
825.000000 MHz	53.0475	20.4196
830.000000 MHz	53.0166	20.3683
835.000000 MHz	52.9528	20.4059
840.000000 MHz	52.9052	20.3938
845.000000 MHz	52.8385	20.3562
850.000000 MHz	52.8285	20.3525
855.000000 MHz	52.7613	20.3373
860.000000 MHz	52.7039	20.3457
865.000000 MHz	52.6465	20.3220
870.000000 MHz	52.5826	20.3065
875.000000 MHz	52.5384	20.2839
880.000000 MHz	52.4835	20.2866
885.000000 MHz	52.4135	20.2741
890.000000 MHz	52.3715	20.2774
895.000000 MHz	52.3441	20.2752
900.000000 MHz	52.3043	20.2519

Muscle

Table 16. 835 MHz head and muscle tissue dielectric parameters

Title SubTitle September 24, 2008 11:05 AM			Title SubTitle September 24, 2008 11:19 AM		
Frequency	e'	e"	Frequency	e'	e"
820.000000 MHz	40.9645	18.8076	820.000000 MHz	53.4080	20.5377
825.000000 MHz	40.9021	18.7955	825.000000 MHz	53.3724	20.5249
830.000000 MHz	40.8420	18.7883	830.000000 MHz	53.3053	20.5290
835.000000 MHz	40.7564	18.7988	835.000000 MHz	53.2624	20.5354
840.000000 MHz	40.7010	18.8011	840.000000 MHz	53.2003	20.5160
845.000000 MHz	40.6456	18.7622	845.000000 MHz	53.1524	20.5026
850.000000 MHz	40.5703	18.7602	850.000000 MHz	53.0829	20.4865
855.000000 MHz	40.4935	18.7486	855.000000 MHz	53.0251	20.4988
860.000000 MHz	40.4543	18.7217	860.000000 MHz	52.9803	20.4848
865.000000 MHz	40.3661	18.6988	865.000000 MHz	52.9236	20.4647
870.000000 MHz	40.2655	18.7355	870.000000 MHz	52.8434	20.4644
875.000000 MHz	40.2303	18.7134	875.000000 MHz	52.7610	20.4545
880.000000 MHz	40.1467	18.6953	880.000000 MHz	52.7422	20.4422
885.000000 MHz	40.0788	18.6931	885.000000 MHz	52.6563	20.4447
890.000000 MHz	40.0440	18.6816	890.000000 MHz	52.6325	20.4554
895.000000 MHz	40.0026	18.6623	895.000000 MHz	52.6011	20.4167
900.000000 MHz	39.9672	18.6612	900.000000 MHz	52.5568	20.4506
905.000000 MHz	39.9131	18.6608	905.000000 MHz	52.5069	20.4400
910.000000 MHz	39.8580	18.6705	910.000000 MHz	52.4507	20.4372
915.000000 MHz	39.8016	18.6563	915.000000 MHz	52.4079	20.4396
920.000000 MHz	39.7387	18.6831	920.000000 MHz	52.3660	20.4417
Head			Muscle		

Table 17. 900 MHz head and muscle tissue dielectric parameters

Title			Title		
SubTitle			SubTitle		
September 29, 2008 01:41 PM			September 29, 2008 02:08 PM		
Frequency	e'	e"	Frequency	e'	e"
2.400000000 GHz	37.5183	14.0972	2.400000000 GHz	50.3643	14.5042
2.405000000 GHz	37.4939	14.1223	2.405000000 GHz	50.3454	14.5344
2.410000000 GHz	37.4796	14.1424	2.410000000 GHz	50.3191	14.5517
2.415000000 GHz	37.4583	14.1569	2.415000000 GHz	50.3015	14.5699
2.420000000 GHz	37.4428	14.1507	2.420000000 GHz	50.2819	14.5832
2.425000000 GHz	37.4119	14.1731	2.425000000 GHz	50.2630	14.5997
2.430000000 GHz	37.3778	14.1844	2.430000000 GHz	50.2353	14.6086
2.435000000 GHz	37.3513	14.1980	2.435000000 GHz	50.2156	14.6299
2.440000000 GHz	37.3384	14.2146	2.440000000 GHz	50.1872	14.6437
2.445000000 GHz	37.3129	14.2221	2.445000000 GHz	50.1591	14.6574
2.450000000 GHz	37.2800	14.2302	2.450000000 GHz	50.1357	14.6657
2.455000000 GHz	37.2681	14.2543	2.455000000 GHz	50.1187	14.6880
2.460000000 GHz	37.2282	14.2736	2.460000000 GHz	50.0960	14.6993
2.465000000 GHz	37.2141	14.2805	2.465000000 GHz	50.0597	14.7201
2.470000000 GHz	37.1753	14.2937	2.470000000 GHz	50.0436	14.7273
2.475000000 GHz	37.1363	14.3099	2.475000000 GHz	50.0182	14.7535
2.480000000 GHz	37.1260	14.3412	2.480000000 GHz	50.0111	14.7646
2.485000000 GHz	37.1172	14.3469	2.485000000 GHz	49.9854	14.7988
2.490000000 GHz	37.0903	14.3537	2.490000000 GHz	49.9621	14.8227
2.495000000 GHz	37.0756	14.3752	2.495000000 GHz	49.9628	14.8393
2.500000000 GHz	37.0593	14.3844	2.500000000 GHz	49.9479	14.8607
	Head			Muscle	

Table 18. 2450 MHz head and muscle tissue dielectric parameters

7.0 SAR SAFETY LIMITS

Standards/Guideline	Localized SAR Limit (W/kg) General public (uncontrolled)	Localized SAR Limits (W/kg) Workers (controlled)
ICNIRP (1998) Standard	2.0 (10g)	10.0 (10g)
IEEE C95.1 (1999) Standard	1.6 (1g)	8.0 (1g)

Table 19. SAR safety limits for Controlled / Uncontrolled environment

Human Exposure	Localized SAR Limits (W/kg) 10g, ICNIRP (1998) Standard	Localized SAR Limits (W/kg) 1g, IEEE C95.1 (1999) Standard
Spatial Average (averaged over the whole body)	0.08	0.08
Spatial Peak (averaged over any X g of tissue)	2.00	1.60
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.00	4.00 (10g)

Table 20. SAR safety limits

Uncontrolled Environments are defined as locations where there is exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

8.0 DEVICE POSITIONING

8.1 Device holder for SAM Twin Phantom

The Device was positioned for all test configurations using the DASY4 holder. The device holder facilitates the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately and with repeatability positioned according to FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

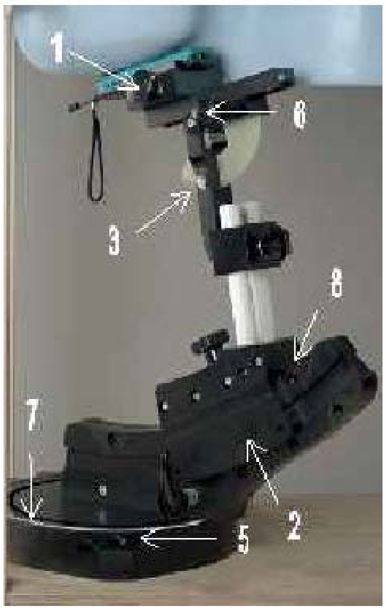

Figure 6. Device Holder

1. Put the phone in the clamp mechanism (1) and hold it straight while tightening. (Curved phones or phones with asymmetrical ear pieces should be positioned so that the earpiece is in the symmetry plane of the clamp).

2. Adjust the sliding carriage (2) to 90°. Then adjust the phone holder angle (3) until the reference line of the phone is horizontal (parallel to the flat phantom bottom). The phone reference line is defined as the front tangential line between the earpiece and the center of the device bottom (or the center of the flip hinge). For devices with parallel front and backsides, the phone holder angle (3) is 0°.

3. Place the device holder at the desired phantom section and move it securely against the positioning pins (4). The screw in front of the turning plate can be applied for correct positioning (5). (Do not tighten it too strongly).

4. Shift the phone clamp (6) so that the earpiece is exactly below the ear marking of the phantom. The phone is now correctly positioned in the holder for all standard phantom measurements, even after changing the phantom or phantom section.

5. Adjust the device position angles to the desired measurement position.

6. After fixing the device angles, move the phone fixture up until the phone touches the ear marking. (The point of contact depends on the design of the device and the positioning angle).

8.2 Description of the test positioning

8.2.1 Test Positions of Device Relative to Head

The handset was tested in two test positions against the head phantom, the “cheek” position and the “tilted” position, on both left and right sides of the phantom.

The handset was tested in the above positions according to IEEE 1528- 2003 “Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”.

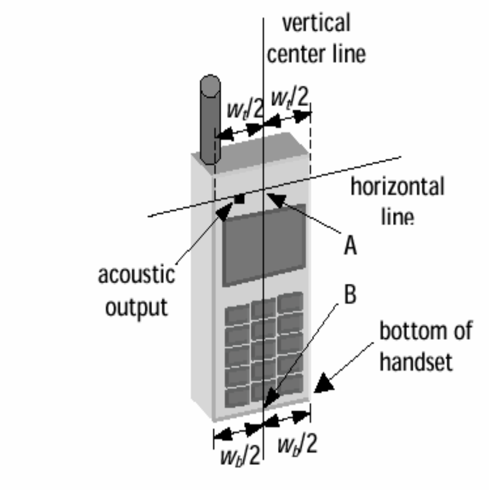

Figure 7a. Handset vertical and horizontal reference lines – fixed case

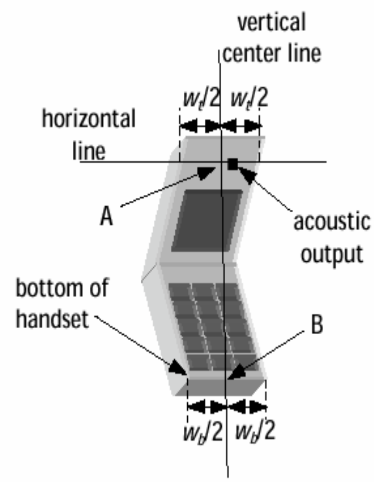

Figure 7b. Handset vertical and horizontal reference lines – “clam-shell”

8.2.1.1 Definition of the "cheek" position

1) Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover.

2) Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width *wt* of the handset at the level of the acoustic output (point A on Figures 7a and 7b), and the midpoint of the width *wb* of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 7a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 7b), especially for clamshell handsets, handsets with flip pieces, and other irregularly shaped handsets.

3) Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7), such that the plane defined by the vertical center line and the horizontal center line is in a plane approximately parallel to the sagittal plane of the phantom.

4) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.

5) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is the plane normal to MB ("*mouth-bac*k") - NF ("*neck-fron*t") including the line MB (reference plane).

6) Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF.

7) While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the ear (cheek).

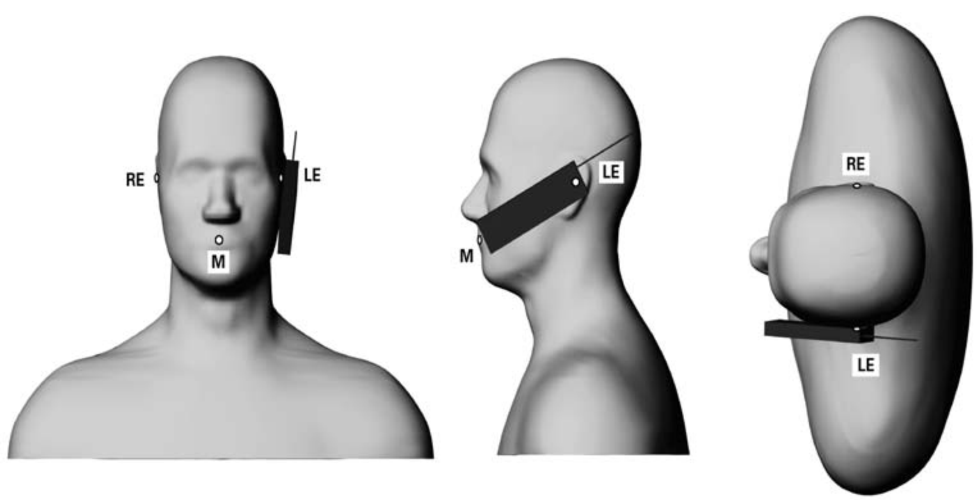

Figure 8. Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.1.2 Definition of the "Tilted" Position

1) Repeat steps 1 to 7 of 5.4.1 (in this report 8.2.1.1) to replace the device in the "cheek position."
2) While maintaining the device in the reference plane (described above) and pivoting against the ear, move the device outward away from the mouth by an angle of 15 degrees, or until the antenna touches the phantom**.**

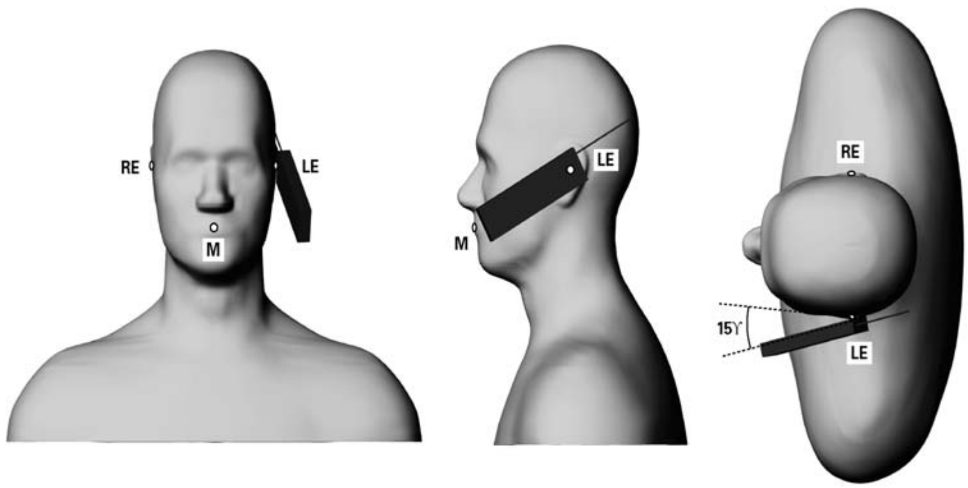

Figure 9. Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.2 Body Holster Configuration

Body worn holsters, as shown on Figure 2, have been test with the device for FCC RF exposure compliance. The EUT was positioned in each holster case and the belt clip was placed against the flat section of the phantom. A headset was then connected to the device to simulate hands-free operation in a body worn holster configuration.

9.0 HIGH LEVEL EVALUATION

9.1 Maximum search

The maximum search is automatically performed after each coarse scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations.

9.2 Extrapolation

The extrapolation can be used in z-axis scans with automatic surface detection. The SAR values can be extrapolated to the inner phantom surface. The extrapolation distance is the sum of the probe sensor offset, the surface detection distance and the grid offset. The extrapolation is based on fourth order polynomial functions. The extrapolation is only available for SAR values.

9.3 Boundary correction

The correction of the probe boundary effect in the vicinity of the phantom surface is done in the standard (worst case) evaluation; the boundary effect is reduced by different weights for the lowest measured points in the extrapolation routine. The result is a slight overestimation of the extrapolated SAR values (2% to 8%) depending on the SAR distribution and gradient. The advanced evaluation makes a full compensation of the boundary effect before doing the extrapolation. This is only possible for probes with specifications on the boundary effect.

9.4 Peak search for 1g and 10g cube averaged SAR

The 1g and 10g peak evaluations are only available for the predefined cube 5x5x7 scan. The routines are verified and optimized for the grid dimensions used in these cube measurements.
The measured volume of 30x30x30mm with 7.5mm resolution in (x,y) and 5mm resolution in z axis amounts to 175 measurement points. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is then moved around until the highest averaged SAR is found. This last procedure is repeated for a 10 g cube. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

10.0 MEASUREMENT UNCERTAINTY

DASY4 Uncertainty Budget
According to IEEE P1528 [1]

Error Description	Uncertainty value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±4.8%	N	1	1	1	±4.8%	±4.8%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±1.0%	N	1	1	1	±1.0%	±1.0%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Conditions	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	$\sqrt{3}$	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	$\sqrt{3}$	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						±10.3%	±10.0%	330
Expanded STD Uncertainty						**±20.6%**	**±20.1%**	

Table 21. Worst-Case uncertainty budget for DASY4 assessed according to IEEE P1528. Source: Schmid & Partner Engineering AG.

[1] The budget is valid for the frequency range 300MHz - 3 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerably smaller.

11.0 TEST RESULTS

11.1 SAR Measurement results at highest power measured against the head

Test Position	Mode	f (MHz)	Cond. Pulsed Avg. Output Power (dBm)	Liquid Temp. (°C)	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Left Head Cheek	2-slots iDEN 800 MHz	806.013	27.72	22.6	0.775	-0.384	0.85
		813.500	27.71	22.3	0.797	-0.083	0.80
		824.9875	27.70	22.0	0.877	-0.070	0.88
Left Head 15° Tilt	2-slots iDEN 800 MHz	806.013	27.72				
		813.500	27.71				
		824.9875	27.70	22.1	0.427	-0.105	0.43
Right Head Cheek	2-slots iDEN 800 MHz	806.013	27.72	22.2	0.876	0.0763	0.88
		813.500	27.71	21.1	0.748	-0.372	0.82
		824.9875	27.70	22.1	0.800	-0.118	0.80
Right Head 15° Tilt	2-slots iDEN 800 MHz	806.013	27.72				
		**813.500	27.71	21.4	0.430	0.0978	0.43
		824.9875	27.70				
Flat Head Push to Talk 25mm Spacer	1-slot iDEN 800 MHz	806.013	27.70				
		**813.500	27.70	21.4	0.235	-0.0575	0.24
		824.9875	27.69				

Table 22. Head SAR results for iDEN 800 head configuration for Rev 2

* Note: If the power drift is ≤ – 0.200 dB, the extrapolated SAR is calculated using the formula:
Extrapolated SAR = (Measured SAR) * 10^(|Power Drift (dB)| / 10)

** Note 2: Supplement C: Middle channel testing is sufficient if SAR < 3 dB below limit

Test Position	Mode	f (MHz)	Cond. Output Power (dBm)	Liquid Temp. (°C)	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Left Head Cheek	2-slots iDEN 900 MHz	896.00	27.72	21.6	1.03	-0.184	1.03
		898.50	27.71	21.6	0.978	-0.186	0.98
		901.00	27.70	21.9	0.989	-0.466	**1.10**
Left Head 15° Tilt	2-slots iDEN 900 MHz	896.00	27.72				
		898.50	27.71				
		901.00	27.70	22.1	0.571	-0.162	0.57
Right Head Cheek	2-slots iDEN 900 MHz	896.00	27.72				
		**898.50	27.71	21.8	0.969	-0.150	0.97
		901.00	27.70				
Right Head 15° Tilt	2-slots iDEN 900 MHz	896.00	27.72				
		**898.50	27.71	22.0	0.597	-0.066	0.60
		901.00	27.70				
Flat Head Push to Talk 25mm Spacer	1-slot iDEN 900 MHz	896.00	27.65				
		**898.50	27.62	21.7	0.292	-0.114	0.29
		901.00	27.63				

Table 23. Head SAR results for iDEN 900 head configuration for Rev 2

* Note: If the power drift is ≤ – 0.200 dB, the extrapolated SAR is calculated using the formula:
Extrapolated SAR = (Measured SAR) * 10^(|Power Drift (dB)| / 10)

** Note 2: Supplement C: Middle channel testing is sufficient if SAR < 3 dB below limit

Test Position	Mode	f (MHz)	Cond. Output Power (dBm)	Liquid Temp. (°C)	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Left Head Cheek	802.11 b 2450 MHz	2412	18.00	22.1	0.132	-0.069	0.132
		2437	17.90	21.9	0.129	-0.178	0.129
		2462	18.05	21.7	0.118	-0.548	0.134
Left Head 15° Tilt	802.11 b 2450 MHz	2412	18.00				
		2437	17.90				
		2462	18.05	21.4	0.120	-0.538	0.136
Right Head Cheek	802.11 b 2450 MHz	2412	18.00				
		2437	17.90				
		2462	18.05	21.4	0.177	0.114	**0.177**
Right Head 15° Tilt	802.11 b 2450 MHz	2412	18.00				
		2437	17.90				
		2462	18.05	21.6	0.139	-0.061	0.139
Right Head Cheek	BT 2450 MHz	2402	7.48				
		2441	7.32	21.8	0.000573	0.390	**0.0006**
		2483	7.64				
Right Head 15° Tilt	BT 2450 MHz	2402	7.48				
		2441	7.32				
		2483	7.64				
Left Head Cheek	BT 2450 MHz	2402	7.48				
		2441	7.32	21.8	0.000195	-0.033	0.0002
		2483	7.64				
Left Head 15° Tilt	BT 2450 MHz	2402	7.48				
		2441	7.32				
		2483	7.64				

Table 24. Head SAR results for BT and WiFi/WLAN/802.11b modes

* Note 1: If the power drift is ≤ – 0.200 dB, the extrapolated SAR is calculated using the formula:
Extrapolated SAR = (Measured SAR) * 10^(|Power Drift (dB)| /10)

**Note 2: Suppliment C: Middle channel testing is sufficient only if SAR < 3dB below limit.

11.2 SAR measurement results at highest power measured against the body using accessories

Mode	Freq. (MHz)	Cond. Power (dBm)	Holster type / device configuration	Liquid Temp. (°C)	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
2-slots iDEN 800 MHz	813.5	27.71	Leather Swivel Holster, back side facing	22.0	0.665	0.0956	0.67
	813.5	27.71	Leather Swivel Holster, front side facing	22.0	0.515	-0.188	0.52
	813.5	27.71	Leather Swivel Holster, headset , back side facing	22.4	0.566	-0.011	0.57
	813.5	27.71	Plastic Holster, front side facing	22.3	0.585	0.0065	0.58
	806.013	27.72	Rugged Holster, back side facing	23.0	0.718	-0.0442	0.72
	813.5	27.71	Rugged Holster, back side facing	23.0	0.740	-0.0039	0.74
	824.987	27.70	Rugged Holster, back side facing	22.8	0.710	-0.221	**0.75**
	824.987	27.70	Rugged Holster, front side facing	22.0	0.619	-0.0152	0.62
	824.987	27.70	Rugged Holster, headset, back side facing	22.0	0.497	-0.182	0.50
	813.5	27.71	No Holster, back side 25 mm away	21.6	0.502	-0.071	0.50

Table 25. SAR results for iDEN 800 body-worn configurations for Rev 2

Mode	Freq. (MHz)	Cond. Power (dBm)	Holster type / device configuration	Liquid Temp. (°C)	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
2-slots iDEN 900 MHz	898.50	27.71	Leather Swivel Holster, back side facing	21.7	0.436	-0.179	0.44
	898.50	27.71	Leather Swivel Holster, front side facing	21.4	0.333	-0.187	0.33
	898.50	27.71	Leather Swivel Holster, headset , back side facing	21.6	0.239	-0.0142	0.24
	898.50	27.71	Plastic Holster, front side facing	21.8	0.398	-0.152	0.40
	898.50	27.71	No Holster, back side 25 mm away	21.9	0.356	-0.156	0.36

Table 26. SAR results for iDEN 900 body-worn configurations for Rev 2

Mode	Freq. (MHz)	Cond. Power (dBm)	Holster type / device configuration	Liquid Temp. (°C)	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dBm)	*Extrapolated (W/kg)
802.11b/ WLAN 2450 MHz	2412	18.00	Leather Swivel Holster, back side facing	22.6	0.113	-0.113	0.11
	2437	17.90	Leather Swivel Holster, back side facing	22.1	0.103	-0.353	0.11
	2462	18.05	Leather Swivel Holster, back side facing	22.2	0.110	-0.332	0.12
	2462	18.05	Leather Swivel Holster, front side facing	22.3	0.085	-0.122	0.08
	2462	18.05	Leather Swivel Holster, headset , back side facing	21.9	0.0271	-0.353	0.03
	2462	18.05	Plastic Holster, front side facing	22.0	0.0433	0.166	0.04
	2412	18.00	Rugged Holster, back side facing	23.6	0.151	-0.176	**0.15**
	2437	17.90	Rugged Holster, back side facing	22.4	0.129	-0.638	0.15
	2462	18.05	Rugged Holster, back side facing	22.0	0.133	-0.533	0.15
	2462	18.05	No Holster, back side 25 mm away	22.1	0.0558	-0.003	0.06
Bluetooth	2441	7.48	Leather Swivel Holster, Back side facing	22.1	0.000926	0.572	**0.0009**
	2441	7.32	Plastic Holster, Front side facing	22.8	0.000376	0.270	0.0004
	2441	7.64	Rugged Holster, Back side facing	23.2	0.000829	0.238	0.0008

Table 27. SAR results for BT/WiFi body-worn configurations for Rev 2

12.0 REFERENCES

[1] IEEE 1528-2003: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[2] EN 50360: 2001, Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)

[3] EN 50361: 2001, Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz)

[4] ICNIRP, International Commission on Non-Ionizing Radiation Protection (1998), Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

[5] Council Recommendation 1999/519/EC of July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

[6] IEEE C95.3-1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

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