SAR Compliance Test Report

Testing Lab: RIM Testing Services
440 Phillip Street
Waterloo, Ontario
Canada N2L 5R9
Phone: 519-888-7465
Fax: 519-746-0189

Applicant: Research In Motion Limited
295 Phillip Street
Waterloo, Ontario
Canada N2L 3W8
Phone: 519-888-7465
Fax: 519-888-6906
Web site: www.rim.com

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. C95.1-2005, Health Canada's Safety Code 6, as reproduced in RSS-102 issue 4-2010 and has been tested in accordance with the measurement procedures specified in FCC OET Procedures, OET Bulletin 65 Supplement C (Edition 01-01), ANSI/IEEE Std. C95.3-2002, IEEE 1528-2003, IEC 62209-1-2005, IEC 62209 - 2-2010 and Health Canada's Safety Code 6.

Tested and documented by:	Signatures	Date
Andrew Becker SAR & HAC Compliance Specialist		25-October-2011
Tested and reviewed by: Daoud Attayi Team Lead: Safety, SAR & HAC Compliance		27-October-2011
Approved by: Masud S. Attayi Manager, Regulatory Compliance		31-October-2011

CONTENTS

1.0 OPERATING CONFIGURATIONS AND TEST CONDITIONS

1.1 Picture of Device

Please refer to Appendix E.

Figure 1.1.1 BlackBerry Smartphone

1.2 Antenna description

Type	Internal fixed antenna
Location	Back bottom centre (main licensed transmitters)
Configuration	Internal fixed antenna

Table 1.2.1. Antenna description

1.3 Device description

Device Model	REQ71UW			
FCC ID	L6AREQ70UW			
PIN	Radiated: 28403322, 2868B77A (Rev5) Conducted :28403295, 2842F698 (Rev5)			
Hardware Rev	Rev 1, Rev 5			
Software Version	7.0.0.1802/1950			
Prototype or Production Unit	Production			
Mode(s) of Operation	1-slot GSM 850 GSM 1900	2-slots EDGE/GPRS 850/1900	3-slots EDGE/GPRS 850/1900	4-slots EDGE/GPRS 850/1900
Nominal Maximum conducted RF Output Power (dBm)	31.5 29.0	30.0 28.0	29.0 26.0	26.5 25.0
Tolerance in Power Setting on centre channel (dB)	± 0.5	± 0.5	± 0.5	± 0.5
Duty Cycle	1:8	2:8	3:8	4:8
Transmitting Frequency Range (MHz)	824.2 – 848.8 1850.2 – 1909.8	824.2 – 848.8 1850.2 – 1909.8	824.2 – 848.8 1850.2 – 1909.8	824.2 – 848.8 1850.2 – 1909.8
Mode(s) of Operation	802.11b	802.11g	802.11n	Bluetooth
Nominal Maximum conducted RF Output Power (dBm)	17.0	15.5	15.5	9.8
Tolerance in Power Setting on centre channel (dB)	± 0.5	± 0.5	± 0.5	N/A
Duty Cycle	1:1	1:1	1:1	N/A
Transmitting Frequency Range (MHz)	2412-2462	2412-2462	2412-2462	2402-2483

Mode(s) of Operation	802.11a/n (low band)	802.11a/n (middle band)	802.11a/n (upper band I)	802.11a/n (upper band II)
Nominal Maximum conducted RF Output Power (dBm)	14.0	14.0	14.5	14.0
Tolerance in Power Setting on centre channel (dB)	± 0.5	± 0.5	± 0.5	± 0.5
Duty Cycle	1:1	1:1	1:1	1:1
Transmitting Frequency Range (MHz)	5180-5240	5260-5320	5500-5700	5749-5805
Mode(s) of Operation	WCDMA / UMTS FDD V (850)	WCDMA / UMTS FDD II (1900)		
Nominal Maximum conducted RF Output Power (dBm)	24.5	22.0		
Tolerance in Power Setting on centre channel (dB)	± 0.5	± 0.5		
Duty Cycle	1:1	1:1		
Transmitting Frequency Range (MHz)	824.6 – 846.6	1852.4 – 1907.6		

Table 1.3.1. Test device description

The REQ71UW device supports GSM/GPRS/EDGE 900/1800 MHz bands and UMTS band I that are not operational in North America, therefore no data is presented in this report for those bands.

1.4 Body worn accessories (holsters)

The device has been tested with the holster below. The holster has been designed with the intended device orientation being with the LCD facing the belt clip only. Proper positioning is vital for protection of the LCD display, and to help maximize the battery life of the device. By design, device cannot be placed in the holster with the backside facing the belt clip/body

Number	Holster Type	Part Number	Separation distance (mm)
1	Leather Holster	HDW-42720-001	21

Table 1.4.1. Body worn holster

Please refer to Appendix E.

Figure 1.4.1. Body-worn holster

1.5 Headset

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

1) HDW-14322-003
2) HDW-15766-005
3) HDW-24529-001

1.6 Battery

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

1) BAT-30615-006

1.7 Procedure used to establish test signal

The device was put into test mode for SAR measurements by placing a voice call from a Rohde & Schwarz CMU 200 Communications Test Instrument. The power control level was set to command the device to transmit at full power at the specified frequency. Other parameters include: Channel type = full rate, discontinuous transmission off, frequency hopping off.

1.8 Highlights of the FCC OET SAR Measurement Requirements

1.8.1 SAR Measurement Requirements for 3-6 GHz and Measurement Procedures for 802.11 a/b/g/n 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: Used SPEAG probe model EX3DV4 for 5 – 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 1.8.1. Probe requirement

• Area scan resolution was maintained at 10mm
• System accuracy validation was conducted within ± 100 MHz of device mid-band frequency and results were within ± 10 % of the manufacturers target value for each band.
• Zoom Scan: The following settings were used for the validation and measurement.

Closet Measurement Point to Phantom	2.0 mm
Zoom Scan (x,y) Resolution	4.0 mm or 3 mm
Zoom Scan (z) Resolution	2.5 mm or 2 mm
Zoom Scan Volume	Minimum 24 x 24 x 20 mm*
Graded Ratio	1.5

Table 1.8.2. Zoom Scan requirement

***Note: "Auto-extend zoom scan when maxima on boundry" is enabled, which can result in the zoom scan dimensions varying between 24x24x20 to 36x36x20.**

• **As per FCC KDB 865664**, graded grids have been used (z), the first measurement point was kept within 2 mm at 5-6 GHz. The subsequent graded grid ratio of 1.5 was used. A zoom scan of minimum 24x24x20 mm^3 was used. Step size of 4.0 mm on (x,y) and 2.5 mm (z) axis were used.
• Frequency Channel Configuration: 802.11 b/g modes are tested on "default test channels" 1, 6 and 11.
• 802.11a is tested for UNII operations on channels 36 and 48 in the lower band 5.15 – 5.25 GHz band; channels 52 and 64 in the 5.25 – 5.35 GHz band; channels 149 and 161 in the 5.8 GHz band.
• 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. The average output power for 802.11a should be measured on all channels in each frequency band.
• SAR test are conducted on each "default test channel" and each band with the worst case modulation that resulted in maximum duty cycle

• Conducted power measurements:

802.11a (low band) 6Mbps		802.11a (mid band) 6Mbps		802.11a (upper band I) 6Mbps	
Chan	**Cond. Power (dBm)**	**Chan**	**Cond. Power (dBm)**	**Chan**	**Cond. Power (dBm)**
36	14.30	52	14.20	104	14.40
40	13.65	56	14.13	116	14.38
44	13.50	60	14.17	124	14.25
48	13.40	64	14.19	140	14.19
				802.11a (upper band II) 6Mbps	
				Chan	**Cond. Power (dBm)**
				149	14.21
				153	14.11
				157	14.10
				161	14.09

		802.11a (lower band)	802.11a (middle band)	802.11a (upper band II)
Data Rate (Mbits)	**Mod.**	**Channel 36**	**Channel 52**	**Channel 149**
		Cond. Power (dBm)	**Cond. Power (dBm)**	**Cond. Power (dBm)**
6	BPSK	14.30	14.20	14.21
9	BPSK	13.76	13.65	13.70
12	QPSK	12.57	12.52	12.50
18	QPSK	11.82	11.65	11.61
24	16-QAM	10.30	10.29	10.00
36	16-QAM	9.42	9.37	9.20
48	64-QAM	7.36	7.24	7.03
54	64-QAM	7.21	6.95	6.84

		802.11 n
Data Rate (Mbps)	**Mod.**	**Channel 104**
		Cond. Power (dBm)
6.5	MCS0	14.28
13	MCS1	12.50
19.5	MCS2	11.85
26	MCS3	10.43
39	MCS4	9.62
52	MCS5	7.42
58.5	MCS6	7.38
65	MCS7	6.22

Table 1.8.3. 802.11 a/n modulation type/data rate vs. conducted power

802.11b @ 1Mbps		802.11g @ 6Mbps		802.11n @ 6.5 Mbps	
Chan	Cond. Power (dBm)	Chan	Cond. Power (dBm)	Chan	Cond. Power (dBm)
1	16.52	1	12.70	1	12.50
6	17.18	6	15.64	6	15.57
11	16.94	11	13.20	11	13.10

802.11g			802.11b		
Data Rate (Mbps)	Mod.	Channel 6 Cond. Power (dBm)	Data Rate (Mbps)	Mod.	Channel 6 Cond. Power (dBm)
6	BPSK	15.64	1	BPSK	17.18
9	BPSK	15.11	2	DQPSK	16.90
12	QPSK	13.32	5.5	CCK	16.32
18	QPSK	12.75	11	CCK	15.75
24	16-QAM	10.05	22	CCK	17.10
36	16-QAM	9.16			
48	64-QAM	8.14			
54	64-QAM	8.00			

802.11 n		
Data Rate (Mbps)	Mod.	Channel 6 Cond. Power (dBm)
6.5	MCS0	15.57
13	MCS1	13.31
19.5	MCS2	12.65
26	MCS3	10.18
39	MCS4	9.38
52	MCS5	8.40
58.5	MCS6	8.32
65	MCS7	7.30

Table 1.8.4. 802.11 b/g/n modulation type/data rate vs. conducted power

1.8.2 SAR Measurement Requirements for Bluetooth

Channel	Freq (MHz)	Mode	Conducted Transmit Power (dBm)
0	2402	DH5	9.83
39	2441	DH5	9.33
78	2480	DH5	8.83

Table 1.8.5. Bluetooth peak conducted power measurements

1.8.3 SAR Measurement Procedures for 3G Devices

WCDMA Handsets

Output Power Verification

• Maximum output power is verified on the High, Middle and Low channels using 12.2 kbps RMC, 12.2 kbps AMR with a 3.4 kbps SRB (signal radio bearer) with TPC (transmit power control) set to all "1's" for WCDMA/HSPA or applying the required inner loop.

• For Release 6 HSPA, output power is measured according to requirements for HS-DPCCH Sub-test 1-4/1-5

Head SAR Measurements

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all "1s". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signalling radio bearer) using the exposure configuration that results in the highest SAR for that RF channel in 12.2 RMC.

Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all "1s". SAR for other spreading codes and multiple $DPDCH_n$, when supported by the DUT, are not required when the maximum average outputs of each RF channel, for each spreading code and $DPDCH_n$ configuration, are less than ¼ dB higher than those measured in 12.2 RMC. Otherwise, SAR is measured on the maximum output channel with an applicable RMC configuration for the corresponding spreading code or $DPDCH_n$ using the exposure configuration that results in the highest SAR with 12.2 RMC.

Handsets with HSPA

Body SAR is not required for handsets with HSPA capabilities, when the maximum average output of each RF channel with HSPA active is less than ¼ dB higher than that measured in 12.2 kbps RMC without HSPA Otherwise, SAR for HSPA is measured using FRC (fixed reference channel) in the body exposure configuration that results in the highest SAR for that RF channel in 12.2kbps RMC.

	Band	**FDD V (850)**			**FDD II (1900)**		
	Channel	4132	4182	4233	9262	9400	9538
	Freq (MHz)	826.4	836.4	846.6	1852.4	1880.0	1907.6
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**			**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	24.4	24.4	24.2	22.3	22.3	22.3
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	24.4	24.4	24.3	22.5	22.5	22.5
Rel5 HSDPA	1	24.3	24.3	24.1	22.4	22.3	22.3
Rel5 HSDPA	2	24.3	24.3	24.1	22.4	22.3	22.3
Rel5 HSDPA	3	24.3	24.3	24.1	22.4	22.3	22.3
Rel5 HSDPA	4	24.4	24.3	24.1	22.4	22.3	22.3
Rel6 HSUPA	1	24.4	24.4	24.1	22.5	22.4	22.3
Rel6 HSUPA	2	24.3	24.3	24.1	22.5	22.4	22.3
Rel6 HSUPA	3	24.3	24.3	24.1	22.5	22.4	22.3
Rel6 HSUPA	4	24.3	24.3	24.1	22.5	22.4	22.3
Rel6 HSUPA	5	24.4	24.3	24.1	22.5	22.4	22.3

Table 1.8.8. WCDMA (Rel99) / HSPA conducted power measurements

1.9 Highlights of the FCC OET SAR Evaluation Considerations for Handsets with Multiple Transmitters/ Antennas & GSM/GPRS/EDGE Procedure

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 each pair of simultaneous transmitting antennas.

or

- when the ratio of SAR to peak SAR separation distance 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 1.9.1. Output Power Thresholds for Unlicensed Transmitters

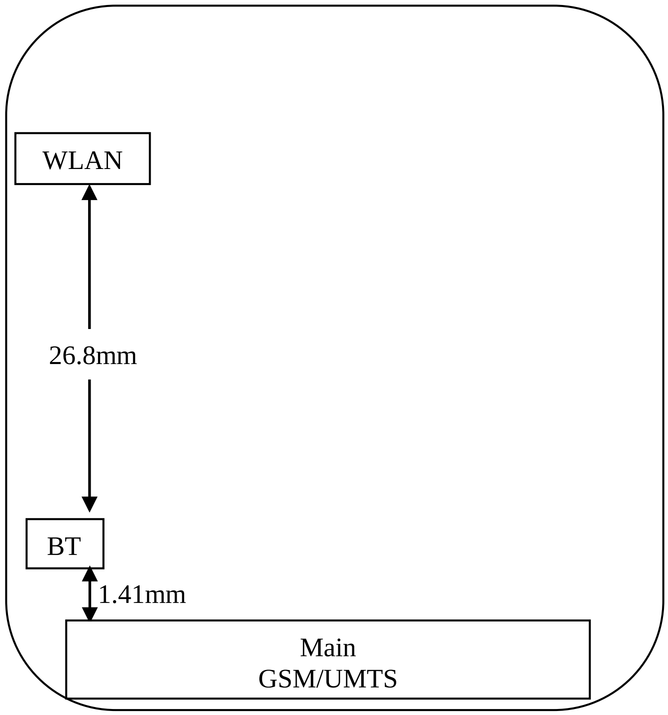

Figure 1.9.1. Back view of device showing closest distance between antenna pairs

Mode	Configuration	Highest 1 g SAR (W/kg)
GSM/GPRS/EDGE/ UMTS	Head-Right-Touch	0.70
	No Holster, back side 15 mm away	1.35
802.11a/b/g/n	Head-Right-Touch	0.03
	No Holster, back side 15 mm away	0.50
BT	Head-Right-Touch	0.00
	No Holster, back side 15 mm away	0.00

Table 1.9.2. Highest SAR values for the same setup

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 (**802.11 b)**	Body SAR with 15 mm separation distance	0.44	-21.5	-41.0	-207.1	
Antenna 2 UMTS band II	Body SAR with 15 mm separation distance	1.35	-15.5	57.5	-207.5	
	SAR Sum	1.79				
	Delta [cm]		-0.6	-9.9	0.0	
	closest Distance [cm]					**9.87**
	Ratio	0.18				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 b)**	Body SAR with 15 mm separation distance, HEADSET	0.39	-9.5	-42.5	-207.5	
Antenna 2 UMTS band II	Body SAR with 15 mm separation distance, HEADSET	1.35	-14.0	56.0	-207.5	
	SAR Sum	1.74				
	Delta [cm]		0.4	-9.9	0.0	
	closest Distance [cm]					**9.86**
	Ratio	0.18				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 b)**	Body SAR with 15 mm separation distance	0.44	-21.5	-41.0	-207.1	
Antenna 2 GPRS 1900 Rev 1	Body SAR with 15 mm separation distance	1.27	-18.5	56.0	-207.4	
	SAR Sum	1.71				
	Delta [cm]		-0.3	-9.7	0.0	
	closest Distance [cm]					**9.71**
	Ratio	0.18				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 b)**	Body SAR with 15 mm separation distance	0.44	-21.5	-41.0	-207.1	
Antenna 2 GPRS 1900 Rev4	Body SAR with 15 mm separation distance	1.17	-24.5	53.0	-207.2	
	SAR Sum	1.61				
	Delta [cm]		0.3	-9.4	0.0	
	closest Distance [cm]					**9.41**
	Ratio	0.17				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 a)**	Body SAR with 15 mm separation distance	0.43	13.0	-36.0	-207.3	
Antenna 2 UMTS band II	Body SAR with 15 mm separation distance	1.35	-15.5	57.5	-207.5	
	SAR Sum	1.78				
	Delta [cm]		2.8	-9.4	0.0	
	closest Distance [cm]					**9.77**
	Ratio	0.18				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 a)**	Body SAR with 15 mm separation distance, HEADSET	0.50	10.0	-40.0	-207.2	
Antenna 2 UMTS band II	Body SAR with 15 mm separation distance, HEADSET	1.35	-14.0	56.0	-207.5	
	SAR Sum	1.85				
	Delta [cm]		2.4	-9.6	0.0	
	closest Distance [cm]					**9.89**
	Ratio	0.19				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 a)**	Body SAR with 15 mm separation distance	0.43	13.0	-36.0	-207.3	
Antenna 2 GPRS 1900 Rev 1	Body SAR with 15 mm separation distance	1.27	-18.5	56.0	-207.4	
	SAR Sum	1.70				
	Delta [cm]		3.1	-9.2	0.0	
	closest Distance [cm]					**9.72**
	Ratio	0.17				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 a)**	Body SAR with 15 mm separation distance, HEADSET	0.50	10.0	-40.0	-207.2	
Antenna 2 GPRS 1900 Rev 1	Body SAR with 15 mm separation distance, HEADSET	1.15	-14.0	51.5	-207.5	
	SAR Sum	1.65				
	Delta [cm]		2.4	-9.1	0.0	
	closest Distance [cm]					**9.46**
	Ratio	0.17				

Antenna	Position	SAR 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 1 **(802.11 a)**	Body SAR with 15 mm separation distance	0.43	13.0	-36.0	-207.3	
Antenna 2 GPRS 1900 Rev 4	Body SAR with 15 mm separation distance	1.17	-24.5	53.0	-207.2	
	SAR Sum	1.60				
	Delta [cm]		3.7	-8.9	0.0	
	closest Distance [cm]					**9.66**
	Ratio	0.17				

Table 1.9.3. Highest SAR values & Peak Coordiates distance

BT & WiFi:

- BT Stand-alone SAR is not required because the BT output power ≤ PRef and the antenna is > 2.5 cm from the WiFi antenna.
- BT Simultaneous Transmission SAR is not required because the sum of the 1-g SAR between the WiFi antenna and BT antenna is < 1.6 W/kg

BT & GSM/WCDMA:

- BT Stand-alone SAR is required because the main antenna, which is < 2.5 cm away, has an output ≥ PRef AND max 1g SAR > 1.2 W/kg
- BT Simultaneous Transmission SAR is not required because the sum of the 1-g SAR between the main antenna and BT antenna is < 1.6 W/kg

GSM & WiFi:

- Head Configuration:
  - Simultaneous Transmission is not required as the sum of the 1-g SAR is < 1.6 W/kg.
- Body Configuration
  - Simultaneous Transmission is not required as ratio of SAR to peak SAR separation distance of simultaneous transmitting antenna pair is < 0.3.

WCDMA & WiFi:

- Head Configuration:
  - Simultaneous Transmission is not required as the sum of the 1-g SAR is < 1.6 W/kg.
- Body Configuration:
  - Simultaneous Transmission is not required as ratio of SAR to peak SAR separation distance of simultaneous transmitting antenna pair is < 0.3.

- The device supports DTM, GPRS Category Class A/B, Multi-Slot Class 11/12 with maximum 5-slots (2/3/4-slots uplink and 3/2/1-slot downlink).
- For head SAR configuration, 1/2/3/4 slots GMSK modulation were evaluated.
- For body SAR configuration, 2/3/4-slots GPRS (PD) mode were tested.
- In EDGE/GPRS mode, GMSK Modulation was used using CS1-CS4 or MCSI-MCS4.
- 8-PSK modulation or MCS5-MCS9 code scheme were avoided since maximum burst avg power was measured lower on those modulation schemes.
- Each slot is set to maximum power, but there is software power reduction of ~ 2 dB in multislot modes.

- Please refer to the conducted power measurements table below:

Mode	Freq. (MHz)	Max burst averaged conducted power (dBm) CS1	Max burst averaged conducted power (dBm) CS4	Max burst averaged conducted power (dBm) MCS1	Max burst averaged conducted power (dBm) MCS4	Max burst averaged conducted power (dBm) MCS5	Max burst averaged conducted power (dBm) MCS9
2-slots GPRS 850 MHz	824.2	30.0	30.0	N/A	N/A	N/A	N/A
	836.8	30.1	30.1	N/A	N/A	N/A	N/A
	848.8	30.0	30.0	N/A	N/A	N/A	N/A
3-slots GPRS 850 MHz	824.2	28.7	28.7	N/A	N/A	N/A	N/A
	836.8	28.9	28.9	N/A	N/A	N/A	N/A
	848.8	28.9	28.9	N/A	N/A	N/A	N/A
4-slots GPRS 850 MHz	824.2	26.5	26.5	N/A	N/A	N/A	N/A
	836.8	26.6	26.6	N/A	N/A	N/A	N/A
	848.8	26.7	26.7	N/A	N/A	N/A	N/A
2-slots EDGE 850 MHz	824.2	29.8	29.7	29.8	29.7	25.9	25.9
	836.8	29.9	29.8	29.9	29.8	25.9	25.9
	848.8	30.0	29.9	30.0	29.9	26.0	26.0
3-slots EDGE 850 MHz	824.2	28.7	28.5	28.7	28.5	24.6	24.6
	836.8	28.6	28.5	28.6	28.5	24.7	24.7
	848.8	28.7	28.6	28.7	28.6	24.7	24.7
4-slots EDGE 850 MHz	824.2	26.4	26.2	26.4	26.2	23.7	23.7
	836.8	26.5	26.4	26.5	26.4	23.6	23.6
	848.8	26.6	26.5	26.6	26.5	23.6	23.6
2-slots GPRS 1900 MHz	1850.2	28.5	28.5	N/A	N/A	N/A	N/A
	1880.0	28.0	28.0	N/A	N/A	N/A	N/A
	1909.8	27.8	27.8	N/A	N/A	N/A	N/A
3-slots GPRS 1900 MHz	1850.2	25.8	25.8	N/A	N/A	N/A	N/A
	1880.0	25.9	25.9	N/A	N/A	N/A	N/A
	1909.8	25.7	25.7	N/A	N/A	N/A	N/A
4-slots GPRS 1900 MHz	1850.2	25.6	25.6	N/A	N/A	N/A	N/A
	1880.0	25.3	25.3	N/A	N/A	N/A	N/A
	1909.8	25.1	25.1	N/A	N/A	N/A	N/A
2-slots EDGE 1900MHz	1850.2	27.9	27.9	27.8	27.8	24.9	24.9
	1880.0	28.0	28.0	29.9	29.9	24.9	24.9
	1909.8	27.9	27.9	27.8	27.8	25.1	25.1
3-slots EDGE 1900MHz	1850.2	25.6	25.6	25.5	25.5	23.9	23.9
	1880.0	25.4	25.4	25.3	25.3	23.8	23.8
	1909.8	25.7	25.7	25.6	25.6	23.8	23.8
4-slots EDGE 1900MHz	1850.2	25.4	25.4	25.3	25.3	22.9	22.9
	1880.0	25.2	25.2	25.2	25.2	22.8	22.8
	1909.8	25.0	25.0	25.0	25.0	22.7	22.7

Mode	Freq. (MHz)	Max burst averaged conducted power (dBm)
1-slot GSM (CS) 850 MHz	824.2	31.6
	836.8	31.7
	848.8	31.8
1-slot GSM (CS) 1900 MHz	1850.2	29.0
	1880.0	29.1
	1909.8	29.1

1.9.3. GSM/EDGE/GPRS channel vs. conducted power

2.0 DESCRIPTION OF THE TEST EQUIPMENT

2.1 SAR measurement system

SAR measurements were performed using a Dosimetric Assessment System (DASY52), an automated SAR measurement system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich, Switzerland.

The DASY 52 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.
· DASY52 software version 52.6(2).
· 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.

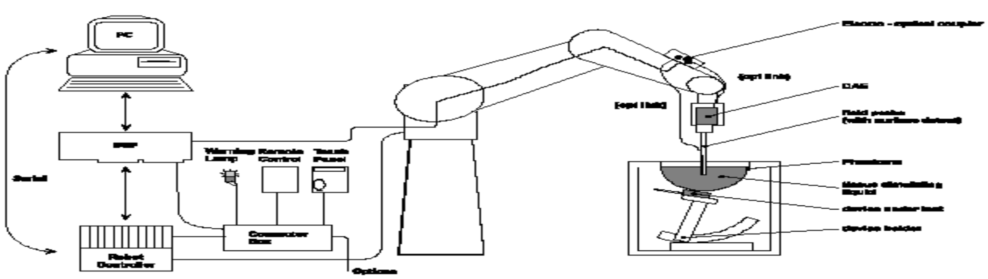

Figure 2.1.1. System Description

2.1.1 Equipment List

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date (MM/DD/YY)
SCHMID & Partner Engineering AG	E-field probe	ES3DV3	3225	01/13/2012
SCHMID & Partner Engineering AG	E-field probe	EX3DV4	3592	11/18/2011
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE3)	DAE3 V1	472	03/07/2012
SCHMID & Partner Engineering AG	Dipole Validation Kit	D835V2	446	01/21/2013
SCHMID & Partner Engineering AG	Dipole Validation Kit	D1900V2	545	01/13/2013
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2450V2	747	11/11/2011
SCHMID & Partner Engineering AG	Dipole Validation Kit	D5GHzV2	1033	11/13/2011
Agilent Technologies	Signal generator	8648C	4037U03155	09/23/2013
Agilent Technologies	Power meter	E4419B	GB40202821	09/23/2013
Agilent Technologies	Power sensor	8481A	MY41095417	09/27/2012
Amplifier Research	Amplifier	5S1G4M3	300986	CNR
Agilent Technologies	Power meter	N1911A	MY45100905	05/17/2013
Agilent Technologies	Power sensor	N1921A	SG45240281	05/16/2012
Weinschel Corp	20dB Attenuator	33-20-34	BMO697	CNR
Agilent Technologies	Network analyzer	8753ES	US39174857	09/20/2012
Rohde & Schwarz	Base Station Simulator	CMU 200	109747	11/25/2011
Rohde & Schwarz	Signal generator	SMA 100A	11-9428537-0045	11/29/2011
CPI Wireless Solutions	Amplifier	VZC-6961K4	SK4310E5	CNR
Rohde & Schwarz	Bluetooth Tester	CBT	100678	11/28/2011

Table 2.1.1. 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.
- Start the DASY 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 probes ES3DV3/ET3DV6 and EX3DV4, 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
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 mm³
Probe model EX3DV4 for 2.4 – 6 GHz	
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 3.1.1. Probe specifications

3.2 Probe calibration and measurement uncertainty

The probe had been calibrated with an accuracy better than ±12% . 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 and below:

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	6.12	6.12	6.12	0.99	1.07 ± 11.0%
1810	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	5.14	5.14	5.14	0.46	1.60 ± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.96	4.96	4.96	0.47	1.57 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.53	4.53	4.53	0.41	1.89 ± 11.0%

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	5.97	5.97	5.97	0.98	1.12 ± 11.0%
1810	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.90	4.90	4.90	0.35	2.07 ± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.83	4.83	4.83	0.32	2.45 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.32	4.32	4.32	0.74	1.27 ± 11.0%

C The validity of ± 100 MHz only applies for DASY v4.4 and higher.
DASY 52 has been used for measurements, therefore ± 100 MHz tolerance is valid.

Measured dielectric parameters are within +/- 5% of the probe calibration values and target values.
Expanded probe calibration uncertainty (k=2) is < 15 %

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.

At above 1.5 – 2 GHz, dipoles maintain good return loss of -15 dB to -20 dB, therefore SAR measurememts are limited to approximately +/- 100 MHz of the probe/dipole calibration frequency.

4.1 System accuracy verification for head adjacent use

f (MHz)	Limits / Measured (MM/DD/YYYY)	SAR 1 g/10 g (W/kg)	Dielectric Parameters		Liquid Temp. (°C)
			ε_r	σ [S/m]	
835	Measured (10/05/2011)	9.39/6.11	41.6	0.87	22.8
	Recommended Limits	9.63/6.27	41.5	0.90	N/A
1900	Measured (10/03/2011)	40.0/20.7	38.1	1.39	22.5
	Measured (10/17/2011)	39.9/20.7	38.1	1.38	22.6
	Measured (10/25/2011)	40.9/21.3	38.2	1.41	22.6
	Recommended Limits	40.0/20.8	40.0	1.40	N/A
2450	Measured (10/11/2011)	56.8/26.5	39.5	1.89	22.4
	Recommended Limits	53.4/24.9	39.2	1.80	N/A
5200	Measured (09/27/2011)	81.5/23.4	35.2	4.94	20.3
	Recommended Limits	77.2/21.8	36.0	4.66	N/A
5500	Measured (09/27/2011)	80.6/23.0	33.7	5.14	20.3
	Recommended Limits	82.9/23.2	35.6	4.96	N/A
5800	Measured (09/27/2011)	78.6/22.3	34.0	5.54	20.3
	Recommended Limits	75.6/21.3	35.3	5.27	N/A

Table 4.1.1. 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 5.0.1. SAM Twin Phantom

6.0 TISSUE DIELECTRIC PROPERTIES

6.1 Composition of tissue simulant

The composition of the brain and muscle simulating liquids are shown in the table below.

INGREDIENT	MIXTURE 800-900MHz		MIXTURE 1800-1900MHz		MIXTURE 2450 MHz		MIXTURE 5 - 6 GHz	
	Brain %	Muscle %	Brain %	Muscle %	Brain %	Muscle %	Brain %	Muscle %
Water	40.29	65.45	55.24	69.91	55.0	68.75	64	64-78
Sugar	57.90	34.31	0	0	0	0	0	0
Salt	1.38	0.62	0.31	0.13	0	0	0	0
HEC	0.24	0	0	0	0	0	0	0
Bactericide	0.18	0.10	0	0	0	0	0	0
DGBE	0	0	44.45	29.96	40.0	31.25	0	0
Triton X-100	0	0	0	0	5.0	0	0	0
Additives and Salt	0	0	0	0	0	0	3	2-3
Emulsifiers	0	0	0	0	0	0	15	9-15
Mineral Oil	0	0	0	0	0	0	18	11-18

Table 6.1.1. Tissue simulant recipe

6.1.1 Equipment

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date (MM/DD/YY)
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
IKA Works Inc.	Hot Plate	RC Basic	3.107433	N/A
Dell	PC using GPIB card	GX110	347	N/A
Agilent Technologies	Dielectric probe kit	HP 85070C	US9936135	CNR
Agilent Technologies	Network Analyzer	8753ES	US39174857	09/20/2012
Control Company	Digital Thermometer	15-077-21	51129471	05/17/2012

Table 6.1.2. 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 manual and from FCC Tissue Dielectric Properties web page at http://www.fcc.gov/fcc-bin/dielec.sh

Band (MHz)	Tissue Type	Limits / Measured (MM/DD/YYYY)	f (MHz)	Dielectric Parameters		Liquid Temp (°C)
				ε_r	σ [S/m]	
835	Head	Measured (10/05/2011)	825	41.6	0.86	22.8
			835	41.6	0.87	
			850	41.4	0.89	
		Recommended Limits	835	41.5	0.90	N/A
	Muscle	Measured (10/05/2011)	825	53.3	0.98	22.8
			835	54.2	0.99	
			850	54.0	1.00	
		Recommended Limits	835	55.2	0.97	N/A
1900	Head	Measured (10/03/2011)	1850	38.3	1.33	22.5
			1900	38.1	1.39	
			1910	38.1	1.40	
		Measured (10/17/2011)	1850	38.3	1.36	22.6
			1900	38.1	1.38	
			1910	38.0	1.39	

		Measured (10/25/2011)	1850	38.4	1.36	22.6
			1900	38.2	1.41	
			1910	38.2	1.42	
		Recommended Limits	1900	40.0	1.40	N/A
	Muscle	Measured (10/03/2011)	1850	51.4	1.50	22.5
			1900	51.1	1.56	
			1910	50.8	1.59	
		Measured (10/17/2011)	1850	51.1	1.49	22.6
			1900	50.9	1.54	
			1910	50.9	1.55	
		Measured (10/25/2011)	1850	51.0	1.51	22.6
			1900	50.8	1.56	
			1910	50.8	1.57	
		Recommended Limits	1900	53.3	1.52	N/A
2450	Head	Measured (10/11/2011)	2412	39.6	1.84	22.4
			2450	39.5	1.88	
			2462	39.4	1.90	
		Recommended Limits	2450	39.2	1.80	N/A
	Muscle	Measured (10/11/2011)	2412	50.7	1.97	22.4
			2450	50.6	2.02	
			2462	50.5	2.04	
		Recommended Limits	2450	52.7	1.95	N/A
5200	Head	Measured (09/27/2011)	5180	35.2	4.92	20.3
			5200	35.2	4.94	
			5280	35.0	5.07	
		Recommended Limits	5200	36.0	4.66	N/A
	Muscle	Measured (09/27/2011)	5180	46.4	5.60	20.1
			5200	46.4	5.62	
			5280	46.2	5.76	
		Recommended Limits	5200	49.0	5.30	N/A
5500	Head	Measured (09/27/2011)	5500	33.7	5.14	20.3
			5620	33.6	5.29	
		Recommended Limits	5500	35.6	4.96	N/A
	Muscle	Measured (09/27/2011)	5500	45.2	5.96	20.1
			5620	45.1	6.14	
		Recommended Limits	5500	48.6	5.65	N/A
5800	Head	Measured (09/27/2011)	5745	34.0	5.47	20.3
			5800	34.0	5.54	
		Recommended Limits	5800	35.3	5.27	N/A
	Muscle	Measured (09/27/2011)	5745	44.9	6.29	20.1
			5800	44.9	6.38	
		Recommended Limits	5800	48.2	6.00	N/A

Table 6.2.1. Electrical parameters of tissue simulating liquid

6.2.2 Test Configuration

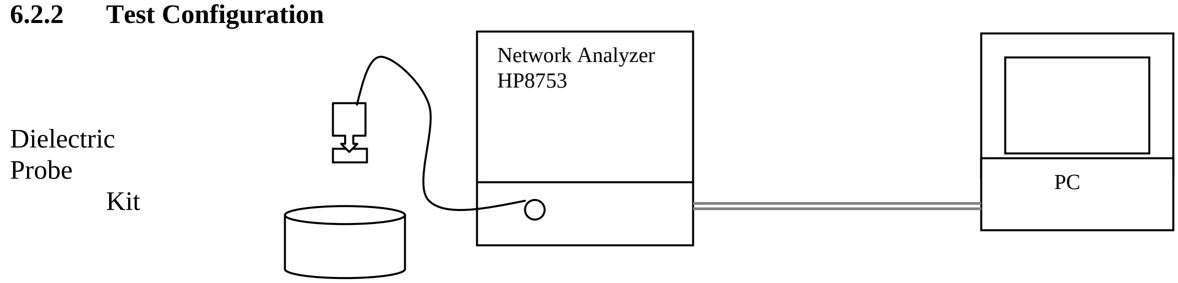

Figure 6.2.1. Test configuration

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 DASY software 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).

7.0 SAR SAFETY LIMITS

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

Table 7.0.1. SAR safety limits for Controlled / Uncontrolled environment

Human Exposure	Localized SAR Limits (W/kg) 10g, ICNIRP Standard	Localized SAR Limits (W/kg) 1g, IEEE C95.1 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 7.0.2. 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 DASY5 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).

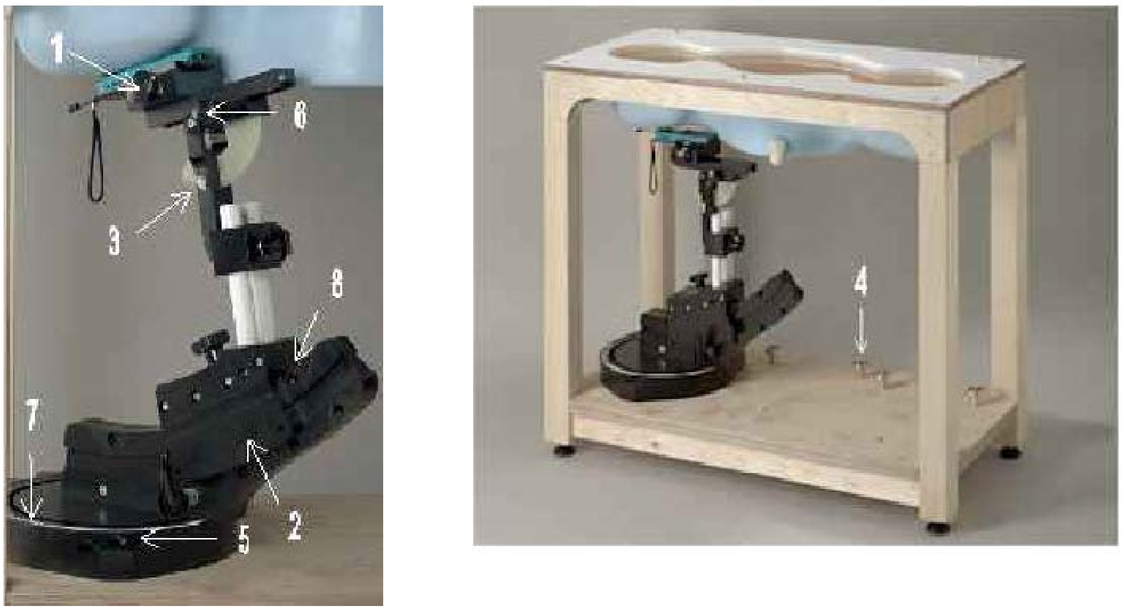

Figure 8.1.1. Device Holder

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".

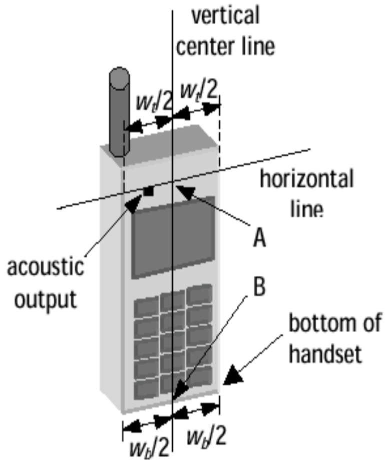

Figure 8.2.1a. Handset vertical and horizontal reference lines – fixed case

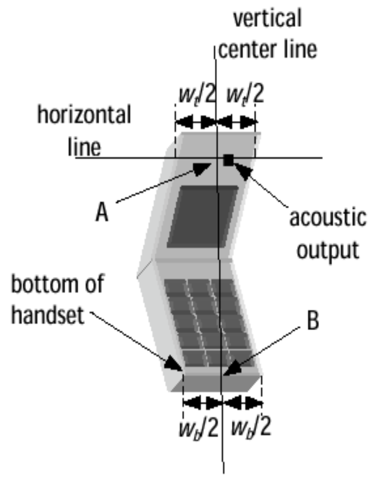

Figure 8.2.1b. Handset vertical and horizontal reference lines – "clam-shell"

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 8.2.1a and 8.2.1b), 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 8.2.1a). 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 8.2.1b), 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 8.2.1), 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-back*") - NF ("*neck-front*") 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).

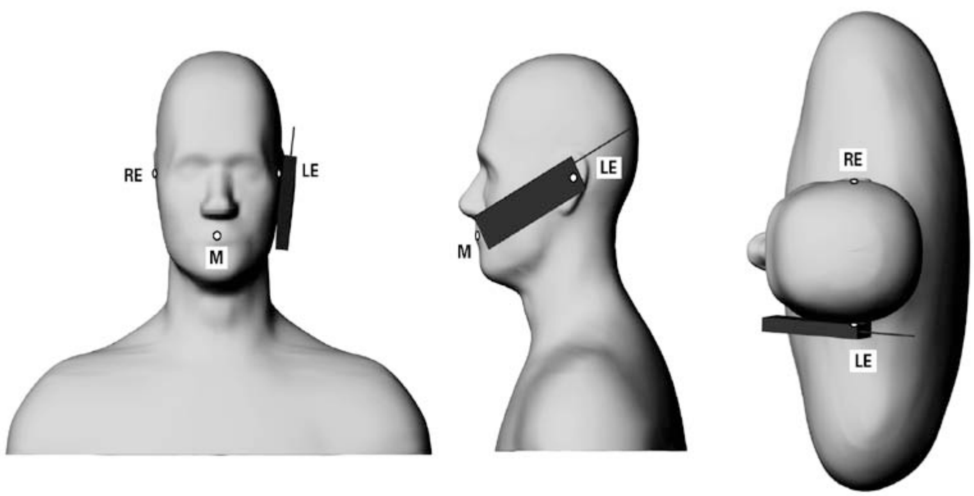

Figure 8.2.2. Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

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**.**

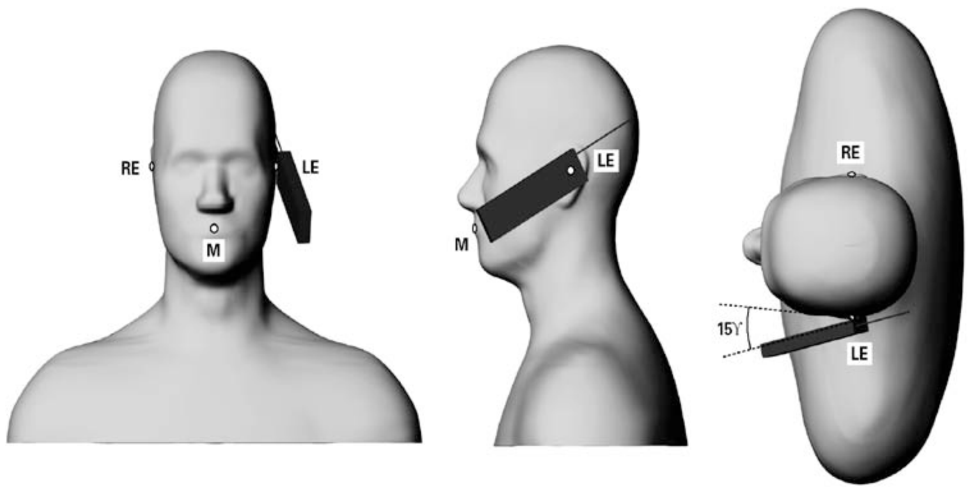

Figure 8.2.3. Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.2 Body Holster Configuration

Body worn holsters, as shown on Figure 1.4.1, 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 / 7x7x9 scan. The routines are verified and optimized for the grid dimensions used in these cube measurements.
The measured volume of 30x30x30mm / 24x24x20 with 7.5mm / 4.0 resolution in (x,y) and 5mm / 2.5mm resolution in z axis amounts to 175 / 693 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

DASY5 Uncertainty Budget
According to IEEE 1528/2003 [1]

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	1	1	1	±5.5 %	±5.5 %	∞
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	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
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 Noise	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±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						±10.7 %	±10.5 %	387
Expanded STD Uncertainty						**±21.4 %**	**±21.0 %**	

Table 10.0.1. Worst-Case uncertainty budget for DASY52 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.

DASY5 Uncertainty Budget
for the 3 - 6 GHz range

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	±6.55 %	N	1	1	1	±6.55 %	±6.55 %	∞
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	±2.0 %	R	$\sqrt{3}$	1	1	±1.2 %	±1.2 %	∞
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	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
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 Noise	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Probe Positioning	±9.9 %	R	$\sqrt{3}$	1	1	±5.7 %	±5.7 %	∞
Max. SAR Eval.	±4.0 %	R	$\sqrt{3}$	1	1	±2.3 %	±2.3 %	∞
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						±12.8 %	±12.6 %	330
Expanded STD Uncertainty						**±25.6 %**	**±25.2 %**	

Table 10.0.2. Worst-Case uncertainty budget for DASY52 assessed according to IEEE P1528.
Source: Schmid & Partner Engineering AG.

11.0 TEST RESULTS

11.1 SAR Measurement results at highest power measured against the head

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)
Right Head Cheek	2-slots GSM/EDGE 850 MHz	824.2					
		836.8	29.9	23.2	0.42	-0.14	0.42
		848.8					
Right Head 15° Tilt	2-slots GSM/EDGE 850 MHz	824.2					
		836.8	29.9	23.2	0.24	-0.09	0.24
		848.8					
Left Head Cheek	2-slots GSM/EDGE 850 MHz	824.2					
		836.8	29.9	23.2	0.48	0.14	0.48
		848.8					
Left Head 15° Tilt	2-slots GSM/EDGE 850 MHz	824.2					
		836.8	29.9	23.2	0.26	0.05	0.26
		848.8					
Left Head Cheek	1-slot GSM 850 MHz	824.2					
		836.8	31.7	22.4	0.39	-0.33	0.42
		848.8					
Left Head Cheek	3-slots GSM/EDGE 850 MHz	824.2					
		836.8	28.6	22.3	0.53	-0.16	0.53
		848.8					
Left Head Cheek	4-slots GSM/EDGE 850 MHz	824.2					
		836.8	26.5	22.3	0.46	0.09	0.46
		848.8					

Table 11.1.1. SAR results for GSM/EDGE 850 head configuration

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: Only Middle channel was tested when 1g Average SAR <0.8 W/Kg or 3dB lower than the 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)
Right Head Cheek	WCDMA FDD V 850 MHz	826.4					
		836.4	24.4	22.2	0.39	0.27	0.39
		846.6					
Right Head 15° Tilt	WCDMA FDD V 850 MHz	826.4					
		836.4	24.4	22.4	0.18	-0.13	0.18
		846.6					
Left Head Cheek	WCDMA FDD V 850 MHz	826.4					
		836.4	24.4	22.5	0.42	-0.03	0.42
		846.6					
Left Head 15° Tilt	WCDMA FDD V 850 MHz	826.4					
		836.4	24.4	22.5	0.19	-0.04	0.19
		846.6					

Table 11.1.2. SAR results for WCDMA FDD V head configuration

Test Position	Mode	f (MHz)	Peaks	Cond. Output Power (dBm)	Liquid Temp. (°C)	SAR, averaged over 1 g Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	2-slots GSM/EDGE 1900 MHz	1850.2						
		1880.0	Peak 1	28.0	22.0	0.55	0.25	0.55
		1880.0	Peak 2	28.0	22.0	0.57	0.46	0.57
		1909.8						
Right Head 15° Tilt	2-slots GSM/EDGE 1900 MHz	1850.2						
		1880.0		28.0	22.7	0.15	0.04	0.15
		1909.8						
Right Head Cheek	1-slot GSM 1900 MHz	1850.2						
		1880.0		29.1	22.0	0.42	-0.13	0.42
		1909.8						
Right Head Cheek	3-slots GSM/EDGE 1900 MHz	1850.2						
		1880.0		25.9	22.0	0.45	0.58	0.45
		1909.8						
Right Head Cheek	4-slots GSM/EDGE 1900 MHz	1850.2						
		1880.0		25.3	22.3	0.52	0.16	0.52
		1909.8						
Left Head Cheek	2-slots GSM/EDGE 1900 MHz	1850.2						
		1880.0	Peak 1	28.0	21.2	0.56	-0.04	0.56
		1880.0	Peak 2	28.0	21.2	0.45	0.37	0.45
		1909.8						
Left Head 15° Tilt	2-slots GSM/EDGE 1900 MHz	1850.2						
		1880.0		28.0	22.2	0.16	-0.37	0.17
		1909.8						

Table 11.1.3. SAR results for GSM/EDGE 1900 head configuration

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)
Right Head Cheek	2-slots GSM/EDGE 1900 MHz	1850.2					
		1880.0		22.2	0.57	0.23	0.57
		1909.8					

Table 11.1.4. Rev 4 SAR results for GSM/EDGE 1900 head configuration

Test Position	Mode	f (MHz)	Peaks	Cond. Output Power (dBm)	Liquid Temp. (°C)	SAR, averaged over 1 g Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	WCDMA FDD II 1900 MHz	1852.4						
		1880.0		22.2	22.2	0.70	0.17	**0.70**
		1907.6						
Right Head 15° Tilt	WCDMA FDD II 1900 MHz	1852.4						
		1880.0		22.2	22.4	0.23	-0.06	0.23
		1907.6						
Left Head Cheek	WCDMA FDD II 1900 MHz	1852.4						
		1880.0	Peak 1	22.2	22.7	0.68	0.09	0.64
		1880.0	Peak 2	22.2	22.7	0.47	0.18	0.44
		1907.6						
Left Head 15° Tilt	WCDMA FDD II 1900 MHz	1852.4						
		1880.0		22.2	22.9	0.21	0.12	0.21
		1907.6						

Table 11.1.5. SAR results for WCDMA FDD II head configuration

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)
Right Head Cheek	802.11 b 2450 MHz	2412	16.5	23.0	0.02	3.25	0.02
		2437	17.2	22.8	0.03	0.15	0.03
		2462	16.9	23.0	0.03	1.70	0.03
Right Head 15° Tilt	802.11 b 2450 MHz	2412					
		2437					
		2462	16.9	22.8	0.01	3.26	0.01
Left Head Cheek	802.11 b 2450 MHz	2412	16.5	22.8	0.02	-0.07	0.02
		2437	17.2	23.0	0.03	2.64	0.03
		2462	16.9	23.3	0.06	1.48	0.06
Left Head 15° Tilt	802.11 b 2450 MHz	2412					
		2437					
		2462	16.9	22.8	0.01	1.83	0.01

Table 11.1.6. SAR results for WiFi/WLAN/802.11b head configuration

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)
Right Head Cheek	Bluetooth 2450 MHz	2402					
		2441	9.3	22.7	0.00	-1.25	0.00
		2480					
Left Head Cheek	Bluetooth 2450 MHz	2402					
		2441	9.3	22.7	0.00	0.15	0.00
		2480					

Table 11.1.7. SAR results for Bluetooth head configuration

Test Position	Mode	f (MHz)	Graded/ Ungraded	Cond. Output Power (dBm)	Liquid Temp. (°C)	SAR, averaged over 1 g Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	802.11 a 5180-5805 MHz	5180	Graded	14.3	20.0	0.02	4.25	0.02
		5260		14.2	21.2	0.03	0.07	0.03
		5260	Ungraded	14.2	23.1	0.03	-0.29	0.03
		5520	Graded	14.4	21.0	0.02	0.17	0.02
		5745		14.2	21.0	0.02	0.10	0.02
Right Head 15° Tilt	802.11 a 5180-5805 MHz	5260	Graded	14.2	21.6	0.02	-0.16	0.02
Left Head Cheek	802.11 a 5180-5805 MHz							
		5260	Graded	14.2	22.5	0.05	-0.37	0.05
		5260	Ungraded	14.2	22.1	0.05	0.09	0.05
Left Head 15° Tilt	802.11 a 5180-5805 MHz	5260	Graded	14.2	22.4	0.04	1.05	0.04

Table 11.1.8. SAR results for 802.11a head configuration
***Note:** Tested only highest output power channel per band

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 GPRS 850 MHz	836.8	30.1	No Holster, back side 15 mm away	22.6	0.74	0.17	0.74
3-slots GPRS 850 MHz	824.2	28.7	No Holster, back side 15 mm away	22.7	0.91	-0.30	0.98
	836.8	28.9	No Holster, back side 15 mm away	22.6	0.91	-0.30	0.98
	848.8	28.9	No Holster, back side 15 mm away	22.5	0.80	0.22	0.80
	836.8	28.9	No Holster, front side 15 mm away	22.4	0.53	-0.11	0.53
	836.8	28.9	Vertical Holster, front side facing phantom	22.5	0.46	-0.15	0.46
	836.8	28.9	No Holster, HS, back side 15 mm away	22.0	0.78	-0.22	0.82
4-slots GPRS 850 MHz	836.8	26.6	No Holster, back side 15 mm away	22.2	0.76	-0.07	0.76

Table 11.2.1. SAR results for GPRS850 body-worn configurations

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: Only Middle channel was tested when 1g Average SAR <0.8 W/Kg or 3dB lower than the limit.

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)
WCDMA FDD V 850 MHz	836.4	24.4	No Holster, back side 15 mm away	22.5	0.79	-0.11	0.79
	836.4	24.4	No Holster, front side 15mm away	22.4	0.48	0.00	0.48
	836.4	24.4	Vertical Holster, front side facing	22.6	0.51	-0.01	0.51
	836.4	24.4	No Holster, HS, back side 15mm away	23.1	0.68	-0.03	0.68

Table 11.2.2. SAR results for WCDMA FDD V body-worn configurations

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 GPRS 1900 MHz	1850.2	28.5	No Holster, back side 15 mm away	21.8	1.16	0.11	1.16
	1880.0	28.0	No Holster, back side 15 mm away	22.9	1.27	0.17	1.27
	1909.8	27.8	No Holster, back side 15 mm away	21.4	1.22	-0.12	1.22
	1880.0	28.0	No Holster, front side 15mm away	22.0	0.45	0.38	0.45
	1880.0	28.0	Leather Holster, front side facing	21.9	0.28	0.45	0.28
	1880.0	28.0	No Holster, HS, back side 15mm away	21.7	1.15	0.00	1.15
3-Slots GPRS 1900 MHz	1880.0	25.9	No Holster, back side 15 mm away	22.1	0.96	0.02	0.96
4-Slots GPRS 1900 MHz	1880.0	25.3	No Holster, back side 15 mm away	22.0	1.14	0.23	1.14

Table 11.2.3. SAR results for GPRS 1900 body-worn configurations

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 GPRS 1900 MHz	1880.0	28.0	No Holster, back side 15 mm away	22.5	1.17	0.07	1.17

Table 11.2.4. Rev 4 SAR results for GPRS 1900 body-worn configurations

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)
WCDMA FDD II 1900 MHz	1852.4	22.3	No Holster, back side 15 mm away	22.3	1.29	0.02	1.29
	1880.0	22.2	No Holster, back side 15 mm away	22.6	1.35	0.10	**1.35**
	1907.6	22.3	No Holster, back side 15 mm away	22.4	1.32	0.09	1.32
	1880.0	22.2	No Holster, front side 15mm away	22.1	0.51	-0.02	0.51
	1880.0	22.2	Vertical Holster, front side facing	22.6	0.31	-0.08	0.31
	1880.0	22.2	No Holster, HS, back side 15mm away	22.1	1.35	0.11	**1.35**

Table 11.2.5. SAR results for WCDMA FDD II body-worn configurations

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)
802.11b/ WLAN 2450 MHz	2412	16.5	No Holster, back side 15 mm away	23.0	0.44	0.11	0.44
	2437	17.2	No Holster, back side 15 mm away	22.9	0.34	-0.09	0.34
	2462	16.9	No Holster, back side 15 mm away	22.8	0.29	0.04	0.29
	2412	16.5	No Holster, front side 15mm away	22.8	0.00	-0.02	0.00
	2412	16.5	Leather Holster, front side facing	22.5	0.00	0.38	0.00
	2412	16.5	No Holster, HS, back side 15mm away	22.7	0.39	-0.02	0.39

Table 11.2.6. SAR results for WiFi/WLAN/802.11b body-worn configurations

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)
Bluetooth 2450 MHz	2441	9.3	No Holster, back side 15 mm away	23.0	0.00	2.36	0.00

Table 11.2.7. SAR results for Bluetooth body-worn configurations
***Note:** Tested only highest output power channel

Mode	Freq. (MHz)	Graded/ Ungraded	Cond. Power (dBm)	Holster type / device configuration	Liquid Temp. (°C)	SAR, averaged over 1 g		
						Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
802.11 a 5180-5805 MHz	5180	Graded	14.3	No Holster, back side 15 mm away	21.9	0.33	0.03	0.33
	5260		14.2	No Holster, back side 15 mm away	21.7	0.43	-0.01	0.43
	5520		14.4	No Holster, back side 15 mm away	21.7	0.22	0.21	0.22
	5745		14.2	No Holster, back side 15 mm away	21.7	0.02	0.10	0.02
	5260		14.2	No Holster, front side 15 mm away	21.7	0.02	0.96	0.02
	5260		14.2	No Holster, HS, back side 15mm away, Ungraded	21.7	0.49	0.09	0.49
	5260	Ungraded	14.2	No Holster, HS, back side 15mm away, Ungraded	21.7	0.50	-0.03	0.50

Table 11.2.8. SAR results for 802.11a body-worn configurations
***Note:** Tested only highest output power channel per band

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] ICNIRP, International Commission on Non-Ionizing Radiation Protection (2009), Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

[4] 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)

[5] IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

[6] IEEE C95.1-2005, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[7] FCC OET Bulletin 65 (Edition 97-01) Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

[8] FCC 96-326, Guidelines for Evaluating the Environmental Effects of Radio-Frequency Radiation.

[9] DASY 5 DOSIMETRIC ASSESSMENT SYSTEM SOFTWARE MANUAL, Schmid & Partner Engineering AG.

[10] Health Canada, Safety Code 6, 2009: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency range from 3 kHz to 300 GHz.

[11] RSS-102, issue 4-2010: Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields.

[12] IEC 62209-1, First Edition-2005: Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)

[13] FCC OET SAR Measurement Requirements for 3 – 6 GHz, October, 2006.

[14] FCC OET SAR Measurement Procedures for 802.11 a/b/g Transmitters, May, 2007.

[15] FCC OET SAR Evaluation Considerations for Handsets with Multiple Transmitters & Antennas, September, 2008.

[16] FCC OET SAR Test Reduction Procedure for GSM/GPRS/EDGE, December, 2008.

[17] FCC OET SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz – 3 GHz, January, 2007.

[18] FCC OET RF Exposure Procedures for Mobile and Portable Devices, and Equipment Authorization Policies, November, 2009.

[19] FCC OET SAR Measurements Procedures for 3G Devices, October, 2007.

[20] Dipole Requirements for SAR System Validation and Verification, Novmeber, 2009.

[21] IEC 62209-2, Edition 1.0-2010: Human exposure to radio frequency fields from hand-held and body-mount wireless communication devices – Human Models, instrumentation, and procedures - part 2 - procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz).