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. C95.1-2005, 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 latest FCC OET KDB 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.

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Test report has been revised to RTS-6012-1211-32 Rev 3, to address FCC inquiries with regards to LTE conducted power measurements, channels/band edges, Volume Multiband data for SVLTE mode.

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	Please refer to Figure 1.9-1
Configuration	Internal fixed antenna

Table 1.2-1 Antenna description

1.3 Device description

Device Model	RFA91LW			
FCC ID	L6ARFA90LW			
PIN	Radiated: 332BEDBD (Rev 1), 332F96D2 (Rev 2/Rev4), 332F9758 (Rev 2) Conducted: 332BED93 (Rev 1), 332F96DD (Rev 2/Rev4), 332F9789 (Rev 2)			
Hardware Rev	Rev 1, Rev 2, Rev 4			
Software Version	127.0.1.1651/1848, 10.0.9.536/602			
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)	32.0 29.0	28.0 26.0	26.5 24.0	25.5 23.0
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	802.11a/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	15.0	13.5	13.5
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	5749-5825
Mode(s) of Operation	802.11b	802.11g	802.11n	Bluetooth
Nominal Maximum	18.0	16.0	16.0	6.50

conducted RF Output Power (dBm)				
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	CDMA2000 Cell 850	CDMA2000 PCS 1900	NFC	
Nominal Maximum conducted RF Output Power (dBm)	24.0	24.0	N/A	
Tolerance in Power Setting on centre channel (dB)	± 0.50	± 0.50	N/A	
Duty Cycle	1:1	1:1	N/A	
Transmitting Frequency Range (MHz)	824.70 – 848.52	1851.25-1908.50	13.56	

Table 1.3-1 Test device characterization non-LTE U.S. wireless operating modes/bands

Note 1: SAR measurements on NFC haven't been conducted, since it is very low power and frequency magnetic field transceiver. SAR probes measure higher frequency/power electric field.

Device Model	RFA91LW			
FCC ID	L6ARFA90LW			
PIN	Radiated: 332BEDBD (Rev 1), 332F96D2 (Rev 2/Rev4), 332F9758 (Rev 2) Conducted: 332BED93 (Rev 1), 332F96DD (Rev 2/Rev4), 332F9789 (Rev 2)			
Hardware Rev	Rev 1, Rev 2, Rev 4			
Software Version	127.0.1.1651/1848, 10.0.9.536/602			
Prototype or Production Unit	Production			
Transmission channel bandwidth	Band 13: 5 MHz, 10 MHz			
Transmission channel number and frequencies				
	LTE band 13			
	Chan.	**f (MHz)**	**BW**	
L[2]	23205	779.5	5 MHz	
M	23230	782	5 MHz, 10 MHz	
H[2]	23255	784.5	5 MHz	
UE Category	Category 3			
Modulation supported in uplink	QPSK, 16QAM			
Description of LTE antenna	1 Tx/Rx Ant, Sharing with GSM; 1 Rx Ant, Sharing with CDMA/802.11bg/BT			
LTE voice available/supported	SVLTE and third party VOIP application might be possible			
Hotspot with LTE+WiFi	Yes			
Hotspot with LTE+WiFi active with CDMA voice	Yes			
LTE MPR permanently built-in by design	Yes			
LTE A-MPR	Disabled during SAR testing , by setting NV value to NV_01 on the CMW500			
LTE maximum average power (dBm)	Band 17: 23.0 dBm			
Other non-LTE U.S. wireless operating modes/bands	GSM/CDMA	835 MHz GSM 1900 MHz GSM 835 MHz CDMA 1900 MHz CDMA		
	WiFi and BT	2.4 GHz Wi-Fi 5 GHz Wi-Fi 2.4 GHz BT		
Simultaneous Tx conditions	Please refer to section 1.9: Highlights of the FCC OET SAR Evaluation Considerations for Handsets with Multiple Transmitters/ Antennas & GSM/GPRS/EDGE Procedure.			
Power reduction applied for SAR compliance	Yes, please refer to sections 1.8.4 and 1.10			

Table 1.3-2 Test device characterization all U.S. wireless operating modes/bands

Note 2: As per 3GPP TS 36.521-1 V10.0.0 (2011-12):

"The channel numbers that designate carrier frequencies so close to the operating band edges that the carrier extends beyond the operating band edge shall not be used. This implies that the first 7, 15, 25, 50, 75 and 100 channel numbers at the lower operating band edge and the last 6, 14, 24, 49, 74 and 99 channel numbers at the upper operating band edge shall not be used for channel bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz respectively."…5.4.4

1.4 Body worn accessories (holsters)

The device has been tested with the first holster listed 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. 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.

Number	Holster Type	Part Number	Separation distance (mm)
1	Vertical Holster	HDW-49270-001	19
2	Vertical Holster, Black Leather	HDW-49272-001	19

Table 1.4-1 Body worn holster

Note: both holsters have identical design, except for different leather material being used.

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-24529-004
2) HDW-15766-005
3) HDW-44306-001

1.6 Battery

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

1) BAT-47277-001

1.7 Procedure used to establish test signal

- The device was put into test mode for SAR measurements by placing a call from a Rohde & Schwarz CMU 200 or CMW 500 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. For LTE specific bandwidths, number of resource blocks, and resource block offsets were set. In addition, LTE A-MPR was disabled.
- Software Tool was used to set WiFi to transmit at maximum power and duty cycle for each band, channel, and modulation.

1.8 Highlights of the FCC OET SAR Measurement Requirements

1.8.1 SAR Measurement Procedures for 802.11 a/b/g/n as per KDB 248227 D01 v01r02 and SAR Measurements 100 MHz to 6 GHz as per KDB 865664 D0 V01

• Repeat measurements when the measured SAR is ≥ 0.80 W/kg. If the measured SAR values are < 1.45 W/kg with ≤ 20% variation, only one repeated measurement was performed to reaffirm that the results are not expected to have substantial variations. An additional repeated measurement is required only if the measured results are within 10% of the SAR limit and vary by more than 20%, which are often related to device and measurement setup difficulties.
• Maintained dielectric parameter uncertainty to ± 5.0% of the target values, (although it is very challenging to control/maintain both permittivity and conductivity for 5-6 GHz for all test channels within ± 5.0% of the target values, some conductivity values were measured slightly higher which resulted in more conservative SAR values.
• Liquid depth from SAM ERP or flat phantom was kept at 15 cm.
• Probe Requirement: Used SPEAG probe model ET3DV6/ES3DV3 for 2.45 GHz and EX3DV4 for 5-6 GHz SAR testing specs are outlined below:

ET3DV6/ES3DV3	
Probe tip to sensor center	2.7 mm / 2.0 mm
Probe tip diameter is	6.8 mm / 4.0 mm
Probe calibration uncertainty	< 15 % for f = 2.45 GHz
Probe calibration range	± 100 MHz
EX3DV4	
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 1.8.1-1 Probe specification requirements

• Area scan resolution was maintained at 10mm (5-6 GHz)
• Area scan resolution was maintained at 12mm (2-3 GHz)
• Area scan resolution was maintained at 15mm (</= 2 GHz)
• 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.

ET3DV6/ES3DV3	
Closest Measurement Point to Phantom	4.0 mm
Zoom Scan (x,y) Resolution	7.5 mm (</= 2 GHz)
Zoom Scan (x,y) Resolution	5 mm (</= 2-3 GHz)
Zoom Scan (z) Resolution	5.0 mm
Zoom Scan Volume	Minimum 30 x 30 x 30 mm[1]
EX3DV4	
Closest Measurement Point to Phantom	2.0 mm
Zoom Scan (x,y) Resolution	4.0 mm (5-6 GHz)
Zoom Scan (z) Resolution	2.0 mm (5-6 GHz)

Zoom Scan Volume	Minimum 22 x 22 x 22 mm[1]

Table 1.8.1-2 Zoom Scan requirement

Note 1: "Auto-extend zoom scan when maxima on boundary" is enabled, which can result in the zoom scan dimensions varying between 30x30x30 to 60x60x30 mm and 22x22x22 to 48x40x22 mm.

- 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 the highest output power channel of each sub band (low, mid, upper band I, and upper band II). If the highest output power channel has a SAR level that is not 3dB lower than the limit, then the low, mid, and high channels of each sub band must also be tested.
- 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/n 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 and highest duty cycle, if the SAR level was within 3dB of the limit.
- Conducted power measurements:

802.11b @ 1Mbps		802.11g @ 6Mbps		802.11n @ 6.5 Mbps	
Chan	**Cond. Power (dBm)**	**Chan**	**Cond. Power (dBm)**	**Chan**	**Cond. Power (dBm)**
1	17.8	1	12.7	1	12.6
6	18.1	6	16.2	6	16.0
11	**18.4**	11	13.3	11	13.2

		802.11g			802.11b
Data Rate (Mbps)	**Mod.**	**Channel 6**	**Data Rate (Mbps)**	**Mod.**	**Channel 11**
		Cond. Power (dBm)			**Cond. Power (dBm)**
6	BPSK	16.2	1	BPSK	18.4
9	BPSK	16.1	2	DQPSK	18.4
12	QPSK	16.0	5.5	CCK	18.2
18	QPSK	15.9	11	CCK	18.1
24	16-QAM	15.2			
36	16-QAM	15.0			
48	64-QAM	12.9			
54	64-QAM	12.8			

		802.11 n
Data Rate (Mbps)	**Mod.**	**Channel 6**
		Cond. Power (dBm)
6.5	MCS0	16.0
13	MCS1	15.9
19.5	MCS2	15.7
26	MCS3	15.2
39	MCS4	14.9
52	MCS5	12.8
58.5	MCS6	12.7
65	MCS7	10.8

Table 1.8.1-3 802.11 b/g/n modulation type/data rate vs. conducted power with Hotspot mode enabled and disabled

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	**14.8**	**52**	**15.5**	**104**	**13.6**
40	14.7	56	15.4	116	13.5
44	14.6	60	15.3	124	13.4
48	14.5	64	15.1	140	13.5

802.11a (upper band II) 6Mbps	
Chan	**Cond. Power (dBm)**
149	13.5
153	13.7
157	13.8
161	13.9
165	**14.0**

		802.11a (lower band)	802.11a (middle band)	802.11a (upper band I)	802.11a (upper band II)
Data Rate (Mbits)	**Mod.**	**Channel 36**	**Channel 52**	**Channel 104**	**Channel 165**
		Cond. Power (dBm)	**Cond. Power (dBm)**	**Cond. Power (dBm)**	**Cond. Power (dBm)**
6	BPSK	14.8	15.5	13.6	14.0
9	BPSK	14.7	15.4	13.6	14.0
12	QPSK	14.6	15.3	13.6	13.8
18	QPSK	14.4	15.2	13.3	13.7
24	16-QAM	14.2	15.0	13.2	13.5
36	16-QAM	14.0	14.7	12.9	13.3
48	64-QAM	13.3	13.0	11.1	11.5
54	64-QAM	13.2	12.9	11.0	11.5

		802.11 n
Data Rate (Mbps)	**Mod.**	**Channel 36**
		Cond. Power (dBm)
6.5	MCS0	14.6
13	MCS1	14.5
19.5	MCS2	14.3
26	MCS3	14.2
39	MCS4	13.9
52	MCS5	13.2
58.5	MCS6	13.1
65	MCS7	11.6

Table 1.8.1-4 Rev 1 802.11 a/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	6.26
39	2441	DH5	6.75
78	2480	DH5	6.84

Table 1.8.2-1 Bluetooth peak conducted power measurements

1.8.3 FCC SAR Measurement Procedures for 3G Devices CDMA 2000 as per KDB 941225 D01 v02

The default test configuration is to measure SAR in RC3 with an established radio link between the DUT and a communication test set. SAR in RC1 is selectively confirmed according to output power and exposure conditions.

Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. Results for at least steps 3, 4 and 10 of the power measurement procedures should be tabulated in the SAR report as shown on Table 1.8.3-3 Steps 3 and 4 should be measured using SO55 with power control bits in "All Up" condition. TDSO / SO32 may be used instead of SO55 for step 4. Step 10 should be measured using TDSO / SO32 with power control bits in the "Bits Hold" condition (i.e. alternative Up/Down Bits).

3GPP2 C.S0011/ TIA-98-E, section 4.4.5.2 Method of Measurement

1. If the mobile station supports Reverse Traffic Channel Radio Configuration 1 and 7 Forward Traffic Channel Radio Configuration 1, set up a call using Fundamental 8 Channel Test Mode 1 with 9600 bps data rate only and perform steps 6 through 8.
2. If the mobile station supports the Radio Configuration 3 Reverse Fundamental 11 Channel and demodulation of Radio Configuration 3, 4, or 5, set up a call using 12 Fundamental Channel Test Mode 3 with 9600 bps data rate only and 13 perform steps 6 through 8.
3. Set the test parameters as specified in **Table 1.8.3-1**
4. Send continuously '0' power control bits to the mobile station.
5. Measure the mobile station output power at the mobile station antenna connector.
6. If the mobile station supports the Radio Configuration 3 Reverse Fundamental Channel, Radio Configuration 3 Reverse Supplemental Channel 0 and demodulation of Radio Configuration 3, 4, or 5, set up a call using Supplemental Channel Test Mode 3 with 9600 bps Fundamental Channel and 9600 bps Supplemental Channel 0 data rate, and perform the following:

a) Set the test parameters as specified in **Table 1.8.3-2**

b) Send alternating '0' and '1' power control bits to the mobile station using the smallest supported closed loop power control step size supported by the mobile station.

c) Determine the active channel configuration. If the desired channel configuration is not active, increase by 1 dB and repeat the verification. Repeat this step until the desired channel configuration becomes active.
d) Measure the mobile station output power at the mobile station antenna connector and record reading.

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table 1.8.3-1

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-86
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table 1.8.3-2

Test Parameters for Maximum RF Output Power for Spreading Rate 1

Head SAR Measurements

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

Body SAR Measurements

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCH_n) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCH_n) with FCH at full rate and SCH_0 enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts.

Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

1x Ev-DO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev. 0 and Rev. A.

Band	Channel	1x EvDO (153.6kbps) Rev 0 (dBm)	1x EvDO (153.6kbps) Rev A (dBm)	CDMA2000 RC	SO2 Loopback (dBm)	SO55 Loopback (dBm)	TDSO SO32 Test Data Service (dBm)
CDMA 850 BC 0	1013	24.1	24.1	RC 1	24.0	24.0	N/A
				RC 3	24.1	24.1	24.1
	384	24.1	24.1	RC 1	24.1	24.0	N/A
				RC 3	24.1	24.1	24.1
	777	23.6	23.6	RC 1	23.5	23.5	N/A
				RC 3	23.5	23.6	23.6
Band	**Channel**	**1x EvDO (153.6kbps) Rev 0 (dBm)**	**1x EvDO (153.6kbps) Rev A (dBm)**	**CDMA2000 RC**	**SO2 Loopback (dBm)**	**SO55 Loopback (dBm)**	**TDSO SO32 Test Data Service (dBm)**
CDMA 1900 BC 1	25	24..1	24..1	RC 1	24.1	24.0	N/A
				RC 3	24.0	24.0	24.1
	600	24.4	24.4	RC 1	24.3	24.3	N/A
				RC 3	24.3	24.3	24.3
	1175	24.1	24.1	RC 1	24.0	24.0	N/A
				RC 3	24.0	24.0	24.0

Table 1.8.3-3a Rev 1 Conducted RF output power (dBm) measured for various settings

Band	Channel	1x EvDO (153.6kbps) Rev 0 (dBm)	1x EvDO (153.6kbps) Rev A (dBm)	CDMA2000 RC	SO2 Loopback (dBm)	SO55 Loopback (dBm)	TDSO SO32 Test Data Service (dBm)
CDMA 1900 BC1	25	21.1	21.2	**RC1**	21.1	21.1	N/A
				RC3	21.1	21.1	21.1
	600	21.3	21.5	**RC1**	21.4	21.4	N/A
				RC3	21.4	21.4	21.4
	1175	21.0	21.2	**RC1**	21.2	21.1	N/A
				RC3	21.2	21.1	21.1

Table 1.8.3-3b Rev 2 Hot Spot Conducted RF output power (dBm) measured for various settings

Band	Channel	1x EvDO (153.6kbps) Rev 0 (dBm)	1x EvDO (153.6kbps) Rev A (dBm)	CDMA2000 RC	SO2 Loopback (dBm)	SO55 Loopback (dBm)	TDSO SO32 Test Data Service (dBm)
CDMA 850 BC0	1013	22.4	22.4	**RC1**	22.4	22.4	N/A
				RC3	22.4	22.4	22.5
	384	22.1	22.2	**RC1**	22.2	22.2	N/A
				RC3	22.2	22.1	22.1
	777	21.8	21.8	**RC1**	21.8	21.8	N/A
				RC3	21.8	21.8	21.8
Band	**Channel**	**1x EvDO (153.6kbps) Rev 0 (dBm)**	**1x EvDO (153.6kbps) Rev A (dBm)**	**CDMA2000 RC**	**SO2 Loopback (dBm)**	**SO55 Loopback (dBm)**	**TDSO SO32 Test Data Service (dBm)**
CDMA 1900 BC1	25	20.1	20.1	**RC1**	20.1	20.1	N/A
				RC3	20.1	20.0	20.0
	600	20.3	20.4	**RC1**	20.4	20.4	N/A
				RC3	20.4	20.4	20.4
	1175	20.1	20.1	**RC1**	20.1	20.1	N/A
				RC3	20.1	20.1	20.0

Table 1.8.3-3c Rev 4 Hot Spot Conducted RF output power (dBm) measured for various settings

1.8.4 SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities as per KDB 941225 D06 v01

Standalone personal wireless routers and handsets with hotspot mode capabilities must address hand-held and other near-body exposure conditions to show SAR compliance. The following procedures are applicable when the overall device length and width are ≥ 9 cm x 5 cm respectively. A test separation of 10 mm is required. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25 mm from that surface or edge, for the data modes, wireless technologies and frequency bands supporting hotspot mode. The standalone SAR results in each device test orientation must be analyzed for the applicable hotspot mode simultaneous transmission configurations to determine SAR test exclusion and volume scan requirements.

Static/fixed power reduction scheme on the following modes/bands have been implemented when Hotspot Mode is enabled or active to comply with body SAR with 10 mm test separation from flat phantom on standalone transmitter and multi-band simultaneous transmission conditions:

- CDMA PCS 1xRTT and EvDO: back off 4 dB
- CDMA Cell 1xRTT and EvDO: back off 2 dB
- LTE B13: back off 4 dB

When Hotspot mode is enabled or active, all 5 GHz WiFi operations are disabled or not supported.

The device supports wireless router operations on CDMA/EvDO and LTE modes. In addition, CDMA 1xRTT voice may operate in conjunction with LTE WiFi Hotspot. Therefore CDMA 1xRTT was tested for Hotspot conditions.

EvDO Rev 0/Rev A was not tested for Hotspot conditions, since conducted power are about the same as CDMA 1xRTT and not higher than 0.25 dB.

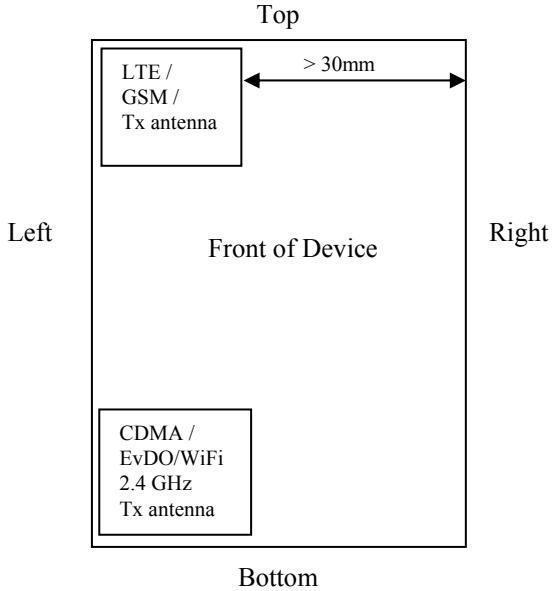

Figure 1.8.4-1 Identification of all sides for SAR Testing

Note: According to FCC guidance, Hotspot SAR testing is not required on any edge that is more than 2.5cm from the transmitting antenna.

Hotspot Sides for SAR Testing						
Mode	**Front**	**Back**	**Top**	**Bottom**	**Left**	**Right**
CDMA 850	Yes	Yes	No	Yes	Yes	No
CDMA 1900	Yes	Yes	No	Yes	Yes	No
WiFi 2.4 GHz	Yes	Yes	No	Yes	Yes	No
LTE band 13	Yes	Yes	Yes	No	Yes	No
GPRS 850	Yes	Yes	Yes	No	Yes	No
GPRS 1900	Yes	Yes	Yes	No	Yes	No

Table 1.8.4-1 Identification of all sides for SAR Testing

1.8.5 SAR Evaluation Procedures for LTE as per KDB 941225 D05 v02

"1. QPSK with 1 RB allocation
Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and *required test channel* combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each *required test channel*. When the *reported* SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and *required test channels* is not required for 1 RB allocation; otherwise, SAR is required for the remaining r*equired test channels* and only for the RB offset configuration with the highest output power for that channel.6 When the *reported* SAR of a *required test channel* is > 1.45 W/kg, SAR is required
for all three RB offset configurations for that *required test channel*.

2. QPSK with 50% RB allocation
The procedures required for 1 RB allocation in 1. are applied to measure the SAR for QPSK with 50% RB allocation.

3. QPSK with 100% RB allocation
For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest *reported* SAR for 1 RB and 50% RB allocation in 1. and 2. are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the *reported* SAR is > 1.45 W/kg, the remaining *required test channels* must also be tested.

Higher order modulations
For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 1. and 2.and 3. to determine the QAM configurations that may need SAR measurement.

For each configuration
identified as required for testing, SAR is required only when the highest maximum output power

for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the *reported* SAR for the QPSK configuration is > 1.45 W/kg.

4. Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section 5.2 to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the *reported* SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

The equivalent channel configuration for the RB allocation, RB offset and modulation etc. Is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing."

• MPR has been implemented permanently by the manufacturer as per 3GPP TS36.101
• A-MPR was disabled for all SAR measurements.
•LTE Head SAR was evaluated to cover third-party VoIP applications at full power.
•LTE Head SAR was evaluated in SVLTE mode at lowered LTE power.

• According to "3GPP TS 36.521-1 V10.0.0 (2011-12)":
  •"The channel numbers that designate carrier frequencies so close to the operating band edges that the carrier extends beyond the operating band edge shall not be used. This implies that the first 7, 15, 25, 50, 75 and 100 channel numbers at the lower operating band edge and the last 6, 14, 24, 49, 74 and 99 channel numbers at the upper operating band edge shall not be used for channel bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz respectively."…

Band	LTE Band 13					
Frequency (MHz)	Channel	BW	Modulation	RB Size	RB Offset	Maximum Avg. Power (dBm)
782	23230	10 MHz	QPSK	1	0	23.25
			QPSK	1	25	23.13
			QPSK	1	49	22.90
			QPSK	25	0	22.41
			QPSK	25	25	22.24
			QPSK	50	0	22.22
			16QAM	1	0	22.71
			16QAM	1	25	22.55
			16QAM	1	49	22.23
			16QAM	16	0	21.64
			16QAM	16	34	21.27
			16QAM	50	0	21.26
779.5	23205	5 MHz	QPSK	1	0	23.13
			QPSK	1	13	23.14
			QPSK	1	24	23.02
			QPSK	10	0	22.47
			QPSK	10	15	22.29
			QPSK	25	0	22.48
			16QAM	1	0	21.70
			16QAM	1	13	21.80
			16QAM	1	24	21.67
			16QAM	8	0	22.64
			16QAM	8	17	22.47
			16QAM	25	0	21.67
782	23230	5 MHz	QPSK	1	0	23.45
			QPSK	1	13	23.30
			QPSK	1	24	23.19
			QPSK	10	0	22.31
			QPSK	10	15	22.17
			QPSK	25	0	22.31
			16QAM	1	0	22.51
			16QAM	1	13	22.40
			16QAM	1	24	22.25
			16QAM	8	0	22.35
			16QAM	8	17	22.16
			16QAM	25	0	21.36
784.5	23255	5 MHz	QPSK	1	0	23.27
			QPSK	1	13	23.00
			QPSK	1	24	23.15
			QPSK	10	0	22.18
			QPSK	10	15	22.13
			QPSK	25	0	22.10
			16QAM	1	0	22.50

			16QAM	1	13	22.31
			16QAM	1	24	22.40
			16QAM	8	0	22.08
			16QAM	8	17	22.01
			16QAM	25	0	21.12

Table 1.8.5-1 Rev 2 LTE band 13 conducted power measurements with Hotspot mode disabled

Band	LTE Band 13					
Frequency (MHz)	Channel	BW	Modulation	RB Size	RB Offset	Maximum Avg. Power (dBm)
782	23230	10 MHz	QPSK	1	0	19.24
			QPSK	1	25	19.15
			QPSK	1	49	19.07
			QPSK	25	0	18.13
			QPSK	25	25	18.04
			QPSK	50	0	18.11
			16QAM	1	0	18.40
			16QAM	1	25	18.25
			16QAM	1	49	18.14
			16QAM	16	0	17.40
			16QAM	16	34	17.03
			16QAM	50	0	17.21
779.5	23205	5 MHz	QPSK	1	*0*	19.27
			QPSK	1	*13*	19.26
			QPSK	1	*24*	19.15
			QPSK	10	*0*	18.25
			QPSK	10	*15*	18.13
			QPSK	25	*0*	18.18
			16QAM	1	*0*	18.40
			16QAM	1	*24*	18.28
			16QAM	8	17	18.20
			16QAM	25	0	17.29
782	23230	5 MHz	QPSK	1	0	19.00
			QPSK	1	13	18.74
			QPSK	1	24	18.80
			QPSK	10	0	18.32
			QPSK	10	15	18.19
			QPSK	25	0	18.21
			16QAM	1	0	17.56
			16QAM	1	13	17.50
			16QAM	1	24	17.45
			16QAM	8	0	18.55
			16QAM	8	17	18.40

			16QAM	25	0	17.46
784.5	23255	5 MHz	QPSK	1	0	19.24
			QPSK	1	13	19.00
			QPSK	1	24	19.09
			QPSK	10	0	18.10
			QPSK	10	15	18.00
			QPSK	25	0	17.94
			16QAM	1	0	18.30
			16QAM	1	13	18.11
			16QAM	1	24	18.20
			16QAM	8	0	17.95
			16QAM	8	17	18.00
			16QAM	25	0	17.00

Table 1.8.5-2 LTE band 13 conducted power measurements with SVLTE and Hot Spot mode enabled

1.8.6 SAR Evaluation Procedures for GSM/(E)GPRS Dual Transfer Mode as per KDB 941225 D04 v01 and SAR Test Reduction Procedures GSM GPRS EDGE as per DDB 941225 D03 vo1

- The device supports EGPRS/GPRS Multi-slot Class 12, DTM/GPRS Multi-slot Class11 and DTM/EGPRS Multi-slot Class10.
- CMU200 base station simulator with DTM software option CMU-K44 was used to set device in DTM (CS+PD) mode for testing. However, device could not be connected in DTM 4-slots uplink.
- For each slot addition in multi-slot modes (DTM, GPRS, EDGE), there is software power reduction of ~ 2 dB per slot.
- For head configurations, 1 slot CS, 2/3/4-slots (PD) and DTM (CS+PD) were evaluated.
- For body SAR configurations, 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.
- Please refer to the conducted power measurements table below:

Mode	Freq. (MHz)	Max burst Slot averaged conducted power (dBm) CS1	Max burst Slot averaged conducted power (dBm) MCS1	Max burst Slot averaged conducted power (dBm) MCS5
2-slots GPRS 850 MHz	824.2	28.6	N/A	N/A
	836.8	28.5	N/A	N/A
	848.8	28.5	N/A	N/A
3-slots GPRS 850 MHz	824.2	27.1	N/A	N/A
	836.8	26.8	N/A	N/A
	848.8	26.8	N/A	N/A
4-slots GPRS 850 MHz	824.2	25.6	N/A	N/A
	836.8	25.7	N/A	N/A
	848.8	25.7	N/A	N/A
2-slots EDGE 850 MHz	824.2	28.7	28.5	26.8
	836.8	28.7	28.6	26.6
	848.8	28.6	28.5	26.4
2-slots DTM 850 MHz	824.2	28.6	28.6	28.5 / 26.3
	836.8	28.6	28.5	28.5 / 26.3
	848.8	28.5	28.5	28.4 / 26.2
3-slots EDGE 850 MHz	824.2	27.0	27.2	25.0
	836.8	27.0	27.1	24.9
	848.8	26.9	27.0	24.8
3-slots DTM 850 MHz	824.2	27.0	N/A	N/A
	836.8	26.9	N/A	N/A
	848.8	26.9	N/A	N./A

4-slots EDGE 850 MHz	824.2	25.7	25.6	23.8
	836.8	25.8	25.8	23.9
	848.8	25.8	25.8	23.7
2-slots GPRS 1900 MHz	1850.2	25.7	25.7	N/A
	1880.0	25.9	N/A	N/A
	1909.8	25.9	N/A	N/A
3-slots GPRS 1900 MHz	1850.2	23.9	N/A	N/A
	1880.0	24.1	N/A	N/A
	1909.8	24.1	N/A	N/A
4-slots GPRS 1900 MHz	1850.2	22.7	N/A	N/A
	1880.0	22.9	N/A	N/A
	1909.8	23.1	N/A	N/A
2-slots EDGE 1900MHz	1850.2	25.7	25.7	25.2
	1880.0	25.7	25.9	25.3
	1909.8	25.8	25.9	25.3
2-slots DTM 1900 MHz	1850.2	25.3	25.3	25.3/24.8
	1880.0	25.6	25.5	25.6/25.0
	1909.8	25.6	25.5	25.5/25.0
3-slots EDGE 1900MHz	1850.2	24.0	23.8	24.1
	1880.0	24.1	24.1	24.4
	1909.8	24.1	24.1	24.5
3-slots DTM 1900 MHz	1850.2	NA	NA	NA
	1880.0	NA	NA	NA
	1909.8	NA	NA	NA
4-slots EDGE 1900MHz	1850.2	22.8	22.7	23.3
	1880.0	23.0	22.9	23.4
	1909.8	22.9	23.1	23.5

Mode	Freq. (MHz)	Max burst averaged conducted power (dBm)
1-slot GSM (CS) 850 MHz	824.2	32.2
	836.8	32.2
	848.8	32.0
1-slot GSM (CS) 1900 MHz	1850.2	29.0
	1880.0	29.4
	1909.8	29.5

1.8.6-1 GSM/EDGE/GPRS channel vs. conducted power with Hotspot mode disabled

1.8.7 SAR Measurement Procedure for Volume Scan and Multiband Evaluation as per KDB 865664

- All Volume Scans and Multiband Simultaneous Transmission SAR plots have been included in Appendix B2 of the SAR report.
- Same Volume Scan procedure was followed for each simultaneous transmitting antenna (CDMA2000, LTE and 802.11b) that required Multi-band SAR.
- Large volume scans of 90 mm x 105 mm x 30 mm were conducted to cover all peaks
- Volume scan step size of 7.5 mm (x), 7.5 mm (y) and 5 mm (z) were used.
- "Grid Anchor" was set to "Grid Reference Point" to have same location for all Volume Scans
- Please see below setup screenshots and a volume scan plot:
- **Volume Scan (13x15x7) = 1365 measurements**

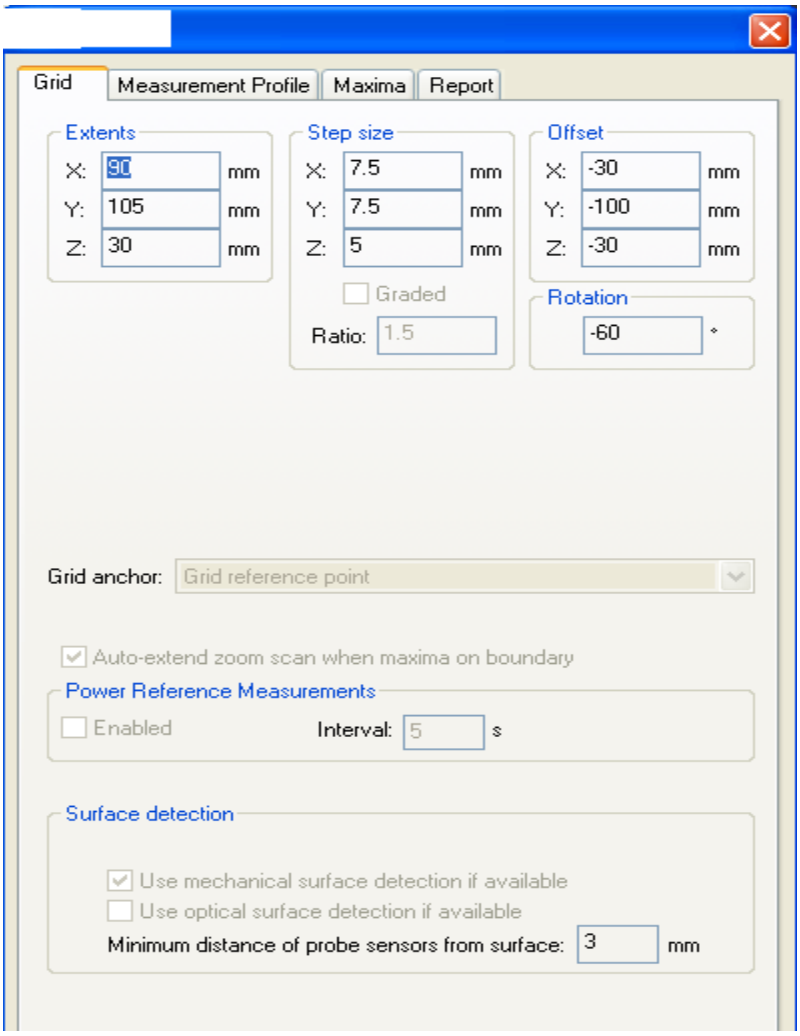

Figure 1.8.6-1 Volume scan properties

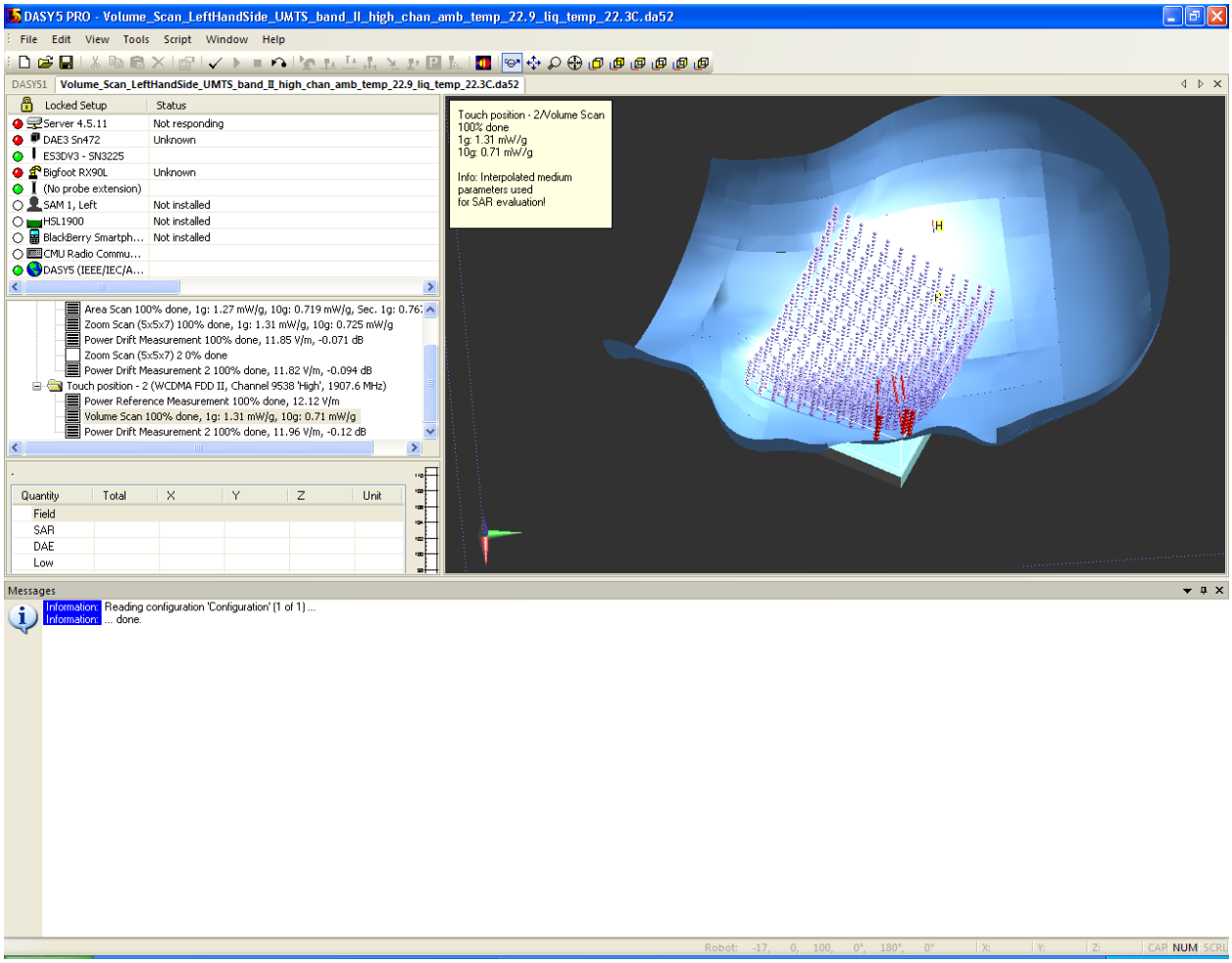

Figure 1.8.6-2 DASY5 view of volume scan

1.9 General SAR Test Reduction and Exclusion procedure as per KDB 447498 D01 V05 and SAR Handsets Multi Xmiter and Ant procedure as per 648474 D04 v01

Standalone SAR test exclusion guidance:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances*

[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·
[$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR, where
$f_{(GHz)}$ is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation[17]
The result is rounded to one decimal place for comparison
distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Simultaneous Transmission SAR Test exclusion considerations:

When the sum of 1-g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration. When the sum is greater than the SAR limit, the SAR to peak location separation ratio procedures described below may be applied to determine if simultaneous transmission SAR test exclusion applies.

The ratio is determined by:

(SAR1 + SAR2)^ 1.5/Ri ≤ 0.04
R_i is the separation distance between the peak SAR locations for the antenna pair in mm

Simultaneous Transmission SAR required:

• antenna pairs with SAR to antenna separation ratio > 0.04; test is only required for the configuration that results in the highest SAR in standalone configuration for each wireless mode and exposure condition.

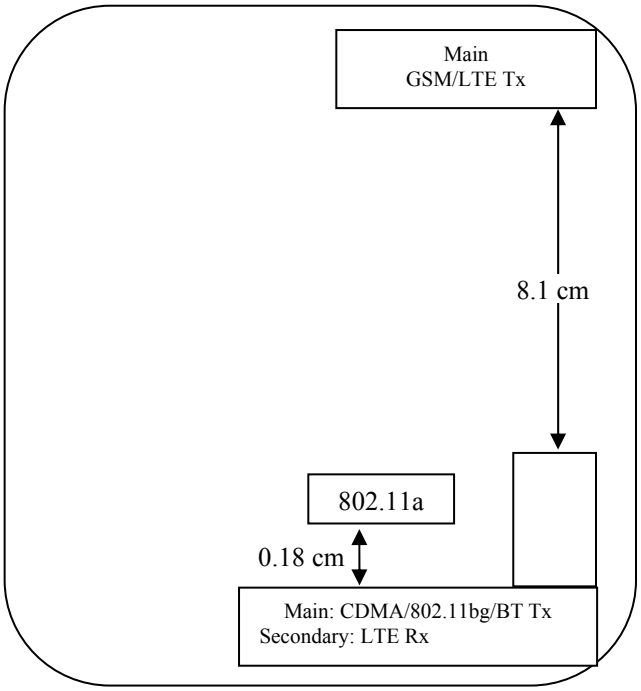

Figure 1.9-1 Back view of device showing closest distance between antenna pairs

1.9.1 Simultaneous Transmission Analysis

Simultaneous Transmission Combination	Head	Body-Worn Accessory	Mobile Hotspot
CDMA2000 voice + LTE + WiFi 2.4 GHz	Yes	Yes	Yes
CDMA2000 voice + LTE + WiFi 5.0 GHz	Yes	Yes	No
CDMA2000 voice + LTE + BT	Yes	Yes	Yes
CDMA2000/GSM voice + WiFi 2.4 GHz	Yes	Yes	Yes
CDMA2000/GSM voice + WiFi 5.0 GHz	Yes	Yes	No
CDMA2000/GSM voice + BT	Yes	Yes	Yes
CMDA2000/EDGE/GPRS data+ LTE + WiFi 2.4 GHz	Yes	Yes	Yes
CMDA2000/EDGE/GPRS data+ LTE + WiFi 5.0 GHz	Yes	Yes	No
CMDA2000/EDGE/GPRS data+ LTE + BT	Yes	Yes	Yes
LTE + WiFi 2.4 GHz	Yes	Yes	Yes
LTE + WiFi 5.00 GHz	Yes	Yes	No

Table 1.9.1-1 Simultaneous Transmission Scenarios

Note 1: BT Stand-alone SAR test is not required and value of zero is considered for SAR summation.

Note 2: GSM/EDGE/GPRS and LTE share the same antenna and thus cannot transmit simultaneously.

Test	Configuration	Licensed Transmitters		WiFi 2.4 G 1 g avg. SAR (W/kg)	SVLTE LTE 13 1 g avg. SAR (W/kg)	Maximum Summation 1 g avg. SAR (W/kg)
		Band	1 g avg. SAR (W/kg)			
Head SAR	Right Cheek	GSM/GPRS/EDGE 850	1.20	0.08	NA	1.28
	Right Cheek	GSM/GPRS/EDGE 1900	1.13			1.21
	Right Cheek	CDMA 850	0.99		0.41	1.48
	Right Cheek	CDMA 1900	0.60			1.09
	Right Tilt	GSM/GPRS/EDGE 850	0.76	0.08	NA	0.84
	Right Tilt	GSM/GPRS/EDGE 1900	0.98			1.06
	Right Tilt	CDMA 850	0.45		0.28	0.81
	Right Tilt	CDMA 1900	0.23			0.59
	Left Cheek	GSM/GPRS/EDGE 850	1.02	0.19	NA	1.21
	Left Cheek	GSM/GPRS/EDGE 1900	0.70			0.89
	Left Cheek	CDMA 850	1.00		0.38	1.57
	Left Cheek	CDMA 1900	1.18			1.75
	Left Tilt	GSM/GPRS/EDGE 850	0.73	0.04	NA	0.77
	Left Tilt	GSM/GPRS/EDGE 1900	0.76			0.80
	Left Tilt	CDMA 850	0.52		0.26	0.82
	Left Tilt	CDMA 1900	0.36			0.66

Table 1.9.1-2 Highest Head SAR values and summation in normal and SVLTE mode

Note 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.
Note 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.

Antenna	Position	SAR Zoom 1g	X [mm]	Y [mm]	Z [mm]	
Antenna 2 (CDMA1900), Mid Chan, CER Rev 2	Left Head Touch	1.18	62.9	253.6	-172	
Antenna 3, WiFi 802.11b	Left Head Touch	0.19	62.9	253.6	-172	
	SAR Sum	1.37				
	SAR Sum ^ 1.5	1.60				
	Delta [mm]		0	0	0	
	Closest Distance [mm]					**0.00**
	Ratio	160				

Table 1.9.1-3 Ratio of SAR to peak separation distance for pair of transmitters in SVLTE mode

Note 3: If the ratio of SAR to peak separation distance is ≤ 0.04, Simultaneous SAR measurement is not required.
Note 4: If the ratio of SAR to peak separation distance is > 0.04, Simultaneous SAR measurement is required and simultaneous transmission SAR value is calculated.
Note 5: For Left Head Touch configuration, CDMA1900+SVLTE+WiFi do not comply with sum or ratio exemption, therefore Volume Scans and Multi-band ST SAR evaluation have been performed.
The result is within the limit as shown below. Please refer to Appendix B2 for SAR plots:

Mode	Configuration	Volume Scan 1g SAR (W/Kg)	Multi-Band Average 1g SAR (W/Kg)
LTE 13	Right Head Cheek	0.42	1.09
CDMA 850		0.97	
802.11b		0.10	
LTE 13	Right Head Cheek	0.42	0.75
CDMA 1900		0.64	
802.11b		0.10	
LTE 13	Left Head Cheek	0.38	1.22
CDMA 850		0.99	
802.11b		0.20	
LTE 13	Left Head Cheek	0.38	**1.42**
CDMA 1900		1.19	
802.11b		0.20	

Table 1.9.1-4 Simultaneous transmission SAR Results with Volume scans in SVLTE mode

Test	Configuration	Licensed Transmitters		WiFi 2.4/5.0G 1 g avg. SAR (W/kg)	SVLTE LTE 13 1 g avg. SAR (W/kg)	Maximum Summation 1 g avg. SAR (W/kg)
		Band	1 g avg. SAR (W/kg)			
Body Worn SAR	15 mm separation, device back	GSM/GPRS/EDGE 850	0.40	0.32	NA	0.72
		GSM/GPRS/EDGE 1900	0.32			0.64
		CDMA 850	0.81		0.21	1.34
		CDMA 1900	1.01			1.54
	Holster device back	GSM/GPRS/EDGE 850	0.29	0.20	NA	0.49
		GSM/GPRS/EDGE 1900	0.19			0.39
		CDMA 850	0.52		0.13	0.85
		CDMA 1900	0.76			1.09
	Holster device front	GSM/GPRS/EDGE 850	0.26	0.29	NA	0.55
		GSM/GPRS/EDGE 1900	0.07			0.36
		CDMA 850	0.57		0.11	0.97
		CDMA 1900	0.25			0.65

Table 1.9.1-5 Highest Body-worn SAR values for the same configuration in normal and SVLTE mode

Note 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.
Note 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters

calculated.

Test	Configuration	Licensed Transmitters		WiFi 2.4 G 1 g avg. SAR (W/kg)	SVLTE LTE 13 1 g avg. SAR (W/kg)	Maximum Summation 1 g avg. SAR (W/kg)
		Band	1 g avg. SAR (W/kg)			
Mobile Hotspot SAR	10 mm separation, device back	GSM/GPRS/EDGE 850	0.63	0.42	NA	1.05
		GSM/GPRS/EDGE 1900	0.78			1.20
		CDMA 850	0.72		0.26	1.40
		CDMA 1900	0.91			1.59
	10 mm separation, device front	GSM/GPRS/EDGE 850	0.45	0.40	NA	0.85
		GSM/GPRS/EDGE 1900	0.24			0.64
		CDMA 850	0.66		0.20	1.26
		CDMA 1900	0.39			0.99
	10 mm separation, device left	GSM/GPRS/EDGE 850	0.24	0.13	NA	0.37
		GSM/GPRS/EDGE 1900	0.10			0.23
		CDMA 850	0.46		0.19	0.78
		CDMA 1900	0.45			0.77
	10 mm separation, device right	GSM/GPRS/EDGE 850	0.29	0.01	NA	0.30
		GSM/GPRS/EDGE 1900	0.04			0.05
		CDMA 850	0.47		0.13	0.61
		CDMA 1900	0.18			0.32
	10 mm separation, device top	GSM/GPRS/EDGE 850	0.14	0.00	NA	0.14
		GSM/GPRS/EDGE 1900	0.20			0.20
		CDMA 850	0.00		0.04	0.04
		CDMA 1900	0.00			0.04
	10 mm separation, device top	GSM/GPRS/EDGE 850	0.00	0.41	NA	0.41
		GSM/GPRS/EDGE 1900	0.00			0.41
		CDMA 850	0.15		0.00	0.56
		CDMA 1900	0.56			0.97

Table 1.9.1-6 Highest Mobile Hotspot SAR values for the same configuration in normal and SVLTE mode

Note 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.
Note 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.

1.10 SVLTE Power Reduction Considerations

This device supports Simultaneous Voice and LTE (SVLTE) calls, i.e. voice call is supported by a CDMA 1xRTT transmitter and the data connection supported by a LTE transmitter. Transmitters have separate antenna, match, PA and RF filtering. Dynamic Power Reduction scheme has been implemented on LTE during SVLTE call with the 1xRTT voice call in both cell and PCS bands from low to high transmitting frequency. Power reduction is applicable to LTE mode only and not on CDMA modes during SVLTE calls. LTE power reduction is triggered when CDMA power is >/= 18.5 dBm.

LTE and EvDO cannot transmit simultaneously in cell and PCS bands.

1.10.1 SVLTE Power Reduction, Test Setup Configuration and Conducted Power Measurements

The LTE power reduction was verified by simultaneously connecting the device to both LTE and CDMA base station simulators. LTE power levels were measured through conducted RF connections by first connecting the device to CWM500 LTE data and CDMA 1xRTT to CMU200 base station simulator.

First, CDMA 1xRTT was set to transmit at maximum transmitting power by setting the following parameters on the CMU200; CDMA and LTE power levels were measured and recorded:

- Power Control Bit was set to: All Bits UP
- BS Signal Level-> CDMA Power was set to: -99 dBm
- Analyzer level was set: 24.0 dBm
- RF Mode was set to: Auto

Then, CDMA 1xRTT power level was lowered by step of 1 dB; CDMA and LTE power levels were measured and recorded by setting the following parameters on the CMU200:

- Power Control Bit was set to: Auto
- BS Signal Level-> CDMA Power was set to: -99 dBm
- Analyzer level was lowered from 24.0 dBm to 17.0 dBm by step of 1 dB.
- RF Mode was set to: Manual

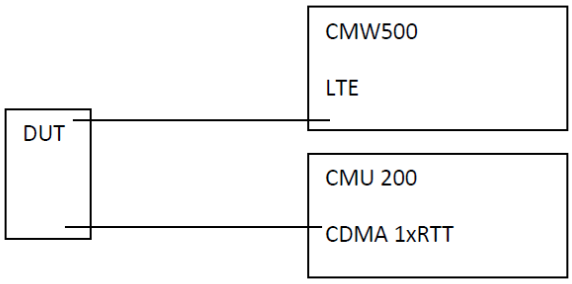

Figure 1.10.1-1 SVLTE Conducted Power Test Setup Diagram

Band	SVLTE_LTE Band 13/CDMA 850						
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**LTE**	**CDMA850**
782	23230	10 MHz	QPSK	1	0	18.55	24.44
			QPSK	1	0	18.55	23.40
			QPSK	1	0	18.56	22.20
			QPSK	1	0	19.55	21.00
			QPSK	1	0	23.04	20.00
			QPSK	1	0	23.45	19.21
			QPSK	1	0	23.48	18.00
			QPSK	1	0	23.45	17.00

Table 1.10.1-1 LTE band 13 and CDMA 850 conducted power measurements with SVLTE mode enabled

Note 1: CMU200 Analyzer level→RF Max Level varied from 17dBm to 24dBm
Note 2: RF mode was set to Manual, Power control bit was set to Auto
Note 3: BS Signal Level →CDMA Power set to -99dBm

Band	SVLTE_LTE Band 13/CDMA 1900						
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**LTE**	**CDMA 1900**
782	23230	10 MHz	QPSK	1	0	19.54	24.10
			QPSK	1	0	19.55	23.10
			QPSK	1	0	19.55	22.10
			QPSK	1	0	19.56	21.10
			QPSK	1	0	19.57	20.10
			QPSK	1	0	23.30	19.00
			QPSK	1	0	23.47	18.00
			QPSK	1	0	23.47	17.00

Table 1.10.1-2 LTE band 13 and CDMA 1900 conducted power measurements with SVLTE mode enabled

Note 1: CMU200 Analyzer level→RF Max Level varied from 17dBm to 24dBm
Note 2: RF mode was set to Manual, Power control bit was set to Auto
Note 3: BS Signal Level →CDMA Power set to -99dBm

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 are 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 52.8.
- 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.

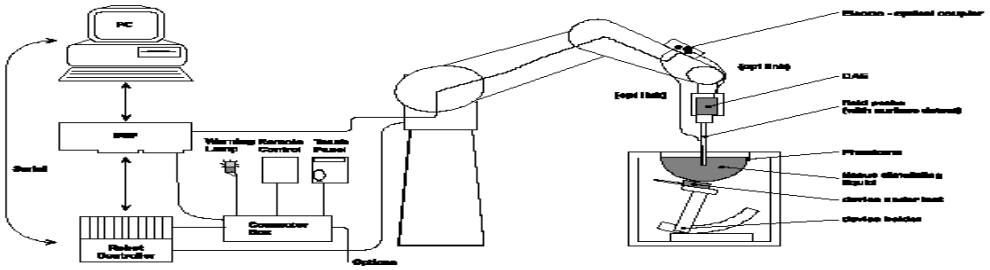

Figure 2.1-1 System Description

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	01/11/2013*
SCHMID & Partner Engineering AG	E-field probe	EX3DV4	3592	11/14/2014
SCHMID & Partner Engineering AG	E-field probe	EX3DV4	3548	01/14/2014
SCHMID & Partner Engineering AG	E-field probe	ET3DV6	1644	11/13/2013
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE3)	DAE3 V1	473	01/13/2013*
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE3)	DAE3 V1	472	03/07/2014
SCHMID & Partner Engineering AG	Dipole Validation Kit	D750V3	1021	01/05/2013*
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	D835V2	4d043	04/07/2013
SCHMID & Partner Engineering AG	Dipole Validation Kit	D1900V2	5d075	04/05/2013
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2450V2	747	11/09/2013
SCHMID & Partner Engineering AG	Dipole Validation Kit	D5000V2	1033	11/15/2013
Agilent Technologies	Signal generator	8648C	4037U03155	09/23/2013
Agilent Technologies	Power meter	E4419B	GB40202821	09/23/2013
Agilent Technologies	Power sensor	8481A	MY41095417	09/26/2013
Amplifier Research	Amplifier	5S1G4M3	300986	CNR
Agilent Technologies	Power meter	N1911A	MY45100905	05/17/2013
Agilent Technologies	Power sensor	N1921A	SG45240281	06/12/2013
Agilent Technologies	Power sensor	N1921A	MY45241383	09/11/2013
Weinschel Corp	20dB Attenuator	33-20-34	BMO697	CNR
Agilent Technologies	Network analyzer	8753ES	US39174857	09/20/2013
Rohde & Schwarz	Base Station Simulator	CMU 200	109747	11/19/2013
CPI Wireless Solutions	Amplifier	VZC-6961K4	SK4310E5	CNR
Rohde & Schwarz	Signal generator	SMA 100A	102106	12/02/2013
Rohde & Schwarz	Wideband Base Station Simulator	CMW 500	109949	12/10/2014
Rohde & Schwarz	Wideband Base Station Simulator	CMW 500	101169	12/10/2014

Table 2.1.1-1 Equipment list

* Equipment were sent for calibration before the calibration due date.

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 mm ³
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 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) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.42	6.42	6.42	0.27	2.04	± 12.0 %
900	41.5	0.97	6.06	6.06	6.06	0.35	1.74	± 12.0 %
1810	40.0	1.40	5.23	5.23	5.23	0.73	1.21	± 12.0 %
1950	40.0	1.40	4.98	4.98	4.98	0.58	1.41	± 12.0 %
2450	39.2	1.80	4.50	4.50	4.50	0.79	1.26	± 12.0 %
2600	39.0	1.96	4.32	4.32	4.32	0.77	1.32	± 12.0 %

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.27	6.27	6.27	0.36	1.74	± 12.0 %
900	55.0	1.05	6.07	6.07	6.07	0.29	2.02	± 12.0 %
1810	53.3	1.52	4.92	4.92	4.92	0.50	1.57	± 12.0 %
1950	53.3	1.52	4.87	4.87	4.87	0.59	1.49	± 12.0 %
2450	52.7	1.95	4.30	4.30	4.30	0.68	1.16	± 12.0 %
2600	52.5	2.16	4.12	4.12	4.12	0.80	0.99	± 12.0 %

Table 3.2-1 Probe ES3DV3 SN: 3225

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)
5200	± 50 / ± 100	36.0 ± 5%	4.66 ± 5%	4.50	4.50	4.50	0.45	1.90 ± 13.1%
5500	± 50 / ± 100	35.6 ± 5%	4.96 ± 5%	4.25	4.25	4.25	0.50	1.90 ± 13.1%
5800	± 50 / ± 100	35.3 ± 5%	5.27 ± 5%	3.98	3.98	3.98	0.52	1.90 ± 13.1%

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)
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	3.95	3.95	3.95	0.52	1.95 ± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	3.73	3.73	3.73	0.55	1.95 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.40	3.40	3.40	0.63	1.95 ± 13.1%

Table 3.2-2 Probe EX3DV4 SN: 3592

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)
2600	± 50 / ± 100	39.0 ± 5%	1.96 ± 5%	7.08	7.08	7.08	0.23	1.34 ± 11.0%
5200	± 50 / ± 100	36.0 ± 5%	4.66 ± 5%	5.01	5.01	5.01	0.40	1.80 ± 13.1%
5500	± 50 / ± 100	35.6 ± 5%	4.96 ± 5%	4.63	4.63	4.63	0.50	1.80 ± 13.1%
5800	± 50 / ± 100	35.3 ± 5%	5.27 ± 5%	4.42	4.42	4.42	0.50	1.80 ± 13.1%

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)
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	7.12	7.12	7.12	0.67	0.71 ± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	4.79	4.79	4.79	0.45	1.90 ± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	4.29	4.29	4.29	0.50	1.90 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	4.08	4.08	4.08	0.60	1.90 ± 13.1%

Table 3.2-3 Probe EX3DV4 SN: 3548

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 measurements 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]	
750	Measured (09/07/2012)	7.92/5.16	41.9	0.90	22.6
	Measured (09/10/2012)	7.96/5.19	40.5	0.90	22.3
	Measured (10/29/2012)	7.79/5.08	41.2	0.91	22.9
	Measured (11/09/2012)	7.95/5.17	40.7	0.90	22.8
	Measured (11/12/2012)	7.83/5.11	40.7	0.88	22.8
	Measured (11/20/2012)	7.71/5.05	40.4	0.90	22.2
	Recommended Limits	8.36/5.45	41.9	0.89	N/A
835	Measured (08/28/2012)	9.69/6.38	40.2	0.93	22.6
	Measured (08/30/2012)	9.20/6.04	40.3	0.87	22.8
	Measured (09/04/2012)	9.57/6.27	40.8	0.92	22.5
	Measured (10/30/2012)	9.09/5.98	40.8	0.88	21.9
	Measured (11/14/2012)	9.49/6.23	40.9	0.91	22.2
	Measured (11/21/2012)	9.20/6.04	39.7	0.90	22.7
	Recommended Limits	9.63/6.27	41.5	0.90	N/A
1900	Measured (10/01/2012)	39.7/20.8	38.5	1.40	22.8
	Measured (10/22/2012)	37.8/19.8	38.3	1.37	21.6
	Measured (10/24/2012)	38.2/20.3	40.5	1.40	22.6
	Measured (11/01/2012)	38.5/20.1	39.7	1.39	22.6
	Measured (11/16/2012)	38.3/19.9	38.3	1.39	22.7
	Measured (11/22/2012)	38.5/20.1	38.4	1.38	22.8
	Recommended Limits	40.0/20.8	40.0	1.40	N/A
2450	Measured (08/23/2012)	53.8/25.4	37.9	1.77	22.6
	Measured (11/05/2012)	54.7/25.7	38.2	1.82	22.5
	Measured (11/19/2012)	55.9/26.2	38.7	1.82	22.6
	Recommended Limits	54.1/25.3	39.2	1.80	N/A
5200	Measured (08/20/2012)	84.7/24.5	34.6	4.78	22.9
	Recommended Limits	80.8/23.0	36.0	4.66	N/A
5500	Measured (08/20/2012)	93.1/26.3	34.2	5.02	22.9

	Recommended Limits	87.3/24.7	35.6	4.96	N/A
5800	Measured (08/20/2012)	83.9/23.7	34.2	5.34	22.8
	Measured (11/07/2012)	84.9/24.2	35.1	5.42	21.8
	Recommended Limits	79.4/22.5	35.3	5.27	N/A

Table 4.1-1 System accuracy (validation 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]	
750	Measured (01/09/2013)*	6.20/4.00*	40.8	0.88	21.1
	Recommended Limits	8.36/5.45	41.9	0.89	N/A
835	Measured (01/08/2013)	9.22/6.08	41.3	0.90	21.2
	Recommended Limits	9.43/6.14	41.5	0.90	N/A
1900	Measured (01/08/2013)	37.60/20.1	38.4	1.43	21.3
	Recommended Limits	40.40/21.0	40.0	1.40	N/A
2450	Measured (01/07/2013)	53.7/25.4	37.8	1.76	21.5
	Recommended Limits	54.1/25.3	39.2	1.80	N/A
5800	Measured (01/10/2013)	86.1/24.4	34.7	5.52	21.1
	Recommended Limits	79.4/22.5	35.3	5.27	N/A

Table 4.1-2 System accuracy (validation for head adjacent use)

* Used 835 MHz dipole since 750 MHz dipole was sent out for calibration.

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	09/20/2013
Control Company	Digital Thermometer	23609-234	21352860	09/26/2013

Table 6.1.1-1 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]	
750	Head	Measured (09/07/2012)	705	42.4	0.86	22.6
			715	42.3	0.87	
			750	41.9	0.90	
			775	41.6	0.92	
			790	41.4	0.93	
		Measured (09/10/2012)	705	41.1	0.85	22.3
			715	41.1	0.87	
			750	40.5	0.90	
			775	40.2	0.92	
			790	39.9	0.93	
		Measured (10/29/12)	705	41.9	0.88	22.9
			715	41.8	0.88	
			750	41.2	0.91	
		Measured (11/09/2012)	705	41.4	0.85	22.8
			715	41.2	0.86	

			750	40.7	0.90	
			775	40.2	0.93	
			790	40.0	0.94	
		Measured (11/12/2012)	715	41.2	0.85	22.8
			750	40.7	0.88	
			775	40.3	0.90	
			790	40.2	0.91	
		Measured (11/20/2012)	715	40.9	0.86	22.2
			750	40.4	0.90	
			775	40.1	0.92	
			790	39.8	0.93	
		Measured (01/09/2013)	715	41.2	0.85	21.1
			750	40.8	0.88	
			775	40.5	0.89	
			790	40.3	0.91	
		Recommended Limits	750	41.9	0.89	N/A
	Muscle	Measured (10/29/12)	705	54.7	0.91	22.9
			715	54.6	0.92	
			750	54.3	0.94	
		Measured (11/09/2012)	705	55.4	0.92	22.8
			715	55.3	0.93	
			750	54.9	0.96	
			775	54.6	0.99	
			790	54.4	1.00	
		Measured (11/12/2012)	715	55.6	0.92	22.8
			750	55.3	0.96	
			775	54.9	0.99	
			790	54.8	1.01	
		Measured (11/20/2012)	715	53.6	0.92	22.2
			750	53.0	0.96	
			775	52.9	0.98	
			790	52.8	0.98	
		Measured (01/09/2013)	715	54.2	0.93	21.0
			750	53.8	0.96	
			775	53.5	0.99	
			790	53.4	1.00	
		Recommended Limits	750	55.5	0.96	N/A
835	Head	Measured (08/28/2012)	825	40.3	0.92	22.6
			835	40.2	0.93	
			850	40.0	0.94	
		Measured (08/30/2012)	825	40.5	0.87	22.8
			835	40.3	0.87	
			850	40.2	0.87	
		Measured (09/04/2012)	825	41.0	0.91	22.5
			835	40.8	0.92	
			850	40.7	0.94	
		Measured (10/30/2012)	825	40.8	0.87	21.9
			835	40.8	0.88	
			850	40.8	0.89	
		Measured (11/14/2012)	825	41.1	0.90	22.2
			835	40.9	0.91	

			850	40.6	0.93	
			865	40.3	0.94	
		Measured (11/21/2012)	825	39.9	0.89	22.7
			835	39.7	0.90	
			850	40.6	0.93	
		Measured (01/08/2013)	825	41.4	0.89	21.2
			835	41.3	0.90	
			850	41.1	0.92	
		Recommended Limits	835	41.5	0.90	N/A
	Muscle	Measured (08/28/2012)	825	53.2	0.97	22.6
			835	53.1	0.98	
			850	52.9	0.99	
		Measured (08/30/2012)	825	52.8	0.96	22.8
			835	52.7	0.97	
			850	52.5	0.99	
		Measured (09/04/2012)	825	54.0	0.94	22.5
			835	53.9	0.94	
			850	53.9	0.95	
		Measured (10/30/2012)	825	53.6	0.94	21.9
			835	53.5	0.95	
			850	53.4	0.97	
		Measured (11/14/2012)	815	53.0	0.93	22.2
			825	52.8	0.94	
			835	52.8	0.95	
			850	52.4	0.96	
		Measured (11/21/2012)	815	52.8	0.94	22.7
			825	52.7	0.95	
			835	52.6	0.96	
			850	52.5	0.98	
		Measured (01/08/2013)	825	52.9	0.96	21.0
			835	52.8	0.97	
			850	52.6	0.98	
		Recommended Limits	835	55.2	0.97	N/A
1900	Head	Measured (10/01/2012)	1850	38.7	1.35	22.8
			1900	38.5	1.40	
			1910	38.4	1.41	
			1980	38.2	1.48	
		Measured (10/22/2012)	1850	38.5	1.33	22.7
			1900	38.3	1.37	
			1910	38.3	1.38	
			1980	38.0	1.44	
		Measured (10/24/2012)	1850	40.8	1.35	22.6
			1900	40.5	1.40	
			1910	40.5	1.41	
			1980	40.2	1.48	
		Measured (11/01/2012)	1850	39.9	1.34	22.7
			1900	39.7	1.39	
			1910	39.7	1.40	
			1980	39.4	1.47	
		Measured (11/16/2012)	1850	38.6	1.35	22.7
			1900	38.3	1.39	
			1910	38.3	1.39	

			1980	38.1	1.45	
		Measured (11/22/2012)	1850	38.8	1.33	22.8
			1900	38.4	1.38	
			1910	38.4	1.39	
			1980	38.2	1.46	
		Measured (01/08/2013)	1850	38.6	1.38	21.3
			1900	38.4	1.43	
			1910	38.3	1.44	
		Recommended Limits	1900	40.0	1.40	N/A
	Muscle	Measured (10/01/2012)	1850	51.2	1.53	23.1
			1900	51.0	1.59	
			1910	51.0	1.60	
		Measured (10/22/2012)	1850	51.6	1.46	22.7
			1900	51.6	1.51	
			1910	51.6	1.52	
		Measured (11/01/2012)	1850	52.4	1.49	22.7
			1900	52.2	1.55	
			1910	52.1	156	
		Measured (11/16/2012)	1850	51.2	1.53	22.7
			1900	51.2	1.57	
			1910	51.2	1.58	
		Measured (11/22/2012)	1850	51.1	1.52	22.7
			1900	50.9	1.57	
			1910	50.8	1.58	
		Measured (01/08/2013)	1850	51.9	1.49	21.5
			1900	51.7	1.55	
			1910	51.7	1.56	
		Recommended Limits	1900	53.3	1.52	N/A
2450	Head	Measured (08/23/2012)	2410	38.00	1.73	22.6
			2450	37.9	1.77	
			2480	37.8	1.80	
		Measured (11/05/2012)	2410	38.3	1.78	22.5
			2450	38.2	1.82	
			2480	38.0	1.83	
		Measured (11/19/2012)	2410	38.8	1.78	22.6
			2450	38.7	1.82	
			2480	38.5	1.85	
		Measured (01/07/2013)	2410	37.9	1.72	22.3
			2450	37.8	1.76	
			2480	37.6	1.79	
		Recommended Limits	2450	39.2	1.80	N/A
	Muscle	Measured (08/23/2012)	2410	52.8	1.87	22.6
			2450	52.6	1.92	
			2480	52.5	1.96	
		Measured (11/05/2012)	2410	52.3	1.86	22.5
			2450	52.2	1.91	
			2480	52.2	1.95	
		Measured (11/19/2012)	2410	52.8	1.89	22.6
			2450	52.7	1.94	
			2480	52.5	1.97	
		Measured (01/07/2013)	2410	51.7	1.86	22.3
			2450	51.6	1.90	

			2480	51.5	1.94	
		Recommended Limits	2450	52.7	1.95	N/A
5200	Head	Measured (08/20/12)	5180	34.6	4.75	22.9
			5200	34.6	4.78	
			5280	34.4	4.86	
		Recommended Limits	5200	36.0	4.66	N/A
	Muscle	Measured (08/21/12)	5180	47.8	5.65	22.5
			5200	47.2	5.31	
			5280	46.9	5.41	
		Recommended Limits	5200	49.0	5.30	N/A
5500	Head	Measured (08/20/12)	5500	34.2	5.02	22.9
			5620	34.1	5.16	
		Recommended Limits	5500	35.6	4.96	N/A
	Muscle	Measured ()08/21/12)	5500	46.8	5.65	22.5
			5620	46.7	5.83	
		Recommended Limits	5500	48.6	5.65	N/A
5800	Head	Measured (08/20/12)	5745	34.3	5.30	22.9
			5800	34.2	5.34	
		Measured (11/07/12)	5745	35.5	5.43	21.8
			5800	35.1	5.42	
		Measured (01/10/13)	5745	34.9	5.43	21.1
			5800	34.7	5.52	
		Recommended Limits	5800	35.3	5.27	N/A
	Muscle	Measured (08/21/12)	5745	46.1	6.08	22.5
			5800	45.9	6.14	
		Measured (11/07/12)	5745	45.9	6.19	21.8
			5800	45.8	6.27	
		Measured (01/10/13)	5745	46.0	5.98	21.0
			5800	45.9	6.06	
		Recommended Limits	5800	48.2	6.00	N/A

Table 6.2-1 Electrical parameters of tissue simulating liquid

6.2.2 Test Configuration

Dielectric
Probe
Kit

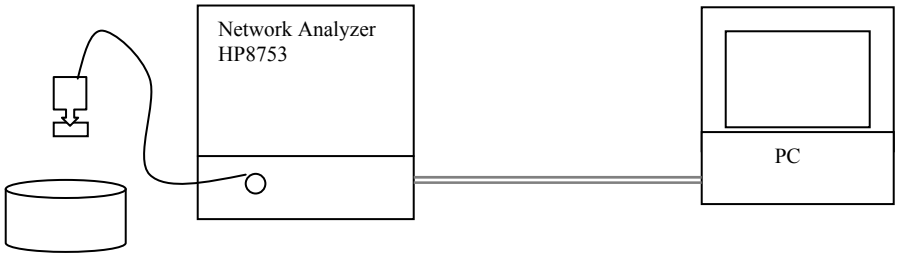

Figure 6.2.2-1 Test configuration

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).

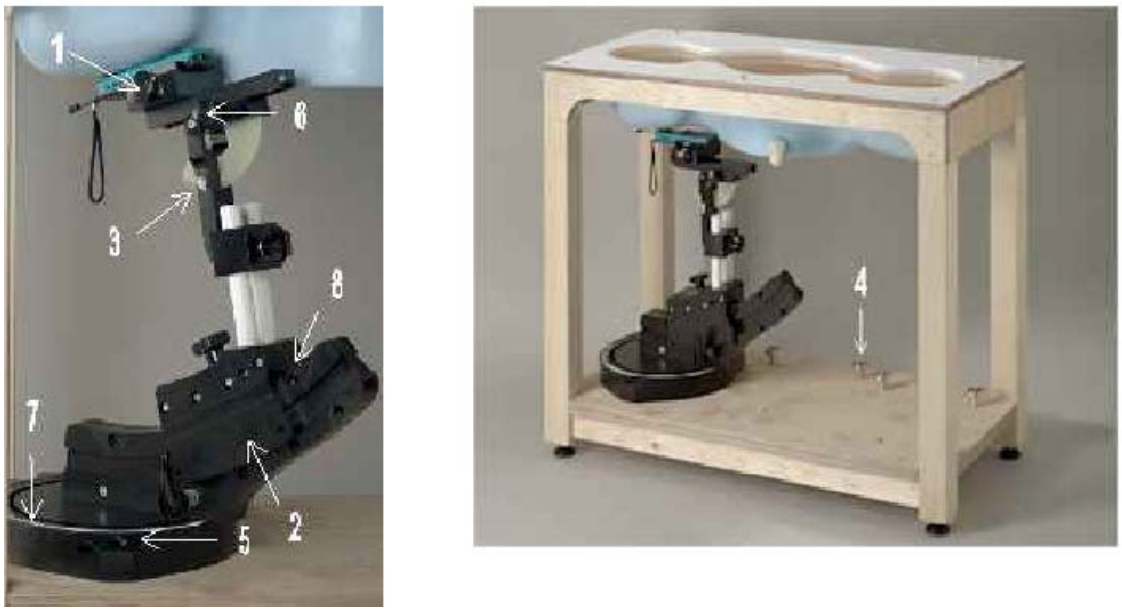

Figure 8.1-1 Device Holder

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".

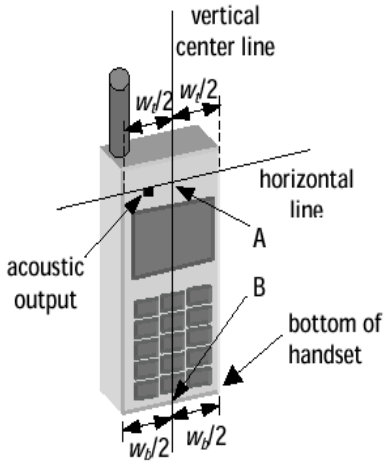

Figure 8.2.1-1 Handset vertical and horizontal reference lines – fixed case

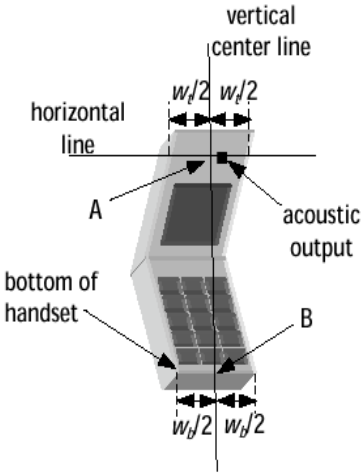

Figure 8.2.1-2 Handset vertical and horizontal reference lines – "clam-shell"

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 8.2.1-1 and 8.2.1-2), 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 8.2.1-1). 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 8.2.1-2), 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 8.2.1-3), 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).

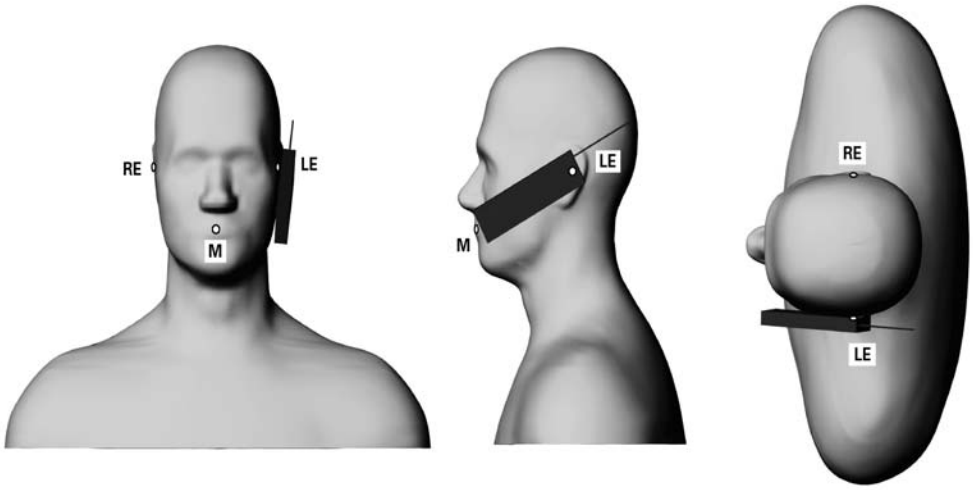

Figure 8.2.1-3 Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

Definition of the "Tilted" Position

1) Repeat steps 1 to 7 from above.
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**.**

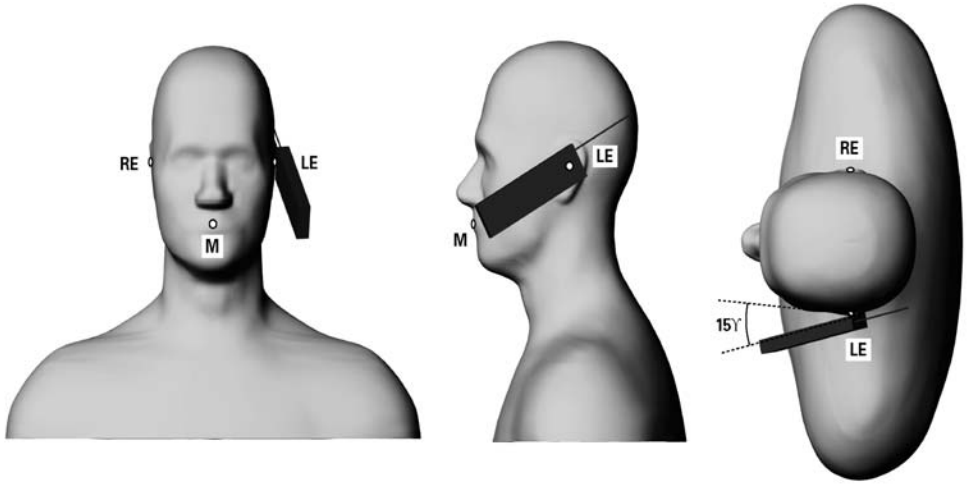

Figure 8.2.1-4 Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.2 Body-worn Configuration

Body-worn holsters, as shown on Figure 1.4-1, have been test with the device for RF exposure compliance. The device 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.

In addition, device was tested with 15 mm RIM recommended separation distance to allow typical after-market holster to be used. RIM body-worn holsters with belt-clip have been designed to maintain ~ 19 mm separation distance from body.

8.2.3 Limb/Hand Configuration

BlackBerry device is not a limb-worn device and hasn't been tested for such a configuration.

As per Clause 6.1.4.9 in the IEC/EN 62209-2 standard:

"Additional studies remain needed for devising a representative method for evaluating SAR in the hand of hand-held devices. Future versions of this standard are intended to contain a test method based on scientific data and rationale. Annex J presents the currently available test procedure."

Clause J.2 of the IEC/EN 62209-2 states that testing for compliance for the exposure of the hand is not applicable for devices that are intended to being hand-held to enable use at the ear (see EN 62209-1) or worn on the body when transmitting.

In addition, BlackBerry device is not intended to be held in hand at a distance of larger than 200 mm from the head and body during normal use.

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 / 22x22x22 with 7.5 / 5 / 4.0 mm resolution in (x,y) and 5mm / 2.mm 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)	Channel	Modulation	# of Resource Blocks	RB Offset	Conducted Output Power (dBm)	SAR, averaged over 1 g		
								Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	LTE Band 13	782	23230	QPSK	1	0	23.2	1.03	-0.20	1.08
		782	23230	QPSK	1	49	22.9	0.96	-0.17	0.96
		782	23230	QPSK	25	0	22.4	0.81	-0.23	0.85
		782	23230	16QAM	1	0	22.7	0.77	-0.10	0.77
		782	23230	16QAM	1	49	22.2	0.71	-0.21	0.74
		782	23230	16QAM	16	0	21.6	0.64	-0.22	0.67
Right Head 15° Tilt	LTE Band 13	782	23230	QPSK	1	0	23.2	0.68	-0.13	0.68
		782	23230	16QAM	1	0	22.7	0.56	-0.01	0.56
Left Head Cheek	LTE Band 13	782	23230	QPSK	1	0	23.2	0.95	0.06	0.95
		782	23230	QPSK	1	49	22.9	0.95	-0.18	0.95
		782	23230	QPSK	25	0	22.4	0.76	0.00	0.76
		782	23230	16QAM	1	0	22.7	0.74	0.12	0.74
		782	23230	16QAM	1	49	22.2	0.72	-0.11	0.72
		782	23230	16QAM	16	0	21.6	0.58	-0.02	0.58
Left Head 15° Tilt	LTE Band 13	782	23230	QPSK	1	0	23.2	0.70	-0.13	0.70
		782	23230	16QAM	1	0	22.7	0.56	0.07	0.56

Table 11.1-1a Rev 1 SAR results for Full Power Normal mode LTE Band 13 (10MHz BW) 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.

Note 3: For LTE if SAR > 1.45, then SAR tests for the smaller bandwidths and 100% RB for the highest bandwidth (10 MHz or 20 MHz) is required.

Test Position	Mode	f (MHz)	Channel	Modulation	# of Resource Blocks	RB Offset	Conducted Output Power (dBm)	SAR, averaged over 1 g		
								Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	LTE Band 13	782	23230	QPSK	1	0	23.2	0.85	-0.15	0.85

Table 11.1-1b Rev 2 SAR results for Full Power Normal mode LTE Band 13 (10MHz BW) head configuration

Test Position	Mode	f (MHz)	Channel	Modulation	# of Resource Blocks	RB Offset	Conducted Output Power (dBm)	SAR, averaged over 1 g		
								Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	LTE Band 13	782	23230	QPSK	25	0	22.4	0.82	0.06	0.82
Left Head Cheek	LTE Band 13	782	23230	QPSK	1	0	23.2	0.84	0.04	0.84

Table 11.1-1c REV 2, Additional/repeat measurements as per latest (Oct. 2012) FCC SAR testing procedures and guidelines

Test Position	Mode	f (MHz)	Channel	Modulation	# of Resource Blocks	RB Offset	Volume Scan	Conducted Output Power (dBm)	SAR, averaged over 1 g		
									Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	LTE Band 13	782	23230	QPSK	1	0		19.2	0.41	-0.17	0.41
		782	23230	QPSK	1	49		19.1	0.36	-0.11	0.36
		782	23230	QPSK	25	0		18.1	0.31	0.00	0.31
		782	23230	16QAM	1	0		18.4	0.32	-0.01	0.32
		782	23230	16QAM	1	49		18.1	0.29	-0.03	0.29
		782	23230	16QAM	16	0		17.4	0.25	0.02	0.25
Right Head Cheek	LTE Band 13	782	23230	QPSK	1	0	Volume	19.2	0.42	0.15	0.42
Right Head 15° Tilt	LTE Band 13	782	23230	QPSK	1	0		19.2	0.28	-0.05	0.28
		782	23230	16QAM	1	0		18.4	0.23	0.07	0.23
Left Head Cheek	LTE Band 13	782	23230	QPSK	1	0		19.2	0.38	-0.13	0.38
		782	23230	QPSK	1	49		19.1	0.35	-0.15	0.35
		782	23230	QPSK	25	0		18.1	0.30	0.04	0.30
		782	23230	16QAM	1	0		18.4	0.31	-0.08	0.31
		782	23230	16QAM	1	49		18.1	0.28	0.01	0.28

		782	23230	16QAM	16	0		17.4	0.23	-0.05	0.23
Left Head Cheek	LTE Band 13	782	23230	QPSK	1	0	Volume	19.2	0.38	-0.08	0.38
Left Head 15° Tilt	LTE Band 13	782	23230	QPSK	1	0		19.2	0.26	0.07	0.26
		782	23230	16QAM	1	0		18.4	0.20	0.02	0.20

Table 11.1-1d SAR results for Reduced Power SVLTE mode LTE Band 13 (10MHz BW) head configuration

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm	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	128	28.7	0.91	-0.04	0.91
		836.8	190	28.7	1.07	0.26	1.07
		848.8	251	28.6	0.83	0.05	0.83
Right Head 15° Tilt	2-slots GSM/EDGE 850 MHz	824.2	128				
		836.8	190	28.7	0.76	-0.18	0.76
		848.8	251				
Right Head Cheek	1-slot GSM 850 MHz	824.2	128				
		836.8	190	32.2	1.05	0.05	1.05
		848.8	251				
Right Head Cheek	3-slots GSM/EDGE 850 MHz	824.2	128				
		836.8	190	27.0	1.12	-0.30	**1.20**
		848.8	251				
Right Head Cheek	4-slots GSM/EDGE 850 MHz	824.2	128				
		836.8	190	25.8	1.15	-0.05	1.15
		848.8	251				
Left Head Cheek	2-slots GSM/EDGE 850 MHz	824.2	128	28.7	0.97	-0.18	0.97
		836.8	190	28.7	0.91	-0.06	0.91
		848.8	251	28.6	0.77	-0.09	0.77
Left Head 15° Tilt	2-slots GSM/EDGE 850 MHz	824.2	128				
		836.8	190	28.7	0.67	-0.39	0.73
		848.8	251				
Left Head Cheek	1-slot GSM 850 MHz	824.2	128	32.2	1.02	-0.13	1.02
		836.8	190				
		848.8	251				

Table 11.1-2a Rev 1 SAR results for GSM/EDGE 850 head configuration

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	3-slots GSM/EDGE 850 MHz	824.2	128				
		836.8	190	27.0	1.04	0.12	1.04
		848.8	251				

Table 11.1-2b Rev 2 SAR results for GSM/EDGE 850 head configuration

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	2-slots DTM 850 MHz	824.2					
		836.8			1.14	0.25	1.14
		848.8					
		848.8					
Right Head Cheek	1-slot GSM 850 MHz	824.2					
		836.8			1.19	-0.06	1.19
		848.8					
Right Head Cheek	3-slots DTM 850 MHz	824.2					
		836.8			1.14	-0.15	1.14
		848.8					

Table 11.1-2c Rev 2 SAR results for GSM/DTM 850 head configuration

Additional/repeat measurements as per latest (Oct. 2012) FCC SAR testing procedures and guidelines

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	CDMA 850 MHz BC 0	824.70	1013	24.1	0.82	-0.26	0.87
		836.52	384	24.1	0.86	-0.24	0.91
		848.52	777	23.5	0.76	0.03	0.76
Right Head 15° Tilt	CDMA 850 MHz BC 0	824.70	1013				
		836.52	384	24.1	0.45	0.17	0.45
		848.52	777				
Left Head Cheek	CDMA 850 MHz BC 0	824.70	1013	24.1	0.81	-0.03	0.81
		836.52	384	24.1	0.91	-0.13	0.91
		848.52	777	23.5	0.81	-0.21	0.85
Left Head 15° Tilt	CDMA 850 MHz BC 0	824.70	1013				
		836.52	384	24.1	0.52	-0.14	0.52
		848.52	777				

Table 11.1-3a Rev 1 SAR results for CDMA 850 BC 0 head configuration

Test Position	Mode	f (MHz)	Channel	Volume Scan	Cond. Output Power (dBm	SAR, averaged over 1 g		
						Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	CDMA 850 MHz RC3, SO55 Loopback Service BC 0	824.70	1013					
		836.52	384		24.1	0.99	0.12	0.99
		848.52	777					
Right Head Cheek		836.52	384	Volume	24.1	0.97	0.05	0.97
Left Head Cheek	CDMA 850 MHz RC3, SO55 Loopback Service BC 0	824.70	1013					
		836.52	384		24.1	1.00	-0.17	1.00
		848.52	777					
Left Head Cheek		836.52	384	Volume	24.1	0.99	-0.05	0.99

Table 11.1-3b Rev 2 SAR results for CDMA 850 BC 0 head configuration

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Left Head Cheek	CDMA 850 MHz RC3, SO55	824.70					
		836.52	384	24.1	0.99	-0.01	0.99

Table 11.1-3c Rev 2 SAR results for CDMA 850 BC 0 head configuration

Repeat measurements as per latest (Oct. 2012) FCC KDB SAR testing procedure

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm	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	512	25.7	0.98	0.06	0.98
		1880.0	661	25.7	0.87	0.54	0.87
		1909.8	810	25.8	0.86	-0.09	0.86
Right Head 15° Tilt	2-slots GSM/EDGE 1900 MHz	1850.2	512	25.7	0.98	-0.01	0.98
		1880.0	661	25.7	0.87	-0.01	0.87
		1909.8	810	25.8	0.89	0.41	0.89
Right Head Cheek	1-slot GSM 1900 MHz	1850.2	512	29.0	1.13	-0.05	1.13
		1880.0	661				
		1909.8	810				
Right Head 15° Tilt	1-slot GSM 1900 MHz	1850.2	512	29.0	0.96	-0.06	0.96
		1880.0	661				
		1909.8	810				
Right Head Cheek	3-slots GSM/EDGE 1900 MHz	1850.2	512	24.0	1.01	0.21	1.01
		1880.0	661				
		1909.8	810				
Right Head Cheek	4-slots GSM/EDGE 1900 MHz	1850.2	512	22.8	0.94	0.09	0.94
		1880.0	661				
		1909.8	810				
Left Head Cheek	2-slots GSM/EDGE 1900 MHz	1850.2	512				
		1880.0	661	25.7	0.70	0.36	0.70
		1909.8	810				
Left Head 15° Tilt	2-slots GSM/EDGE 1900 MHz	1850.2	512				
		1880.0	661	25.7	0.76	-0.09	0.76
		1909.8	810				
Left	1-slot	1850.2	512				

Head Cheek	GSM 1900 MHz	1880.0	661	29.4	0.64	0.14	0.64
		1909.8	810				
Left Head 15° Tilt	1-slot GSM 1900 MHz	1850.2	512				
		1880.0	661	29.4	0.71	0.23	0.71
		1909.8	810				

Table 11.1-4a SAR results for GSM/EDGE 1900 head configuration

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	2-slots DTM 1900 MHz	1850.2	512		1.06	-0.01	1.06
		1880.0	661				
		1909.8	810				
Right Head Cheek	1-slot GSM 1900 MHz	1850.2	512		1.10	0.28	1.10
		1880.0	661				
		1909.8	810				
Right Head Cheek	3-slots DTM 1900 MHz	1850.2	512		1.03	0.03	1.03
		1880.0	661				
		1909.8	810				

Table 11.1-5b SAR results for GSM/DTM 1900 head configuration

Repeat measurements as per latest (Oct. 2012) FCC KDB SAR testing procedures

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm)	SAR, averaged over 1 g		
					Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	CDMA 1900 MHz BC 1	1851.25	25				
		1880.00	600	24.3	0.59	0.05	0.59
		1908.50	1175				
Right Head 15° Tilt	CDMA 1900 MHz BC 1	1851.25	25				
		1880.00	600	24.3	0.23	0.04	0.23
		1908.50	1175				
Left Head Cheek	CDMA 1900 MHz BC 1	1851.25	25	24.0	0.74	-0.02	0.74
		1880.00	600	24.3	0.93	-0.10	0.93
		1908.50	1175	24.0	0.83	-0.03	0.83
Left Head 15° Tilt	CDMA 1900 MHz BC 1	1851.25	25				
		1880.00	600	24.3	0.36	0.01	0.36
		1908.50	1175				

Table 11.1-5a Rev 1 SAR results for CDMA 1900 head configuration

Test Position	Mode	f (MHz)	Channel	Volume Scan	Cond. Output Power (dBm)	SAR, averaged over 1 g		
						Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Right Head Cheek	CDMA 1900 MHz BC 1	1851.25	25					
		1880.00	600		24.3	0.60	-0.09	0.60
		1908.50	1175					
Right Head Cheek	CDMA 1900 MHz BC 1	1880.00	600	Volume	24.3	0.64	0.04	0.64
Left Head Cheek	CDMA 1900 MHz BC 1	1851.25	25		24.0	0.95	-0.19	0.95
		1880.00	600		24.3	1.18	-0.09	1.18
		1908.50	1175		24.0	0.87	-0.04	0.87
Left Head Cheek	CDMA 1900 MHz BC 1	1880.00	600	Volume	24.3	1.19	0.14	1.19

Table 11.1-5b Rev 2 SAR results for CDMA 1900 head configuration

Test Position	Mode	f (MHz)	Channel		Cond. Output Power (dBm)	SAR, averaged over 1 g		
						Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
Left Head Cheek	CDMA 1900 MHz BC 1	1851.25						
		1880.00	600		24.3	1.07	-0.14	1.07
		1908.50						

Table 11.1-5c Rev 2 SAR results for CDMA 1900 head configuration

Repeat measurements as per latest (Oct. 2012) FCC KDB SAR testing procedures

Test Position	Mode	f (MHz)	Channel	Volume Scan	Cond. Output Power (dBm)	Measured SAR (W/kg)		
						Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
Right Head Cheek	802.11 b 2450 MHz	2412	1					
		2437	6					
		2462	11		18.4	0.04	0.08	0.05
		2462	11	Volume	18.4	0.30	0.10	0.05
Right Head 15° Tilt	802.11 b 2450 MHz	2412	1					
		2437	6					
		2462	11		18.4	0.29	0.08	0.04
Left Head Cheek	802.11 b 2450 MHz	2412	1					
		2437	6					
		2462	11		18.4	0.24	0.19	0.10
		2462	11	Volume	18.4	0.27	0.20	0.10
Left Head 15° Tilt	802.11 b 2450 MHz	2412	1					
		2437	6					
		2462	11		18.4	0.17	0.04	0.02

Table 11.1-6 SAR results for WiFi/WLAN/802.11b head configuration

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm)	Measured SAR (W/kg)		
					Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
Left Head Cheek	802.11 b 2450 MHz	2412	1				
		2437	6				
		2462	11		0.07	0.18	0.10

Table 11.1-7 SAR results for WiFi/WLAN/802.11b head configuration

Measurement procedure as per latest (Oct. 2012) FCC KDBs

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm)	Measured SAR (W/kg)		
					Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
Right Head Cheek	802.11 a 5180-5825 MHz	5180	36	14.8	1.21	0.00	0.00
		5260	52	15.5	0.44	0.00	0.00
		5520	104	13.6	1.95	0.01	0.00
		5825	165	14.0	0.19	0.03	0.01
Right Head 15° Tilt	802.11 a 5180-5825 MHz	5825	165	14.0	0.22	0.01	0.01
Left Head Cheek	802.11 a 5180-5825 MHz	5180	36	14.8	0.14	0.02	0.01
		5260	52	15.5	0.73	0.02	0.00
		5520	104	13.6	0.44	0.01	0.00
		5825	165	14.0	-0.14	0.03	0.00
Left Head 15° Tilt	802.11 a 5180-5825 MHz	5825	165	14.0	0.76	0.01	0.01
Head Flat Phantom	802.11 a 5180-5825 MHz	5825	165	14.0	-0.2	0.06	0.02

Table 11.1-7a Rev 1 SAR results for 802.11a head configuration

Note 4: Only the highest output power channel per sub band was tested.

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm)	Measured SAR (W/kg)		
					Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
Left Head Cheek	802.11 a 5180-5825 MHz	5825	165	14.0	4.13	0.05	0.00
Left Head 15° Tilt	802.11 a 5180-5825 MHz	5825	165	14.0	3.43	0.03	0.00
Head Flat Phantom	802.11 a 5180-5825 MHz	5825	165	14.0	1.00	0.11	0.04

Table 11.1-7b Rev 2 SAR results for 802.11a head configuration

Test Position	Mode	f (MHz)	Channel	Cond. Output Power (dBm)	Measured SAR (W/kg)		
					Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
Head Flat Phantom	802.11 a 5180-5825 MHz	**5825**	**165**	14.0	3.10	0.12	0.05

Table 11.1-7c Rev 2 SAR results for 802.11a head configuration

Measurement procedure as per latest (Oct. 2012) FCC KDBs

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

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Modulation	# of Resource Blocks	RB Offset	Conducted Output Power (dBm)	SAR, averaged over 1 g		
										Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
LTE Band 13	782	23230	Body Mobile Hotspot Mode	1.0	Back	QPSK	1	0	23.2	0.70	-0.02	0.70
	782	23230		1.0	Back	QPSK	1	49	22.9	0.65	-0.06	0.65
	782	23230		1.0	Back	QPSK	25	0	22.4	0.55	0.04	0.55
	782	23230		1.0	Back	16QAM	1	0	22.7	0.56	0.06	0.56
	782	23230		1.0	Back	16QAM	1	49	22.2	0.52	0.01	0.52
	782	23230		1.0	Back	16QAM	16	0	21.6	0.44	0.11	0.44
	782	23230		1.0	Front	QPSK	1	0	23.2	0.44	0.01	0.44
	782	23230		1.0	Left	QPSK	1	0	23.2	0.40	-0.01	0.40
	782	23230		1.0	Right	QPSK	1	0	23.2	0.29	-0.08	0.29
	782	23230		1.0	Top	QPSK	1	0	23.2	0.13	-0.05	0.13
	782	23230		1.0	Back+ HS	QPSK	1	0	23.2	0.44	-0.21	0.46
LTE Band 13	782	23230	Body-worn	1.5	Back	QPSK	1	0	23.2	0.50	-0.07	0.50
	782	23230		Holster	Back	QPSK	1	0	23.2	0.35	0.00	0.35
	782	23230		Holster	Front	QPSK	1	0	23.2	0.27	0.01	0.27

Table 11.2-1a Rev 1 SAR results for Full Power Normal mode LTE Band 13 (10MHz BW) body-worn and Hotspot 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.

Note 3: Device was tested with 15 mm RIM recommended separation distance to allow typical after-market holster to be used. RIM body-worn holsters with belt-clip have been designed to maintain ~ 19 mm separation distance from body.

Note 4: For Hot Spot mode any side of the phone that is further than 2.5 cm away from the transmitting antenna can be exempted from testing.

Note 5: For LTE if SAR > 1.45, then SAR tests for the smaller bandwidths and 100% RB for the highest bandwidth (10 MHz or 20 MHz) is required.

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Modulation	# of Resource Blocks	RB Offset	Conducted Output Power (dBm)	SAR, averaged over 1 g		
										Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
LTE Band 13	782	23230	Body Mobile Hotspot Mode	1.0	Back	QPSK	1	0	23.2	0.64	-0.09	0.64

Table 11.2-1b Rev 2 SAR results for Full Power Normal mode LTE Band 13 (10MHz BW) body-worn and Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Modulation	# of Resource Blocks	RB Offset	Conducted Output Power (dBm)	SAR, averaged over 1 g		
										Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
LTE Band 13	782	23230	Body Mobile Hotspot Mode	1.0	Back	QPSK	1	0	19.2	0.26	-0.15	0.26
	782	23230		1.0	Back	QPSK	1	49	19.1	0.24	0.01	0.24
	782	23230		1.0	Back	QPSK	25	0	18.1	0.22	-0.06	0.22
	782	23230		1.0	Back	16QAM	1	0	18.4	0.22	-0.05	0.22
	782	23230		1.0	Back	16QAM	1	49	18.1	0.19	-0.04	0.19
	782	23230		1.0	Back	16QAM	16	0	17.4	0.17	0.03	0.17
	782	23230		1.0	Front	QPSK	1	0	19.2	0.20	-0.04	0.20
	782	23230		1.0	Left	QPSK	1	0	19.2	0.19	0.04	0.19
	782	23230		1.0	Right	QPSK	1	0	19.2	0.13	0.03	0.13
	782	23230		1.0	Top	QPSK	1	0	19.2	0.04	0.07	0.04
	782	23230		1.0	Back+ HS	QPSK	1	0	19.2	0.16	0.01	0.16
LTE Band 13	782	23230	Body-worn	1.5	Back	QPSK	1	0	19.2	0.21	0.08	0.21
	782	23230		Holster	Back	QPSK	1	0	19.2	0.13	0.05	0.13
	782	23230		Holster	Front	QPSK	1	0	19.2	0.11	-0.06	0.11

Table 11.2-1c SAR results for Reduced Power SVLTE mode LTE Band 13 (10MHz BW) body-worn and Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
2-slots GPRS 850MHz	824.2	128	Body Mobile Hotspot Mode	1.0	Back				
	836.8	190		1.0	Back	28.5	0.59	0.11	0.59
	848.8	251		1.0	Back				
	836.8	190		1.0	Front	28.5	0.45	-0.14	0.45
	836.8	190		1.0	Left	28.5	0.22	-0.31	0.24
	836.8	190		1.0	Right	28.5	0.29	-0.02	0.29
	836.8	190		1.0	Top	28.5	0.14	-0.12	0.14
	836.8	190		1.0	Back+ HS	28.5	0.47	-0.43	0.52
3-slots GPRS 850MHz	836.8	190		1.0	Back	26.8	0.63	-0.18	0.63
4-slots GPRS 850MHz	836.8	190		1.0	Back	25.7	0.63	-0.06	0.63
2-slots GPRS 850MHz	836.8	190	Body-worn	1.5	Back	28.5	0.40	-0.10	0.40
	836.8	190		Holster	Back	28.5	0.29	-0.15	0.29
	836.8	190		Holster	Front	28.5	0.25	-0.22	0.26

Table 11.2-2a Rev 1 SAR results for GPRS 850 body-worn and Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
3-slots GPRS 850 MHz	836.8	190	Body Mobile Hotspot Mode	1.0	Back	26.8	0.62	-0.12	0.62

Table 11.2-2b Rev 2 SAR results for GPRS 850 body-worn and Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 850 MHz RC3, SO32 Test Data Service BC 0	836.52	384	Body-worn	1.5	Back	24.1	0.74	0.00	0.74
	836.52	384		Holster	Back	24.1	0.52	-0.10	0.52
	836.52	384		Holster	Front	24.1	0.57	0.02	0.57

Table 11.2-3a Rev 1 SAR results for CDMA 850 body-worn configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 850 MHz RC3, SO32 Test Data Service BC 0	824.70	1013	Body Mobile Hotspot Mode	1.0	Back				
	836.52	384		1.0	Back	22.1	0.72	-0.04	0.72
	848.52	777		1.0	Back				
	836.52	384		1.0	Front	22.1	0.66	-0.02	0.66
	836.52	384		1.0	Left	22.1	0.46	-0.01	0.46
	836.52	384		1.0	Right	22.1	0.47	0.15	0.47
	836.52	384		1.0	Bottom	22.1	0.15	0.03	0.15
	836.52	384		1.0	Top				
	836.52	384		1.0	Back+ HS	22.1	0.70	0.06	0.70
CDMA 850 MHz RC3, SO32 Test Data Service BC 0	824.70	1013	Body-worn	1.5	Back	24.1	0.76	0.01	0.76
	836.52	384		1.5	Back	24.1	0.81	0.01	0.81
	848.52	777		1.5	Back	23.5	0.61	0.02	0.61

Table 11.2-3b Rev 4 SAR results for CDMA 850 body-worn configurations and Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 850 MHz RC3, SO32 Test Data Service BC 0	824.70	1013	Body-worn						
	836.52	384		1.5	Back	24.1	0.79	0.25	0.79
	848.52	777							

Table 11.2-3c Rev 4 SAR results for CDMA 850 body-worn configurations and Hotspot configurations
Additional/repeat measurements as per latest (Oct. 2012) FCC SAR testing procedures and guidelines

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
2-slots GPRS 1900 MHz	1850.2	512	Body Mobile Hotspot Mode	1.0	Back				
	1880.0	661		1.0	Back	25.9	0.78	-0.14	0.78
	1909.8	810		1.0	Back				
	1880.0	661		1.0	Front	25.9	0.24	0.00	0.24
	1880.0	661		1.0	Left	25.9	0.10	0.01	0.10
	1880.0	661		1.0	Right	25.9	0.04	0.15	0.04
	1880.0	661		1.0	Top	25.9	0.20	0.04	0.20
	1880.0	661		1.0	Back+HS	25.9	0.40	-0.17	0.40
3-slots GPRS 1900 MHz	1880.0	661	Body Mobile Hotspot Mode	1.0	Back	24.1	0.64	0.00	0.64
4-slots GPRS 1900 MHz	1880.0	661	Body Mobile Hotspot Mode	1.0	Back	22.9	0.68	0.20	0.68
2-slots GPRS 1900 MHz	1880.0		Body-worn	1.5	Back	25.9	0.32	-0.08	0.32
	1880.0			Holster	Back	25.9	0.19	0.32	0.19
	1880.0			Holster	Front	25.9	0.07	0.06	0.07

Table 11.2-4 SAR results for GPRS 1900 body-worn and Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 1900 MHz RC3, SO32 Test Data Service BC 01	1851.2	25	Body-worn	1.5	Back	24.0	0.90	-0.04	0.90
	1880.0	600		1.5	Back	24.3	1.01	-0.17	**1.01**
	1908.5	1175		1.5	Back	24.0	0.90	-0.06	0.90
	1880.0	600		Holster	Back	24.3	0.64	-0.03	0.64
	1880.0	600		Holster	Front	24.3	0.25	-0.04	0.25

Table 11.2-5a Rev 1 SAR results for CDMA 1900 body-worn configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 1900 MHz RC3, SO32 Test Data Service BC 01	1880.0	600	Body Mobile Hotspot Mode	1.0	Front	21.4	0.39	0.04	0.39
	1880.0	600		1.0	Left	21.4	0.45	-0.05	0.45
	1880.0	600		1.0	Right	21.4	0.18	-0.09	0.18
	1880.0	600		1.0	Bottom	21.4	0.56	-0.06	0.56
	1909.8	1175		1.0	Back+HS	21.4	0.84	-0.02	0.84
CDMA 1900 MHz RC3, SO32 Test Data Service BC 0	1851.2	25	Body-worn	1.5	Back	24.0	0.90	-0.10	0.90
	1880.0	600		1.5	Back	24.3	0.95	-0.04	0.95
	1908.5	1175		1.5	Back	24.0	0.90	0.02	0.90
	1880.0	600		Holster	Back	24.3	0.76	0.11	0.76
	1880.0	600		Holster	Front	24.3	0.24	0.03	0.24

Table 11.2-5b Rev 2 SAR results for CDMA 1900 body-worn and Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 1900 MHz RC3, SO32, TDS	1851.2	25	Body-worn	1.5	Back				
	1880.0	600		1.5	Back	24.3	0.87	0.09	0.87
	1908.5	1175		1.5	Back				

Table 11.2-5c Rev 2 SAR results for CDMA 1900 body-worn configuration
Additional/repeat measurements as per latest (Oct. 2012) FCC SAR testing procedures and guidelines

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 1900 MHz RC3, SO32 Test Data Service BC 01	1850.2	25	Body Mobile Hotspot Mode	1.0	Back	20.0	0.79	-0.01	0.79
	1880.0	600		1.0	Back	20.4	0.91	0.09	**0.91**
	1909.8	1175		1.0	Back	20.0	0.84	-0.06	0.84

Table 11.2-5c Rev 4 SAR results for CDMA 1900 Hotspot configurations

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	SAR, averaged over 1 g		
							Measured (W/kg)	Power Drift (dB)	*Extrapolated (W/kg)
CDMA 1900 MHz RC3, SO32	1850.2	25	Body Mobile Hotspot Mode	1.0	Back				
	1880.0	600		1.0	Back	20.4	0.88	0.08	0.88
	1909.8	1175		1.0	Back				

Table 11.2-5d Rev 4 SAR results for CDMA 1900 Hotspot configurations

Additional/repeat measurements as per latest (Oct. 2012) FCC SAR testing procedures and guidelines

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	Measured SAR (W/kg)		
							Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
802.11b/ WLAN 2450 MHz	2462	11	Body Mobile Hotspot Mode	1.0	Back	18.4	0.02	0.42	0.20
	2462	11		1.0	Front	18.4	0.17	0.40	0.19
	2462	11		1.0	Left	18.4	0.07	0.13	0.07
	2462	11		1.0	Right	18.4	0.00	0.01	0.01
	2462	11		1.0	Bottom	18.4	0.02	0.41	0.21
	2462	11		1.0	Back+ HS	18.4	0.03	0.38	0.18
802.11b/ WLAN 2450 MHz	2462	11	Body-worn	1.5	Back	18.4	0.18	0.17	0.09
	2462	11		1.5	Front	18.4	0.41	0.19	0.10
	2462	11		Holster	Back	18.4	0.31	0.14	0.08
	2462	11		Holster	Front	18.4	-0.10	0.17	0.09

Table 11.2-6a SAR results for WiFi/WLAN/802.11b body-worn and Hot Spot configurations

Note 5: Only the highest output power channel was tested.

Mode	f (MHz)	Channel	Test Position	Spacing (cm)/ Holster	Side	Conducted Output Power (dBm)	Measured SAR (W/kg)		
							Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
802.11b/ WLAN 2450 MHz	2462	11	Body Mobile Hotspot Mode	1.0	Back	18.4	-0.10	0.40	0.18
802.11b/ WLAN 2450 MHz	2462	11	Body-worn	1.5	Front	18.4	-0.04	0.17	0.09

Table 11.2-6b SAR results for WiFi/WLAN/802.11b body-worn and Hotspot configurations

Additional/repeat measurements as per latest (Oct. 2012) FCC SAR testing procedures and guidelines

Mode	Freq. (MHz)	Channel	Holster type / device configuration	Conducted Output Power (dBm	Measured SAR (W/kg)		
					Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
802.11a 5180 - 5825 MHz	5180	36	No Holster, back side 15 mm away	14.8	0.04	0.12	0.05
	5260	52	No Holster, back side 15 mm away	15.5	-0.06	0.16	0.06
	5520	104	No Holster, back side 15 mm away	13.6	0.21	0.12	0.05
	5825	165	No Holster, back side 15 mm away	14.0	0.13	0.32	0.13
	5825	165	No Holster, front side 15mm away	14.0	0.19	0.04	0.02
	5825	165	Leather Holster, back side facing	14.0	-0.09	0.20	0.09
	5825	165	No Holster, HS, back side 15mm away	14.0	-0.05	0.29	0.12

Table 11.2-7a Rev 1 SAR results for 802.11a body-worn configurations

Note 5: Only the highest output power channel per sub-band was tested.

Mode	Freq. (MHz)	Channel	Holster type / device configuration	Conducted Output Power (dBm	Measured SAR (W/kg)		
					Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
802.11a 5180 - 5825 MHz	5825	165	No Holster, back side 15 mm away	14.0	0.34	0.26	0.09

Table 11.2-7b Rev 2 SAR results for 802.11a body-worn configurations

Mode	Freq. (MHz)	Channel	Holster type / device configuration	Conducted Output Power (dBm	Measured SAR (W/kg)		
					Power Drift (dB)	Averaged over 1 g	Averaged over 10 g
802.11a 5180 - 5825 MHz	5825	165	No Holster, back side 15 mm away	14.0	1.00	0.23	0.09

Table 11.2-7c Rev 2 SAR results for 802.11a body-worn configurations

Additional/repeat measurements as per latest (Oct. 2012) FCC SAR testing procedures and guidelines

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