SAR Compliance Test Report

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Statement of Compliance: BlackBerry RTS 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, FCC 47 CFR Part 2.1093, FCC 96-326, IEEE Std. C95.1-1992, 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, ANSI/IEEE Std. C95.3-2002, IEEE 1528-2013, and RSS 102-issue4-2010.

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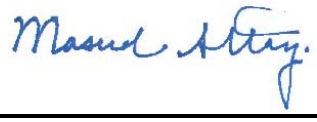

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RTS is accredited according to EN ISO/IEC 17025 by:

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Note: According to the manufacturer hardware similarity documentation, BlackBerry models RHD131LW and RHC161LW have the same PCB, antennas/locations, WiFi/BT design, conducted RF Tx power, but changes are on the BOM/ cellular antenna match to support different LTE bands. Due to these similarities, conducted powers on the common bands were tested on the parent model: RHC161LW and re-used for the variant model: RHD131LW. Radiated SAR measurements were fully done on RHC161LW and then partially tested on the variant RHD131LW based on worst case position (s)/configuration.
BT/Wi-Fi modes/bands were not tested on RHD131LW since they have identical design as RHC161LW.

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		RHD131LW (STR100-1)			
FCC ID		L6ARHD130LW			
PIN	**Radiated**	2FFE7836 (DVT Rev 3-01/04), 2FFE7815 (DVT Rev 3-01/04), 2FFE80F6 (DVT Rev 4-00)			
	Conducted	2FFE76BA (EVT Rev 2-01/04), 2FFE8118 (Rev 4-00)			
Hardware Rev		EVT Rev 2-01/04, DVT Rev 3-01/04. DVT Rev 4-00			
Software	**OS Version**	10.3.1.2174, 10.3.1.2534			
	Radio Version	10.3.1.2175, 10.3.1.2535			
	SW Release Version	10.3.1.1518, 10.3.1.1751			
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
Target Nominal Maximum conducted RF Output Power (dBm)		32.5 30.0	30.0 28.0	28.5 26.0	27.0 25.0
Tolerance in Power Setting on centre channel (dB)		± 0.6	± 0.5	± 0.5	± 0.5
Duty Cycle		1:8	2:8	3:8	4:8
Transmitting Frequency Range (MHz)		824.2 – 848.8 1850.2 – 1909.8	824.2 – 848.8 1850.2 – 1909.8	824.2 – 848.8 1850.2 – 1909.8	824.2 – 848.8 1850.2 – 1909.8
Mode(s) of Operation		802.11b	802.11g	802.11n	Bluetooth
Target Nominal Maximum conducted RF Output Power (dBm)		16.0	17.0	17.0	11.0
Tolerance in Power Setting on centre channel (dB)		+2/-2.5	+2/-2.5	+2/-2.5	± 0.75
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		HSPA+/ WCDMA / UMTS FDD V (850)	HSPA+/ WCDMA / UMTS FDD II (1900)	NFC	
Target Nominal Maximum conducted RF Output Power (dBm)		24.0	23.7	N/A	
Tolerance in Power Setting on centre		± 0.5	± 0.5	N/A	

channel (dB)				
Duty Cycle	1:1	1:1	N/A	
Transmitting Frequency Range (MHz)	824.6 – 846.6	1852.4 – 1907.6	13.56	

Table 1.3-1 Test device characterization for 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.

Note 2: Open loop antenna tuning is used for all transmitters (GSM/WCDMA) which is equivalent to the static tuning configurations used in traditional handsets that do not have any specific antenna tuning flexibility or additional hardware.

Note 3: The BlackBerry model: RHD131LW also supports GSM/GPRS/EDGE 900/1800 MHz, and UMTS/HSPA$^+$ Band I/VIII, and LTE bands that are operational outside of North America only, therefore no data is presented in this report for those bands.

Device Model		RHC161LW (STR100-2)
PIN	**RADIATED**	2FFE780C (DVT Rev 3-01/04), 2FFE7A1D (DVT Rev 3-01/04),
	CONDUCTED	2FFE768F (EVT Rev 2-01/04)
HARDWARE REV		EVT Rev2-01/04, DVT Rev3-01/04
SOFTWARE	**OS VERSION**	10.3.1.2174, 10.3.1.2534
	RADIO VERSION	10.3.1.2175, 10.3.1.2535
	SW RELEASE VERSION	10.3.1.1518, 10.3.1.1751

Table 1.3-2 Parent test device information

Note 1: Device model RHC161LW was used a parent, full/complete SAR measurements were performed on the common bands and then worst case positions were tested on the variant model RHD131LW.

Note 2: Device model RHC161LW and RHD131LW have identical Wi-Fi/BT design, therefore, no additional tests were performed on model: RHD131LW for those bands.

1.4 Body worn accessories (holsters)

The device has been tested with the holster listed below and/or a 15mm manufacturer recommended separation distance. 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	Body-worn Holster	HDW-60810-001 Rev B Ver 1	20

Table 1.4.1. Body worn holster

1.5 Headset

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

1)HDW-44306-001

1.6 Battery

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

1)BAT-50136-00x

1.7 Procedure used to establish test signal

- Software Tool was used to set Wi-Fi to transmit at maximum power and duty cycle for each band, channel, and modulation.
- A Rohde & Schwarz CBT Bluetooth Tester was used to establish a connection with the DUT's Bluetooth radio.

1.8 Highlights of the KDB/FCC OET SAR Measurement Requirements

1.8.1 SAR Measurements 100 MHz to 6 GHz as per KDB 865664 D01 v01r03

• 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. Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
• 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 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

Table 1.8.1-1 Probe specification requirements

• Area scan resolution was maintained at 12mm (2-3 GHz), and 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 (ET3)/ 3.0 mm (ES3)
Zoom Scan (x,y) Resolution	7.5 mm (≤2 GHz) or 5 mm (2-3 GHz)
Zoom Scan (z) Resolution	5.0 mm
Zoom Scan Volume	Minimum 30 x 30 x 30 mm[1]

Table 1.8.1-2 Zoom Scan requirement

Note: "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 24x24x22 to 48x48x22 mm

1.8.2 802.11b/g/n SAR Measurement Procedures as per KDB 248227 D01 v01r02

- Frequency Channel Configuration: 802.11 b/g/n modes are tested on the highest output power channel.

- 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.

1.8.3 3G SAR Measurement Procedures as per KDB 941225 D01 v03r00

In the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest *reported* SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as "otherwise" in the applicable procedures; SAR measurement is required for the secondary mode.

For example, when the *reported* SAR of a primary mode is 1.4 W/kg and the maximum output power specified for the primary and secondary modes are 250 mW and 200 mW, the scaled SAR would be 1.4 x (200/250) = 1.12 W/kg; therefore, SAR is not required for the secondary mode.

1.8.3.1 GSM, GPRS, EDGE and DTM

The following procedures may be considered for each frequency band to determine SAR test reduction for devices operating in GSM/GPRS/EDGE modes to demonstrate RF exposure compliance. GSM voice mode transmits with 1 time slot. GPRS and EDGE may transmit up to 4 time slots in the 8 time-slot frame according to the multi slot class implemented in a device. For Class A devices with Dual Transfer Mode (DTM) capability that support simultaneously transmission using both circuit switched (CS) and pack switched (PS) connections, the aggregate time slots must be considered in the applicable exposure conditions to determine SAR compliance. Unless it is clearly explained in the SAR report that DTM is not feasible or does not apply to a device, DTM SAR results are expected for Class A GSM/(E)GPRS devices to demonstrate SAR compliance. When enhanced EDGE mode with additional time slots or higher order modulations (QAM) applies, until procedures are available, a KDB inquiry is necessary to determine the configurations required for SAR testing. The SAR test reduction procedures for GSM/(E)GPRS devices may be considered in conjunction with the applicable SAR test reduction provisions in KDB Publication 447498. Regardless of whether DTM applies to a GSM/(E)GPRS device, operating parameters such as device Class, (E)GPRS multi slot class, DTM multi slot class and the maximum time-slot burst averaged conducted output power must be clearly identified in the SAR report to support the test configurations and measurement results. A summary of the specific procedures and test configurations applied to the SAR measurements must be clearly described in the SAR report to support the test results.

Dual Transfer Mode (DTM)
Class A GSM/(E)GPRS devices operate in DTM can transmit simultaneously using both circuit switched (CS) and packet switched (PS) connections defined by the DTM multi slot classes (see 3GPP TS 43.055 and TS 45.001). Mobile stations operating in DTM configurations are required to have one allocated CS time-slot for voice and additional PS slots for packet data. The total number of downlink and uplink time slots is defined by the DTM multi slot class. DTM devices may operate according to earlier GSM requirements using two transceivers or the more recent 3GPP requirements using a single transceiver to transmit CS and PS data in consecutive time-slots within the same GSM frame. Furthermore, additional DTM multi slot classes and enhanced DTM configurations have also been considered in recent and on-going revisions of the 3GPP/GSM requirements, which may require further considerations for SAR testing.

For Class A devices, the SAR evaluation must take into account the maximum CS and PS time slots defined by the DTM multi slot class for the device, with respect to head body-worn accessory and other near body operating configurations and exposure conditions. SAR may be evaluated for DTM with the device operating in DTM using one CS plus the number of PS time-slots that result in the highest source-based time-averaged maximum output or by summing the single time-slot CS and highest maximum output multi slot PS SAR.38 A communication test set with DTM support is necessary to configure the test device for SAR measurement in DTM mode. Alternatively, the single slot CS GSM/GMSK voice mode SAR for each applicable exposure condition can be added respectively to the PS (E)GPRS multi slot data-mode SAR to demonstrate SAR compliance for DTM.

General Reporting Requirements
The following information is required in the SAR report to identify the required test configurations for supporting the results.
1) Device class - A, B or C
2) Identify the GPRS/EDGE multi slot class, including the maximum number of downlink, uplink and total time slots per frame
3) For Class A devices with DTM capability, identify the DTM multi slot class and include the maximum number of downlink, uplink and total time slots per frame for DTM operations; i.e. CS and PS time-slots

4) The maximum output power specified for production units, including tune-up tolerance, within the time-slot burst for each operating mode – GMSK/8-PSK in CS/GSM and PS/(E)GPRS configurations
5) Descriptions of the test device and communication test set configurations used in the DTM SAR measurements or procedures applied to sum DTM SAR for the required operating configurations and exposure conditions, with respect to maximum measured time-slot burst averaged conducted output power and maximum number of time slots defined by the DTM multi slot class for the device.

SAR Test Reduction
SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GSM voice and GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

Additional Information
- 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 ≈ 3/1/2 dB per slot respectively for GSM 850 and 2/2.5/0.5 dB per slot respectively for GSM 1900.
- For head configurations, 1 slot CS, 2/3-slots (PD) and DTM (CS+PD) were evaluated.
- For body SAR configurations, 1 slot CS, 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.
- As per IEEE 1528 -2013 “both GSM and GPRS use GMSK, which is a constant amplitude modulation; therefore, the maximum time-averaged output power with respect to the maximum number of time slots used in each mode can be used to determine the most conservative mode for SAR testing. Similarly, EGPRS (which uses GMSK and 8PSK) can be included with GSM and GPRS in this determination of the most conservative mode for SAR testing due to its innate similarities to GSM and GPRS.”

1.8.3.2 UMTS/WCDMA, HSPA, HSPA+, and DC-HSDPA

WCDMA Handsets
The following procedures are applicable to 3GPP Release 99, Release 5 and Release 6 UMTS/WCDMA handsets. The default test configuration is to measure SAR with an established radio link between the handset and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCHn), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Uplink and downlink are both configured with the same RMC and required AMR. SAR for Release 5 HSDPA and Release 6 HSPA are measured respectively using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified by applying the applicable versions of 3GPP TS 34.121. SAR must be measured

according to these maximum output conditions and requirements in KDB Publication 447498. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

Output Power Verification
Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1's" for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are requied in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified

Head SAR Measurements
SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest *reported* SAR configuration in 12.2 kbps RMC for head exposure.

Body SAR Measurements
SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest *reported* body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

Handsets with Release 5 HSDPA
The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the *HSDPA body SAR* procedures in the "Release 5 HSDPA Data Devices" section of this document, for the highest *reported* SAR body-worn accessory exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

Handsets with Release 6 HSPA (HSDPA/HSUPA)
The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the *HSPA body SAR* procedures in the "Release 6 HSPA Data Devices" section of this document, for the highest *reported* body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Release 5 HSDPA Data Devices
The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. SAR is required for devices in body-worn accessory and other body exposure conditions, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with WCDMA and requires an active DPCCH. The default test configuration is to measure SAR in WCDMA with HSDPA

remain inactive, to establish a radio link between the test device and a communication test set using a 12.2 kbps RMC configured in Test Loop Mode 1. SAR for HSDPA is selectively measured using the highest *reported* SAR configuration in WCDMA, with an FRC in H-set 1 and a 12.2 kbps RMC. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCHn) according to exposure conditions, device operating capabilities and maximum output power specified for production units, including tune-up tolerance by applying the 3G SAR test reduction procedures. Maximum output power is verified according to the applicable versions of 3GPP TS 34.121. SAR must be measured based on these maximum output conditions and requirements in KDB Publication 447498, with respect to the UE Categories, and explained in the SAR report. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

Output Power Verification

Maximum output power is verified on the high, middle and low channels according to Release 5 procedures described in section 5.2 of 3GPP TS 34.121, using an FRC with H-set 1 and a 12.2 kbps RMC with TPC set to all "1's". When HSDPA is active, output power is measured according to requirements for HS-DPCCH Sub-test 1 - 4. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc.), with and without HSDPA active, are required in the SAR report. All configurations that are not supported by the test device or cannot be measured due to technical or equipment limitations must be clearly identified.

SAR Measurement

When voice transmission in next to the ear head exposure conditions is applicable to a WCDMA/HSDPA data device, head SAR is measured according to the 'Head SAR' procedures in the 'WCDMA Handsets' section of this document. SAR for body exposure configurations is measured according to the 'Body-Worn Accessory SAR' procedures in the 'WCDMA Handsets' section. The 3G SAR test reduction procedure is applied to *HSDPA body SAR* with 12.2 kbps RMC as the primary mode. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest *reported* SAR configuration in 12.2 kbps RMC without HSDPA.

HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(β c, β d), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) are set according to values indicated in Table 1. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.
Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Table 1.8.2.2-1: Sub-test settings for HSDPA

Release 6 HSPA Data Devices

The following procedures are applicable to HSPA (HSUPA/HSDPA) data devices operating under 3GPP Release 6.29 SAR is required for devices in body-worn accessory and other body exposure conditions, including handsets and data modems operating in various electronic devices. HSUPA operates in conjunction with WCDMA and HSDPA. SAR is initially measured in WCDMA test configurations with HSPA remain inactive. The default test configuration is to establish a radio link between the test device and a communication test set to configure a 12.2 kbps RMC in Test Loop Mode 1. SAR for HSPA is selectively measured with HS-DPCCH, E-DPCCH and E-DPDCH, all enabled, along with a 12.2 kbps RMC using the highest *reported* SAR configuration in WCDMA with 12.2 kbps RMC only.
An FRC is configured according to HS-DPCCH Sub-test 1 using H-set 1 and QPSK.31 HSPA is configured according to E-DCH Sub-test 5 requirements. SAR for other HSPA sub-test configurations is confirmed selectively according to exposure conditions, E-DCH UE Category and maximum output power of production units, including tune-up tolerance by applying the 3G SAR test reduction procedure. Maximum output power is verified according to procedures in applicable versions of 3GPP TS 34.121. SAR must be measured based on these maximum output conditions and requirements in KDB Publication 447498, with respect to the UE Categories for HS-DPCCH and HSPA, and explained in the SAR report. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

Output Power Verification

Maximum output power is verified on the high, middle and low channels according to Release 6 procedures in section 5.2 of 3GPP TS 34.121, using the appropriate RMC, FRC and E-DCH configurations. When E-DCH is not active, TPC is set to all "1's"; otherwise, inner loop power control with power control algorithm 2 is required to maintain E-TFCI requirements. When HSPA is active output power for the applicable HSPA modes should be measured for E-DCH Sub-test 1 - 5. Results for all applicable physical channel configurations (DPCCH, DPDCH and spreading codes, HS-DPCCH, E-DPCCH, E-DPDCHk) are required in the SAR report. All configurations that are not supported by the test device or cannot be measured due to technical or equipment limitations must be clearly identified.

SAR Measurement

When voice transmission in next to the ear head exposure conditions is applicable to a WCDMA/HSPA data device, head SAR is measured according to the 'Head SAR Measurements' procedures in the 'WCDMA Handsets' section of this document. SAR for body exposure configurations is measured according to the 'Body-Worn Accessory SAR' procedures in the 'WCDMA Handsets' section. The 3G SAR test reduction procedure is applied to *HSPA body SAR* with 12.2 kbps RMC as the primary mode. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest *reported* body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in Table 2 and other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of this document.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}[1]	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM[2] (dB)	MPR (dB)	AG[4] Index	E-TFCI
1	11/15[3]	15/15[3]	64	11/15[3]	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15[4]	15/15[4]	64	15/15[4]	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} cannot be set directly; it is set by Absolute Grant Value.

Table 1.8.2.2-2: Sub-test for HUSPA

HSPA, HSPA+ and DC-HSDPA SAR Guidance

SAR test exclusion may apply to 3GPP Rel. 6 HSPA, Rel. 7 HSPA+ and Rel. 8 DC-HSDPA. When SAR measurement is required for HSPA, HSPA+ or DC-HSDPA, a KDB inquiry is required to confirm that the wireless mode configurations in the test setup have remained stable throughout the SAR measurements. Without prior KDB confirmation to determine the SAR results are acceptable, a PBA is required for TCB approval.

SAR test exclusion for HSPA, HSPA+ and DC-HSDPA is determined according to the following:

1. The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.
2. SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.
3. SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.
4. Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+ or DC-HSDPA:
    a. The output power measurement results and applicable release version(s) of 3GPP TS 34.121
        i. Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.
    b. The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.

c. The UE category, operating parameters, such as the β and Δ values used to configure the device for testing, power setback procedures described in 3GGPP TS 34.121 for the power measurements, and HSPA/HSPA+ channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.

5. When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including E-TFCI and AG index stability and output power conditions.

1.8.6 SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities as per KDB 941225 D06 v02r00

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.

1.8.7 Procedure for Fast SAR Scan as per KDB 447498 D01 v05r02

Fast SAR or area scan based 1-g SAR estimation can be used instead of full SAR measurements as long as the following conditions are fulfilled:

- For dipole validation the 1g SAR for the area and zoom scan must be with ±3%
- 1g Measured SAR ≤ 1.2 W/kg
- The difference between the zoom and area scan 1g SAR ≤ 0.1 W/kg
- A zoom scan is required on the worst case for each configuration of a frequency band.
  - For head configuration: A zoom scan is required for **each** position with 1g SAR ≥ 0.8 and 1 additional zoom scan to cover all the remaining positions. The scan is done on the worst case for the position(s)
- Polynomial fit algorithm is utilized. Set in DASY by double clicking the area scan procedure
- Area scan is measure at a distance ≤ 4 mm from the phantom surface
- A zoom scan is not required for any other purpose
  - For simultaneous transmission the coordinates for the maxima can be found using the area scan
- DASY must not show any error, warning, or alert messages during the scan.
  - Example: noise in measurement, peak to close to the scan boundary. Peaks are too sharp, etc.
- The frequency band being tested is ≤ 3 GHz

1.8.8 Procedure for Fast SAR Testing as per IEEE 1528 - 2013

Overview of the steps from the Spreadsheet/wizard provided by Industry Canada

STEP A: **FAST SAR** scans done on all necessary configurations and positions.

STEP B: **FULL SAR** scan done on the maximum SAR for each band. (1 Full Scan per band).

STEP C-1: Select the band with the overall highest **FULL SAR.**

STEP C-2: Perform additional **FULL SAR** measurements on all **FAST SAR** scans ≥ **Threshold 1**.

$$Threshold\ 1 = SAR_{maxFAST\ for\ a\ band} \times 0.76557 (< 3GHz),\ SAR_{maxFAST\ for\ a\ band} \times 0.71921 (> 5GHz)$$

Note 1: This threshold changes with each band as it is dependent on the highest **FAST SAR** for THAT band. Use the equation based on the frequency of the band being examined.

Note 2: these values are based on the uncertainty found in the uncertainty budget and will change if they do. Refer below to the derivation of this equation.

STEP D: Just reports the highest **FULL SAR** measurement of each band.

STEP E: Perform STEP C-2 on any band whose maximum **FULL SAR** measurement ≥ **Threshold 2**.

$$Threshold\ 2 = SAR_{highest\ overall\ FULL\ SAR\ for\ all\ bands} \times 0.68388 (< 3GHz)$$

$$Threshold\ 2 = SAR_{highest\ overall\ FULL\ SAR\ for\ all\ bands} \times 0.63880 (> 5GHz)$$

Note 1: This threshold is the SAME for ALL BANDS as it is dependent on the overall highest **FULL SAR** out of all the bands. Therefore, you will use (< 3 GHz) or (>5 GHz) depending on where the overall highest **FULL SAR** is located.

Note2: these values are based on the uncertainty found in the uncertainty budget and will change if they do. Refer below to the derivation of this equation.

STEP F: Do any omitted FAST SAR scans from STEP A. Basically wants you to fill in any blanks you left in STEP A.

Threshold 1 (SAR $_{i, j, fast}$ equation) derived for our lab:

$$SAR_{i,j,fast} \geq SAR_{i,max,fast} \times \left[B_{i,fast} - \sqrt{(B_{i,fast})^2 - 1} \right]$$

$SAR_{i,j,fast}$ = Any **FAST SAR** scan done on the band being examined

$SAR_{i,max,fast}$ = The maximum **FAST SAR** of the band being examined

$$B_{i,fast} = \frac{1}{1 - \left[1.64(U_{i,fast})\right]^2}$$

$U_{i,fast}$ = **11.35 %** for < 3 GHz, $U_{i,fast}$ = **13.9 %** for > 5 GHz

Note: Uncertainty found in the uncertainty budget ÷ 2 ($U_{i,fast}$ is in K=1, budget is in k=2). So, 22.7%/2, and 27.8%/2 = 11.35 and 13.9. Input them in <u>decimal</u> form, so 0.1135 and 0.1390.

$$B_{i,fast} = 1.03589 \ (< 3\ GHz), \qquad B_{i,fast} = 1.05481 \ (> 5\ GHz)$$

$$\left[B_{i,fast} - \sqrt{(B_{i,fast})^2 - 1} \right] = 0.76557 \ (< 3\ GHz),$$

$$\left[B_{i,fast} - \sqrt{(B_{i,fast})^2 - 1} \right] = 0.71921 (> 5\ GHz)$$

$$SAR_{i,j,fast} \geq SAR_{i,max,fast} \times 0.76557 (< 3GHz), \quad SAR_{i,j,fast} \geq SAR_{i,max,fast} \times 0.71921 (> 5GHz)$$

In words: Threshold 1 is the maximum **FAST SAR** measurement for that band multiplied by 0.76557 or 0.71921. Any **FAST SAR** measurement in the same band equal or above this threshold must have a **FULL SAR** measurement done.

Note: This threshold changes with each band as it is dependent on the highest **FAST SAR** for THAT band.

Threshold 2 (SAR $_{i, j, full}$ equation) derived for our lab:

$$SAR_{i,max,full} \geq SAR_{highest,full} \times \left[B_i - \sqrt{(B_i)^2 - 1}\right]$$

$SAR_{i,max,full}$ = The maximum **FULL SAR** of the band being examined

$SAR_{highest,full}$ = The overall highest **FULL SAR** out of all the bands

$$B_i = \frac{1}{1 - \left[1.64 \times \sqrt{(U_{i,fast})^2 + (U_{i,full})^2}\right]^2}$$

	$U_{i,fast}$	$U_{i,full}$
< 3 GHz	11.35 %	11.15 %
> 5 GHz	13.90 %	12.30 %

Note: Uncertainty found in the uncertainty budget ÷ 2 ($U_{i,fast}$ is in K=1, budget is in k=2). So, 22.7%/2, and 22.3%/2 = 11.35 and 11.15. Input them in <u>decimal</u> form, so 0.1135 and 0.1115

$$B_i = 1.07306 (< 3\ GHz), \quad B_i = 1.10212 (> 5\ GHz)$$

$$\left[B_i - \sqrt{(B_i)^2 - 1}\right] = 0.68388 (< 3\ GHz), \quad \left[B_i - \sqrt{(B_i)^2 - 1}\right] = 0.63880 (> 5\ GHz)$$

$$SAR_{i,max,full} \geq SAR_{highest,full} \times 0.68388 (< 3GHz)$$

$$SAR_{i,max,full} \geq SAR_{highest,full} \times 0.63880 (> 5GHz)$$

In words: Threshold 2 is the overall highest **FULL SAR** out of all bands multiplied by 0.68388 or 0.63880. When the maximum **FULL SAR** of a band is equal or above **Threshold 2** then you must apply **Threshold 1** to the band and perform the additional FULL SAR scans.

Note: This threshold is the <u>SAME for ALL BANDS</u> as it is dependent on the overall highest **FULL SAR** out of all the bands. Therefore, you will use (< 3 GHz) or (>5 GHz) depending on where the overall highest **FULL SAR** is located.

Glossary

N = a frequency band + Modulations. I.e. GSM 850, UMTS V, CDMA 850

i = all the N bands/all supported frequency bands. i^{th} band refers to a specific supported band.

j = all test configurations performed on a band. Refers to all the **FAST SAR** or **FULL SAR** scans performed on a band.

$U_{i,\ fast}$ = Uncertainty of **FAST SAR** when k = 1. (In the uncertainty budget k = 2 so you ÷ 2).

$U_{i,\ full}$ = Uncertainty of **FULL SAR** when k = 1. (In the uncertainty budget k = 2 so you ÷ 2).

$$B_{i,fast} = \frac{1}{1 - \left[1.64\left(U_{i,fast}\right)\right]^2}$$

$$B_i = \frac{1}{1 - \left[1.64 \times \sqrt{\left(U_{i,fast}\right)^2 + \left(U_{i,full}\right)^2}\right]^2}$$

$SAR_{i,\ max,\ fast}$ = The max **FAST SAR** for each band

$SAR_{i,\ j,\ fast}$ = Each individual **FAST SAR** scan performed

$SAR_{i,\ max,\ full}$ = The max **FULL SAR** for each band

$SAR_{max,\ full}$ = $\mathrm{Max}\left(SAR_{i,maxfull}\right)$: the overall highest **FULL SAR** from the max **FULL SAR** of each band

$SAR_{i,\ j,\ full}$ = Each individual **FULL SAR** scan performed

$SAR_{highest,\ full}$ = $\mathrm{Max}\left(SAR_{i,j,full}\right)$: the overall highest **FULL SAR** from ALL the **FULL SAR** scans done.

$$SAR_{i,j,fast} \geq SAR_{i,max,fast} \times \left[B_{i,fast} - \sqrt{\left(B_{i,fast}\right)^2 - 1}\right]$$ (Determines THE additional **FULL SAR** scans to be done)

$$SAR_{i,max,full} \geq SAR_{highest,full} \times \left[B_i - \sqrt{\left(B_i\right)^2 - 1}\right]$$ (Determines IF additional **FULL SAR** scans need to be done)

1.9 General SAR Test Reduction and Exclusion procedure as per KDB 447498 D01 V05r02 and SAR Handsets Multi transmitters and Ant procedure as per KDB 648474 D04 v01r02

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*

$$\left(\frac{\text{max. power of channel, including tune-up tolerance (mW)}}{\text{min. test separation distance (mm)}} \times \sqrt{f_{(GHz)}}\right) \leq 3.0$$, For 1g 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]
- If *distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion
- The result is rounded to one decimal place for comparison

SAR test reduction considerations:

Testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g for the mid-band or highest output power is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz

Note: Highest output channel is only tested if the maximum output power variation across the required test channels is > ½ dB

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:

$$\left([SAR1 + SAR2]^{\frac{1.5}{Ri}}\right) \leq 0.04$$

Where:

- Ri = the separation distance between the peak SAR locations for the antenna pair (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.

1.10 Wi-Fi and Hotspot Mode Power Reductions

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:

- UMTS band II ≈ 2.0 dB

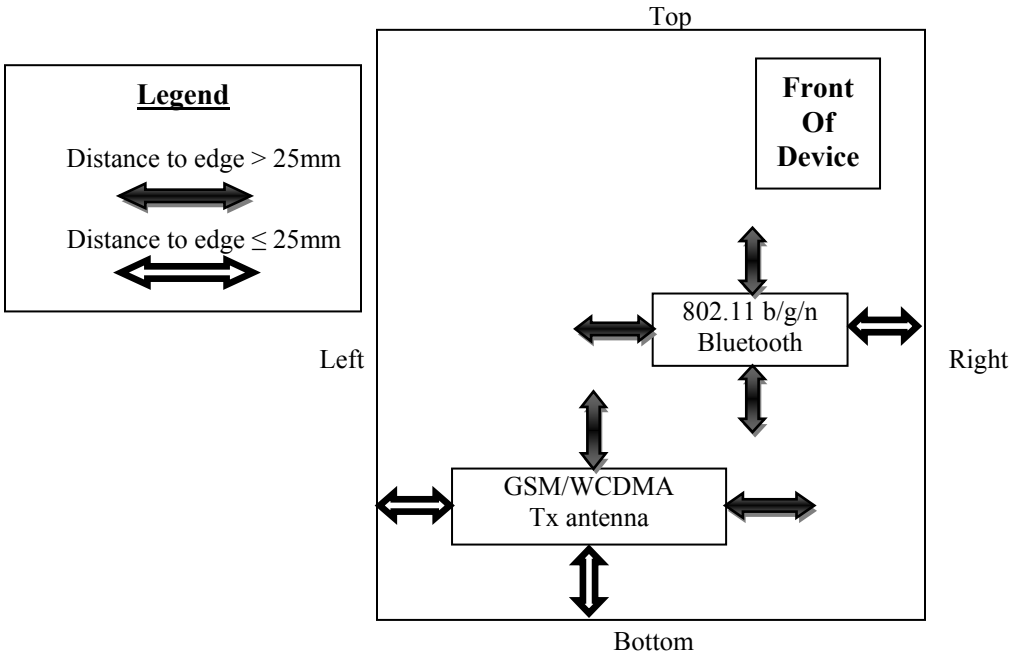

Figure 1.8.4-1 Identification of all sides for SAR Testing

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**
GPRS 850/1900, WCDMA/HSPA II//V	Yes	Yes	No	Yes	Yes	No
Bluetooth 2.4GHz/802.11 b/g/n (2.4 GHz)	Yes	Yes	No	No	No	Yes

Table 1.8.4-1 Identification of all sides for SAR Testing

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.

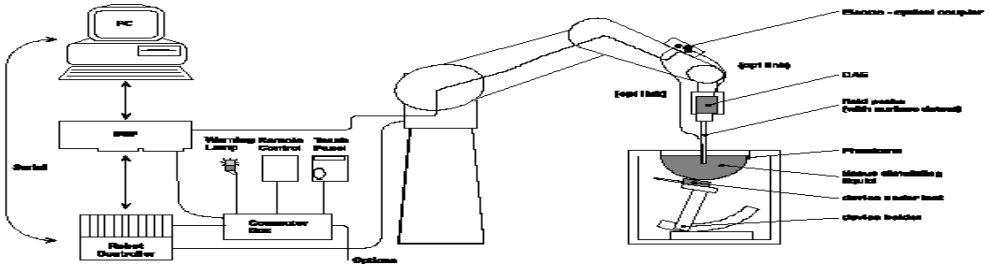

Figure 2.1-1 System Description

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	02/25/2016
SCHMID & Partner Engineering AG	E-field probe	ET3DV6	1643	03/10/2015
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE4)	DAE4	881	01/13/2016
SCHMID & Partner Engineering AG	Dipole Validation Kit	D750V2	1021	03/07/2015
SCHMID & Partner Engineering AG	Dipole Validation Kit	D835V2	446	03/07/2015
SCHMID & Partner Engineering AG	Dipole Validation Kit	D1800V2	2d020	03/09/2015
SCHMID & Partner Engineering AG	Dipole Validation Kit	D1900V2	545	03/09/2015
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2450V2	791	09/10/2015
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2600V2	1033	03/11/2015
Agilent Technologies	Signal generator	8648C	4037U03155	09/25/2015
Agilent Technologies	Power meter	E4419B	GB40202821	09/25/2015
Agilent Technologies	Power sensor	8481A	MY41095233	10/06/2015
Agilent Technologies	Power sensor	8481A	MY41095417	10/06/2015
Amplifier Research	Amplifier	5S1G4M3	300986	CNR
Amplifier Research	Coupler	DC7144	300993	CNR
Agilent Technologies	Network analyzer	8753ES	US39174857	10/24/2015
Agilent Technologies	Power meter	N1911A	MY45100905	05/29/2015
Agilent Technologies	Power sensor	N1921A	SG45240281	02/04/2016
Rohde & Schwarz	Wideband Base Station Simulator	CMW 500	136298	11/28/2016
Rohde & Schwarz	Wideband Base Station Simulator	CMW 500	140101	03/12/2015
Rohde & Schwarz	Base Station Simulator	CMU 200	109747	11/27/2015
Rohde & Schwarz	Bluetooth Tester	CBT	100370	11/25/2015
Weinschel Corp	20dB Attenuator	33-20-34	BMO697	CNR

Table 2.1.1-1 Equipment list

2.2 Description of the test setup

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

2.2.1 Device and base station simulator setup

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

2.2.2 DASY setup

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

3.0 ELECTRIC FIELD PROBE CALIBRATION

3.1 Probe Specifications

SAR measurements were conducted using the dosimetric probes ES3DV3/ET3DV6, 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

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, and 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 [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.55	6.55	6.55	0.41	2.30	± 12.0 %
900	41.5	0.97	6.15	6.15	6.15	0.38	2.41	± 12.0 %
1810	40.0	1.40	5.17	5.17	5.17	0.80	2.07	± 12.0 %
1950	40.0	1.40	4.92	4.92	4.92	0.80	2.04	± 12.0 %
2450	39.2	1.80	4.46	4.46	4.46	0.80	1.83	± 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 [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.24	6.24	6.24	0.43	2.19	± 12.0 %
900	55.0	1.05	6.03	6.03	6.03	0.38	2.61	± 12.0 %
1810	53.3	1.52	4.59	4.59	4.59	0.80	2.41	± 12.0 %
1950	53.3	1.52	4.64	4.64	4.64	0.80	2.33	± 12.0 %
2450	52.7	1.95	4.07	4.07	4.07	0.70	1.23	± 12.0 %

Table 3.2-1 Probe ET3DV6 SN: 1643 (Cal issued: 03/10/2014)

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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 [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.50	6.50	6.50	0.61	1.31	± 12.0 %
900	41.5	0.97	6.22	6.22	6.22	0.30	1.84	± 12.0 %
1810	40.0	1.40	5.26	5.26	5.26	0.50	1.46	± 12.0 %
1950	40.0	1.40	5.01	5.01	5.01	0.80	1.11	± 12.0 %
2300	39.5	1.67	4.77	4.77	4.77	0.75	1.25	± 12.0 %
2450	39.2	1.80	4.60	4.60	4.60	0.57	1.49	± 12.0 %
2600	39.0	1.96	4.40	4.40	4.40	0.72	1.30	± 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 [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.19	6.19	6.19	0.80	1.23	± 12.0 %
900	55.0	1.05	6.07	6.07	6.07	0.53	1.41	± 12.0 %
1810	53.3	1.52	4.89	4.89	4.89	0.63	1.46	± 12.0 %
1950	53.3	1.52	4.86	4.86	4.86	0.44	1.86	± 12.0 %
2300	52.9	1.81	4.48	4.48	4.48	0.80	1.29	± 12.0 %
2450	52.7	1.95	4.34	4.34	4.34	0.72	1.14	± 12.0 %
2600	52.5	2.16	4.06	4.06	4.06	0.80	1.08	± 12.0 %

Table 3.2-2 Probe ES3DV3 SN: 3225 (Cal issued: 02/25/2015)

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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)	Measured Date	Dielectric Parameters		Liquid Temp. (^{0}C)	Scan Type	SAR 1g/10g (W/Kg)
		ε_r	σ [s/m]			
835	2/20/2015	41.2	0.88	21.0	Area Scan/Fast SAR	9.34/6.2
					Zoom Scan/Full SAR	9.32/6.16
	2/23/2015	41.7	0.89	21.8	Area Scan/Fast SAR	9.33/6.20
					Zoom Scan/Full SAR	9.33/6.17
	Limits:	41.5	0.90		Dipole: 446	9.39/6.13
1900	2/6/2015	40.09	1.43	21.0	Area Scan/Fast SAR	39.1/20.7
					Zoom Scan/Full SAR	38.3/20.4
	2/9/2015	38.64	1.41	21.8	Area Scan/Fast SAR	37.9/20.1
					Zoom Scan/Full SAR	37.2/20.0
	Limits:	40.0	1.40		Dipole: 545	40.2/21.1
2450	3/2/2015	40.32	1.85	22.1	Area Scan/Fast SAR	53.8/25.6
					Zoom Scan/Full SAR	54.1/25.4
	Limits:	39.2	1.80		Dipole: 791	51.6/24.0

Table 4.1-1 System accuracy (validation for head adjacent use)

5.0 PHANTOM DESCRIPTION

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

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

Left side head
Right side head
Flat phantom

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

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

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

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

Figure 5.0-1 SAM Twin Phantom

6.0 TISSUE DIELECTRIC PROPERTIES

6.1 Composition of tissue simulant

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

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

Table 6.1-1 Tissue simulant recipe

6.1.1 Equipment

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date (MM/DD/YY)
Pyrex, England	Graduated Cylinder	N/A	N/A	N/A
Pyrex, USA	Beaker	N/A	N/A	N/A
Acculab	Weight Scale	V1-1200	018WB2003	N/A
IKA Works Inc.	Hot Plate	RC Basic	3.107433	N/A
Dell	PC using GPIB card	GX110	347	N/A
Agilent Technologies	Dielectric probe kit	HP 85070C	US9936135	CNR
Agilent Technologies	Network Analyzer	8753ES	US39174857	10/24/2015
Control Company	Digital Thermometer	23609-234	21352860	09/22/2015
Control Company	Digital Thermometer	15-077-21	51129471	06/11/2015

Table 6.1.1-1 Tissue simulant preparation equipment

Note 1: "*" equipment was sent out for calibration before it's due date.

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 P1528-2013:
" 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	Measured Date	f (MHz)	Dielectric Parameters		Liquid Temp. (^{0}C)
				Ɛr	σ [s/m]	
835	Head	2/20/2015	815	41.39	0.86	21.0
			825	41.29	0.87	
			835	41.16	0.88	
			850	40.96	0.89	
			865	40.76	0.91	
		2/23/2015	815	41.93	0.87	21.8
			825	41.83	0.88	
			835	41.71	0.89	
			850	41.49	0.90	
			865	41.28	0.92	
		Limits:	835	41.5	0.90	
	Muscle	2/23/2015	815	52.91	0.94	21.5
			825	52.83	0.96	

			835	52.78	0.97	
			850	52.6	0.98	
		Limits:	835	55.2	0.97	
1900	Head	2/4/2015	1850	40.27	1.37	21.0
			1900	40.09	1.43	
			1910	40.06	1.44	
			1980	39.71	1.52	
		2/9/2015	1850	38.83	1.36	21.8
			1900	38.64	1.41	
			1910	39.59	1.42	
			1980	38.33	1.49	
		Limits:	1900	40.0	1.40	
Band (MHZ)	**Tissue Type**	**Measured Date**	**F (MHz)**	**Dielectric Parameters**		**Liquid Temp. (^{0}C)**
				Ɛr	**σ [s/m]**	
1900	Muscle	2/4/2015	1850	52.15	1.52	21.2
			1900	51.97	1.58	
			1910	51.94	1.59	
		2/9/2015	1850	52.19	1.5	21.8
			1900	52.04	1.56	
			1910	52	1.57	
		Limits:	1900	53.3	1.52	
2450	Head	3/2/2015	2410	40.44	1.8	22.1
			2450	40.32	1.85	
			2480	40.23	1.88	
		Limits:	2450	39.2	1.80	
	Muscle	3/2/2015	2410	51.68	1.96	22.0
			2450	51.6	2.01	
			2480	51.48	2.04	
		Limits:	2450	52.7	1.95	

Table 6.2-1 Electrical parameters of tissue simulating liquid

6.2.2 Test Configuration

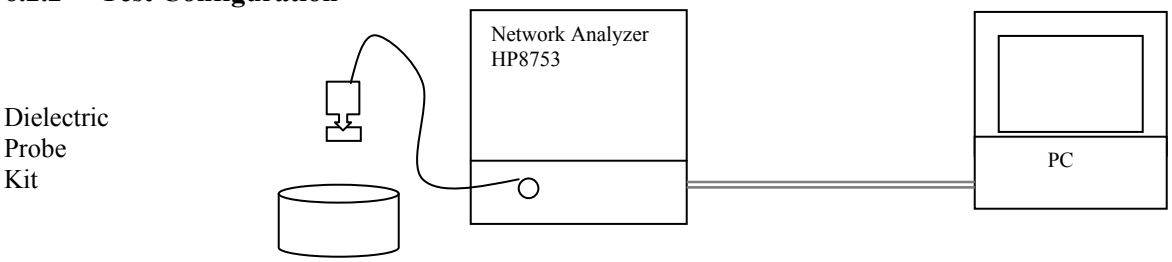

Figure 6.2.2-1 Test configuration

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).

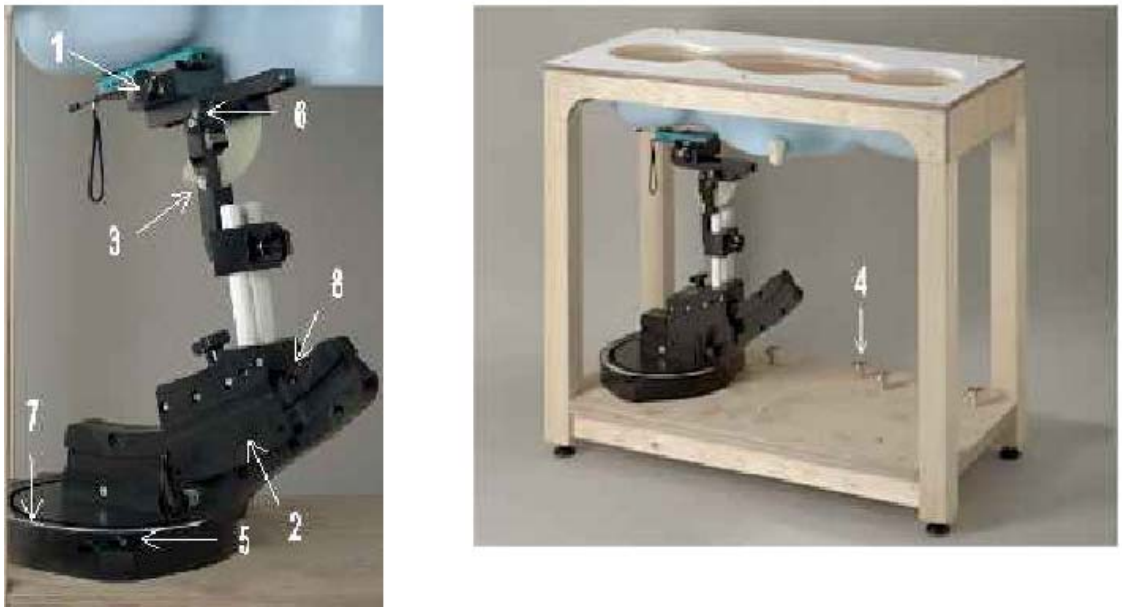

Figure 8.1-1 Device Holder

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".

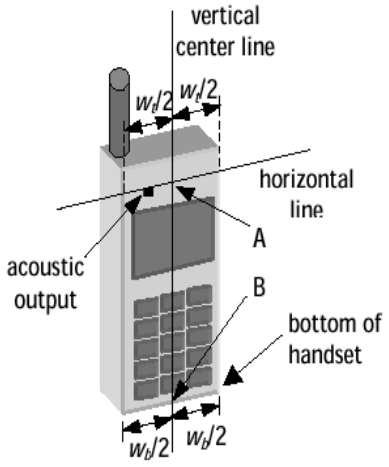

Figure 8.2.1-1 Handset vertical and horizontal reference lines – fixed case

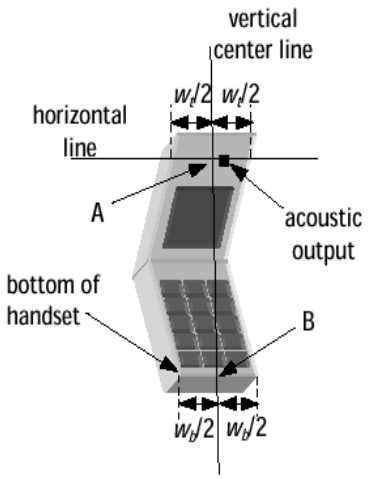

Figure 8.2.1-2 Handset vertical and horizontal reference lines – "clam-shell"

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).

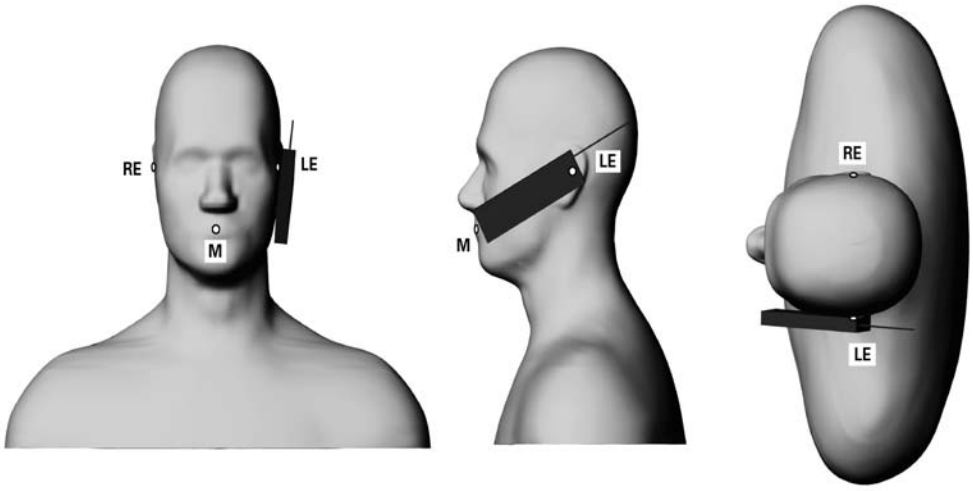

Figure 8.2.1-3 Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

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**.**

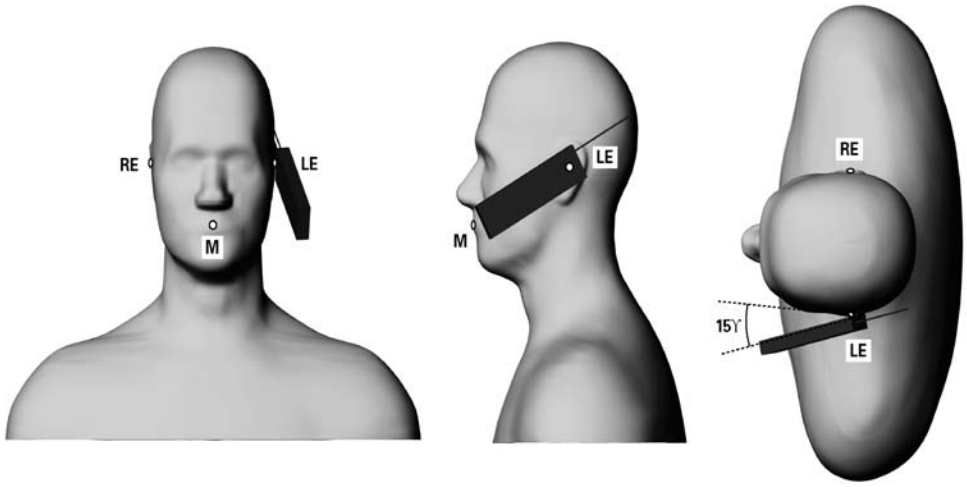

Figure 8.2.1-4 Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.2 Body-worn Configuration

Body-worn configurations, as shown in appendix E, have been tested with the device for RF exposure compliance. The device was tested with a holster and/or a minimum separation distance. The device was tested with 15 mm BLACKBERRY recommended separation distance to allow typical after-market holster to be used. For holster testing the 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. BLACKBERRY body-worn holsters with belt-clip have been designed to maintain ~ 19-20 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
(0.3 - 3 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	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
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%	∞
Modulation Response[m]	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
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.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
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%	∞
Power Scaling[p]	±0%	R	$\sqrt{3}$	1	1	±0.0%	±0.0%	∞
Phantom and Setup								
Phantom Uncertainty	±6.1%	R	$\sqrt{3}$	1	1	±3.5%	±3.5%	∞
SAR correction	±1.9%	R	$\sqrt{3}$	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)[DAK]	±2.5%	R	$\sqrt{3}$	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.) [DAK]	±2.5%	R	$\sqrt{3}$	0.26	0.26	±0.3%	±0.4%	∞
Temp. unc. - Conductivity [BB]	±3.4%	R	$\sqrt{3}$	0.78	0.71	±1.5%	±1.4%	∞
Temp. unc. - Permittivity [BB]	±0.4%	R	$\sqrt{3}$	0.23	0.26	±0.1%	±0.1%	∞
Combined Std. Uncertainty						±11.2%	±11.1%	361
Expanded STD Uncertainty						**±22.3%**	**±22.2%**	

Table 10.0-1 Worst-Case uncertainty budget for DASY5 assessed according to IEEE P1528-2013. 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.

Relative DASY5 Uncertainty Budget for Fast SAR Tests
(0.3 - 3 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	±6.0%	N	1	0	0			
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%	∞
Modulation Response	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	0	0			
Response Time	±0.8%	R	$\sqrt{3}$	0	0			
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	$\sqrt{3}$	0	0			
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%	∞
Spatial x-y-Resolution	±10.0%	R	$\sqrt{3}$	1	1	±5.8%	±5.8%	∞
Fast SAR z-Approximation	±7.0%	R	$\sqrt{3}$	1	1	±4.0%	±4.0%	∞
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%	∞
Power Scaling	±0%	R	$\sqrt{3}$	0	0			
Phantom and Setup								
Phantom Uncertainty	±6.1%	R	$\sqrt{3}$	1	1	±3.5%	±3.5%	∞
SAR correction	±1.9%	R	$\sqrt{3}$	0	0			
Liquid Conductivity (mea.)	±2.5%	R	$\sqrt{3}$	0	0			
Liquid Permittivity (mea.)	±2.5%	R	$\sqrt{3}$	0	0			
Temp. unc. - Conductivity	±3.4%	R	$\sqrt{3}$	0	0			
Temp. unc. - Permittivity	±0.4%	R	$\sqrt{3}$	0	0			
Combined Std. Uncertainty						±11.4%	±11.4%	748
Expanded STD Uncertainty						**±22.7%**	**±22.7%**	

Table 10.0-2 Worst-Case uncertainty budget for DASY5 assessed according to IEEE P1528-2013
Source: Schmid & Partner Engineering AG.

11.0 TEST RESULTS

11.1 Conducted power results at maximum transmit power

GSM/EDGE/GPRS/DTM With Full Power					
Mode	**Freq. (MHz)**	**Channel**	**Max burst averaged conducted power (dBm) CS1**	**Max burst averaged conducted power (dBm) MCS1**	**Max burst averaged conducted power (dBm) MCS5**
1-slot GPRS/EDGE 850 MHz	824.2	128	32.5		
	836.8	190	32.5		
	848.8	251	32.9		
2-slots GPRS 850 MHz	824.2	128	29.6		
	836.8	190	29.5		
	848.8	251	29.7		
3-slots GPRS 850 MHz	824.2	128	28.2		
	836.8	190	28.2		
	848.8	251	28.3		
4-slots GPRS 850 MHz	824.2	128	26.2		
	836.8	190	26.2		
	848.8	251	26.2		
2-slots EDGE 850 MHz	824.2	128	29.7	29.4	26.0
	836.8	190	29.6	29.3	26.0
	848.8	251	29.8	29.4	26.0
2-slots DTM 850 MHz	824.2	128	29.7	29.6	29.6
	836.8	190	29.6	29.5	29.6
	848.8	251	29.7	29.7	29.7
3-slots EDGE 850 MHz	824.2	128	28.4	28.0	24.3
	836.8	190	28.4	28.1	24.3
	848.8	251	28.5	28.2	24.3
3-slots DTM 850 MHz	824.2	128	28.3	28.2	28.2
	836.8	190	28.4	28.3	28.3
	848.8	251	28.5	28.5	28.5
4-slots EDGE 850 MHz	824.2	128	25.9	25.8	23.2
	836.8	190	25.9	25.9	23.2
	848.8	251	26.1	25.9	23.2
1-slot GPRS/EDGE 1900 MHz	1850.2	512	29.8		
	1880.0	661	29.7		
	1909.8	810	29.8		
2-slots GPRS 1900 MHz	1850.2	512	27.0		
	1880.0	661	26.8		
	1909.8	810	26.8		

3-slots GPRS 1900 MHz	1850.2	512	25.0		
	1880.0	661	24.9		
	1909.8	810	24.9		
4-slots GPRS 1900 MHz	1850.2	512	23.8		
	1880.0	661	23.6		
	1909.8	810	23.6		
2-slots EDGE 1900MHz	1850.2	512	27.0	27.2	23.0
	1880.0	661	26.9	27.0	22.9
	1909.8	810	26.8	27.0	23.0
2-slots DTM 1900MHz	1850.2	512	27.0	26.9	26.8
	1880.0	661	26.7	26.6	26.6
	1909.8	810	26.8	26.8	26.7
3-slots EDGE 1900MHz	1850.2	512	25.0	25.1	21.2
	1880.0	661	24.9	25.0	21.1
	1909.8	810	24.9	25.0	21.2
3-slots DTM 1900MHz	1850.2	512	25.0	25.0	24.9
	1880.0	661	24.9	24.9	24.8
	1909.8	810	24.9	24.9	24.8
4-slots EDGE 1900MHz	1850.2	512	23.9	23.9	20.0
	1880.0	661	23.8	23.7	19.9
	1909.8	810	23.8	23.7	19.9

Mode	**Freq. (MHz)**	**Channel**	**Max burst averaged conducted power (dBm)**
1-slot GSM (CS) 850 MHz	824.2	128	32.5
	836.8	190	32.5
	848.8	251	32.9
1-slot GSM (CS) 1900 MHz	1850.2	512	29.7
	1880.0	661	29.7
	1909.8	810	29.8

Table 11.1-1a GSM/EDGE/GPRS/DTM conducted power measurements for normal mode

Calculation Of Time Based Average Power Per Slot 850 MHz					
Mode	**Freq. (MHz)**	**Channel**	**Slot average power (measured) (dBm) CS1**	**# of slots**	**Time based average power (calculated) (dBm) CS1**
1-slot	824.2	128	32.5	1	23.5
GPRS/EDGE	836.8	190	32.5	1	23.5
850 MHz	848.8	251	32.9	1	23.9
2-slots	824.2	128	29.6	2	23.6
GPRS	836.8	190	29.5	2	23.5
850 MHz	848.8	251	29.7	2	23.7
3-slots	824.2	128	28.2	3	23.9
GPRS	836.8	190	28.2	3	23.9
850 MHz	848.8	251	28.3	3	**24.0**
4-slots	824.2	128	26.2	4	23.2
GPRS	836.8	190	26.2	4	23.2
850 MHz	848.8	251	26.2	4	23.2
2-slots	824.2	128	29.7	2	23.7
EDGE	836.8	190	29.6	2	23.6
850 MHz	848.8	251	29.8	2	23.8
2-slots	824.2	128	29.7	2	23.7
DTM	836.8	190	29.6	2	23.6
850 MHz	848.8	251	29.7	2	23.7
3-slots	824.2	128	28.4	3	24.1
EDGE	836.8	190	28.4	3	24.1
850 MHz	848.8	251	28.5	3	**24.2**
3-slots	824.2	128	28.3	3	24.0
DTM	836.8	190	28.4	3	24.1
850 MHz	848.8	251	28.5	3	**24.2**
4-slots	824.2	128	25.9	4	22.9
EDGE	836.8	190	25.9	4	22.9
850 MHz	848.8	251	26.1	4	23.1
1-slot	824.2	128	32.5	1	23.5
GSM (CS)	836.8	190	32.5	1	23.5
850 MHz	848.8	251	32.9	1	23.9

11.1-1b GSM/EDGE/GPRS/DTM 850 calculation of time based average power per slot

Note: As per IEEE 1528 -2013 “both GSM and GPRS use GMSK, which is a constant amplitude modulation; therefore, the maximum time-averaged output power with respect to the maximum number of time slots used in each mode can be used to determine the most conservative mode for SAR testing. Similarly, EGPRS (which uses GMSK and 8PSK) can be included with GSM and GPRS in this determination of the most conservative mode for SAR testing due to its innate similarities to GSM and GPRS.”

Calculation Of Time Based Average Power Per Slot 1900 MHz					
Mode	**Freq. (MHz)**	**Channel**	**Slot average power (measured) (dBm) CS1**	**# of slots**	**Time based average power (calculated) (dBm) CS1**
1-slot	1850.2	512	29.8	1	20.8
GPRS/EDGE	1880.0	661	29.7	1	20.7
1900 MHz	1909.8	810	29.8	1	20.8
2-slots	1850.2	512	27	2	**21.0**
GPRS	1880.0	661	26.8	2	20.8
1900 MHz	1909.8	810	26.8	2	20.8
3-slots	1850.2	512	25	3	20.7
GPRS	1880.0	661	24.9	3	20.6
1900 MHz	1909.8	810	24.9	3	20.6
4-slots	1850.2	512	23.8	4	20.8
GPRS	1880.0	661	23.6	4	20.6
1900 MHz	1909.8	810	23.6	4	20.6
2-slots	1850.2	512	27	2	**21.0**
EDGE	1880.0	661	26.9	2	20.9
1900MHz	1909.8	810	26.8	2	20.8
2-slots	1850.2	512	27	2	**21.0**
DTM	1880.0	661	26.7	2	20.7
1900MHz	1909.8	810	26.8	2	20.8
3-slots	1850.2	512	25	3	20.7
EDGE	1880.0	661	24.9	3	20.6
1900MHz	1909.8	810	24.9	3	20.6
3-slots	1850.2	512	25	3	20.7
DTM	1880.0	661	24.9	3	20.6
1900MHz	1909.8	810	24.9	3	20.6
4-slots	1850.2	512	23.9	4	20.9
EDGE	1880.0	661	23.8	4	20.8
1900MHz	1909.8	810	23.8	4	20.8
1-slot	1850.2	512	29.7	1	20.7
GSM (CS)	1880.0	661	29.7	1	20.7
1900 MHz	1909.8	810	29.8	1	20.8

11.1-1c GSM/EDGE/GPRS/DTM 1900 calculation of time based average power per slot

Note: As per IEEE 1528 -2013 “both GSM and GPRS use GMSK, which is a constant amplitude modulation; therefore, the maximum time-averaged output power with respect to the maximum number of time slots used in each mode can be used to determine the most conservative mode for SAR testing. Similarly, EGPRS (which uses GMSK and 8PSK) can be included with GSM and GPRS in this determination of the most conservative mode for SAR testing due to its innate similarities to GSM and GPRS.”

WCDMA With Full Power				
	Band	**FDD V (850)**		
	Freq (MHz)	826.4	836.4	846.6
	Channel	4132	4182	4233
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	23.86	24.23	24.32
Rel99	12.2kbps, Voice, AMR, SRB 3.4 kbps	23.85	24.06	24.25
HSUPA	1	22.05	22.84	22.35
HSUPA	2	21.72	21.90	22.07
HSUPA	3	21.46	21.50	21.72
HSUPA	4	21.98	22.11	22.31
HSUPA	5	22.00	22.09	22.35
HSDPA+	1	22.96	22.95	22.92
HSDPA+	2	22.77	22.92	23.10
HSDPA+	3	22.29	22.45	22.68
HSDPA+	4	22.24	22.43	22.54
DC-HSDPA	1	22.33	22.71	23.35
DC-HSDPA	2	22.30	22.54	23.31
DC-HSDPA	3	21.77	22.05	22.79
DC-HSDPA	4	21.84	22.10	22.79
	Band	**FDD II (1900)**		
	Freq (MHz)	1852.4	1880.0	1907.6
	Channel	9262	9400	9538
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	24.12	23.72	23.89
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	24.10	23.71	23.88
HSUPA	1	22.50	22.36	22.78
HSUPA	2	21.97	21.74	21.87
HSUPA	3	21.90	21.53	21.84
HSUPA	4	22.41	22.08	22.29
HSUPA	5	22.28	22.43	22.40
HSDPA+	1	23.05	22.84	22.80
HSDPA+	2	22.93	22.62	22.63
HSDPA+	3	22.31	22.17	22.23
HSDPA+	4	22.36	22.16	22.15
DC-HSDPA	1	23.00	22.53	22.94
DC-HSDPA	2	23.04	22.51	22.93
DC-HSDPA	3	22.52	22.14	22.46
DC-HSDPA	4	22.52	22.10	22.44

Table 11.1-2a WCDMA (Rel99) / HSPA/HSPA+ conducted power measurements for normal mode

WCDMA With Reduced Power For Hotspot Mode				
	Band	**FDD II (1900)**		
	Freq (MHz)	1852.4	1880.0	1907.6
	Channel	9262	9400	9538
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	20.96	20.89	20.86
Rel99	12.2kbps, Voice, AMR, SRB 3.4 kbps	20.80	20.86	20.85
HSUPA	1	19.42	19.40	19.39

Table 11.1-2b WCDMA (Rel99) / HSPA/HSPA+ conducted power measurements for Hotspot mode

Channel	Freq (MHz)	Mode	Conducted Avg. Transmit Power (dBm)
0	2402	DH5	9.30
39	2441		11.40
78	2480		8.80
0	2402	2-DH5	5.90
39	2441		7.90
78	2480		5.50
0	2402	3-DH5	5.90
39	2441		7.90
78	2480		5.60

Table 11.1-3 Bluetooth conducted power measurements

802.11b/g/n Full Power in Normal/MHS/GO/Direct mode with Band Edge power reduction for FCC Compliance								
802.11b @ 1Mbps			802.11g @ 6Mbps			802.11n @ 6.5 Mbps		
f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)
2412	1	16.50	2412	1	16.40	2412	1	16.24
2437	6	16.80	2437	6	17.87	2437	6	16.60
2462	11	16.20	2462	11	13.00	2462	11	12.98

802.11g			802.11b		
Data Rate (Mbps)	Mod.	Channel 6 Max. average conducted power (dBm)	Data Rate (Mbps)	Mod.	Channel 11 Max. average conducted power (dBm)
6	BPSK	17.87	1	BPSK	16.80
9	BPSK	17.86	2	DQPSK	16.75
12	QPSK	17.80	5.5	CCK	16.80
18	QPSK	17.78	11	CCK	16.80
24	16-QAM	16.65			
36	16-QAM	16.60			
48	64-QAM	15.40			
54	64-QAM	14.50			

802.11 n		
Data Rate (Mbps)	Mod.	Channel 6 Max. average conducted power (dBm)
6.5	MCS0	16.60
13	MCS1	16.58
19.5	MCS2	16.50
26	MCS3	16.50
39	MCS4	15.30
52	MCS5	15.20
58.5	MCS6	14.30
65	MCS7	14.30

Table 11.1-3a 802.11 b/g/n modulation type/data rate vs. conducted power

Note 1: There is no power reduction for Wi-Fi Direct/GO mode or Hotspot mode

Note 2: Since Wi-Fi must be certified for FCC and R&TTE testing was done using the R&TTE conducted power levels. The only difference between the two modes is there is no band edge power reduction for R&TTE, so the SAR measurements done on low and high channel will actually be more conservative.

802.11b/g/n Full Power in Normal/MHS/GO/Direct mode without Band Edge power reduction for R&TTE Compliance								
802.11b @ 1Mbps			802.11g @ 6Mbps			802.11n @ 6.5 Mbps		
f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)
2412	1	16.50	2412	1	17.70	2412	1	17.60
2437	6	16.80	**2437**	**6**	**17.87**	**2437**	6	17.80
2462	11	16.20	2462	11	17.20	2462	11	17.13
2472	13	15.98	2472	13	16.80	2472	13	16.70

802.11g			802.11b		
Data Rate (Mbps)	Mod.	Channel 6 Max. average conducted power (dBm)	Data Rate (Mbps)	Mod.	Channel 11 Max. average conducted power (dBm)
6	BPSK	17.87	1	BPSK	16.80
9	BPSK	17.86	2	DQPSK	16.75
12	QPSK	17.80	5.5	CCK	16.80
18	QPSK	17.78	11	CCK	16.80
24	16-QAM	16.65			
36	16-QAM	16.60			
48	64-QAM	15.40			
54	64-QAM	14.50			

802.11 n		
Data Rate (Mbps)	Mod.	Channel 6 Max. average conducted power (dBm)
6.5	MCS0	17.80
13	MCS1	17.70
19.5	MCS2	16.50
26	MCS3	16.40
39	MCS4	15.40
52	MCS5	15.30
58.5	MCS6	14.30
65	MCS7	14.20

Table 11.1-3b 802.11 b/g/n modulation type/data rate vs. conducted power

Note 1: There is no power reduction for Wi-Fi Direct/GO mode or Hotspot mode

Note 2: Since Wi-Fi must be certified for FCC and R&TTE testing was done using the R&TTE conducted power levels. The only difference between the two modes is there is no band edge power reduction for R&TTE, so the SAR measurements done on low and high channel will actually be more conservative.

11.2 SAR measurement results at highest power measured against the head

Measured/Extrapolated SAR Values - Head - GSM/EDGE/DTM 850 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.3					
		190	836.6	29	28.4	-0.11	0.544		0.625	
		251	848.8	29	28.5					
Right 15° Tilt	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.3					
		190	836.6	29	28.4	0.00	0.396		0.455	
		251	848.8	29	28.5					
Left Cheek	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.3	-0.05	0.640	0.651	0.752	0.765
		190	836.6	29	28.4	-0.13	0.590		0.677	
		251	848.8	29	28.5	-0.21	0.591		0.663	
Left 15° Tilt	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.3					
		190	836.6	29	28.4	0.01	0.373		0.428	
		251	848.8	29	28.5					

Threshold 1 For This Band:	0.658	
Max FAST SAR For Band:	0.859	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.846	
Additional Full SAR Required:		NO

Table 11.2-1a SAR testing results for GSM/EDGE/DTM 850 head configuration tested on device model: RHC161LW

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 reported SAR ≤ 0.8 W/Kg or 3dB lower than the limit. Low, Middle and High channels were tested on the worst case position regardless of the SAR level.

Note 3a: For KDB Fast SAR a zoom scan is required for each head position with 1g measured SAR ≥ 0.8 W/Kg and one additional zoom scan to cover all the remaining head positions. The scan is done on the worst case for the position(s)

Note 3b: For KDB Fast SAR the technique cannot be utilized when 1g measured SAR ≥ 1.2 W/Kg, an error message occurs, or difference between the zoom and area scan 1g SAR ≥ 0.1 W/kg for that configuration.

Note 4: A 2nd scan is required when 1g measured SAR ≥ 0.8 W/Kg. A 3rd scan is required when the 1g measured SAR ≥ 1.45 W/Kg or the 2nd scan SAR differs more than 20%. A 4th scan is required when the 1g measured SAR ≥ 1.50 W/Kg or the previous measurements differ more than 20%.

Note 5a: For IEEE 1528 Fast SAR requirements, additional zoom scans/Full SAR measurements are done for all Fast SAR scans that are above the "threshold 1" for that Band. Threshold 1 is determined for each band separately and is based off of the overall maximum Fast SAR value of that band.

Note 5b : For IEEE 1528 Fast SAR requirements, if the overall maximum Full SAR value of a band is below "threshold 2" then no additional zoom scans/Full SAR measurements need to be done on that band. Threshold 2 is based off of the overall maximum Full SAR value of the entire device and does not change like "threshold 1."

Note 5c: Both thresholds are calculated using the measured SAR to avoid the thresholds changing should target power be changed throughout the testing period.

Measured/Extrapolated SAR Values - Head - GSM/EDGE/DTM 850 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.3	-0.14	0.620		0.728	
		190	836.6	29	28.4	0.22	0.710	0.680	0.815	0.781
		251	848.8	29	28.5	0.01	0.646		0.725	
Right 15° Tilt	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2							
		190	836.6							
		251	848.8							
Left Cheek	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.3	-0.03	0.711		0.835	
		190	836.6	29	28.4	-0.02	0.712	0.714	0.817	0.820
		251	848.8	29	28.5	-0.04	0.665		0.746	
Left 15° Tilt	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2							
		190	836.6							
		251	848.8							
Repeat Scans - Left Cheek										
2nd Scan	3	128	824.2	29	28.3	-0.06	0.713	0.720	0.838	0.846

Table 11.2-1b SAR testing results for GSM/EDGE/DTM 850 head configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Head - WCDMA FDD V 850 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	4132	826.4	24.5	23.86	-0.02	0.343		0.397	
	4182	836.4	24.5	24.23	0.05	0.484	0.464	0.515	0.494
	4233	846.6	24.5	24.32	0.02	0.386		0.402	
Right 15° Tilt	4132	826.4							
	4182	836.4	24.5	24.23	0.01	0.248	0.253	0.264	0.269
	4233	846.6							
Left Cheek	4132	826.4	24.5	23.86					
	4182	836.4	24.5	24.23	0.12	0.470	0.475	0.500	0.505
	4233	846.6	24.5	24.32					
Left 15° Tilt	4132	826.4							
	4182	836.4	24.5	24.23	-0.03	0.254		0.270	
	4233	846.6							

Threshold 1 For This Band:	0.635	
Max FAST SAR For Band:	0.830	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.813	
Additional Full SAR Required:		NO

Table 11.2-2a SAR testing results for WCDMA FDD V head configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Head - WCDMA FDD V 850 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	4132	826.4	24.5	23.86	0.07	0.331		0.384	
	4182	836.4	24.5	24.23	0.00	0.455	0.453	0.484	0.482
	4233	846.6	24.5	24.32	0.10	0.354		0.369	
Right 15° Tilt	4132	826.4							
	4182	836.4	24.5	24.23					
	4233	846.6							
Left Cheek	4132	826.4	24.5	23.86					
	4182	836.4	24.5	24.23	-0.14	0.439		0.467	
	4233	846.6	24.5	24.32					
Left 15° Tilt	4132	826.4							
	4182	836.4	24.5	24.23					
	4233	846.6							

Table 11.2-2b SAR testing results for WCDMA FDD V head configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Head - GSM/EDGE/DTM 1900 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0	28.5	26.7	-0.15	0.436	0.428	0.660	0.648
		810	1909.8							
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
Right 15° Tilt	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0	28.5	26.7	0.01	0.205		0.310	
		810	1909.8							
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
Left Cheek	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2	28.5	27.0	0.08	0.621	0.617	0.877	0.872
		661	1880.0	28.5	26.7	0.06	0.699	0.704	1.06	1.07
		810	1909.8	28.5	26.8	-0.03	0.737	0.750	1.09	1.11
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
Left 15° Tilt	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0	28.5	26.7	0.02	0.305		0.462	
		810	1909.8							
	3	512	1850.2							
		661	1880.0							
		810	1909.8							

Threshold 1 For This Band:	0.564	
Max FAST SAR For Band:	0.737	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.750	
Additional Full SAR Required:		NO

Table 11.2-3a SAR testing results for GSM/EDGE/DTM 1900 head configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Head - GSM/EDGE/DTM 1900 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0	28.5	26.8	0.13	0.363		0.537	
		810	1909.8							
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
Right 15° Tilt	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0							
		810	1909.8							
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
Left Cheek	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2	28.5	27.0	0.00	0.564		0.797	
		661	1880.0	28.5	26.8	0.11	0.606		0.896	
		810	1909.8	28.5	26.8	-0.01	0.692	0.700	1.02	1.04
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
Left 15° Tilt	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0							
		810	1909.8							
	3	512	1850.2							
		661	1880.0							
		810	1909.8							

Table 11.2-3b SAR testing results for GSM/EDGE/DTM 1900 head configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Head - WCDMA FDD II 1900 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	9262	1852.4							
	9400	1880.0	24.2	23.72	-0.054	0.632		0.706	
	9538	1907.6							
Right 15° Tilt	9262	1852.4							
	9400	1880.0	24.2	23.72	-0.111	0.312		0.348	
	9538	1907.6							
Left Cheek	9262	1852.4	24.2	24.12	-0.165	0.910	0.903	0.927	0.920
	9400	1880.0	24.2	23.72	0.15	1.01	0.981	1.13	1.10
	9538	1907.6	24.2	23.89	0.059	0.878	0.881	0.943	0.946
Left 15° Tilt	9262	1852.4							
	9400	1880.0	24.2	23.72	0.133	0.465		0.519	
	9538	1907.6							
Repeat Scans - Left Cheek									
2nd Scan	9400	1880.0	24.2	23.72	0.057	1.00	1.01	1.12	1.13
3rd Scan									
4th Scan									

Threshold 1 For This Band:	0.773	
Max FAST SAR For Band:	1.01	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.01	
Additional Full SAR Required:		YES

Table 11.2-4a SAR testing results for WCDMA FDD II head configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Head - WCDMA FDD II 1900 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	9262	1852.4							
	9400	1880.0	24.2	23.72	0.047	0.605	0.595	0.676	0.665
	9538	1907.6							
Right 15° Tilt	9262	1852.4							
	9400	1880.0	24.2	23.72	0.027	0.327		0.365	
	9538	1907.6							
Left Cheek	9262	1852.4	24.2	24.12	-0.009	0.856		0.872	
	9400	1880.0	24.2	23.72	0.244	0.990	0.961	1.11	1.07
	9538	1907.6	24.2	23.89	0.125	0.822		0.883	
Left 15° Tilt	9262	1852.4							
	9400	1880.0	24.2	23.72	0.084	0.476		0.532	
	9538	1907.6							
Repeat Scans - Left Cheek									
2nd Scan	9400	1880.0	24.2	23.72	0.031	1.01	1.01	1.13	**1.13**
3rd Scan									
4th Scan									

Table 11.2-4b SAR testing results for WCDMA FDD II head configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Head - 802.11b/g/n 2450 MHz												
Position	Data Rate (Mbps)	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Duty Factor (%)	1g SAR (W/Kg)				
							Extrapolated		Reported		FULL SAR at 100% DF
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR	
Right Cheek	6	1	2412.0	19	17.7	95.0	0.397	0.389	0.536	0.525	0.551
		6	2437.0	19	17.87	95.0	0.527	0.515	0.684	0.668	0.701
		11	2462.0	19	17.2	95.0	0.369	0.361	0.559	0.546	0.574
Right 15° Tilt	6	1	2412.0	19	17.7	95.0					
		6	2437.0	19	17.87	95.0	0.086	0.096	0.111	0.125	0.131
		11	2462.0	19	17.2	95.0					
Left Cheek	6	1	2412.0	19	17.7	95.0					
		6	2437.0	19	17.87	95.0	0.210	0.224	0.272	0.291	0.305
		11	2462.0	19	17.2	95.0					
Left 15° Tilt	6	1	2412.0	19	17.7	95.0					
		6	2437.0	19	17.87	95.0	0.110	0.120	0.143	0.156	0.163
		11	2462.0	19	17.2	95.0					
Additional Scans - Right Cheek											
802.11b	1	6	2437.0	17	16.8	95.0	0.406	0.397	0.425	0.416	0.436

Threshold 1 For This Band:	0.403	
Max FAST SAR For Band:	0.527	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.515	
Additional Full SAR Required:		NO

Table 11.2-5 SAR testing results for Wi-Fi/WLAN/802.11b/g/n head configuration tested on device model: RHC161LW

Note 1: SAR measurements were performed on the highest output power mode and channel.
In addition, low and high cannels were tested on the worst case position.

Measured/Extrapolated SAR Values - Head - Bluetooth 2450 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	0	2402.0							
	39	2441.0	11.75	11.4	0.49	0.082	0.084	0.089	0.091
	78	2480.0							
Right 15° Tilt	0	2402.0							
	39	2441.0							
	78	2480.0							
Left Cheek	0	2402.0							
	39	2441.0	11.75	11.4	-0.14	0.001	0.000	0.001	
	78	2480.0							
Left 15° Tilt	0	2402.0							
	39	2441.0							
	78	2480.0							

Threshold 1 For This Band:	0.063	
Max FAST SAR For Band:	0.082	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.084	
Additional Full SAR Required:		NO

Table 11.2-6 SAR testing results for Bluetooth head configuration tested on device model: RHC161LW

Note: SAR measurements were performed on the highest output power channel.

11.3 SAR measurement results at highest power measured for Hotspot and body-worn configurations

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - GSM/EDGE/DTM 850 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.2	-0.08	0.832	0.835	1.00	1.00
		190	836.6	29	28.2	-0.18	0.859	0.835	1.03	1.00
		251	848.8	29	28.3	-0.06	0.713	0.718	0.838	0.844
	4	128	824.2							
		190	836.6							
		251	848.8							
10mm Front	3	128	824.2	29	28.2	-0.01	0.700	0.705	0.842	0.848
		190	836.6	29	28.2	-0.05	0.662	0.667	0.796	0.802
		251	848.8	29	28.3	-0.10	0.567		0.666	
10mm Left	3	128	824.2	29	28.2					
		190	836.6	29	28.2	-0.14	0.588		0.707	
		251	848.8	29	28.3					
10mm Right		128	824.2							
		190	836.6							
		251	848.8							
10mm Bottom	3	128	824.2	29	28.2					
		190	836.6	29	28.2	-0.06	0.18		0.216	
		251	848.8	29	28.3					
Repeat Scans - 10mm Back										
2nd Scan	3	190	836.6	29	28.2	-0.10	0.846	0.846	1.02	1.02

Threshold 1 For This Band:	0.658	
Max FAST SAR For Band:	0.859	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.846	
Additional Full SAR Required:		NO

Table 11.3-1a SAR testing results for GSM/EDGE/GPRS 850 Hotspot configuration tested on device model: RHC161LW

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 reported SAR ≤ 0.8 W/Kg or 3dB lower than the limit. Low, Middle and High channels were tested on the worst case position regardless of the SAR level.

Note 3a: For KDB Fast SAR a zoom scan is required for each head position with 1g measured SAR ≥ 0.8 W/Kg and one additional zoom scan to cover all the remaining head positions. The scan is done on the worst case for the position(s)

Note 3b: For KDB Fast SAR the technique cannot be utilized when 1g measured SAR ≥ 1.2 W/Kg, an error message occurs, or difference between the zoom and area scan 1g SAR ≥ 0.1 W/kg for that configuration.

Note 4: A 2nd scan is required when 1g measured SAR ≥ 0.8 W/Kg. A 3rd scan is required when the 1g measured SAR ≥ 1.45 W/Kg or the 2nd scan SAR differs more than 20%. A 4th scan is required when the 1g measured SAR ≥ 1.50 W/Kg or the previous measurements differ more than 20%.

Note 5a: For IEEE 1528 Fast SAR requirements, additional zoom scans/Full SAR measurements are done for all Fast SAR scans that are above the "threshold 1" for that Band. Threshold 1 is determined for each band separately and is based off of the overall maximum Fast SAR value of that band.

Note 5b : For IEEE 1528 Fast SAR requirements, if the overall maximum Full SAR value of a band is below "threshold 2" then no additional zoom scans/Full SAR measurements need to be done on that band. Threshold 2 is based off of the overall maximum Full SAR value of the entire device and does not change like "threshold 1."

Note 5c: Both thresholds are calculated using the measured SAR to avoid the thresholds changing should target power be changed throughout the testing period.

Note 6: Device was tested with 15 mm BLACKBERRY recommended separation distance to allow typical after-market holster to be used.

Note 7: For Hotspot mode any side of the phone that is further than 2.5 cm away from the transmitting antenna can be exempted from testing.

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - GSM/EDGE/DTM 850 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.2	-0.16	0.880		1.06	
		190	836.6	29	28.2	-0.18	0.978	0.956	1.18	1.15
		251	848.8	29	28.3	-0.02	0.865		1.02	
	4	128	824.2							
		190	836.6							
		251	848.8							
10mm Front		128	824.2							
		190	836.6							
		251	848.8							
10mm Left		128	824.2							
		190	836.6							
		251	848.8							
10mm Right		128	824.2							
		190	836.6							
		251	848.8							
10mm Bottom		128	824.2							
		190	836.6							
		251	848.8							
10mm + Headset	3	128	824.2							
		190	836.6	29	28.2	-0.06	0.709		0.852	
		251	848.8							
Repeat Scans										
2nd Scan	3	190	836.6	29	28.2	0.06	0.952	0.968	1.14	**1.16**

Table 11.3-1b SAR testing results for GSM/EDGE/GPRS 850 Hotspot configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - GSM/EDGE/DTM 850 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.2	-0.10	0.730	0.722	0.878	0.868
		190	836.6	29	28.2	-0.12	0.722	0.719	0.868	0.864
		251	848.8	29	28.3	-0.06	0.588		0.691	
	4	128	824.2							
		190	836.6							
		251	848.8							
15mm Front	3	128	824.2	29	28.2	-0.12	0.656		0.789	
		190	836.6	29	28.2	0.19	0.619		0.744	
		251	848.8	29	28.3	-0.04	0.515		0.605	
Holster Back	3	128	824.2	29	28.2	-0.17	0.646		0.777	
		190	836.6	29	28.2	0.06	0.630		0.757	
		251	848.8	29	28.3	-0.16	0.483		0.567	

Threshold 1 For This Band:	0.658	
Max FAST SAR For Band:	0.859	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.846	
Additional Full SAR Required:		NO

Table 11.3-1c SAR testing results for GSM/EDGE/GPRS 850 body-worn configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - GSM/EDGE/DTM 850 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	1	128	824.2							
		190	836.6							
		251	848.8							
	2	128	824.2							
		190	836.6							
		251	848.8							
	3	128	824.2	29	28.2	-0.13	0.740		0.890	
		190	836.6	29	28.2	0.05	0.820	0.829	0.986	**0.997**
		251	848.8	29	28.3	-0.07	0.749		0.880	
	4	128	824.2							
		190	836.6							
		251	848.8							

Table 11.3-1c SAR testing results for GSM/EDGE/GPRS 850 body-worn configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - WCDMA FDD V 850 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	4132	826.4	24.5	23.86	-0.08	0.576		0.667	
	4182	836.4	24.5	24.23	-0.06	0.830	0.803	0.883	0.855
	4233	846.6	24.5	24.32	0.02	0.827	0.813	0.862	0.847
10mm Front	4132	826.4							
	4182	836.4	24.5	24.23	0.01	0.673	0.677	0.716	0.720
	4233	846.6							
10mm Left	4132	826.4							
	4182	836.4	24.5	24.23	-0.06	0.297		0.316	
	4233	846.6							
10mm Right	4132	826.4							
	4182	836.4							
	4233	846.6							
10mm Bottom	4132	826.4							
	4182	836.4	24.5	24.23	-0.06	0.707	0.650	0.752	0.692
	4233	846.6							
10mm + Headset	4132	826.4							
	4182	836.4							
	4233	846.6							
Repeat Scans - 10mm Back									
2nd Scan	4182	836.4	24.5	24.23	-0.03	0.822	0.809	0.875	0.861

Threshold 1 For This Band:	0.635	
Max FAST SAR For Band:	0.830	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.813	
Additional Full SAR Required:		NO

Table 11.3-2a SAR testing results for WCDMA FDD V Hotspot configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - WCDMA FDD V 850 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	4132	826.4	24.5	23.86	0.04	0.629		0.729	
	4182	836.4	24.5	24.23	0.03	0.879	0.854	0.935	0.909
	4233	846.6	24.5	24.32	0.10	0.885	0.870	0.922	0.907
10mm Front	4132	826.4							
	4182	836.4	24.5	24.23	-0.06	0.613		0.652	
	4233	846.6							
10mm Left	4132	826.4							
	4182	836.4							
	4233	846.6							
10mm Right	4132	826.4							
	4182	836.4							
	4233	846.6							
10mm Bottom	4132	826.4							
	4182	836.4							
	4233	846.6							
10mm + Headset	4132	826.4							
	4182	836.4							
	4233	846.6							
Additional Scans When 1g Reported SAR > 1.2 W/Kg									
HSDPA									
Repeat Scans - 10mm Back									
2nd Scan	4233	846.6	24.5	24.32	0.03	0.876	0.856	0.913	0.892

Table 11.3-2b SAR testing results for WCDMA FDD V Hotspot configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - WCDMA FDD V 850 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	4132	826.4	24.5	23.86	0.04	0.404		0.468	
	4182	836.4	24.5	24.23	0.01	0.494	0.499	0.526	0.531
	4233	846.6	24.5	24.32	-0.04	0.429		0.447	
15mm Front	4132	826.4							
	4182	836.4	24.5	24.23	0.01	0.466		0.496	
	4233	846.6							
Holster Back	4132	826.4							
	4182	836.4	24.5	24.23	-0.12	0.444		0.472	
	4233	846.6							

Threshold 1 For This Band:	0.635	
Max FAST SAR For Band:	0.830	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.813	
Additional Full SAR Required:		NO

Table 11.3-2c SAR testing results for WCDMA FDD V body-worn configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - WCDMA FDD V 850 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	4132	826.4	24.5	23.86	-0.02	0.409		0.474	
	4182	836.4	24.5	24.23	-0.04	0.511	0.513	0.544	0.546
	4233	846.6	24.5	24.32	-0.06	0.463		0.483	
15mm Front	4132	826.4							
	4182	836.4	24.5	24.23	0.00	0.468		0.498	
	4233	846.6							

Table 11.3-2d SAR testing results for WCDMA FDD V body-worn configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - GSM/EDGE/DTM 1900 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2	28.5	27.0	0.02	0.546		0.771	
		661	1880.0	28.5	26.8	0.02	0.577	0.579	0.853	0.856
		810	1909.8	28.5	26.8	-0.07	0.584	0.588	0.864	0.870
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
	4	512	1850.2							
		661	1880.0							
		810	1909.8							
10mm Front	2	512	1850.2							
		661	1880.0	28.5	26.8	0.06	0.487		0.720	
		810	1909.8							
10mm Left	2	512	1850.2							
		661	1880.0	28.5	26.8	-0.08	0.417		0.617	
		810	1909.8							
10mm Right		512	1850.2							
		661	1880.0							
		810	1909.8							
10mm Bottom	2	512	1850.2							
		661	1880.0	28.5	26.8	-0.01	0.268		0.396	
		810	1909.8							

Threshold 1 For This Band:	0.564	
Max FAST SAR For Band:	0.737	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.750	
Additional Full SAR Required:		NO

Table 11.3-3a SAR testing results for GSM/EDGE/GPRS 1900 Hotspot configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - GSM/EDGE/DTM 1900 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2	28.5	27.0	-0.14	0.545		0.770	
		661	1880.0	28.5	26.8	0.03	0.578		0.855	
		810	1909.8	28.5	26.8	0.02	0.602	0.615	0.890	0.910
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
	4	512	1850.2							
		661	1880.0							
		810	1909.8							
10mm Front	2	512	1850.2							
		661	1880.0	28.5	26.8	-0.01	0.505		0.747	
		810	1909.8							

Table 11.3-3b SAR testing results for GSM/EDGE/GPRS 1900 Hotspot configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - GSM/EDGE/DTM 1900 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0							
		810	1909.8	28.5	26.8	-0.06	0.304		0.450	
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
	4	512	1850.2							
		661	1880.0							
		810	1909.8							
Holster Back	2	512	1850.2							
		661	1880.0	28.5	26.8	0.02	0.225	0.222	0.333	0.328
		810	1909.8							

Threshold 1 For This Band:	0.564	
Max FAST SAR For Band:	0.737	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.750	
Additional Full SAR Required:		NO

Table 11.3-3c SAR testing results for GSM/EDGE/GPRS 1900 body-worn configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - GSM/EDGE/DTM 1900 MHz										
Position	Time Slot	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
							Extrapolated		Reported	
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	1	512	1850.2							
		661	1880.0							
		810	1909.8							
	2	512	1850.2							
		661	1880.0							
		810	1909.8	28.5	26.8	0.04	0.331	0.329	0.490	0.487
	3	512	1850.2							
		661	1880.0							
		810	1909.8							
	4	512	1850.2							
		661	1880.0							
		810	1909.8							

Table 11.3-3d SAR testing results for GSM/EDGE/GPRS 1900 body-worn configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - WCDMA FDD II 1900 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	9262	1852.4	22	20.96	-0.018	0.649	0.611	0.825	0.776
	9400	1880.0	22	20.89	-0.058	0.617	0.627	0.797	0.810
	9538	1907.6	22	20.86	-0.025	0.616	0.665	0.801	0.865
10mm Front	9262	1852.4							
	9400	1880.0	22	20.89	0.07	0.425		0.549	
	9538	1907.6							
10mm Left	9262	1852.4							
	9400	1880.0	22	20.89	0.065	0.372		0.480	
	9538	1907.6							
10mm Right	9262	1852.4							
	9400	1880.0	22	20.89	0.333	0.148		0.191	
	9538	1907.6							
10mm Bottom	9262	1852.4							
	9400	1880.0	22	20.89	-0.105	0.229		0.296	
	9538	1907.6							
10mm + Headset	9262	1852.4							
	9400	1880.0							
	9538	1907.6							
Repeat Scans - 10mm Back									
2nd Scan	9538	1907.6	22	20.86	0.03	0.606	0.651	0.788	0.846

Threshold 1 For This Band:	0.773	
Max FAST SAR For Band:	1.01	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.01	
Additional Full SAR Required:		YES

Table 11.3-4a SAR testing results for WCDMA FDD II Hotspot configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - WCDMA FDD II 1900 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	9262	1852.4	22	20.96	-0.182	0.560		0.712	
	9400	1880.0	22	20.89	0.008	0.539		0.696	
	9538	1907.6	22	20.86	-0.016	0.568	0.593	0.738	0.771
10mm Front	9262	1852.4							
	9400	1880.0	22	20.89	-0.085	0.493		0.637	
	9538	1907.6							
10mm Left	9262	1852.4							
	9400	1880.0	22	20.89	0.107	0.421		0.544	
	9538	1907.6							
10mm Right	9262	1852.4							
	9400	1880.0							
	9538	1907.6							
10mm Bottom	9262	1852.4							
	9400	1880.0	22	20.89	-0.082	0.249		0.322	
	9538	1907.6							

Table 11.3-4a SAR testing results for WCDMA FDD II Hotspot configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - WCDMA FDD II 1900 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	9262	1852.4	24.2	24.12	-0.129	0.467		0.476	
	9400	1880.0	24.2	23.72	0.055	0.474	0.471	0.529	0.526
	9538	1907.6	24.2	23.89	-0.029	0.427		0.459	
15mm Front	9262	1852.4							
	9400	1880.0	24.2	23.72	-0.01	0.433		0.484	
	9538	1907.6							
Holster Back	9262	1852.4							
	9400	1880.0	24.2	23.72	-0.18	0.329		0.367	
	9538	1907.6							

Threshold 1 For This Band:	0.773	
Max FAST SAR For Band:	1.01	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.01	
Additional Full SAR Required:		YES

Table 11.3-4c SAR testing results for WCDMA FDD II body-worn configuration tested on device model: RHC161LW

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - WCDMA FDD II 1900 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	9262	1852.4	24.2	24.12	-0.051	0.477		0.486	
	9400	1880.0	24.2	23.72	0.115	0.506	0.504	0.565	0.563
	9538	1907.6	24.2	23.89	0.035	0.428		0.460	
15mm Front	9262	1852.4							
	9400	1880.0	24.2	23.72	-0.042	0.495		0.553	
	9538	1907.6							
Holster Back	9262	1852.4							
	9400	1880.0	24.2	23.72	-0.169	0.363		0.405	
	9538	1907.6							

Table 11.3-4d SAR testing results for WCDMA FDD II body-worn configuration tested on device model: RHD131LW

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - 802.11bgn 2450 MHz												
Position	Data Rate (Mbps)	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Duty Factor (%)	1g SAR (W/Kg)					
							Extrapolated		Reported		SAR at 100% DF
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR	
10mm Back	6	1	2412.0	19	17.7	95.0	0.208	0.226	0.281	0.305	0.320
		6	2437.0	19	17.87	95.0	0.238	0.259	0.309	0.336	0.353
		11	2462.0	19	17.2	95.0	0.164	0.178	0.248	0.269	0.283
10mm Front	6	1	2412.0								
		6	2437.0	19	17.87	95.0	0.113	0.122	0.147	0.158	0.166
		11	2462.0								
10mm Left	6	1	2412.0								
		6	2437.0								
		11	2462.0								
10mm Right	6	1	2412.0								
		6	2437.0	19	17.87	95.0	0.144	0.160	0.187	0.208	0.218
		11	2462.0								
10mm Bottom	6	1	2412.0								
		6	2437.0								
		11	2462.0								
10mm + Headset	6	1	2412.0								
		6	2437.0								
		11	2462.0								
Additional Scans - 10mm Back											
802.11b	1	6	2437.0	17	16.8	95.0	0.195	0.210	0.204	0.220	0.231

Threshold 1 For This Band:	0.403	
Max FAST SAR For Band:	0.527	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.515	
Additional Full SAR Required:		NO

Table 11.3-11a SAR testing results for Wi-Fi/WLAN/802.11b/g/n Hotspot configuration tested on device model: RHC161LW

Note 1: SAR measurements were performed on the highest output power mode and channel.
In addition, low and high channels were testing on the worst case position.

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - 802.11bgn 2450 MHz											
Position	Data Rate (Mbps)	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Duty Factor (%)	1g SAR (W/Kg)				
							Extrapolated		Reported		FULL SAR at 100% DF
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR	
15mm Back	6	1	2412.0	19	17.7	95.0	0.092	0.098	0.124	0.132	0.139
		6	2437.0	19	17.87	95.0	0.098	0.103	0.127	0.134	0.140
		11	2462.0	19	17.2	95.0	0.067	0.072	0.102	0.109	0.114
15mm Front	6	1	2412.0								
		6	2437.0	19	17.87	95.0	0.064	0.068	0.083	0.088	0.093
		11	2462.0								
Holster Back	6	1	2412.0								
		6	2437.0	19	17.87	95.0	0.070	0.074	0.091	0.096	0.101
		11	2462.0								

Threshold 1 For This Band:	0.403	
Max FAST SAR For Band:	0.527	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.515	
Additional Full SAR Required:		NO

Table 11.3-11b SAR testing results for Wi-Fi/WLAN/802.11b/g/n body-worn configuration tested on device model: RHC161LW

Note 1: SAR measurements were performed on the highest output power mode and channel.
In addition, low and high channels were testing on the worst case position.

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - Bluetooth 2450 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	0	2402.0							
	39	2441.0	11.5	11.4	-0.18	0.042	0.047	0.043	0.048
	78	2480.0							

Threshold 1 For This Band:	0.063	
Max FAST SAR For Band:	0.082	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.084	
Additional Full SAR Required:		NO

Table 11.3-12a SAR testing results for Bluetooth Hotspot configuration tested on device model: RHC161LW

Note: SAR measurements were performed on the highest output power channel

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - Bluetooth 2450 MHz									
Position	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
						Extrapolated		Reported	
			Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR
15mm Back	0	2402.0							
	39	2441.0	11.5	11.4	0.01	0.001	0.000	0.001	
	78	2480.0							

Threshold 1 For This Band:	0.063	
Max FAST SAR For Band:	0.082	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.084	
Additional Full SAR Required:		NO

Table 11.3-12b SAR testing results for Bluetooth body-worn configuration tested on device model: RHC161LW

11.4 Simultaneous transmission analysis for SAR measurement results

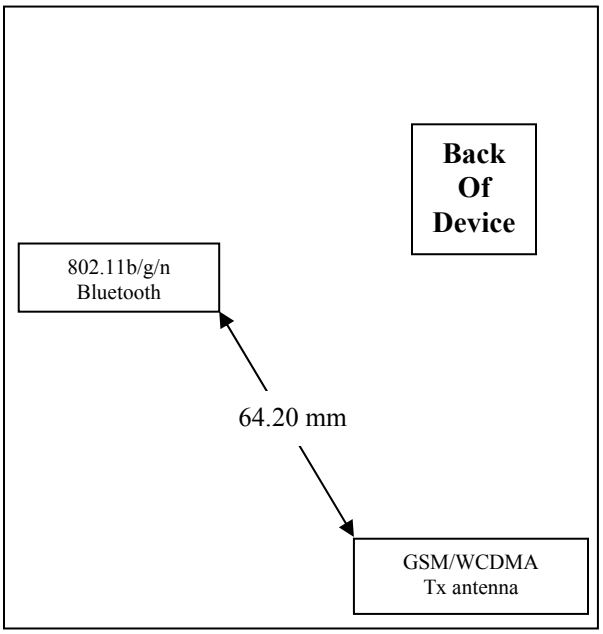

Figure 11.4-1 Back view of device showing closest distance between antenna pairs

Separate Transmitting Antenna		
Separate Antenna	**Technologies Utilized By Each Antenna**	
Antenna 1	GSM, WCDMA	
Antenna 2	Wi-Fi 2.4 GHz, Bluetooth	
Simultaneous Transmission Combinations		
Configuration	**Simultaneous Transmission (by Antenna)**	**Simultaneous Transmission (by Technology)**
Head	Antenna 1 + Antenna 2	GSM/WCDMA + Wi-Fi/BT
Body-Worn	Antenna 1 + Antenna 2	GSM/WCDMA + Wi-Fi/BT
Hotspot	Antenna 1 + Antenna 2	GSM/WCDMA + Wi-Fi/BT

Table 11.4-1 Simultaneous Transmission Scenarios

Note 1: BT and Wi-Fi cannot transmit simultaneously since the design doesn't allow it and they use the same antenna.
Note 2: GSM/WCDMA cannot transmit simultaneously since it shares the same antenna.

Head SAR Values Summation On The Same Test Position					
Config.	Position	Licensed Transmitters		Wi-Fi 2.4GHz 1g avg. SAR (W/Kg)	Max Sum 1g avg. SAR (W/Kg)
		Band	1g avg. SAR (W/Kg)		
Head SAR	Right Cheek	GSM/DTM 850	0.625	0.701	1.326
		WCDMA FDD V	0.494	0.701	1.195
		GSM/DTM 1900	0.648	0.701	1.349
		WCDMA FDD II	0.706	0.701	1.407
Head SAR	Right Tilt	GSM/DTM 850	0.455	0.131	0.586
		WCDMA FDD V	0.269	0.131	0.400
		LTE Band 2	0.326	0.131	0.457
		GSM/DTM 1900	0.310	0.131	0.441
Head SAR	Left Cheek	GSM/DTM 850	0.765	0.305	1.070
		WCDMA FDD V	0.505	0.305	0.810
		GSM/DTM 1900	1.11	0.305	1.415
		WCDMA FDD II	1.13	0.305	1.435
Head SAR	Left Tilt	GSM/DTM 850	0.428	0.163	0.591
		WCDMA FDD V	0.270	0.163	0.433
		GSM/DTM 1900	0.462	0.163	0.625
		WCDMA FDD II	0.519	0.163	0.682

Table 11.4-2a Highest Head SAR values and summation on the same test position for device model: RHC161LW

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.

Head SAR Values Summation On The Same Test Position					
Config.	Position	Licensed Transmitters		WiFi 2.4/5.0GHz 1g avg. SAR (W/Kg)	Max Sum 1g avg. SAR (W/Kg)
		Band	1g avg. SAR (W/Kg)		
Head SAR	Right Cheek	GSM/DTM 850	0.781	0.701	1.482
		WCDMA FDD V	0.482	0.701	1.183
		GSM/DTM 1900	0.537	0.701	1.238
		WCDMA FDD II	0.665	0.701	1.366
Head SAR	Right Tilt	GSM/DTM 850			0.000
		WCDMA FDD V			0.000
		GSM/DTM 1900			0.000
		WCDMA FDD II	0.365	0.131	0.496
Head SAR	Left Cheek	GSM/DTM 850	0.846	0.305	1.151
		WCDMA FDD V	0.467	0.305	0.772
		GSM/DTM 1900	1.04	0.305	1.345
		WCDMA FDD II	1.13	0.305	1.435
Head SAR	Left Tilt	GSM/DTM 850			0.000
		WCDMA FDD V			0.000
		GSM/DTM 1900			0.000
		WCDMA FDD II	0.532	0.163	0.695

Table 11.4-2b Highest Head SAR values and summation on the same test position for device model: RHD131LW

Hotspot Mode SAR Values Summation On The Same Test Position					
Config.	Position	Licensed Transmitters		Wi-Fi 2.4GHz 1g avg. SAR (W/Kg)	Max Sum 1g avg. SAR (W/Kg)
		Band	1g avg. SAR (W/Kg)		
Hotspot Mode SAR	10mm Back	GSM/DTM 850	1.02	0.353	1.373
		WCDMA FDD V	0.861	0.353	1.214
		GSM/DTM 1900	0.870	0.353	1.223
		WCDMA FDD II	0.865	0.353	1.218
Hotspot Mode SAR	10mm Front	GSM/DTM 850	0.848	0.166	1.014
		WCDMA FDD V	0.720	0.166	0.886
		GSM/DTM 1900	0.720	0.166	0.886
		WCDMA FDD II	0.549	0.166	0.715
Hotspot Mode SAR	10mm Left	GSM/DTM 850	0.707	---	0.707
		WCDMA FDD V	0.316	---	0.316
		GSM/DTM 1900	0.617	---	0.617
		WCDMA FDD II	0.480	---	0.480
Hotspot Mode SAR	10mm Right	GSM/DTM 850	---	0.218	0.218
		WCDMA FDD V	---	0.218	0.218
		GSM/DTM 1900	---	0.218	0.218
		WCDMA FDD II	0.191	0.218	0.409
Hotspot Mode SAR	10mm Bottom	GSM/DTM 850	0.216	---	0.216
		WCDMA FDD V	0.692	---	0.692
		GSM/DTM 1900	0.396	---	0.396
		WCDMA FDD II	0.296	---	0.296
Hotspot Mode SAR	10mm Top	GSM/DTM 850	---	---	---
		WCDMA FDD V	---	---	---
		GSM/DTM 1900	---	---	---
		WCDMA FDD II	---	---	---

Table 11.4-3a Highest Hotspot SAR values and summation on the same test position for device model: RHC161LW

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.

Hotspot Mode SAR Values Summation On The Same Test Position					
Config.	Position	Licensed Transmitters		WiFi 2.4/5.0GHz 1g avg. SAR (W/Kg)	Max Sum 1g avg. SAR (W/Kg)
		Band	1g avg. SAR (W/Kg)		
Hotspot Mode SAR	10mm Back	GSM/DTM 850	1.16	0.353	1.513
		WCDMA FDD V	0.909	0.353	1.262
		GSM/DTM 1900	0.910	0.353	1.263
		WCDMA FDD II	0.771	0.353	1.124
Hotspot Mode SAR	10mm Front	GSM/DTM 850	---	---	0.000
		WCDMA FDD V	0.652	0.166	0.818
		GSM/DTM 1900	0.747	0.166	0.913
		WCDMA FDD II	0.637	0.166	0.803
Hotspot Mode SAR	10mm Left	GSM/DTM 850	---	---	0.000
		WCDMA FDD V	---	---	0.000
		GSM/DTM 1900	---	---	0.000
		WCDMA FDD II	0.544	0	0.544
Hotspot Mode SAR	10mm Right	GSM/DTM 850	---	---	0.000
		WCDMA FDD V	---	---	0.000
		GSM/DTM 1900	---	---	0.000
		WCDMA FDD II	---	---	0.000
Hotspot Mode SAR	10mm Bottom	WCDMA FDD II	0.322	0	0.322

Table 11.4-3b Highest Hotspot SAR values and summation on the same test position for device model: RHD131LW

Body-Worn SAR Values Summation On The Same Test Position					
Config.	Position	Licensed Transmitters		Wi-Fi 2.4GHz 1g avg. SAR (W/Kg)	Max Sum 1g avg. SAR (W/Kg)
		Band	1g avg. SAR (W/Kg)		
Body Worn SAR	15mm Back	GSM/DTM 850	0.868	0.14	1.008
		WCDMA FDD V	0.531	0.14	0.671
		GSM/DTM 1900	0.450	0.14	0.590
		WCDMA FDD II	0.526	0.14	0.666
Body Worn SAR	15mm Front	GSM/DTM 850	0.789	0.093	0.882
		WCDMA FDD V	0.496	0.093	0.589
		GSM/DTM 1900	---	---	---
		WCDMA FDD II	0.484	0.093	0.577
Body Worn SAR	Holster Back	GSM/DTM 850	0.777	0.101	0.878
		WCDMA FDD V	0.472	0.101	0.573
		GSM/DTM 1900	0.328	0.101	0.429
		WCDMA FDD II	0.367	0.101	0.468
Body Worn SAR	Holster Front	GSM/DTM 850	---	---	---
		WCDMA FDD V	---	---	---
		GSM/DTM 1900	---	---	---
		WCDMA FDD II	---	---	---

Table 11.4-4a Highest Body-worn SAR values and summation on the same test position for device model: RHC161LW

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 is required.

Body-Worn SAR Values Summation On The Same Test Position					
Config.	Position	Licensed Transmitters		WiFi 2.4/5.0GHz 1g avg. SAR (W/Kg)	Max Sum 1g avg. SAR (W/Kg)
		Band	1g avg. SAR (W/Kg)		
Body Worn SAR	15mm Back	GSM/DTM 850	0.997	0.14	1.137
		WCDMA FDD V	0.546	0.14	0.686
		GSM/DTM 1900	0.487	0.14	0.627
		WCDMA FDD II	0.563	0.14	0.703
Body Worn SAR	15mm Front	GSM/DTM 850	---	---	0.000
		WCDMA FDD V	0.498	0.093	0.591
		GSM/DTM 1900	---	---	0.000
		WCDMA FDD II	0.553	0.093	0.646
Body Worn SAR	Holster Back	GSM/DTM 850	---	---	0.000
		WCDMA FDD V	---	---	0.000
		GSM/DTM 1900	---	---	0.000
		WCDMA FDD II	0.405	0.101	0.506

Table 11.4-4b Highest Body-worn SAR values and summation on the same test position for device model: RHD131LW

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