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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Note: According to the hardware similarity document, BlackBerry models RHC161LW and RHD131LW share the same conducted RF circuitry and power level. Due to this conducted power for LTE band 7 normal mode was measured using RHD131LW and reused for RHC161LW. Also, although LTE band 7 is not operational in the United States; it is operational in Canada and remains in this report for filing to Industry Canada

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APPENDIX A: SAR DISTRIBUTION COMPARISON FOR ACCURACY VERIFICATION

APPENDIX B: SAR DISTRIBUTION PLOTS – HEAD CONFIGURATION

APPENDIX C1: SAR DISTRIBUTION PLOTS – HOT SPOT CONFIGURATION

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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		RHC161LW (STR100-2)			
FCC ID		L6ARHC160LW			
IC ID		2503A-RHC160LW			
PIN	**RADIATED**	2FFE780C (DVT Rev 3/3-04), 2FFE7A1D (DVT Rev 3/3-04),			
	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			
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 IV (1800)	HSPA$^+$/ WCDMA / UMTS FDD II (1900)	NFC
Target nominal maximum conducted RF output power (dBm)		24.0	23.5	23.7	N/A
Tolerance in power setting on centre channel (dB)		± 0.5	± 0.5	± 0.5	N/A
Duty cycle		1:1	1:1	1:1	N/A
Transmitting frequency range (MHz)		824.6 – 846.6	1712.4 – 1752.6	1852.4 – 1907.6	13.56

Table 1.3-1 Test device characterization for U.S. wireless operating modes/bands on model RHC161LW

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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/LTE) 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: RHC161LW also supports GSM/GPRS/EDGE 900/1800 MHz, and UMTS/HSPA$^+$ Band I, and LTE band 1 that are operational outside North America only, therefore no data is presented in this report for those bands.

Device Model		RHC161LW (STR100-2)
FCC ID		L6ARHC160LW
IC ID		2503A-RHC160LW
PIN	**RADIATED**	2FFE780C (DVT Rev 3/3-04), 2FFE7A1D (DVT Rev 3/3-04)
	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
Prototype or Production Unit		Production
Transmission channel bandwidth		Band 2: 1.4 MHz , 3 MHz , 5 MHz, 10 MHz, 15 MHz, 20 MHz Band 4: 1.4 MHz , 3 MHz , 5 MHz, 10 MHz, 15 MHz, 20 MHz Band 5: 1.4 MHz , 3 MHz , 5 MHz, 10 MHz Band 17: 5 MHz, 10 MHz

Transmission channel number and frequencies at highest bandwidth

	LTE band 2		LTE band 4		LTE band 5	
	f (MHz)	**Chan.**	**f (MHz)**	**Chan.**	**f (MHz)**	**Chan.**
L	1860.0	18700	1720.0	20050	829.0	20450
M	1880.0	18900	1732.5	20175	836.5	20525
H	1900.0	19100	1745.0	20300	844.0	20600
	LTE band 7		**LTE band 13**		**LTE band 17**	
	f (MHz)	**Chan.**	**f (MHz)**	**Chan.**	**f (MHz)**	**Chan.**
L	2510.0	20850			709.0	23780
M	2535.0	21100	782.0	23230	710.0	23790
H	2560.0	21350			711.0	23800

UE Category	Category 3
Modulation supported in uplink	QPSK, 16QAM
Description of LTE antenna	1 Tx/Rx Ant sharing with GSM/UMTS, 1 Rx Ant for LTE Band 7, 1 Rx Ant for all other LTE Bands
LTE voice available/supported	Possible
Hotspot with LTE+Wi-Fi	Yes
Hotspot with LTE+Wi-Fi active with GSM/UMTS voice	No
LTE MPR permanently built-in by design	Yes
LTE A-MPR	Disabled during testing , by setting NV value to NV_01 on the CMW500

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Target nominal maximum conducted RF Output Power (dBm) +/- Tolerance in Power Setting on centre channel (dB)	Band 2: 23.0 ± 0.50 Band 4: 23.5 ± 0.50 Band 5: 23.5 ± 0.50 Band 7: 23.1 ± 0.50 Band 13: 23.0 ± 0.50 Band 17: 23.0 ± 0.50	
Other non-LTE U.S. wireless operating modes/bands	GSM//WCDMA/HSPA^{+}	GSM 850 MHz UMTS/WCDMA 850 MHz UMTS/WCDMA 1800 MHz GSM 1900 MHz UMTS/WCDMA 1900 MHz
	802.11 b/g/n	2.4 GHz Wi-Fi 2.4 GHz BT

Table 1.3-2 Test device characterization for all North American wireless operating modes/bands on model RHC161LW

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

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

Note 2: Open loop antenna tuning is used for all transmitters (GSM/WCDMA/LTE) 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: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

Device Model		RHD131LW (STR100-1)
PIN	**RADIATED**	2FFE80F6 (Rev4-00)
	CONDUCTED	2FFE76BA (EVT Rev2-01/04), 2FFE8118 (DVT Rev4-00)
HARDWARE REV		EVT Rev2-01/04, DVT Rev4-00
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

Table 1.3-3 Test device characterization for LTE band 7 testing on model RHD131LW

Note: Model RHD131LW was used to test conducted power on LTE band 7, and to do partial SAR testing for LTE band 7 on Rev 4.

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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

- The device was put into test mode for SAR measurements by placing a call from a Rohde & Schwarz CMU 200 or CMW 500 Communications Test Instrument. The power control level was set to command the device to transmit at full power at the specified frequency. Other parameters include: Channel type = full rate, discontinuous transmission off, frequency hopping off. For LTE specific bandwidths, number of resource blocks, and resource block offsets were set. In addition, LTE A-MPR was disabled.
- Software Tool was used to set 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.

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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

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

- Frequency Channel Configuration: 802.11 b/g 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.

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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.

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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.

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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.

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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.

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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 $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.
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.

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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

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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.

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1.8.4 LTE SAR Evaluation Procedures as per KDB 941225 D05 v02r03

Largest channel bandwidth standalone SAR test requirements

QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and *required test channel* combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each *required test channel*. When the *reported* SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and *required test channels* is not required for 1 RB allocation; otherwise, SAR is required for the remaining *required test channels* and only for the RB offset configuration with the highest output power for that channel.8 When the *reported* SAR of a *required test channel* is > 1.45 W/kg, SAR is required for all three RB offset configurations for that *required test channel*.

QPSK with 50% RB allocation

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

QPSK with 100% RB allocation

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

Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply all the above the QPSK to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the *reported* SAR for the QPSK configuration is > 1.45 W/kg.

Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section 1.0 to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the *reported* SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation etc. is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

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Additional information

• MPR has been implemented permanently by the manufacturer as per 3GPP TS36.101
• A-MPR was disabled for all SAR measurements.
• LTE Head SAR was evaluated to cover third-party VoIP applications at full power.
• According to "3GPP TS 36.521-1 V10.0.0 (2011-12)":
  •"The channel numbers that designate carrier frequencies so close to the operating band edges that the carrier extends beyond the operating band edge shall not be used. This implies that the first 7, 15, 25, 50, 75 and 100 channel numbers at the lower operating band edge and the last 6, 14, 24, 49, 74 and 99 channel numbers at the upper operating band edge shall not be used for channel bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz respectively."…

1.8.5 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.

1.8.6 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

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1.8.7 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**.

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

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**.

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

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

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.

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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

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

$U_{i,fast}$ = **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.

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

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

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

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

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.

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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 decimal form, so 0.1135 and 0.1115

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

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

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

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

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 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.

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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

$SAR_{max,\ full}$
$= \mathrm{Max}\left(SAR_{i,max,full}\right)$: 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)

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

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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*

$$\left(\frac{max.power\ of\ channel, including\ tune-up\ tolerance\ (mW)}{min.test\ separation\ distance\ (mm)} \times \sqrt{\frac{f}{(GHz)}}\right) \leq 3.0$$, 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:

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

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.

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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
- LTE band 2 ≈ 3.0 dB
- LTE band 7 ≈ 4.0 dB

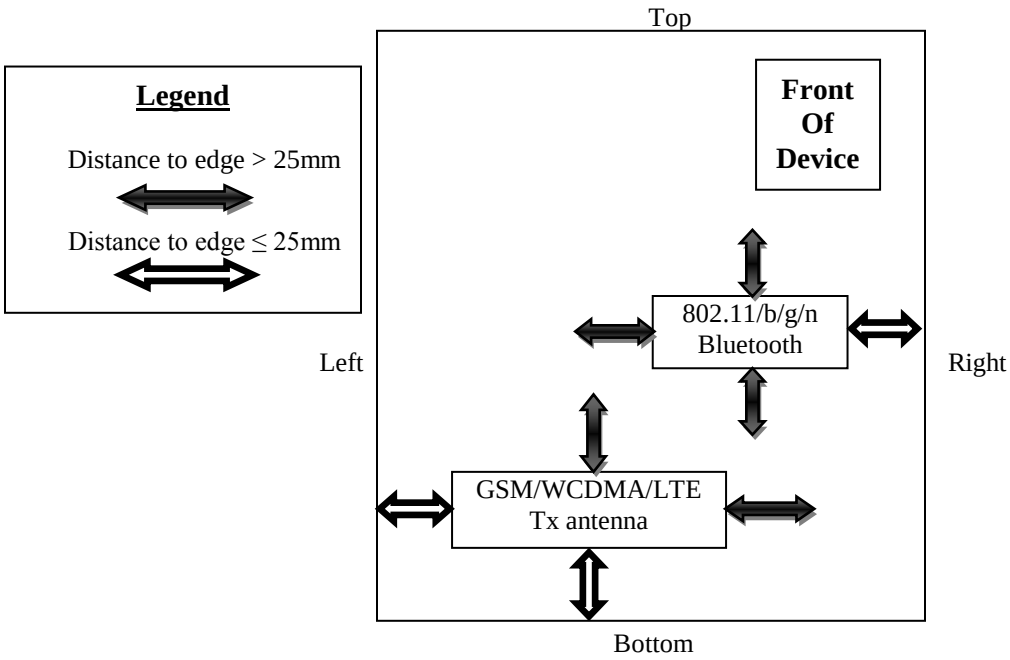

Figure 1.8.4-1 Identification of all sides for SAR Testing

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/IV/V, LTE band 2/4/5/7/17	Yes	Yes	No	Yes	Yes	No
Bluetooth 2.4GHz/802.11b/g/n (2.4 GHz)	Yes	Yes	No	No	No	Yes

Table 1.8.4-1 Identification of all sides for SAR Testing

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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.

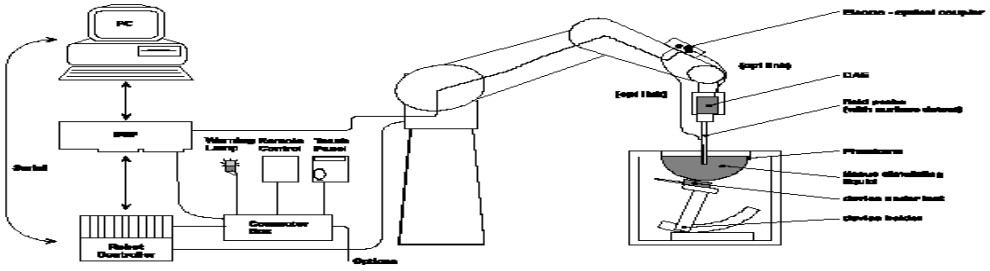

Figure 2.1-1 System Description

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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	3/10/2015
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	11/29/2016
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

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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:

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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.

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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.

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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)
		ℰr	σ [s/m]			
750	2/26/2015	41.41	0.89	21.8	Area Scan/Fast SAR	8.14/5.48
					Zoom Scan/Full SAR	8.14/5.33
	Limits:	41.9	0.89		Dipole: 1021	8.46/5.51
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
1800	2/11/2015	40.37	1.46	21.4	Area Scan/Fast SAR	36.7/19.7
					Zoom Scan/Full SAR	36.2/19.2
	2/17/2015	38.94	1.47	22.0	Area Scan/Fast SAR	36.3/19.6
					Zoom Scan/Full SAR	35.7/19.0
	Limits:	40.0	1.40		Dipole: 2d020	38.5/20.3
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
2600	3/3/2015	39.80	2.02	22.0	Area Scan/Fast SAR	60.6/26.7
					Zoom Scan/Full SAR	58.9/26.2
	Limits:	39.0	1.96		Dipole: 1033	58.6/26.2

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

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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

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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.

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6.1.2 Preparation procedure

800-900 MHz liquids

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

1800-2450 MHz liquid

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

6.2 Electrical parameters of the tissue simulating liquid

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

Band (MHZ)	Tissue Type	Measured Date	F (MHz)	Dielectric Parameters		Liquid Temp. (^{0}C)
				ε r	σ [s/m]	
750	Head	2/26/2015	705	42.04	0.86	21.8
			715	41.88	0.86	
			750	41.41	0.89	
			775	41.04	0.92	
			790	40.83	0.93	
		Limits:	750	41.9	0.89	
	Muscle	2/26/2015	705	54.72	0.91	21.7
			715	54.59	0.92	
			750	54.14	0.95	
			775	53.88	0.98	
			790	53.72	0.99	
		Limits:	750	55.5	0.96	

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Band (MHZ)	Tissue Type	Measured Date	F (MHz)	Dielectric Parameters		Liquid Temp. (^{0}C)
				ℰr	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	
1800	Head	2/11/2015	1710	40.76	1.37	21.4
			1750	40.57	1.41	
			1800	40.37	1.46	
		2/17/2015	1710	39.31	1.38	22.0
			1750	39.18	1.42	
			1800	38.94	1.47	
		Limits:	1800	40.0	1.40	
	Muscle	2/11/2015	1710	51.55	1.48	21.3
			1750	51.47	1.52	
			1800	51.32	1.58	
		2/17/2015	1710	51.86	1.49	21.8
			1750	51.74	1.54	
			1800	51.56	1.6	
		Limits:	1800	53.3	1.52	
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	

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Band (MHZ)	Tissue Type	Measured Date	F (MHz)	Dielectric Parameters		Liquid Temp. (^{0}C)
				ℰr	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	
2600	Head	3/3/2015	2500	40.17	1.91	22.0
			2570	39.88	1.99	
			2600	39.8	2.02	
		Limits:	2600	39.0	1.96	
	Muscle	3/3/2015	2500	51.39	2.07	22.0
			2570	51.16	2.01	
			2600	51.06	2.2	
		Limits:	2600	52.5	2.16	

Table 6.2-1 Electrical parameters of tissue simulating liquid

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6.2.2 Test Configuration

Dielectric Probe Kit

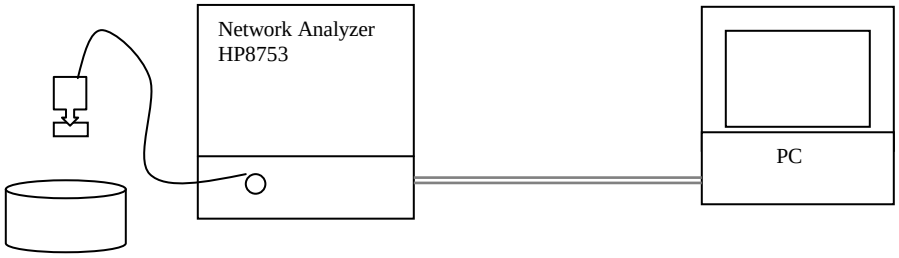

Figure 6.2.2-1 Test configuration

6.2.3 Procedure

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

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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).

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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).

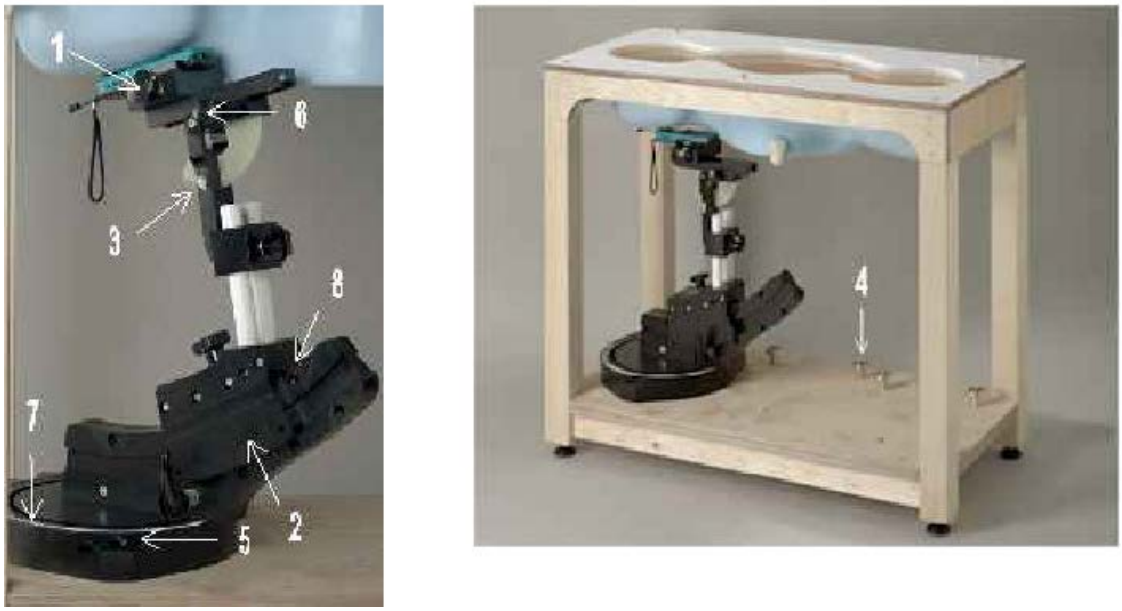

Figure 8.1-1 Device Holder

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).

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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".

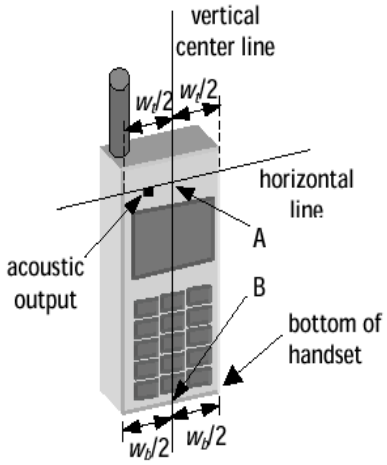

Figure 8.2.1-1 Handset vertical and horizontal reference lines – fixed case

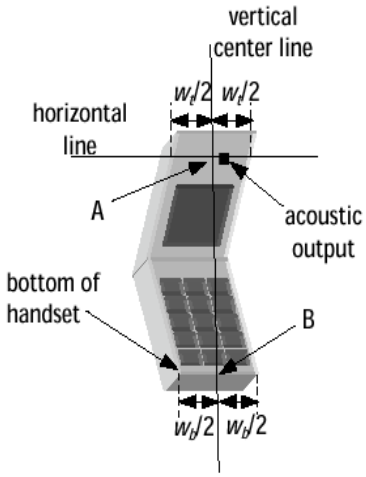

Figure 8.2.1-2 Handset vertical and horizontal reference lines – "clam-shell"

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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).

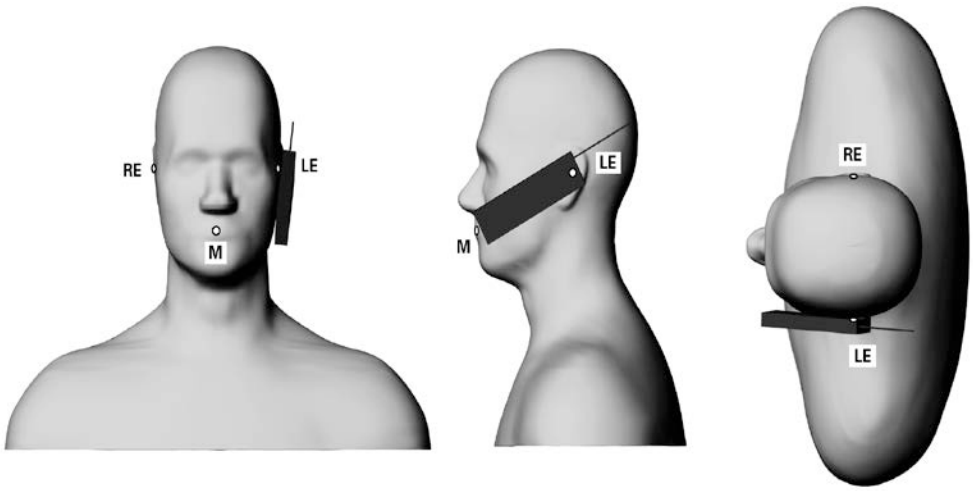

Figure 8.2.1-3 Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

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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**.**

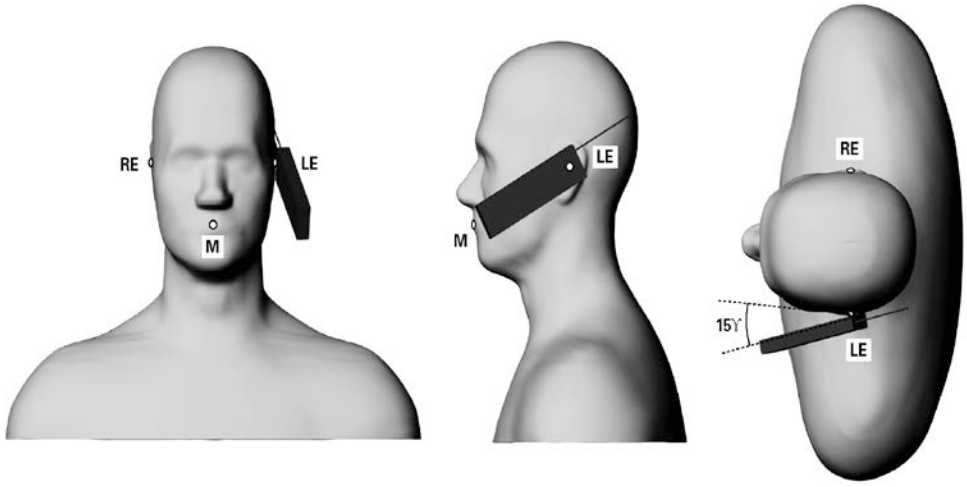

Figure 8.2.1-4 Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

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."

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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.

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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	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Modulation Response[m]	±2.4%	R	√3	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	√3	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±2.0%	R	√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	√3	1	1	±2.9%	±2.9%	∞
Power Scaling[p]	±0%	R	√3	1	1	±0.0%	±0.0%	∞
Phantom and Setup								
Phantom Uncertainty	±6.1%	R	√3	1	1	±3.5%	±3.5%	∞
SAR correction	±1.9%	R	√3	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)[DAK]	±2.5%	R	√3	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.) [DAK]	±2.5%	R	√3	0.26	0.26	±0.3%	±0.4%	∞
Temp. unc. - Conductivity [BB]	±3.4%	R	√3	0.78	0.71	±1.5%	±1.4%	∞
Temp. unc. - Permittivity [BB]	±0.4%	R	√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.

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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.

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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		

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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

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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.”

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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: 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.”

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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 IV (1700)**		
	Freq (MHz)	1712.4	1732.6	1752.6
	Channel	1312	1413	1513
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	23.55	23.44	23.67
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	23.54	23.42	23.65
HSUPA	1	21.82	22.09	22.28
HSUPA	2	21.50	21.52	21.52
HSUPA	3	21.39	21.27	21.44
HSUPA	4	21.95	21.78	21.91
HSUPA	5	22.39	22.22	22.08
HSDPA+	1	22.65	22.55	22.66
HSDPA+	2	22.54	22.49	22.63
HSDPA+	3	22.05	21.97	22.08
HSDPA+	4	22.06	21.92	22.09
DC-HSDPA	1	22.55	22.55	22.08
DC-HSDPA	2	22.56	22.58	22.07
DC-HSDPA	3	22.11	22.12	21.49
DC-HSDPA	4	22.12	22.13	21.48

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	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

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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

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LTE Band 2 With Full Power						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
2	20	QPSK	18700	1	LOW	22.79
2	20	QPSK	18700	1	MID	22.86
2	20	QPSK	18700	1	HIGH	22.81
2	20	QPSK	18700	50	LOW	21.64
2	20	QPSK	18700	50	HIGH	21.62
2	20	QPSK	18700	100	LOW	21.63
2	20	Q16	18700	1	LOW	21.83
2	20	Q16	18700	1	MID	21.92
2	20	Q16	18700	1	HIGH	21.87
2	20	Q16	18700	75	LOW	20.47
2	20	Q16	18700	75	HIGH	20.46
2	20	Q16	18700	100	LOW	20.54
2	20	QPSK	18900	1	LOW	22.85
2	20	QPSK	18900	1	MID	22.59
2	20	QPSK	18900	1	HIGH	22.72
2	20	QPSK	18900	50	LOW	21.46
2	20	QPSK	18900	50	HIGH	21.47
2	20	QPSK	18900	100	LOW	21.60
2	20	Q16	18900	1	LOW	21.82
2	20	Q16	18900	1	MID	21.56
2	20	Q16	18900	1	HIGH	21.71
2	20	Q16	18900	75	LOW	20.39
2	20	Q16	18900	75	HIGH	20.46
2	20	Q16	18900	100	LOW	20.48
2	20	QPSK	19100	1	LOW	22.63
2	20	QPSK	19100	1	MID	22.72
2	20	QPSK	19100	1	HIGH	22.66
2	20	QPSK	19100	50	LOW	21.50
2	20	QPSK	19100	50	HIGH	21.51
2	20	QPSK	19100	100	LOW	21.54
2	20	Q16	19100	1	LOW	22.27
2	20	Q16	19100	1	MID	22.35

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2	20	Q16	19100	1	HIGH	22.31
2	20	Q16	19100	75	LOW	20.56
2	20	Q16	19100	75	HIGH	20.51
2	20	Q16	19100	100	LOW	20.58
2	15	QPSK	18900	1	LOW	22.60
2	15	QPSK	18900	1	MID	22.54
2	15	QPSK	18900	1	HIGH	22.72
2	15	QPSK	18900	36	LOW	21.52
2	15	QPSK	18900	36	HIGH	21.56
2	15	QPSK	18900	75	LOW	21.39
2	15	Q16	18900	1	LOW	21.51
2	15	Q16	18900	1	MID	21.43
2	15	Q16	18900	1	HIGH	21.62
2	15	Q16	18900	16	LOW	21.59
2	15	Q16	18900	16	HIGH	21.67
2	15	Q16	18900	75	LOW	20.40
2	10	QPSK	18900	1	LOW	22.55
2	10	QPSK	18900	1	MID	22.53
2	10	QPSK	18900	1	HIGH	22.70
2	10	QPSK	18900	25	LOW	21.71
2	10	QPSK	18900	25	HIGH	21.62
2	10	QPSK	18900	50	LOW	21.51
2	10	Q16	18900	1	LOW	22.11
2	10	Q16	18900	1	MID	22.07
2	10	Q16	18900	1	HIGH	22.25
2	10	Q16	18900	30	LOW	20.55
2	10	Q16	18900	30	HIGH	20.65
2	10	Q16	18900	50	LOW	20.45
2	5	QPSK	18900	1	LOW	22.70
2	5	QPSK	18900	1	MID	22.53
2	5	QPSK	18900	1	HIGH	22.63
2	5	QPSK	18900	10	LOW	21.77
2	5	QPSK	18900	10	HIGH	21.63
2	5	QPSK	18900	25	LOW	21.57
2	5	Q16	18900	1	LOW	21.40
2	5	Q16	18900	1	MID	21.22
2	5	Q16	18900	1	HIGH	21.38
2	5	Q16	18900	8	LOW	21.86

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2	5	Q16	18900	8	HIGH	21.71
2	5	Q16	18900	25	LOW	20.58
2	3	QPSK	18900	1	LOW	22.68
2	3	QPSK	18900	1	MID	22.47
2	3	QPSK	18900	1	HIGH	22.51
2	3	QPSK	18900	6	LOW	21.66
2	3	QPSK	18900	6	HIGH	21.58
2	3	QPSK	18900	15	LOW	21.61
2	3	Q16	18900	1	LOW	22.27
2	3	Q16	18900	1	MID	22.07
2	3	Q16	18900	1	HIGH	22.11
2	3	Q16	18900	4	LOW	21.90
2	3	Q16	18900	4	HIGH	21.83
2	3	Q16	18900	15	LOW	20.70
2	1.4	QPSK	18900	1	LOW	22.63
2	1.4	QPSK	18900	1	MID	22.52
2	1.4	QPSK	18900	1	HIGH	22.59
2	1.4	QPSK	18900	3	LOW	22.65
2	1.4	QPSK	18900	3	HIGH	22.61
2	1.4	QPSK	18900	6	LOW	21.69
2	1.4	Q16	18900	1	LOW	21.47
2	1.4	Q16	18900	1	MID	21.35
2	1.4	Q16	18900	1	HIGH	21.40
2	1.4	Q16	18900	5	LOW	21.69
2	1.4	Q16	18900	5	HIGH	21.68
2	1.4	Q16	18900	6	LOW	20.63

Table 11.1-3a LTE band 2 conducted power measurements for normal mode

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LTE Band 2 With Reduced Power For Hotspot Mode						
Band	BW (MHz)	Mod.	Channel	RB#	Offset	Max. avg. conducted power (dBm)
2	20	QPSK	18700	1	LOW	19.97
2	20	QPSK	18700	1	MID	19.90
2	20	QPSK	18700	1	HIGH	19.84
2	20	QPSK	18700	50	LOW	19.84
2	20	QPSK	18700	50	HIGH	19.64
2	20	QPSK	18700	100	LOW	19.67
2	20	Q16	18700	1	LOW	19.93
2	20	Q16	18700	1	MID	19.99
2	20	Q16	18700	1	HIGH	19.87
2	20	Q16	18700	75	LOW	19.57
2	20	Q16	18700	75	HIGH	19.64
2	20	Q16	18700	100	LOW	19.62
2	20	QPSK	18900	1	LOW	19.77
2	20	QPSK	18900	1	MID	19.69
2	20	QPSK	18900	1	HIGH	19.77
2	20	QPSK	18900	50	LOW	19.55
2	20	QPSK	18900	50	HIGH	19.62
2	20	QPSK	18900	100	LOW	19.58
2	20	Q16	18900	1	LOW	19.76
2	20	Q16	18900	1	MID	19.63
2	20	Q16	18900	1	HIGH	19.76
2	20	Q16	18900	75	LOW	19.47
2	20	Q16	18900	75	HIGH	19.44
2	20	Q16	18900	100	LOW	19.56
2	20	QPSK	19100	1	LOW	19.57
2	20	QPSK	19100	1	MID	19.71
2	20	QPSK	19100	1	HIGH	19.68
2	20	QPSK	19100	50	LOW	19.63
2	20	QPSK	19100	50	HIGH	19.56
2	20	QPSK	19100	100	LOW	19.60
2	20	Q16	19100	1	LOW	19.72
2	20	Q16	19100	1	MID	19.88

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2	20	Q16	19100	1	HIGH	19.86
2	20	Q16	19100	75	LOW	19.56
2	20	Q16	19100	75	HIGH	19.55
2	20	Q16	19100	100	LOW	19.55
2	15	QPSK	18900	1	LOW	19.63
2	15	QPSK	18900	1	MID	19.56
2	15	QPSK	18900	1	HIGH	19.65
2	15	QPSK	18900	36	LOW	19.60
2	15	QPSK	18900	36	HIGH	19.58
2	15	QPSK	18900	75	LOW	19.51
2	15	Q16	18900	1	LOW	19.50
2	15	Q16	18900	1	MID	19.42
2	15	Q16	18900	1	HIGH	19.57
2	15	Q16	18900	16	LOW	19.59
2	15	Q16	18900	16	HIGH	19.69
2	15	Q16	18900	75	LOW	19.43
2	10	QPSK	18900	1	LOW	19.52
2	10	QPSK	18900	1	MID	19.54
2	10	QPSK	18900	1	HIGH	19.68
2	10	QPSK	18900	25	LOW	19.69
2	10	QPSK	18900	25	HIGH	19.62
2	10	QPSK	18900	50	LOW	19.53
2	10	Q16	18900	1	LOW	20.06
2	10	Q16	18900	1	MID	20.05
2	10	Q16	18900	1	HIGH	20.23
2	10	Q16	18900	30	LOW	19.61
2	10	Q16	18900	30	HIGH	19.65
2	10	Q16	18900	50	LOW	19.48
2	5	QPSK	18900	1	LOW	19.77
2	5	QPSK	18900	1	MID	19.56
2	5	QPSK	18900	1	HIGH	19.65
2	5	QPSK	18900	10	LOW	19.81
2	5	QPSK	18900	10	HIGH	19.61
2	5	QPSK	18900	25	LOW	19.55
2	5	Q16	18900	1	LOW	19.37
2	5	Q16	18900	1	MID	19.20
2	5	Q16	18900	1	HIGH	19.34
2	5	Q16	18900	8	LOW	19.80

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2	5	Q16	18900	8	HIGH	19.67
2	5	Q16	18900	25	LOW	19.58
2	3	QPSK	18900	1	LOW	19.73
2	3	QPSK	18900	1	MID	19.56
2	3	QPSK	18900	1	HIGH	19.55
2	3	QPSK	18900	6	LOW	19.72
2	3	QPSK	18900	6	HIGH	19.64
2	3	QPSK	18900	15	LOW	19.66
2	3	Q16	18900	1	LOW	20.18
2	3	Q16	18900	1	MID	20.09
2	3	Q16	18900	1	HIGH	20.11
2	3	Q16	18900	4	LOW	19.85
2	3	Q16	18900	4	HIGH	19.80
2	3	Q16	18900	15	LOW	19.71
2	1.4	QPSK	18900	1	LOW	19.70
2	1.4	QPSK	18900	1	MID	19.61
2	1.4	QPSK	18900	1	HIGH	19.57
2	1.4	QPSK	18900	3	LOW	19.71
2	1.4	QPSK	18900	3	HIGH	19.62
2	1.4	QPSK	18900	6	LOW	19.67
2	1.4	Q16	18900	1	LOW	19.47
2	1.4	Q16	18900	1	MID	19.35
2	1.4	Q16	18900	1	HIGH	19.41
2	1.4	Q16	18900	5	LOW	19.70
2	1.4	Q16	18900	5	HIGH	19.69
2	1.4	Q16	18900	6	LOW	19.62

Table 11.1-3b LTE band 2 conducted power measurements for Hotspot mode

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LTE Band 4 With Full Power						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
4	20	QPSK	20050	1	LOW	22.73
4	20	QPSK	20050	1	MID	22.75
4	20	QPSK	20050	1	HIGH	22.81
4	20	QPSK	20050	50	LOW	21.58
4	20	QPSK	20050	50	HIGH	21.60
4	20	QPSK	20050	100	LOW	21.60
4	20	Q16	20050	1	LOW	21.82
4	20	Q16	20050	1	MID	21.83
4	20	Q16	20050	1	HIGH	21.87
4	20	Q16	20050	75	LOW	20.51
4	20	Q16	20050	75	HIGH	20.60
4	20	Q16	20050	100	LOW	20.60
4	20	QPSK	20175	1	LOW	22.75
4	20	QPSK	20175	1	MID	22.77
4	20	QPSK	20175	1	HIGH	22.95
4	20	QPSK	20175	50	LOW	21.55
4	20	QPSK	20175	50	HIGH	21.66
4	20	QPSK	20175	100	LOW	21.57
4	20	Q16	20175	1	LOW	21.77
4	20	Q16	20175	1	MID	21.79
4	20	Q16	20175	1	HIGH	21.92
4	20	Q16	20175	75	LOW	20.50
4	20	Q16	20175	75	HIGH	20.60
4	20	Q16	20175	100	LOW	20.59
4	20	QPSK	20300	1	LOW	22.73
4	20	QPSK	20300	1	MID	22.81
4	20	QPSK	20300	1	HIGH	22.96
4	20	QPSK	20300	50	LOW	21.65
4	20	QPSK	20300	50	HIGH	21.67
4	20	QPSK	20300	100	LOW	21.66
4	20	Q16	20300	1	LOW	22.44
4	20	Q16	20300	1	MID	22.41

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4	20	Q16	20300	1	HIGH	22.50
4	20	Q16	20300	75	LOW	20.61
4	20	Q16	20300	75	HIGH	20.68
4	20	Q16	20300	100	LOW	20.73
4	15	QPSK	20175	1	LOW	22.72
4	15	QPSK	20175	1	MID	22.75
4	15	QPSK	20175	1	HIGH	22.79
4	15	QPSK	20175	36	LOW	21.57
4	15	QPSK	20175	36	HIGH	21.66
4	15	QPSK	20175	75	LOW	21.59
4	15	Q16	20175	1	LOW	21.69
4	15	Q16	20175	1	MID	21.69
4	15	Q16	20175	1	HIGH	21.75
4	15	Q16	20175	16	LOW	21.78
4	15	Q16	20175	16	HIGH	21.87
4	15	Q16	20175	75	LOW	20.59
4	10	QPSK	20175	1	LOW	22.65
4	10	QPSK	20175	1	MID	22.71
4	10	QPSK	20175	1	HIGH	22.77
4	10	QPSK	20175	25	LOW	21.59
4	10	QPSK	20175	25	HIGH	21.67
4	10	QPSK	20175	50	LOW	21.56
4	10	Q16	20175	1	LOW	22.21
4	10	Q16	20175	1	MID	22.28
4	10	Q16	20175	1	HIGH	22.32
4	10	Q16	20175	30	LOW	20.63
4	10	Q16	20175	30	HIGH	20.69
4	10	Q16	20175	50	LOW	20.58
4	5	QPSK	20175	1	LOW	22.66
4	5	QPSK	20175	1	MID	22.72
4	5	QPSK	20175	1	HIGH	22.82
4	5	QPSK	20175	10	LOW	21.73
4	5	QPSK	20175	10	HIGH	21.75
4	5	QPSK	20175	25	LOW	21.62
4	5	Q16	20175	1	LOW	21.38
4	5	Q16	20175	1	MID	21.42
4	5	Q16	20175	1	HIGH	21.51
4	5	Q16	20175	8	LOW	21.83

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4	5	Q16	20175	8	HIGH	21.84
4	5	Q16	20175	25	LOW	20.69
4	3	QPSK	20175	1	LOW	22.68
4	3	QPSK	20175	1	MID	22.72
4	3	QPSK	20175	1	HIGH	22.71
4	3	QPSK	20175	6	LOW	21.78
4	3	QPSK	20175	6	HIGH	21.78
4	3	QPSK	20175	15	LOW	21.67
4	3	Q16	20175	1	LOW	22.26
4	3	Q16	20175	1	MID	22.25
4	3	Q16	20175	1	HIGH	22.25
4	3	Q16	20175	4	LOW	21.93
4	3	Q16	20175	4	HIGH	21.97
4	3	Q16	20175	15	LOW	20.80
4	1.4	QPSK	20175	1	LOW	22.68
4	1.4	QPSK	20175	1	MID	22.72
4	1.4	QPSK	20175	1	HIGH	22.73
4	1.4	QPSK	20175	3	LOW	22.76
4	1.4	QPSK	20175	3	HIGH	22.76
4	1.4	QPSK	20175	6	LOW	21.77
4	1.4	Q16	20175	1	LOW	21.52
4	1.4	Q16	20175	1	MID	21.56
4	1.4	Q16	20175	1	HIGH	21.56
4	1.4	Q16	20175	5	LOW	21.80
4	1.4	Q16	20175	5	HIGH	21.77
4	1.4	Q16	20175	6	LOW	20.74

Table 11.1-4 LTE band 4 conducted power measurements

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LTE Band 5 With Full Power						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
5	10	QPSK	20450	1	LOW	22.90
5	10	QPSK	20450	1	MID	22.98
5	10	QPSK	20450	1	HIGH	23.01
5	10	QPSK	20450	25	LOW	21.94
5	10	QPSK	20450	25	HIGH	21.92
5	10	QPSK	20450	50	LOW	21.87
5	10	Q16	20450	1	LOW	21.81
5	10	Q16	20450	1	MID	21.86
5	10	Q16	20450	1	HIGH	21.96
5	10	Q16	20450	30	LOW	20.97
5	10	Q16	20450	30	HIGH	20.99
5	10	Q16	20450	50	LOW	20.88
5	10	QPSK	20525	1	LOW	23.02
5	10	QPSK	20525	1	MID	23.00
5	10	QPSK	20525	1	HIGH	22.88
5	10	QPSK	20525	25	LOW	21.99
5	10	QPSK	20525	25	HIGH	21.92
5	10	QPSK	20525	50	LOW	21.81
5	10	Q16	20525	1	LOW	21.65
5	10	Q16	20525	1	MID	21.59
5	10	Q16	20525	1	HIGH	21.58
5	10	Q16	20525	30	LOW	20.95
5	10	Q16	20525	30	HIGH	20.85
5	10	Q16	20525	50	LOW	20.82
5	10	QPSK	20600	1	LOW	22.84
5	10	QPSK	20600	1	MID	22.90
5	10	QPSK	20600	1	HIGH	23.20
5	10	QPSK	20600	25	LOW	21.95
5	10	QPSK	20600	25	HIGH	21.96
5	10	QPSK	20600	50	LOW	21.85
5	10	Q16	20600	1	LOW	22.41
5	10	Q16	20600	1	MID	22.48
5	10	Q16	20600	1	HIGH	22.72
5	10	Q16	20600	30	LOW	20.87
5	10	Q16	20600	30	HIGH	20.90
5	10	Q16	20600	50	LOW	20.82

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5	5	QPSK	20525	1	LOW	23.04
5	5	QPSK	20525	1	MID	22.98
5	5	QPSK	20525	1	HIGH	23.01
5	5	QPSK	20525	10	LOW	22.05
5	5	QPSK	20525	10	HIGH	21.99
5	5	QPSK	20525	25	LOW	21.88
5	5	Q16	20525	1	LOW	22.35
5	5	Q16	20525	1	MID	22.29
5	5	Q16	20525	1	HIGH	22.30
5	5	Q16	20525	8	LOW	22.04
5	5	Q16	20525	8	HIGH	21.97
5	5	Q16	20525	25	LOW	20.82
5	3	QPSK	20525	1	LOW	22.93
5	3	QPSK	20525	1	MID	22.90
5	3	QPSK	20525	1	HIGH	22.86
5	3	QPSK	20525	6	LOW	22.10
5	3	QPSK	20525	6	HIGH	21.95
5	3	QPSK	20525	15	LOW	21.98
5	3	Q16	20525	1	LOW	22.52
5	3	Q16	20525	1	MID	22.48
5	3	Q16	20525	1	HIGH	22.43
5	3	Q16	20525	4	LOW	22.19
5	3	Q16	20525	4	HIGH	22.09
5	3	Q16	20525	15	LOW	21.05
5	1.4	QPSK	20525	1	LOW	22.96
5	1.4	QPSK	20525	1	MID	22.90
5	1.4	QPSK	20525	1	HIGH	22.91
5	1.4	QPSK	20525	3	LOW	23.01
5	1.4	QPSK	20525	3	HIGH	22.94
5	1.4	QPSK	20525	6	LOW	22.10
5	1.4	Q16	20525	1	LOW	21.76
5	1.4	Q16	20525	1	MID	21.72
5	1.4	Q16	20525	1	HIGH	21.72
5	1.4	Q16	20525	5	LOW	22.06
5	1.4	Q16	20525	5	HIGH	22.06
5	1.4	Q16	20525	6	LOW	21.03

Table 11.1-5 LTE band 5 conducted power measurements

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LTE Band 7 With Full Power For Rev 3 Measured On Model RHD131LW						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
7	20	QPSK	20850	1	LOW	24.11
7	20	QPSK	20850	1	MID	24.27
7	20	QPSK	20850	1	HIGH	24.21
7	20	QPSK	20850	50	LOW	22.79
7	20	QPSK	20850	50	HIGH	22.94
7	20	QPSK	20850	100	LOW	22.89
7	20	Q16	20850	1	LOW	23.04
7	20	Q16	20850	1	MID	23.20
7	20	Q16	20850	1	HIGH	23.13
7	20	Q16	20850	75	LOW	21.84
7	20	Q16	20850	75	HIGH	21.88
7	20	Q16	20850	100	LOW	21.91
7	20	QPSK	21100	1	LOW	23.94
7	20	QPSK	21100	1	MID	23.57
7	20	QPSK	21100	1	HIGH	23.07
7	20	QPSK	21100	50	LOW	22.57
7	20	QPSK	21100	50	HIGH	22.00
7	20	QPSK	21100	100	LOW	22.32
7	20	Q16	21100	1	LOW	23.52
7	20	Q16	21100	1	MID	23.14
7	20	Q16	21100	1	HIGH	22.78
7	20	Q16	21100	75	LOW	21.32
7	20	Q16	21100	75	HIGH	21.06
7	20	Q16	21100	100	LOW	21.31
7	20	QPSK	21350	1	LOW	22.87
7	20	QPSK	21350	1	MID	23.11
7	20	QPSK	21350	1	HIGH	23.24
7	20	QPSK	21350	50	LOW	21.68
7	20	QPSK	21350	50	HIGH	22.01
7	20	QPSK	21350	100	LOW	21.88
7	20	Q16	21350	1	LOW	21.95
7	20	Q16	21350	1	MID	22.18
7	20	Q16	21350	1	HIGH	22.33
7	20	Q16	21350	75	LOW	20.72
7	20	Q16	21350	75	HIGH	20.83
7	20	Q16	21350	100	LOW	20.90

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7	15	QPSK	21100	1	LOW	23.90
7	15	QPSK	21100	1	MID	23.56
7	15	QPSK	21100	1	HIGH	23.13
7	15	QPSK	21100	36	LOW	22.60
7	15	QPSK	21100	36	HIGH	22.09
7	15	QPSK	21100	75	LOW	22.31
7	15	Q16	21100	1	LOW	22.84
7	15	Q16	21100	1	MID	22.42
7	15	Q16	21100	1	HIGH	22.03
7	15	Q16	21100	16	LOW	22.76
7	15	Q16	21100	16	HIGH	22.17
7	15	Q16	21100	75	LOW	21.24
7	10	QPSK	21100	1	LOW	23.90
7	10	QPSK	21100	1	MID	23.59
7	10	QPSK	21100	1	HIGH	23.14
7	10	QPSK	21100	25	LOW	22.56
7	10	QPSK	21100	25	HIGH	22.21
7	10	QPSK	21100	50	LOW	22.31
7	10	Q16	21100	1	LOW	23.27
7	10	Q16	21100	1	MID	23.02
7	10	Q16	21100	1	HIGH	22.66
7	10	Q16	21100	30	LOW	21.52
7	10	Q16	21100	30	HIGH	21.29
7	10	Q16	21100	50	LOW	21.35
7	5	QPSK	21100	1	LOW	23.78
7	5	QPSK	21100	1	MID	23.56
7	5	QPSK	21100	1	HIGH	23.38
7	5	QPSK	21100	10	LOW	22.57
7	5	QPSK	21100	10	HIGH	22.43
7	5	QPSK	21100	25	LOW	22.39
7	5	Q16	21100	1	LOW	22.34
7	5	Q16	21100	1	MID	22.18
7	5	Q16	21100	1	HIGH	22.05
7	5	Q16	21100	8	LOW	22.65
7	5	Q16	21100	8	HIGH	22.52
7	5	Q16	21100	25	LOW	21.47

Table 11.1-6a LTE band 7 conducted power measurements for normal mode on model RHD131LW Rev 3

Note 1: According to the hardware similarity document BlackBerry models RHC161LW and RHD131LW share the same conducted RF circuitry and power level. Due to this conducted power for normal mode was measured using RHD131LW and reused for RHC161LW.

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Note 2: Since power is lower by approximately 1 dB for Rev 4, SAR testing was fully completed using Rev 3 devices and only partial testing was done on Rev 4 for comparison.

Note 3: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

LTE Band 7 With Final Full Power For Rev 4 Measured On Model RHD131LW						
Band	**BW (MHz)**	**Mod.**	**Channel**	**RB**	**Offset**	**Max. avg. conducted power (dBm)**
7	20	QPSK	20850	1	LOW	23.00
7	20	QPSK	20850	1	MID	23.01
7	20	QPSK	20850	1	HIGH	23.00
7	20	QPSK	20850	50	LOW	21.63
7	20	QPSK	20850	50	HIGH	21.73
7	20	QPSK	20850	100	LOW	21.70
7	20	Q16	20850	1	LOW	21.94
7	20	Q16	20850	1	MID	22.00
7	20	Q16	20850	1	HIGH	22.06
7	20	Q16	20850	75	LOW	20.58
7	20	Q16	20850	75	HIGH	20.63
7	20	Q16	20850	100	LOW	20.70
7	20	QPSK	21100	1	LOW	22.65
7	20	QPSK	21100	1	MID	22.58
7	20	QPSK	21100	1	HIGH	22.72
7	20	QPSK	21100	50	LOW	21.45
7	20	QPSK	21100	50	HIGH	21.42
7	20	QPSK	21100	100	LOW	21.46
7	20	Q16	21100	1	LOW	22.35
7	20	Q16	21100	1	MID	22.21
7	20	Q16	21100	1	HIGH	22.42
7	20	Q16	21100	75	LOW	20.41
7	20	Q16	21100	75	HIGH	20.32
7	20	Q16	21100	100	LOW	20.39
7	20	QPSK	21350	1	LOW	22.68
7	20	QPSK	21350	1	MID	22.81

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7	20	QPSK	21350	1	HIGH	22.60
7	20	QPSK	21350	50	LOW	21.61
7	20	QPSK	21350	50	HIGH	21.52
7	20	QPSK	21350	100	LOW	21.67
7	20	Q16	21350	1	LOW	21.85
7	20	Q16	21350	1	MID	21.90
7	20	Q16	21350	1	HIGH	21.65
7	20	Q16	21350	75	LOW	20.61
7	20	Q16	21350	75	HIGH	20.48
7	20	Q16	21350	100	LOW	20.48

Table 11.1-6b LTE band 7 conducted power measurements for normal mode on model RHD131LW Rev 4

Note 1: According to the hardware similarity document BlackBerry models RHC161LW and RHD131LW share the same conducted RF circuitry and power level. Due to this conducted power for normal mode was measured using RHD131LW and reused for RHC161LW.

Note 2: Since power is lower by approximately 1 dB for Rev 4, SAR testing was fully completed using Rev 3 devices and only partial testing was done on Rev 4 for comparison.

Note 3: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

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LTE Band 7 With Reduced Power For Hotspot Mode Measured On Model RHC161LW						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
7	20	QPSK	20850	1	LOW	20.50
7	20	QPSK	20850	1	MID	20.23
7	20	QPSK	20850	1	HIGH	20.18
7	20	QPSK	20850	50	LOW	20.00
7	20	QPSK	20850	50	HIGH	19.98
7	20	QPSK	20850	100	LOW	19.98
7	20	Q16	20850	1	LOW	20.54
7	20	Q16	20850	1	MID	20.29
7	20	Q16	20850	1	HIGH	20.29
7	20	Q16	20850	75	LOW	20.10
7	20	Q16	20850	75	HIGH	20.00
7	20	Q16	20850	100	LOW	20.03
7	20	QPSK	21100	1	LOW	19.80
7	20	QPSK	21100	1	MID	19.80
7	20	QPSK	21100	1	HIGH	19.91
7	20	QPSK	21100	50	LOW	19.78
7	20	QPSK	21100	50	HIGH	19.67
7	20	QPSK	21100	100	LOW	19.70
7	20	Q16	21100	1	LOW	19.78
7	20	Q16	21100	1	MID	19.81
7	20	Q16	21100	1	HIGH	19.97
7	20	Q16	21100	75	LOW	19.57
7	20	Q16	21100	75	HIGH	19.61
7	20	Q16	21100	100	LOW	19.62
7	20	QPSK	21350	1	LOW	20.10
7	20	QPSK	21350	1	MID	20.00
7	20	QPSK	21350	1	HIGH	20.03
7	20	QPSK	21350	50	LOW	19.75
7	20	QPSK	21350	50	HIGH	19.65
7	20	QPSK	21350	100	LOW	19.67
7	20	Q16	21350	1	LOW	20.60

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7	20	Q16	21350	1	MID	20.50
7	20	Q16	21350	1	HIGH	20.52
7	20	Q16	21350	75	LOW	19.74
7	20	Q16	21350	75	HIGH	19.68
7	20	Q16	21350	100	LOW	19.64

Table 11.1-6c LTE band 7 conducted power measurements for Hotspot mode on model RHC161LW

Note: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

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LTE Band 13 With Full Power						
Band	BW (MHz)	Mod.	Channel	RB#	Offset	Max. avg. conducted power (dBm)
13	10	QPSK	23230	1	LOW	23.08
13	10	QPSK	23230	1	MID	22.94
13	10	QPSK	23230	1	HIGH	22.91
13	10	QPSK	23230	25	LOW	21.94
13	10	QPSK	23230	25	HIGH	21.88
13	10	QPSK	23230	50	LOW	21.85
13	10	Q16	23230	1	LOW	22.64
13	10	Q16	23230	1	MID	22.49
13	10	Q16	23230	1	HIGH	22.52
13	10	Q16	23230	30	LOW	20.95
13	10	Q16	23230	30	HIGH	20.89
13	10	Q16	23230	50	LOW	20.83
13	10	QPSK	23230	1	LOW	23.05
13	10	QPSK	23230	1	MID	22.88
13	10	QPSK	23230	1	HIGH	22.88
13	10	QPSK	23230	25	LOW	21.92
13	10	QPSK	23230	25	HIGH	21.85
13	10	QPSK	23230	50	LOW	21.86
13	10	Q16	23230	1	LOW	22.62
13	10	Q16	23230	1	MID	22.47
13	10	Q16	23230	1	HIGH	22.49
13	10	Q16	23230	30	LOW	20.86
13	10	Q16	23230	30	HIGH	20.85
13	10	Q16	23230	50	LOW	20.81
13	10	QPSK	23230	1	LOW	23.02
13	10	QPSK	23230	1	MID	22.81
13	10	QPSK	23230	1	HIGH	22.86
13	10	QPSK	23230	25	LOW	21.91
13	10	QPSK	23230	25	HIGH	21.87
13	10	QPSK	23230	50	LOW	21.79
13	10	Q16	23230	1	LOW	22.60
13	10	Q16	23230	1	MID	22.42
13	10	Q16	23230	1	HIGH	22.46
13	10	Q16	23230	30	LOW	20.85
13	10	Q16	23230	30	HIGH	20.88
13	10	Q16	23230	50	LOW	20.76

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13	5	QPSK	23200	1	LOW	22.99
13	5	QPSK	23200	1	MID	23.13
13	5	QPSK	23200	1	HIGH	23.08
13	5	QPSK	23200	10	LOW	21.99
13	5	QPSK	23200	10	HIGH	22.02
13	5	QPSK	23200	25	LOW	21.89
13	5	Q16	23200	1	LOW	22.26
13	5	Q16	23200	1	MID	22.44
13	5	Q16	23200	1	HIGH	22.44
13	5	Q16	23200	8	LOW	22.06
13	5	Q16	23200	8	HIGH	22.00
13	5	Q16	23200	25	LOW	20.87
13	5	QPSK	23230	1	LOW	23.02
13	5	QPSK	23230	1	MID	22.84
13	5	QPSK	23230	1	HIGH	22.99
13	5	QPSK	23230	10	LOW	21.96
13	5	QPSK	23230	10	HIGH	21.95
13	5	QPSK	23230	25	LOW	21.84
13	5	Q16	23230	1	LOW	21.94
13	5	Q16	23230	1	MID	21.72
13	5	Q16	23230	1	HIGH	21.92
13	5	Q16	23230	8	LOW	21.91
13	5	Q16	23230	8	HIGH	21.93
13	5	Q16	23230	25	LOW	20.77
13	5	QPSK	23260	1	LOW	22.97
13	5	QPSK	23260	1	MID	22.87
13	5	QPSK	23260	1	HIGH	22.67
13	5	QPSK	23260	10	LOW	21.92
13	5	QPSK	23260	10	HIGH	21.37
13	5	QPSK	23260	25	LOW	21.68
13	5	Q16	23260	1	LOW	21.55
13	5	Q16	23260	1	MID	21.50
13	5	Q16	23260	1	HIGH	21.44
13	5	Q16	23260	8	LOW	22.04
13	5	Q16	23260	8	HIGH	21.49
13	5	Q16	23260	25	LOW	20.74

Table 11.1-8 LTE band 13 conducted power measurements

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LTE Band 17 With Full Power						
Band	BW (Mhz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
17	10	QPSK	23780	1	LOW	23.04
17	10	QPSK	23780	1	MID	23.10
17	10	QPSK	23780	1	HIGH	23.19
17	10	QPSK	23780	25	LOW	22.11
17	10	QPSK	23780	25	HIGH	22.11
17	10	QPSK	23780	50	LOW	21.99
17	10	Q16	23780	1	LOW	21.98
17	10	Q16	23780	1	MID	22.06
17	10	Q16	23780	1	HIGH	22.15
17	10	Q16	23780	30	LOW	21.05
17	10	Q16	23780	30	HIGH	21.02
17	10	Q16	23780	50	LOW	20.91
17	10	QPSK	23790	1	LOW	23.01
17	10	QPSK	23790	1	MID	22.99
17	10	QPSK	23790	1	HIGH	23.27
17	10	QPSK	23790	25	LOW	21.99
17	10	QPSK	23790	25	HIGH	21.96
17	10	QPSK	23790	50	LOW	21.93
17	10	Q16	23790	1	LOW	21.76
17	10	Q16	23790	1	MID	21.67
17	10	Q16	23790	1	HIGH	21.96
17	10	Q16	23790	30	LOW	21.00
17	10	Q16	23790	30	HIGH	21.03
17	10	Q16	23790	50	LOW	20.87
17	10	QPSK	23800	1	LOW	22.94
17	10	QPSK	23800	1	MID	22.91
17	10	QPSK	23800	1	HIGH	23.10
17	10	QPSK	23800	25	LOW	21.96
17	10	QPSK	23800	25	HIGH	22.09
17	10	QPSK	23800	50	LOW	21.84
17	10	Q16	23800	1	LOW	22.51
17	10	Q16	23800	1	MID	22.51
17	10	Q16	23800	1	HIGH	22.63

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17	10	Q16	23800	30	LOW	20.96
17	10	Q16	23800	30	HIGH	20.95
17	10	Q16	23800	50	LOW	20.84
17	5	QPSK	23790	1	LOW	22.89
17	5	QPSK	23790	1	MID	23.05
17	5	QPSK	23790	1	HIGH	23.14
17	5	QPSK	23790	10	LOW	21.99
17	5	QPSK	23790	10	HIGH	22.12
17	5	QPSK	23790	25	LOW	22.03
17	5	Q16	23790	1	LOW	22.16
17	5	Q16	23790	1	MID	22.34
17	5	Q16	23790	1	HIGH	22.41
17	5	Q16	23790	8	LOW	22.05
17	5	Q16	23790	8	HIGH	22.08
17	5	Q16	23790	25	LOW	20.90

Table 11.1-9 LTE band 17 conducted power measurements

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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 11.1-10 Bluetooth conducted power measurements

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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 11.1-11a 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.

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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 11.1-11b 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.

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11.2 SAR measurement results at highest power measured against the head

Measured/Extrapolated SAR Values - Head - LTE Band 17 700 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	23780	709.0	49	23.5	23.19					
				23790	710.0	49	23.5	23.27	-0.19	0.183		0.193	
				23800	711.0	49	23.5	23.10					
			25	23780	709.0	25	22.5	22.11					
				23790	710.0	0	22.5	21.99					
				23800	711.0	25	22.5	22.09					
			50	23780	709.0	0	22.5	21.99					
Right 15° Tilt	QPSK	10.0	1	23780	709.0								
				23790	710.0	49	23.5	23.27	-0.03	0.120		0.127	
				23800	711.0								
Left Cheek	QPSK	10.0	1	23780	709.0	49	23.5	23.19	0.12	0.205	0.207	0.220	0.222
				23790	710.0	49	23.5	23.27	-0.14	0.199		0.210	
				23800	711.0	49	23.5	23.10	0.15	0.178		0.195	
			25	23780	709.0	25	22.5	22.11	0.05	0.143		0.156	
				23790	710.0	0	22.5	21.99					
				23800	711.0	25	22.5	22.09					
			50	23780	709.0	0	22.5	21.99					
Left 15° Tilt	QPSK	10.0	1	23780	709.0								
				23790	710.0	49	23.5	23.27	-0.12	0.132		0.139	
				23800	711.0								

Threshold 1 For This Band:	0.368	
Max FAST SAR For Band:	0.481	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.466	
Additional Full SAR Required:		NO

Table 11.2-1 SAR testing results for LTE Band 17 (10MHz BW) head configuration

Note 1: If the power drift is ≤ – 0.200 dB, the extrapolated SAR is calculated using the formula:

Extrapolated SAR = (Measured SAR) * 10^(|Power Drift (dB)| / 10)

Note 2: Only Middle channel was tested when 1g 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.

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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 LTE it is only required to test the configuration (channel and offset) yielding the highest conducted power for RB 1 and RB 50% when combined 1g avg. SAR < 0.8 W/Kg or 3dB lower than the limit for both cases. Also, when the highest conducted power for RB 1 and RB 50% are both greater than RB 100%, then SAR testing for RB 100% can be excluded.
Note 5b: For LTE if 1g avg. SAR > 0.8 W/Kg or not at least 3dB lower than the limit, than the remaining channels for that RB number must be tested and one additional scan must be done with RB 100%. For all additional scans the highest conducted power configuration (channel and offset) must be used.
Note 5c: For LTE if SAR ≤ 1.45, then SAR tests for the smaller bandwidths are not required
Note 5d: For LTE the lower bandwidths are only tested on the cases where the conducted power is 0.5 dB greater than those found on the highest bandwidth or when the reported 1g SAR > 1.45 for the highest bandwidth.
Note 5e: For LTE 16 QAM is only tested on the cases where its conducted power is 0.5 dB greater than QPSK or when the reported 1g SAR > 1.45 for QPSK.
Note 6a: 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 6b: 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 6c: Both thresholds are calculated using the measured SAR to avoid the thresholds changing should target power be changed throughout the testing period.

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Measured/Extrapolated SAR Values - Head - LTE Band 13 750 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	0.33	0.373		0.411	
				23279	786.9								
			25	23180	777.0								
				23230	782.0								
				23279	786.9								
			50										
Right 15° Tilt	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	-0.02	0.296		0.326	
				23279	786.9								
Left Cheek	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	-0.01	0.526	0.529	0.579	0.583
				23279	786.9								
			25	23180	777.0								
				23230	782.0	0	22.5	21.94	-0.12	0.373		0.424	
				23279	786.9								
			50										
Left 15° Tilt	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	-0.09	0.257		0.283	
				23279	786.9								

Threshold 1 For This Band:	0.518	
Max FAST SAR For Band:	0.677	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.655	
Additional Full SAR Required:		NO

Table 11.2-2 SAR testing results for LTE Band 13 (10MHz BW) head configuration

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Measured/Extrapolated SAR Values - Head - LTE Band 5 850 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	20450	829.0	49	24	23.01	-0.01	0.373		0.468	
				20525	836.5	0	24	23.02	-0.05	0.267		0.335	
				20600	844.0	49	24	23.20	-0.03	0.369		0.444	
			25	20450	829.0	0	22.5	21.94					
				20525	836.5	0	22.5	21.99	-0.08	0.261		0.294	
				20600	844.0	25	22.5	21.96					
			50	20450	829.0	0	23	21.87					
Right 15° Tilt	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0	49	24	23.20	-0.06	0.186		0.224	
Left Cheek	QPSK	10.0	1	20450	829.0	49	24	23.01	-0.12	0.375	0.381	0.471	0.479
				20525	836.5	0	24	23.02	-0.02	0.258		0.323	
				20600	844.0	49	24	23.20	0.03	0.366		0.440	
			25	20450	829.0	0	22.5	21.94					
				20525	836.5	0	22.5	21.99	0.08	0.260		0.292	
				20600	844.0	25	22.5	21.96					
			50	20450	829.0	0	23	21.87					
Left 15° Tilt	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0	49	24	23.20	0.01	0.190		0.228	

Threshold 1 For This Band:	0.593	
Max FAST SAR For Band:	0.774	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.763	
Additional Full SAR Required:		NO

Table 11.2-3 SAR testing results for LTE Band 5 (10MHz BW) head configuration

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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 11.2-4 SAR testing results for GSM/EDGE/DTM 850 head configuration

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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 11.2-5 SAR testing results for WCDMA FDD V head configuration

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Measured/Extrapolated SAR Values - Head - LTE Band 4 1800 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	20050	1720.0	99	24	22.81					
				20175	1732.5	99	24	22.95					
				20300	1745.0	99	24	22.96	-0.07	0.519		0.659	
			50	20050	1720.0	50	23	21.60					
				20175	1732.5	50	23	21.66					
				20300	1745.0	50	23	21.67	-0.07	0.361		0.490	
			100	20300	1745.0	0	23	21.66					
Right 15° Tilt	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	24	22.96	0.10	0.338		0.429	
Left Cheek	QPSK	20.0	1	20050	1720.0	99	24	22.81	0.01	0.933	0.921	1.23	1.21
				20175	1732.5	99	24	22.95	-0.07	0.698		0.889	
				20300	1745.0	99	24	22.96	0.16	1.03	1.02	1.31	1.30
			50	20050	1720.0	50	23	21.60	-0.03	0.715		0.987	
				20175	1732.5	50	23	21.66	-0.08	0.544		0.741	
				20300	1745.0	50	23	21.67	0.01	0.706		0.959	
			100	20300	1745.0	0	23	21.66	-0.04	0.686		0.934	
Left 15° Tilt	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	24	22.96	0.185	0.466		0.592	
Repeat Scans - Left Cheek													
2nd Scan	QPSK	20.0	1	20300	1745.0	99	24	22.96	0.06	1.03	1.03	1.31	**1.31**
3rd Scan													
4th Scan													

Threshold 1 For This Band:	0.789	
Max FAST SAR For Band:	1.03	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.03	
Additional Full SAR Required:		YES

Table 11.2-6 SAR testing results for LTE Band 4 (20MHz BW) head configuration

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Measured/Extrapolated SAR Values - Head - WCDMA FDD IV 1800 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	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44	0.01	0.422		0.480	
	1513	1752.6	24	23.67					
Right 15° Tilt	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44	0.03	0.266		0.303	
	1513	1752.6	24	23.67					
Left Cheek	1312	1712.4	24	23.55	-0.11	0.963	0.962	1.07	1.07
	1413	1732.6	24	23.44	0.00	0.850	0.851	0.967	0.968
	1513	1752.6	24	23.67	0.03	1.13	1.13	1.22	1.22
Left 15° Tilt	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44	-0.08	0.324		0.369	
	1513	1752.6	24	23.67					
Repeat Scans - Left Cheek									
2nd Scan	1513	1752.6	24	23.67	-0.16	1.13	1.15	1.22	1.24
3rd Scan									
4th Scan									

Threshold 1 For This Band:	0.972	
Max FAST SAR For Band:	1.27	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.28	
Additional Full SAR Required:		YES

Table 11.2-7 SAR testing results for WCDMA FDD IV head configuration

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Measured/Extrapolated SAR Values - Head - LTE Band 2 1900 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.02	0.479		0.555	
				18900	1880.0	0	23.5	22.85					
				19100	1900.0	50	23.5	22.72					
			50	18700	1860.0	0	22	21.64	-0.10	0.401		0.436	
				18900	1880.0	50	22	21.47					
				19100	1900.0	50	22	21.51					
			100	18700	1860.0	0	22	21.63					
Right 15° Tilt	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.00	0.281		0.326	
				18900	1880.0	0	23.5	22.85					
				19100	1900.0	50	23.5	22.72					
Left Cheek	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.01	0.728	0.718	0.844	0.832
				18900	1880.0	0	23.5	22.85	0.16	0.879	0.880	1.02	1.02
				19100	1900.0	50	23.5	22.72	-0.04	0.771	0.771	0.923	0.923
			50	18700	1860.0	0	22	21.64	0.15	0.602		0.654	
				18900	1880.0	50	22	21.47					
				19100	1900.0	50	22	21.51					
			100	18700	1860.0	0	22	21.63	-0.03	0.577		0.628	
Left 15° Tilt	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.11	0.370		0.429	
				18900	1880.0	0	23.5	22.85					
				19100	1900.0	50	23.5	22.72					
Repeat Scans - Left Cheek													
2nd Scan	QPSK	20.0	1	18900	1880.0	0	23.5	22.85	0.02	0.863	0.870	1.00	1.01
3rd Scan													
4th Scan													

Threshold 1 For This Band:	0.673	
Max FAST SAR For Band:	0.879	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.880	
Additional Full SAR Required:		NO

Table 11.2-8 SAR testing results for LTE Band 2 (20MHz BW) head configuration

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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 11.2-9 SAR testing results for GSM/EDGE/DTM 1900 head configuration

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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 11.2-10 SAR testing results for WCDMA FDD II head configuration

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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
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR	SAR at 100% DF
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 11.2-11 SAR testing results for Wi-Fi/WLAN/802.11b head configuration

Note 1: SAR measurements were performed first on the highest output power mod and channel, then the remaining channels were tested on the worst position.

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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 11.2-12 SAR testing results for Bluetooth head configuration

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

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Measured/Extrapolated SAR Values - Head - LTE Band 7 2600 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	20850	2510.0	50	24.3	24.27	0.18	0.144	0.146	0.145	0.147
				21100	2535.0								
				21350	2560.0								
			50	20850	2510.0								
				21100	2535.0								
				21350	2560.0								
			100										
Right 15° Tilt	QPSK	20.0	1	20850	2510.0	50	24.3	24.27	0.108	0.120	0.130	0.121	0.131
				21100	2535.0								
				21350	2560.0								
Left Cheek	QPSK	20.0	1	20850	2510.0	50	24.3	24.27	0.90	0.334	0.352	0.336	0.354
				21100	2535.0	0	24.3	23.94	-0.05	0.303	0.320	0.329	0.348
				21350	2560.0	99	24.3	23.24	0.08	0.204	0.213	0.260	0.272
			50	20850	2510.0	50	23	22.94	0.29	0.257	0.262	0.261	0.266
				21100	2535.0								
				21350	2560.0								
			100										
Left 15° Tilt	QPSK	20.0	1	20850	2510.0	50	24.3	24.27	-0.01	0.175	0.184	0.176	0.185
				21100	2535.0								
				21350	2560.0								

Threshold 1 For This Band:	0.972	
Max FAST SAR For Band:	1.27	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.29	
Additional Full SAR Required:		YES

Table 11.2-13a SAR testing results for LTE band 7(20 MHz BW) head configuration
Measured on model RHC161LW Rev 3

Note: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

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Measured/Extrapolated SAR Values - Head - LTE Band 7 2600 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	20850	2510.0	50	23.6	23.01	0.05		0.145		0.166
				21100	2535.0								
				21350	2560.0								
			50	20850	2510.0								
				21100	2535.0								
				21350	2560.0								
			100										
Right 15° Tilt	QPSK	20.0	1	20850	2510.0	50	23.6	23.01	0.17		0.136		0.156
				21100	2535.0								
				21350	2560.0								
Left Cheek	QPSK	20.0	1	20850	2510.0	50	23.6	23.01	-0.05		0.352		0.403
				21100	2535.0	99	23.6	22.72	0.30		0.279		0.342
				21350	2560.0	50	23.6	22.81	0.09		0.370		0.444
			50	20850	2510.0	50	22.6	21.73	0.19		0.256		0.313
				21100	2535.0								
				21350	2560.0								
			100										
Left 15° Tilt	QPSK	20.0	1	20850	2510.0	50	23.6	23.01	-0.09		0.163		0.187
				21100	2535.0								
				21350	2560.0								

Table 11.2-13a SAR testing results for LTE band 7(20 MHz BW) head configuration
Measured on model RHD131LW Rev 4

Note 1: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

Note 2: Partial testing was done on head configuration to see the impact of the Rev 4 changes. The worst case measured SAR values for each Rev are only 5% apart, thus no additional measurements were done.

Note 3: Please refer to the hardware similarity document and hardware declaration document for more information.

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

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - LTE Band 17 700 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	23780	709.0	49	23.5	23.19	0.01	0.481	0.466	0.517	0.500
				23790	710.0	49	23.5	23.27	-0.04	0.471	0.453	0.497	0.478
				23800	711.0	49	23.5	23.10	-0.05	0.451	0.437	0.495	0.479
			25	23780	709.0	25	22.5	22.11	0.09	0.376	0.367	0.411	0.401
				23790	710.0	0	22.5	21.99					
				23800	711.0	25	22.5	22.09					
			50	23780	709.0	0	22.5	21.99					
10mm Front	QPSK	10.0	1	23780	709.0								
				23790	710.0	49	23.5	23.27	0.01	0.302		0.318	
				23800	711.0								
10mm Left	QPSK	10.0	1	23780	709.0								
				23790	710.0	49	23.5	23.27	0.02	0.299		0.315	
				23800	711.0								
10mm Right	QPSK	10.0	1	23780	709.0								
				23790	710.0								
				23800	711.0								
10mm Bottom	QPSK	10.0	1	23780	709.0								
				23790	710.0	49	23.5	23.27	-0.01	0.316		0.333	
				23800	711.0								
10mm + Headset	QPSK	10.0	1	23780	709.0								
				23790	710.0								
				23800	711.0								

Threshold 1 For This Band:	0.368	
Max FAST SAR For Band:	0.481	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.466	
Additional Full SAR Required:		NO

Table 11.3-1a SAR testing results for LTE Band 17 (10MHz BW) Hotspot configuration

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Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - LTE Band 17 700 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	23780	709.0	49	23.5	23.19	-0.02	0.317	0.315	0.340	0.338
				23790	710.0	49	23.5	23.27	0.07	0.301		0.317	
				23800	711.0	49	23.5	23.10	-0.04	0.280		0.307	
			25	23780	709.0	25	22.5	22.11	0.03	0.252		0.276	
				23790	710.0	0	22.5	21.99					
				23800	711.0	25	22.5	22.09					
			50	23780	709.0	0	22.5	21.99					
15mm Front	QPSK	10.0	1	23780	709.0								
				23790	710.0	49	23.5	23.27	0.02	0.243		0.256	
				23800	711.0								
Holster Back	QPSK	10.0	1	23780	709.0								
				23790	710.0	49	23.5	23.27	-0.04	0.243		0.256	
				23800	711.0								

Threshold 1 For This Band:	0.368	
Max FAST SAR For Band:	0.481	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.466	
Additional Full SAR Required:		NO

Table 11.3-1b SAR testing results for LTE Band 17 (10MHz BW) body-worn configuration

Note 1: If the power drift is ≤ – 0.200 dB, the extrapolated SAR is calculated using the formula:
Extrapolated SAR = (Measured SAR) * 10^(|Power Drift (dB)| / 10)
Note 2: Only Middle channel was tested when 1g reported SAR ≤ 0.8 W/Kg or 3dB lower than the limit.
Note 3a: For 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 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 5: Device was tested with 15 mm BLACKBERRY recommended separation distance to allow typical after-market holster to be used.
Note 6: For Hot Spot mode any side of the phone that is further than 2.5 cm away from the transmitting antenna can be exempted from testing.
Note 7a: For LTE it is only required to test the configuration (channel and offset) yielding the highest conducted power for RB 1 and RB 50% when combined 1g avg. SAR < 0.8 W/Kg or 3dB lower than the limit for both cases. Also, when the highest conducted power for RB 1 and RB 50% are both greater than RB 100%, then SAR testing for RB 100% can be excluded.

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Note 7b: For LTE if 1g avg. SAR > 0.8 W/Kg or not at least 3dB lower than the limit, than the remaining channels for that RB number must be tested and one additional scan must be done with RB 100%. For all additional scans the highest conducted power configuration (channel and offset) must be used.
Note 7c: For LTE if SAR ≤ 1.45, then SAR tests for the smaller bandwidths are not required
Note 7d: For LTE the lower bandwidths are only tested on the cases where the conducted power is 0.5 dB greater than those found on the highest bandwidth or when the reported 1g SAR > 1.45 for the highest bandwidth.
Note 7e: For LTE 16 QAM is only tested on the cases where its conducted power is 0.5 dB greater than QPSK or when the reported 1g SAR > 1.45 for QPSK.
Note 8a: 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 8b: 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 8c: Both thresholds are calculated using the measured SAR to avoid the thresholds changing should target power be changed throughout the testing period.

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Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - LTE Band 13 750 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	0.00	0.677	0.655	0.746	0.722
				23279	786.9								
			25	23180	777.0								
				23230	782.0	0	22.5	21.94	0.02	0.481		0.547	
				23279	786.9								
			50										
10mm Front	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	0.07	0.566	0.570	0.623	0.628
				23279	786.9								
10mm Left	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	-0.03	0.490		0.540	
				23279	786.9								
10mm Right	QPSK	10.0	1	23180	777.0								
				23230	782.0								
				23279	786.9								
10mm Bottom	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	-0.05	0.107		0.118	
				23279	786.9								
10mm + Headset	QPSK	10.0	1	23180	777.0								
				23230	782.0								
				23279	786.9								

Threshold 1 For This Band:	0.518	
Max FAST SAR For Band:	0.677	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.655	
Additional Full SAR Required:		NO

Table 11.3-2a SAR testing results for LTE Band 13 (10MHz BW) Hotspot configuration

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Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - LTE Band 13 750 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	0.06	0.493	0.502	0.543	0.553
				23279	786.9								
			25	23180	777.0								
				23230	782.0	0	22.5	21.94	-0.06	0.385		0.438	
				23279	786.9								
			50										
15mm Front	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	-0.03	0.446		0.491	
				23279	786.9								
Holster Back	QPSK	10.0	1	23180	777.0								
				23230	782.0	0	23.5	23.08	-0.01	0.403		0.444	
				23279	786.9								

Threshold 1 For This Band:	0.518	
Max FAST SAR For Band:	0.677	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.655	
Additional Full SAR Required:		NO

Table 11.3-2b SAR testing results for LTE Band 13 (10MHz BW) body-worn configuration

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Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - LTE Band 5 850 MHz (BW 10 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	20450	829.0	49	24	23.01	-0.01	0.620	0.613	0.779	0.770
				20525	836.5	0	24	23.02	0.04	0.485		0.608	
				20600	844.0	49	24	23.20	-0.09	0.774	0.763	0.931	0.917
			25	20450	829.0	0	22.5	21.94					
				20525	836.5	0	22.5	21.99					
				20600	844.0	25	22.5	21.96	-0.04	0.465		0.527	
			50	20450	829.0	0	23	21.87	0.01	0.364		0.472	
10mm Front	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0	49	24	23.20	0.00	0.517		0.622	
10mm Left	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0	49	24	23.20	-0.01	0.174		0.209	
10mm Right	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0								
10mm Bottom	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0	49	24	23.20	-0.02	0.520	0.505	0.625	0.607
10mm + Headset	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0								

Threshold 1 For This Band:	0.593	
Max FAST SAR For Band:	0.774	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.763	
Additional Full SAR Required:		NO

Table 11.3-3a SAR testing results for LTE Band 5 (10MHz BW) Hotspot configuration

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Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - LTE Band 5 850 MHz (BW 10 MHz)												
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	10.0	1	20450	829.0	49	24	23.01	-0.02	0.412	0.416	0.517	0.523
				20525	836.5	0	24	23.02	-0.02	0.297		0.372	
				20600	844.0	49	24	23.20	0.03	0.416	0.418	0.500	0.503
			25	20450	829.0	0	22.5	21.94					
				20525	836.5	0	22.5	21.99	-0.09	0.281		0.316	
				20600	844.0	25	22.5	21.96					
			50	20450	829.0	0	23	21.87					
15mm Front	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0	49	24	23.20	-0.04	0.355		0.427	
Holster Back	QPSK	10.0	1	20450	829.0								
				20525	836.5								
				20600	844.0	49	24	23.20	-0.11	0.381		0.458	

Threshold 1 For This Band:	0.593	
Max FAST SAR For Band:	0.774	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.763	
Additional Full SAR Required:		NO

Table 11.3-3b SAR testing results for LTE Band 5 (10MHz BW) body-worn configuration

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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 11.3-4a SAR testing results for GSM/EDGE/GPRS 850 Hotspot configuration

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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 11.3-4b SAR testing results for GSM/EDGE/GPRS 850 body-worn configuration

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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 11.3-5a SAR testing results for WCDMA FDD V Hotspot configuration

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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 11.3-5b SAR testing results for WCDMA FDD V body-worn configuration

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Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - LTE Band 4 1800 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	Cond. Output Power (dBm)		Power Drift (dB)	1g SAR (W/Kg)			
										Extrapolated		Reported	
							Declared	Measured		FAST	FULL	FAST	FULL
10mm Back	QPSK	20.0	1	20050	1720.0	99	24	22.81	-0.05	0.889	0.899	1.17	1.18
				20175	1732.5	99	24	22.95	-0.07	0.606		0.772	
				20300	1745.0	99	24	22.96	0.00	0.867	0.875	1.10	1.11
			50	20050	1720.0	50	23	21.60	-0.01	0.712		0.983	
				20175	1732.5	50	23	21.66	-0.11	0.488		0.664	
				20300	1745.0	50	23	21.67	-0.06	0.616		0.837	
			100	20300	1745.0	0	23	21.66	-0.12	0.676		0.920	
10mm Front	QPSK	20.0	1	20050	1720.0	99	24	22.81	-0.01	0.817	0.838	1.07	1.10
				20175	1732.5	99	24	22.95	0.01	0.609		0.776	
				20300	1745.0	99	24	22.96	0.03	0.827	0.846	1.05	1.07
10mm Left	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	24	22.96	-0.011	0.602		0.765	
10mm Right	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0								
10mm Bottom	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	24	22.96	0.06	0.453		0.576	
10mm + Headset	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0								
Repeat Scans - 10mm Back													
2nd Scan	QPSK	20.0	1	20050	1720.0	99	24	22.81	-0.05	0.955	0.955	1.26	1.26

Threshold 1 For This Band:	0.789	
Max FAST SAR For Band:	1.03	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.03	
Additional Full SAR Required:		YES

Table 11.3-6a SAR testing results for LTE Band 4 (20 MHz BW) Hotspot configuration

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Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - LTE Band 4 1800 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	20050	1720.0	99	24	22.81	-0.06	0.577	0.577	0.759	0.759
				20175	1732.5	99	24	22.95	-0.02	0.516		0.657	
				20300	1745.0	99	24	22.96	-0.02	0.527		0.670	
			50	20050	1720.0	50	23	21.60					
				20175	1732.5	50	23	21.66					
				20300	1745.0	50	23	21.67	-0.02	0.370		0.503	
			100	20300	1745.0	0	23	21.66					
15mm Front	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	24	22.96	0.04	0.512		0.651	
Holster Back	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	24	22.96	-0.06	0.394		0.501	

Threshold 1 For This Band:	0.789	
Max FAST SAR For Band:	1.03	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.03	
Additional Full SAR Required:		YES

Table 11.3-6b SAR testing results for LTE Band 4 (20 MHz BW) body-worn configuration

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Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - WCDMA FDD IV 1800 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	1312	1712.4	24	23.55	-0.10	1.22	1.21	1.35	1.34
	1413	1732.6	24	23.44	-0.32	0.930	0.913	1.06	1.04
	1513	1752.6	24	23.67	-0.01	1.11	1.12	1.20	1.21
10mm Front	1312	1712.4	24	23.55	-0.04	1.02	1.05	1.13	1.16
	1413	1732.6	24	23.44	-0.03	0.799		0.909	
	1513	1752.6	24	23.67	0.01	1.02	1.04	1.10	1.12
10mm Left	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44	-0.03	0.498		0.567	
	1513	1752.6	24	23.67					
10mm Right	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44					
	1513	1752.6	24	23.67					
10mm Bottom	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44	0.15	0.000	0.000	0.000	
	1513	1752.6	24	23.67					
10mm + Headset	1312	1712.4	24	23.55	-0.07	1.27	1.28	1.41	**1.42**
	1413	1732.6	24	23.44					
	1513	1752.6	24	23.67					
Repeat Scans - 10mm + Headset									
2nd Scan	1312	1712.4	24	23.55	-0.02	1.24	1.28	1.38	1.42
3rd Scan									
4th Scan									

Threshold 1 For This Band:	0.972	
Max FAST SAR For Band:	1.27	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.28	
Additional Full SAR Required:		YES

Table 11.3-7a SAR testing results for WCDMA FDD IV Hotspot configuration

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Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - WCDMA FDD IV 1800 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	1312	1712.4	24	23.55	0.11	0.674	0.677	0.748	0.751
	1413	1732.6	24	23.44	-0.06	0.420		0.478	
	1513	1752.6	24	23.67	0.04	0.528		0.570	
15mm Front	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44	0.03	0.409		0.465	
	1513	1752.6	24	23.67					
Holster Back	1312	1712.4	24	23.55					
	1413	1732.6	24	23.44	-0.12	0.282		0.321	
	1513	1752.6	24	23.67					

Threshold 1 For This Band:	0.972	
Max FAST SAR For Band:	1.27	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.28	
Additional Full SAR Required:		YES

Table 11.3-7b SAR results for WCDMA FDD IV body-worn configuration

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Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - LTE Band 2 1900 MHz (BW 20 MHz)												
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	Cond. Output Power (dBm)		Power Drift	1g SAR (W/Kg)		
										Extrapolated		Reported	
							Declared	Measured	(dB)	FAST	FULL	FAST	FULL
10mm Back	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.02	0.699	0.710	0.810	0.823
				18900	1880.0	0	23.5	22.85	-0.03	0.763	0.765	0.886	0.889
				19100	1900.0	50	23.5	22.72	0.02	0.764	0.779	0.914	0.932
			50	18700	1860.0	0	22	21.64	-0.13	0.518		0.563	
				18900	1880.0	50	22	21.47					
				19100	1900.0	50	22	21.51					
			100	18700	1860.0	0	22	21.63	-0.08	0.518		0.564	
10mm Front	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	-0.04	0.556		0.644	
				18900	1880.0								
				19100	1900.0								
10mm Left	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.02	0.575		0.666	
				18900	1880.0								
				19100	1900.0								
10mm Right	QPSK	20.0	1	18700	1860.0								
				18900	1880.0								
				19100	1900.0								
10mm Bottom	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.00	0.607		0.703	
				18900	1880.0								
				19100	1900.0								

Threshold 1 For This Band:	0.673	
Max FAST SAR For Band:	0.879	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.880	
Additional Full SAR Required:		NO

Table 11.3-8a SAR testing results for LTE Band 2 (20 MHz BW) Hotspot configuration

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Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - LTE Band 2 1900 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	-0.08	0.348		0.403	
				18900	1880.0	0	23.5	22.85	0.05	0.435	0.433	0.505	0.503
				19100	1900.0	50	23.5	22.72	-0.02	0.408		0.488	
			50	18700	1860.0	0	22	21.64	-0.02	0.298		0.324	
				18900	1880.0	50	22	21.47					
				19100	1900.0	50	22	21.51					
			100	18700	1860.0	0	22	21.63					
15mm Front	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	-0.02	0.367		0.425	
				18900	1880.0								
				19100	1900.0								
Holster Back	QPSK	20.0	1	18700	1860.0	50	23.5	22.86	0.02	0.241		0.279	
				18900	1880.0								
				19100	1900.0								

Threshold 1 For This Band:	0.673	
Max FAST SAR For Band:	0.879	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	0.880	
Additional Full SAR Required:		NO

Table 11.3-8b SAR testing results for LTE Band 2 (20 MHz BW) body-worn configuration

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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 11.3-9a SAR testing results for GSM/EDGE/GPRS 1900 Hotspot configuration

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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 11.3-9b SAR testing results for GSM/EDGE/GPRS 1900 body-worn configuration

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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 11.3-10a SAR testing results for WCDMA FDD II Hotspot configuration

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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 11.3-10b SAR testing results for WCDMA FDD II body-worn configuration

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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 Hotspot configuration

Note 1: SAR measurements were performed on the highest output power mode and channel.

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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 body-worn configuration

Note 1: SAR measurements were performed on the highest output power mode and channel.

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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

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

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

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Measured/Extrapolated SAR Values - Hotspot - LTE Band 7 2600 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	20850	2510.0	0	20.5	20.50	0.12	0.968	1.03	0.968	1.03
				21100	2535.0	99	20.5	19.91	0.15	0.945	0.983	1.08	1.13
				21350	2560.0	0	20.5	20.10	-0.12	0.993	1.04	1.09	1.14
			50	20850	2510.0	0	20	20	-0.11	0.948	0.991	0.948	0.991
				21100	2535.0	0	20	19.78	-0.07	0.928	0.974	0.976	1.02
				21350	2560.0	0	20	19.75	0.03	1.01	1.04	1.07	1.10
			100	20850	2510.0	0	20	19.98	0.20	0.947	0.982	0.951	0.987
10mm Front	QPSK	20.0	1	20850	2510.0	0	20.5	20.50	0.00	0.514		0.514	
				21100	2535.0								
				21350	2560.0								
10mm Left	QPSK	20.0	1	20850	2510.0	0	20.5	20.50	0.09	0.167		0.167	
				21100	2535.0								
				21350	2560.0								
10mm Right	QPSK	20.0	1	20850	2510.0								
				21100	2535.0								
				21350	2560.0								
10mm Bottom	QPSK	20.0	1	20850	2510.0	0	20.5	20.50	-0.06	1.14	1.17	1.14	1.17
				21100	2535.0	99	20.5	19.91	0.01	1.14	1.17	1.31	1.34
				21350	2560.0	0	20.5	20.10	-0.05	1.21	1.26	1.33	1.38
10mm Bottom + Headset	QPSK	20.0	1	20850	2510.0								
				21100	2535.0								
				21350	2560.0	0	20.5	20.10	-0.07	1.27	1.29	1.39	1.41
Repeat Scans - 10mm Bottom + Headset													
2nd Scan	QPSK	20.0	1	21350	2560.0	0	20.5	20.10	-0.04	1.27	1.28	1.39	1.40

Threshold 1 For This Band:	0.972	
Max FAST SAR For Band:	1.27	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.29	
Additional Full SAR Required:		YES

Table 11.3-13a SAR testing results for LTE band 7 (20 MHz BW) Hotspot configuration

Note: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

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Measured/Extrapolated SAR Values - Body-Worn - LTE Band 7 2600 MHz (BW 20 MHz)										FCC (Body Liquid)			
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	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	QPSK	20.0	1	20850	2510.0	50	24.3	24.27	0.01	0.814		0.820	
				21100	2535.0	0	24.3	23.94	-0.04	0.827	0.833	0.898	0.905
				21350	2560.0	99	24.3	23.24	0.03	0.803	0.805	1.02	**1.03**
			50	20850	2510.0	50	23	22.94	0.09	0.620		0.629	
				21100	2535.0	0							
				21350	2560.0	50							
			100	20850	2510.0	0							
15mm Front	QPSK	20.0	1	20850	2510.0	50	24.3	24.27	-0.06	0.431		0.434	
				21100	2535.0								
				21350	2560.0								
Holster Back	QPSK	20.0	1	20850	2510.0	50	24.3	24.27	-0.19	0.616		0.620	
				21100	2535.0								
				21350	2560.0								
Holster Front	QPSK	20.0	1	20850	2510.0								
				21100	2535.0								
				21350	2560.0								
15mm + Headset	QPSK	20.0	1	20850	2510.0								
				21100	2535.0								
				21350	2560.0								
Repeat Scans - 15mm Back													
2nd Scan	QPSK	20.0	1	21350	2560.0	99	24.3	23.24	0.17	0.810	0.799	1.03	1.02

Threshold 1 For This Band:	0.972	
Max FAST SAR For Band:	1.27	
Threshold 2 For All Bands:	0.882	
Max FULL SAR For Band:	1.29	
Additional Full SAR Required:		YES

Table 11.3-13b SAR testing results for LTE band 7 (20 MHz BW) body-worn configuration

Note: LTE band 7 is not supported in the United States; however it is supported in Canada and remains in this report for filing to Industry Canada

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11.4 Simultaneous transmission analysis for SAR measurement results

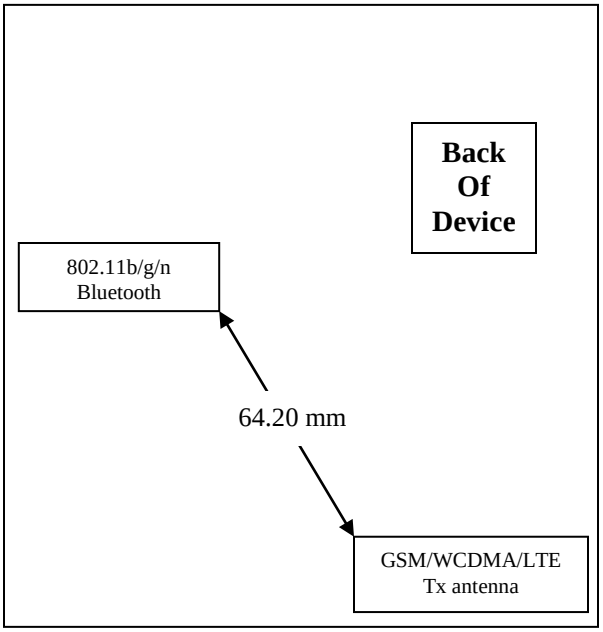

Figure 11.4-1 Back view of device showing closest distance between antenna pairs

Separate Transmitting Antenna		
Separate Antenna	**Technologies Utilized By Each Antenna**	
Antenna 1	GSM, WCDMA, LTE	
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/LTE + Wi-Fi/BT
Body-Worn	Antenna 1 + Antenna 2	GSM/WCDMA/LTE + Wi-Fi/BT
Hotspot	Antenna 1 + Antenna 2	GSM/WCDMA/LTE + 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: LTE and GSM/WCDMA cannot transmit simultaneously since it shares the same antenna.

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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	LTE Band 17	0.193	0.701	0.894
		LTE Band 13	0.411	0.701	1.112
		LTE Band 5	0.468	0.701	1.169
		GSM/DTM 850	0.625	0.701	1.326
		WCDMA FDD V	0.494	0.701	1.195
		LTE Band 4	0.659	0.701	1.360
		WCDMA FDD IV	0.480	0.701	1.181
		LTE Band 2	0.555	0.701	1.256
		GSM/DTM 1900	0.648	0.701	1.349
		WCDMA FDD II	0.706	0.701	1.407
		LTE Band 7	0.147	0.701	0.848
Head SAR	Right Tilt	LTE Band 17	0.127	0.131	0.258
		LTE Band 13	0.326	0.131	0.457
		LTE Band 5	0.224	0.131	0.355
		GSM/DTM 850	0.455	0.131	0.586
		WCDMA FDD V	0.269	0.131	0.400
		LTE Band 4	0.429	0.131	0.560
		WCDMA FDD IV	0.303	0.131	0.434
		LTE Band 2	0.326	0.131	0.457
		GSM/DTM 1900	0.310	0.131	0.441
		WCDMA FDD II	0.348	0.131	0.479
		LTE Band 7	0.131	0.131	0.262
Head SAR	Left Cheek	LTE Band 17	0.222	0.305	0.527
		LTE Band 13	0.583	0.305	0.888
		LTE Band 5	0.479	0.305	0.784
		GSM/DTM 850	0.765	0.305	1.070
		WCDMA FDD V	0.505	0.305	0.810
		LTE Band 4	1.31	0.305	**1.615**
		WCDMA FDD IV	1.24	0.305	1.545
		LTE Band 2	1.02	0.305	1.325
		GSM/DTM 1900	1.11	0.305	1.415
		WCDMA FDD II	1.13	0.305	1.435
		LTE Band 7	0.354	0.305	0.659

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Head SAR	Left Tilt	LTE Band 17	0.139	0.163	0.302
		LTE Band 13	0.283	0.163	0.446
		LTE Band 5	0.228	0.163	0.391
		GSM/DTM 850	0.428	0.163	0.591
		WCDMA FDD V	0.270	0.163	0.433
		LTE Band 4	0.592	0.163	0.755
		WCDMA FDD IV	0.369	0.163	0.532
		LTE Band 2	0.429	0.163	0.592
		GSM/DTM 1900	0.462	0.163	0.625
		WCDMA FDD II	0.519	0.163	0.682
		LTE Band 7	0.185	0.163	0.348

Table 11.4-2a Highest Head SAR values and summation on the same test position

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

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 4	Left Cheek	1.31	62.9	257.0	-171.1
2	802.11g	Left Cheek	0.305	80.9	313.8	-165.4
SAR Sum	1.615	Coord. Delta (mm)		-18.0	-56.8	-5.7
SAR SUM^1.5	2.05	Closest Distance (mm):				59.84
Ratio	**0.03**					

Table 11.4-2b Head configuration ratio of SAR to peak separation distance for pair of transmitters

Note: If the ratio of SAR to peak separation distance is ≤ 0.04, Simultaneous SAR measurement is not required.

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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	LTE Band 17	0.500	0.353	0.853
		LTE Band 13	0.722	0.353	1.075
		LTE Band 5	0.917	0.353	1.270
		GSM/DTM 850	1.02	0.353	1.373
		WCDMA FDD V	0.861	0.353	1.214
		LTE Band 4	1.26	0.353	**1.613**
		WCDMA FDD IV	1.42	0.353	**1.773**
		LTE Band 2	0.932	0.353	1.285
		GSM/DTM 1900	0.870	0.353	1.223
		WCDMA FDD II	0.865	0.353	1.218
		LTE Band 7	1.14	0.353	1.493
Hotspot Mode SAR	10mm Front	LTE Band 17	0.318	0.166	0.484
		LTE Band 13	0.628	0.166	0.794
		LTE Band 5	0.622	0.166	0.788
		GSM/DTM 850	0.848	0.166	1.014
		WCDMA FDD V	0.720	0.166	0.886
		LTE Band 4	1.10	0.166	1.266
		WCDMA FDD IV	1.16	0.166	1.326
		LTE Band 2	0.644	0.166	0.810
		GSM/DTM 1900	0.720	0.166	0.886
		WCDMA FDD II	0.549	0.166	0.715
		LTE Band 7	0.514	0.166	0.680
Hotspot Mode SAR	10mm Left	LTE Band 17	0.315	---	0.315
		LTE Band 13	0.540	---	0.540
		LTE Band 5	0.209	---	0.209
		GSM/DTM 850	0.707	---	0.707
		WCDMA FDD V	0.316	---	0.316
		LTE Band 4	0.765	---	0.765
		WCDMA FDD IV	0.567	---	0.567
		LTE Band 2	0.666	---	0.666
		GSM/DTM 1900	0.617	---	0.617
		WCDMA FDD II	0.480	---	0.480
		LTE Band 7	0.167	---	0.167
Hotspot Mode SAR	10mm Right	LTE Band 17	---	0.218	0.218
		LTE Band 13	---	0.218	0.218
		LTE Band 5	---	0.218	0.218
		GSM/DTM 850	---	0.218	0.218

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		WCDMA FDD V	---	0.218	0.218
		LTE Band 4	---	0.218	0.218
		WCDMA FDD IV	---	0.218	0.218
		LTE Band 2	---	0.218	0.218
		GSM/DTM 1900	---	0.218	0.218
		WCDMA FDD II	0.191	0.218	0.409
		LTE Band 7	---	0.218	0.218
Hotspot Mode SAR	10mm Bottom	LTE Band 17	0.333	---	0.333
		LTE Band 13	0.118	---	0.118
		LTE Band 5	0.607	---	0.607
		GSM/DTM 850	0.216	---	0.216
		WCDMA FDD V	0.692	---	0.692
		LTE Band 4	0.576	---	0.576
		WCDMA FDD IV	0.000	---	0.000
		LTE Band 2	0.703	---	0.703
		GSM/DTM 1900	0.396	---	0.396
		WCDMA FDD II	0.296	---	0.296
		LTE Band 7	1.41	---	1.410
Hotspot Mode SAR	10mm Top	LTE Band 12	---	---	---
		LTE Band 17	---	---	---
		LTE Band 13	---	---	---
		LTE Band 5	---	---	---
		GSM/DTM 850	---	---	---
		WCDMA FDD V	---	---	---
		CDMA 800 BC10	---	---	---
		CDMA 850 BC0	---	---	---
		LTE Band 4	---	---	---
		WCDMA FDD IV	---	---	---
		CDMA 1700 BC15	---	---	---
		LTE Band 2	---	---	---
		LTE Band 25	---	---	---
		GSM/DTM 1900	---	---	---
		WCDMA FDD II	---	---	---
		CDMA 1900 BC1	---	---	---
		LTE Band 7	---	---	---

Table 11.4-3a Highest Hotspot SAR values and summation on the same test position

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.

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Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 4	10mm Back	1.26	-32.0	44.0	-208.1
2	802.11g	10mm Back	0.353	11.8	7.2	-207.9
SAR Sum	1.613	Coord. Delta (mm)		-43.8	36.8	-0.2
SAR SUM^1.5	2.05	Closest Distance (mm):				57.21
Ratio	**0.04**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	UMTS IV	10mm Back	1.42	-33.5	43.5	-208.3
2	802.11g	10mm Back	0.353	11.8	7.2	-207.9
SAR Sum	1.773	Coord. Delta (mm)		-45.3	36.3	-0.4
SAR SUM^1.5	2.36	Closest Distance (mm):				58.05
Ratio	**0.04**					

Table 11.4-3b Hotspot configuration ratio of SAR to peak separation distance for pair of transmitters

Note: If the ratio of SAR to peak separation distance is ≤ 0.04, Simultaneous SAR measurement is not required.

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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	LTE Band 17	0.338	0.14	0.478
		LTE Band 13	0.553	0.14	0.693
		LTE Band 5	0.523	0.14	0.663
		GSM/DTM 850	0.868	0.14	1.008
		WCDMA FDD V	0.531	0.14	0.671
		LTE Band 4	0.759	0.14	0.899
		WCDMA FDD IV	0.751	0.14	0.891
		LTE Band 2	0.503	0.14	0.643
		GSM/DTM 1900	0.450	0.14	0.590
		WCDMA FDD II	0.526	0.14	0.666
		LTE Band 7	1.03	0.14	1.170
Body Worn SAR	15mm Front	LTE Band 17	0.256	0.093	0.349
		LTE Band 13	0.491	0.093	0.584
		LTE Band 5	0.427	0.093	0.520
		GSM/DTM 850	0.789	0.093	0.882
		WCDMA FDD V	0.496	0.093	0.589
		LTE Band 4	0.651	0.093	0.744
		WCDMA FDD IV	0.465	0.093	0.558
		LTE Band 2	0.425	0.093	0.518
		GSM/DTM 1900	---	---	---
		WCDMA FDD II	0.484	0.093	0.577
		LTE Band 7	0.434	0.093	0.527
Body Worn SAR	Holster Back	LTE Band 17	0.256	0.101	0.357
		LTE Band 13	0.444	0.101	0.545
		LTE Band 5	0.458	0.101	0.559
		GSM/DTM 850	0.777	0.101	0.878
		WCDMA FDD V	0.472	0.101	0.573
		LTE Band 4	0.501	0.101	0.602
		WCDMA FDD IV	0.321	0.101	0.422
		LTE Band 2	0.279	0.101	0.380
		GSM/DTM 1900	0.328	0.101	0.429
		WCDMA FDD II	0.367	0.101	0.468
		LTE Band 7	0.620	0.101	0.721
Body Worn SAR	Holster Front	LTE Band 17	---	---	---
		LTE Band 13	---	---	---
		LTE Band 5	---	---	---

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		GSM/DTM 850	---	---	---
		WCDMA FDD V	---	---	---
		LTE Band 4	---	---	---
		WCDMA FDD IV	---	---	---
		LTE Band 2	---	---	---
		GSM/DTM 1900	---	---	---
		WCDMA FDD II	---	---	---
		LTE Band 7	---	---	---

Table 11.4-4 Highest Body-worn SAR values and summation on the same test position

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.

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