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 5-2015 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-issue5-2015.

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Report issue date: May 14, 2015

Revision History		
Rev. Number	**Date**	**Changes**
Initial	May 14, 2015	Initial
Rev2	June 18, 2015	- By using latest probe calibration file, some SAR values have been slightly changed. Updated some SAR values on page: 99, 119-120, 125 and 136. - SAR plots were replaced on page: 87-102 of the APPENDIX B……Part 2 of 3.

Contents

1.0 OPERATING CONFIGURATIONS AND TEST CONDITIONS

1.1 Picture of Device

Please refer to Appendix E.

Figure 1.1-1 BlackBerry Smartphone

1.2 Antenna description

Type	Internal fixed antenna
Location	Please refer to Figure 1.9-1
Configuration	Internal fixed antenna

Table 1.2-1 Antenna description

1.3 Device description

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Device Model		RHR191LW (SQW100-4)
FCC ID		L6ARHR190LW
IC ID		2503A-RHR190LW
Serial Number	**Radiated**	1160686730, 1160686664,1160701958
	Conducted	1160693374, 116070178, 0805-2121-8272
Hardware Rev		CER-59662-001- Rev 1-x08-00, Rev 2-x08-01, Rev 2-x08-02, Rev 3-x10-00
Software		AAA728 (Software Build Number) 10.3.2.2024 (OS Version), 10.3.2.2025 (Radio Version), 10.3.2.2012 (SW Release Version) 10.3.2.2054 (OS Version), 10.3.2.2055 (Radio Version), 10.3.2.2032 (SW Release Version)
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 30.5	29.9 28.5	28.8 25.8	27.8 26.0
Tolerance in power setting on centre channel (dB)	± 0.6 ± 0.6	± 1.0	± 1.0	± 1.0
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)	15.0	18.5	17.0	10.0
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	802.11 a/n/ac (U-NII-1)	802.11 a/n/ac (U-NII-2A)	802.11 a/n/ac (U-NII-2C)	802.11 a/n/ac (U-NII-3)
Target nominal maximum conducted RF output power (dBm)	18.0	18.0	18.0	18.0
Tolerance in power setting on centre channel (dB)	+2/-2.5	+2/-2.5	+2/-2.5	+2/-2.5

Duty cycle	1:1	1:1	1:1	1:1
Transmitting frequency range (MHz)	5180-5240	5260-5320	5520-5700	5745-5825
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)	24.2	24.2	24.3	-----
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

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: RHR191LW also supports GSM/GPRS/EDGE 900/1800 MHz, and UMTS/HSPA$^+$ Bands I/VIII, and LTE bands 1/3/8/20 that are operational outside North America only, therefore no data is presented in this report for those bands.

Device Model		RHR191LW (SQW100-4)
FCC ID		L6ARHR190LW
IC ID		2503A-RHR190LW
SERIAL NUMBER	**RADIATED**	1160686730, 1160686664,1160701958
	CONDUCTED	1160693374, 1160701781
HARDWARE REV		CER-59662-001- Rev 1-x08-00, Rev 2-x08-01, Rev 2-x08-02, Rev 3-x10-00
SOFTWARE		AAA728 (Software Build Number) 10.3.2.2024 (OS Version), 10.3.2.2025 (Radio Version), 10.3.2.2012 (SW Release Version) 10.3.2.2054 (OS Version), 10.3.2.2055 (Radio Version), 10.3.2.2032 (SW Release Version)
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 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz Band 13: 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, and 1 Rx ant	
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	
Target nominal maximum conducted RF Output Power (dBm) +/- Tolerance in Power Setting on centre channel (dB)	Band 2: 23.5 ± 0.50 Band 4: 23.4 ± 0.50 Band 5: 23.2 ± 0.50 Band 7: 22.5 ± 0.50 Band 13: 23.3 ± 0.50 Band 17: 23.2 ± 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 a/b/g/n/ac	2.4 GHz Wi-Fi 2.4 GHz BT 5.0 GHz Wi-Fi

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

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.

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-60691-003	19

Table 1.4.1. Body worn holster

1.5 Headset

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

1)HDW-49299-00x
2)HDW-44306-00x

1.6 Battery

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

1)BAT-58107-00x

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.

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
EX3DV4	
Probe tip to sensor center	1.0 mm
Probe tip diameter is	2.5 mm
Probe calibration uncertainty	< 15 % for f = 2.45 to < 6.0 GHz
Probe calibration range	± 100 MHz

Table 1.8.1-1 Probe specification requirements

• Area scan resolution was maintained at 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
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]
EX3DV4	
Closest Measurement Point to Phantom	2.0 mm
Zoom Scan (x,y) Resolution	4.0 mm (5-6 GHz)
Zoom Scan (z) Resolution	2.0 mm (5-6 GHz)
Zoom Scan Volume	Minimum 24 x 24 x 22 mm[1]

Table 1.8.1-2 Zoom Scan requirement

Note: "Auto-extend zoom scan when maxima on boundary" is enabled, which can result in the zoom scan dimensions varying between 30x30x30 to 60x60x30 mm and 24x24x22 to 48x48x22 mm

1.8.2 802.11b/g/n SAR Measurement Procedures as per KDB 248227 D01 v02

Duty cycle

- Must scale *reported* SAR results up to 100% duty cycle.

Typical steps to consider for SAR testing

Note: for 802.11b DSSS testing just use step 2, 3, and 5

1. Identify the maximum output power specified at each antenna port of production units for the applicable OFDM configurations
    a. An initial test configuration is selected for each antenna port based on the highest declared output power and according to channel bandwidth, modulation and data rate combinations in each frequency band or aggregated band.
        i. See section "*Choosing an OFDM transmission mode and test channel*" for more info.
2. Apply the "*default power measurement procedures*" to measure maximum output power for each standalone and aggregated frequency band.
    a. When band gap channels between U-NII-2C band and U-NII-3 band or §15.247 5.8 GHz band are used, apply the following to determine high, middle and low channels for power measurement and SAR test reduction.
        i. channels in U-NII-2C band below 5.65 GHz are considered as one band
        ii. channels above 5.65 GHz, together with channels in U-NII-3 band or §15.247 5.8 GHz band, are considered as a separate band
    b. The maximum output power of band gap channels is limited to the lowest maximum output power certified for the adjacent bands.
    c. The measured maximum output power results are used to reduce the number of channels that need testing.
3. Apply *initial test configuration* procedures to each frequency band or aggregated band.
    a. For next to the ear, UMPC mini-tablet or hotspot mode exposure configurations with multiple test positions, the *initial test position* procedure is applied using the *initial test configuration* to reduce the number of test positions.
    b. Apply the *2.45 GHz and 5.0 GHz test reduction* as necessary
4. *Subsequent test configuration* procedures are applied to determine if the remaining OFDM transmission mode configurations may need testing.
    a. All channels in a smaller channel bandwidth configuration that overlap with a larger channel bandwidth in the initial test configuration need consideration.
    b. Additional test reduction may be applied according to the highest reported SAR of the initial test configuration or previous subsequent test configuration(s).
5. Apply simultaneous transmission SAR test exclusion and, when required, perform SAR measurement.
    a. If SAR testing has not been done on a particular position due to *initial test position* reductions then for simultaneous transmission exemption you apply the highest *reported* SAR value for that configuration (Head, body, HS).

Default power measurement procedures

- OFDM (a/g/n/ac): Identify the highest declared power (target + tolerance) on 802.11a/g/n/ac for each frequency band and channel bandwidth applicable.
    - For each frequency band power is measured using the transmission mode configuration (802.11 mode, channel bandwidth, modulation, and data rate) yielding the highest declared power (target + tolerance).
        - When the same declared power applies to multiple transmission modes then measure power on the highest channel bandwidth configuration with the lowest order modulation and data rate.
        - When the same declared power applies to multiple 802.11 modes with the same channel bandwidth and modulation then measure power on all these configurations.
- DSSS (b): Test on channels 1, 6, 11 using the highest bandwidth and lowest order modulation and date rate.
- You want to test on the low, mid, and high channels of a frequency band.
    - If there is not an absolute middle channel due to an even number of channels in the band, you must test on two mid channels.
    - Data rates are not expected to affect conducted power in any major way.

Initial Test Configuration

- An initial test configuration is determined according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each frequency band and aggregated band for SAR measurement using the highest measured maximum output power channel.
    - Use the criteria found in "*choosing an OFDM transmission mode and test channel*"
    - *Reported* SAR > 0.8 W/kg – Test the channel with the 2nd/3rd/4th etc. highest measured output power until the *reported* SAR ≤ 1.2 W/kg or all channels are tested

Choosing a OFDM transmission mode and test channel

- You want to test on the 802.11 OFDM configuration with the highest declared power (Target + Tune-up Tolerance) for that frequency band
    - When the same declared power is specified for multiple transmission modes within a frequency band then test with the highest channel bandwidth, lowest order modulation and lowest data rate.
    - When the same declared power applies to multiple 802.11 modes the use the same channel bandwidth, modulation, and data rate then test using the lowest order 802.11 mode.
        - The order goes 802.11a, g, n, ac
- Test on the channel with the highest measured output power.
    - Channels with measured output power within ¼ dB are considered to be equal.
    - If multiple channels have the same measured power then select the channel closest to the mid-band frequency.

- If multiple channels have the same measured power and are the same distance from the mid-band frequency (i.e. two mid channels or high and low channels) the higher frequency channel is tested.

Initial Test Position

- You find the initial test position for Head and MHS by using Area scans on all the test positions.
  - The test position with the highest SAR becomes the initial test position for that configuration.
  - You will have one for Head and one for MHS and you must do it for 2.4GHz and 5.0GHz.
  - Rank all the positions from highest SAR to lowest. When additional test positions are required to be tested you test the next worst case.
- **Additional test positions required?** Check the *reported* SAR of the initial test position
  - *Reported* SAR ≤ 0.4 W/kg – No further SAR testing required
  - *Reported* SAR > 0.4 W/kg – Test the test position that resulted in the $2^{nd}/3^{rd}/4^{th}$ etc. highest SAR (from the Area scans) until the *reported* SAR ≤ 0.8 W/kg or all the test positions are tested.
- **Additional channels required?** Check the *reported* SAR of each test position
  - *Reported* SAR > 0.8 W/kg – Test the channel with the $2^{nd}/3^{rd}/4^{th}$ etc. highest measured output power until the *reported* SAR ≤ 1.2 W/kg or all channels are tested.

Subsequent Test Configuration

- SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each frequency band, in each exposure condition, according to the declared power.
- Not tested if the highest *reported* SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration declared power and the adjusted SAR ≤ 1.2 W/kg.
  - Initial mode SAR $_{\text{reported}}$ x(Subsequent mode $_{\text{Declared power, mW}}$ /Initial mode $_{\text{Declared power, mW}}$) ≤ 1.2W/kg
  - This is checked with each 802.11 mode separately.
  - If some of the other 802.11 modes have the same power apply the same criteria used to find the initial test configuration.
- When the subsequent test configuration is found, test like we did before
  - Test using the highest measured output channel
  - Test using the initial test position
  - *Reported* SAR > 1.2 W/kg – Test the channel with the $2^{nd}/3^{rd}/4^{th}$ etc. highest measured output power until the *reported* SAR ≤ 1.2 W/kg or all channels are tested.
    - Slightly different then the rules for the initial test configuration

2.4 GHz test reduction

- Split into 802.11b DSSS and 802.11g/n OFDM
- 802.11b DSSS SAR Testing
  - Tested on the highest measured maximum output power channel
  - *Reported* SAR > 0.8 W/kg, the 2^{nd} highest conducted power channel is tested

- If any *reported* SAR > 1.2 W/kg, then all channels must be tested

- 802.11g/n OFDM SAR Testing
  - Not tested if the highest *reported* SAR for 802.11b DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR ≤ 1.2 W/kg
    - $SAR_{reported} \times (OFDM_{Declared\ power,\ mW} / DSSS_{Declared\ power,\ mW}) \leq 1.2$ W/kg

5.0 GHz test reduction

- U-NII-1 (low band) and U-NII-2A (mid band) have additional SAR reduction when both are used on the same transmitter
  - When the same maximum output power is specified for both bands
    - Test on U-NII-2A and if the highest *reported* SAR ≤ 1.2 W/kg, U-NII-1 isn't required for that exposure condition.
  - When different maximum output power is specified for the bands
    - Test on the band with the higher specified power.
    - If the highest *reported* SAR (of an exposure condition) is adjusted by the ratio of lower to higher specified power and the adjusted SAR ≤ 1.2 W/kg, testing on the lower power band isn't required for that exposure condition.
    - $SAR_{reported} \times (\text{Lower P Band}_{declared\ power,\ mW} / \text{Higher P Band}_{declared\ power,\ mW})$

Mode		GHz	Channel
802.11a UNII	U-NII-1	5.18	36
		5.20	40
		5.22	44
		5.24	48
	U-NII-2A	5.26	52
		5.28	56
		5.30	60
		5.32	64
	U-NII-2C	5.500	100
		5.520	104
		5.540	108
		5.560	112
		5.580	116
		5.600	120
		5.620	124
		5.640	128
		5.660	132
		5.680	136
		5.700	140
	U-NII-3	5.745	149
		5.765	153
		5.785	157
		5.805	161
		5.825	165

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

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

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

1.8.3.1 GSM, GPRS, EDGE and DTM

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

Dual Transfer Mode (DTM)

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

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

General Reporting Requirements

The following information is required in the SAR report to identify the required test configurations for supporting the results.

1) Device class - A, B or C
2) Identify the GPRS/EDGE multi slot class, including the maximum number of downlink, uplink and total time slots per frame
3) For Class A devices with DTM capability, identify the DTM multi slot class and include the maximum number of downlink, uplink and total time slots per frame for DTM operations; i.e. CS and PS time-slots
4) The maximum output power specified for production units, including tune-up tolerance, within the time-slot burst for each operating mode – GMSK/8-PSK in CS/GSM and PS/(E)GPRS configurations
5) Descriptions of the test device and communication test set configurations used in the DTM SAR measurements or procedures applied to sum DTM SAR for the required operating configurations and exposure conditions, with respect to maximum measured time-slot burst averaged conducted output power and maximum number of time slots defined by the DTM multi slot class for the device.

SAR Test Reduction

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

Additional Information

- The device supports EGPRS/GPRS Multi-slot Class 12, DTM/GPRS Multi-slot Class11 and DTM/EGPRS Multi-slot Class10.
- CMU200 base station simulator with DTM software option CMU-K44 was used to set device in DTM (CS+PD) mode for testing. However, device could not be connected in DTM 4-slots uplink.
- For each slot addition in multi-slot modes (DTM, GPRS, EDGE), there is software power reduction of ≈ 3/1/2 dB per slot respectively for GSM 850 and 2/2.5/0.5 dB per slot respectively for GSM 1900.
- For head configurations, 1 slot CS, 2/3-slots (PD) and DTM (CS+PD) were evaluated.
- For body SAR configurations, 1 slot CS, 2/3/4-slots GPRS (PD) mode were tested.
- In EDGE/GPRS mode, GMSK Modulation was used using CS1-CS4 or MCSI-MCS4.
- 8-PSK modulation or MCS5-MCS9 code scheme were avoided since maximum burst avg . power was measured lower on those modulation schemes.
- As per IEEE 1528 -2013 "both GSM and GPRS use GMSK, which is a constant amplitude modulation; therefore, the maximum time-averaged output power with respect to the maximum number of time slots used in each mode can be used to determine the most conservative mode for SAR testing. Similarly, EGPRS (which uses GMSK and 8PSK) can be included with GSM and GPRS in this determination of the most conservative mode for SAR testing due to its innate similarities to GSM and GPRS."

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

WCDMA Handsets

The following procedures are applicable to 3GPP Release 99, Release 5 and Release 6 UMTS/WCDMA handsets. The default test configuration is to measure SAR with an established radio link between the handset and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCHn), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Uplink and downlink are both configured with the same RMC and required AMR. SAR for Release 5 HSDPA and Release 6 HSPA are measured respectively using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified by applying the applicable versions of 3GPP TS 34.121. SAR must be measured according to these maximum output conditions and requirements in KDB Publication 447498. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

Output Power Verification

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

Head SAR Measurements

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

Body SAR Measurements

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

Handsets with Release 5 HSDPA

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

Handsets with Release 6 HSPA (HSDPA/HSUPA)

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

Release 5 HSDPA Data Devices

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

Output Power Verification

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

SAR Measurement

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

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

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

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
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.

Output Power Verification

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

SAR Measurement

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

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

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

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

Table 1.8.2.2-2: Sub-test for HUSPA

HSPA, HSPA+ and DC-HSDPA SAR Guidance

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

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

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

1.8.4 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.

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

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**.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Note: This threshold is the 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.

Glossary

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Standalone SAR test exclusion guidance:

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

$$\left(\frac{\text{max. power of channel, including tune-up tolerance (mW)}}{\text{min. test separation distance (mm)}} \times \sqrt{f_{(GHz)}}\right) \leq 3.0$$, For 1g SAR

Where:

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation[17]
- If *distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion
- The result is rounded to one decimal place for comparison

SAR test reduction considerations:

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

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

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

Simultaneous Transmission SAR Test exclusion considerations:

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

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

Where:

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

Simultaneous Transmission SAR required:

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

1.10 Wi-Fi and Hotspot Mode Power Reductions

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

- UMTS band II ≈ 2.0 dB
- LTE band 2 ≈ 2.0 dB
- LTE band 7 ≈ 3.5 dB
- 802.11a (U-NII-3) ≈ 2.0 dB

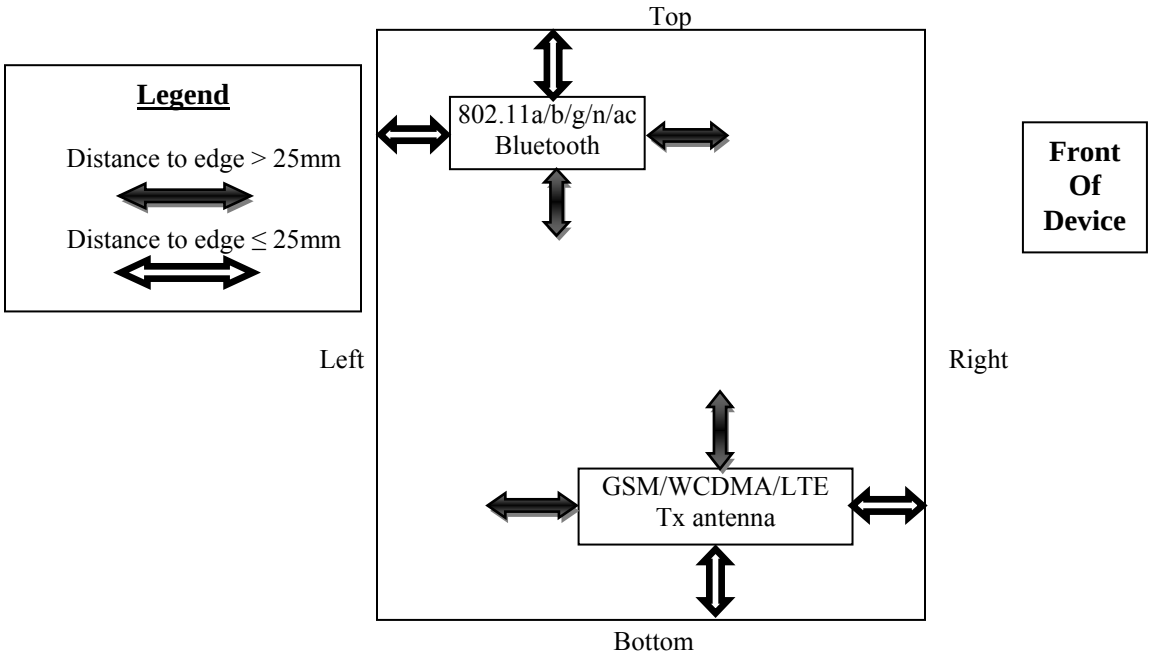

Figure 1.8.4-1 Identification of all sides for SAR Testing

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

Hotspot Sides for SAR Testing						
Mode	**Front**	**Back**	**Top**	**Bottom**	**Left**	**Right**
GPRS 850/1900, WCDMA/HSPA II/IV/V, LTE band 2/4/5/7/17	Yes	Yes	No	Yes	No	Yes
Bluetooth 2.4GHz, 802.11b/g/n (2.4 GHz), 802.11a/n/ac (5.0 GHz)	Yes	Yes	Yes	No	Yes	No

Table 1.8.4-1 Identification of all sides for SAR Testing

2.0 DESCRIPTION OF THE TEST EQUIPMENT

2.1 SAR measurement system

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

The DASY 52 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
- An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A DAE module that performs the signal amplification, signal multiplexing, A/D conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the Electro-optical coupler (EOC).
- A unit to operate the optical surface detector that is connected to the EOC.
- The EOC performs the conversion from an optical signal into the digital electric signal of the DAE. The EOC is connected to the PC plug-in card.
- The functions of the PC plug-in card based on a DSP are to perform the time critical tasks such as signal filtering, surveillance of the robot operation fast movement interrupts.
- A computer operating Windows.
- DASY52 software version 52.8.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM Twin Phantom enabling testing left-hand and right-hand usage.
- The device holder for mobile phones.
- Tissue simulating liquid mixed according to the given recipes (see section 6.1).
- System validation dipoles allowing for the validation of proper functioning of the system.

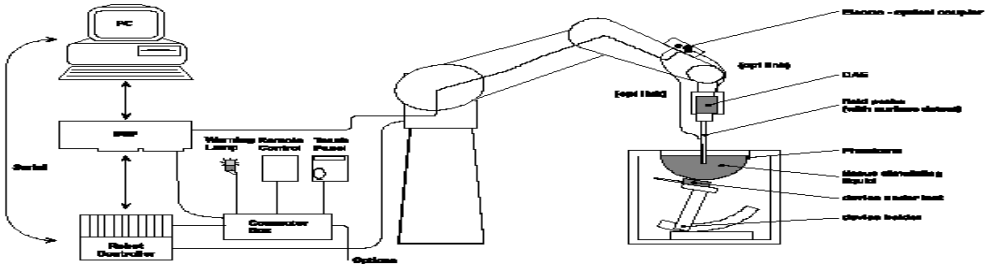

Figure 2.1-1 System Description

2.1.1 Equipment List

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date (MM/DD/YY)
SCHMID & Partner Engineering AG	E-field probe	EX3DV4	3592	11/10/2015
SCHMID & Partner Engineering AG	E-field probe	ET3DV6	1643	3/13/2016
SCHMID & Partner Engineering AG	E-field probe	ES3DV3	3225	2/25/2016
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE4)	DAE4	881	01/13/2016
SCHMID & Partner Engineering AG	Dipole Validation Kit	D750V2	1021	03/11/2017
SCHMID & Partner Engineering AG	Dipole Validation Kit	D835V2	446	03/11/2017
SCHMID & Partner Engineering AG	Dipole Validation Kit	D1800V2	2d020	03/12/2017
SCHMID & Partner Engineering AG	Dipole Validation Kit	D1900V2	545	03/12/2017
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2450V2	791	09/10/2015
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2600V2	1033	03/13/2017
SCHMID & Partner Engineering AG	Dipole Validation Kit	D5000V2	1033	11/08/2015
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	Signal generator	SMA 100	102106	11/28/2015
CPI Wireless Solutions	Amplifier	VZC-6961K4	SK4310E5	CNR
Rohde & Schwarz	Wideband Base Station Simulator	CMW 500	136298	11/29/2016
Rohde & Schwarz	Base Station Simulator	CMU 200	109747	11/27/2015
Rohde & Schwarz	Bluetooth Tester	CBT	100370	11/25/2015
Weinschel Corp	20dB Attenuator	33-20-34	BMO697	CNR

Table 2.1.1-1 Equipment list

2.2 Description of the test setup

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

2.2.1 Device and base station simulator setup

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

2.2.2 DASY setup

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

3.0 ELECTRIC FIELD PROBE CALIBRATION

3.1 Probe Specifications

SAR measurements were conducted using the dosimetric probes ES3DV3/ET3DV6 and EX3DV4, designed by Schmid & Partner Engineering AG for the measurement of SAR. The probe is constructed using the thin film technique, with printed resistive lines on ceramic substrates. It has a symmetrical design with triangular core, built-in optical fibre for the surface detection system and built-in shielding against static discharge. The probe is sensitive to E-fields and thus incorporates three small dipoles arranged so that the overall response is close to isotropic. The table below summarizes the technical data for the probe.

Property	Data
Frequency range	30 MHz – 3 GHz
Linearity	±0.1 dB
Directivity (rotation around probe axis)	≤ ±0.2 dB
Directivity (rotation normal to probe axis)	±0.4 dB
Dynamic Range	5 mW/kg – 100 W/kg
Probe positioning repeatability	±0.2 mm
Spatial resolution	< 0.125 mm ³
Probe model EX3DV4 for 2.4 – 6 GHz	
Probe tip to sensor center	1.0 mm
Probe tip diameter is	2.5 mm
Probe calibration uncertainty	< 15 % for f = 2.45 to < 6.0 GHz
Probe calibration range	± 100 MHz

Table 3.1-1 Probe specifications

3.2 Probe calibration and measurement uncertainty

The probe had been calibrated with accuracy better than ±12% (<2600 MHz) and 13.1% (5000 MHz). The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe were tested. The probe calibration parameters are shown on Appendix D and below:

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.69	6.69	6.69	0.32	3.00	± 12.0 %
900	41.5	0.97	6.09	6.09	6.09	0.33	3.00	± 12.0 %
1810	40.0	1.40	5.18	5.18	5.18	0.80	2.02	± 12.0 %
1950	40.0	1.40	4.93	4.93	4.93	0.80	2.06	± 12.0 %
2450	39.2	1.80	4.58	4.58	4.58	0.80	1.62	± 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	6.29	6.29	6.29	0.36	2.49	± 12.0 %
900	55.0	1.05	6.00	6.00	6.00	0.33	3.00	± 12.0 %
1810	53.3	1.52	4.50	4.50	4.50	0.80	2.60	± 12.0 %
1950	53.3	1.52	4.56	4.56	4.56	0.80	2.23	± 12.0 %
2450	52.7	1.95	3.93	3.93	3.93	0.70	1.60	± 12.0 %

Table 3.2-1 Probe ET3DV6 SN: 1643 (Cal issued: 03/13/2015)

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.50	6.50	6.50	0.61	1.31	± 12.0 %
900	41.5	0.97	6.22	6.22	6.22	0.30	1.84	± 12.0 %
1810	40.0	1.40	5.26	5.26	5.26	0.50	1.46	± 12.0 %
1950	40.0	1.40	5.01	5.01	5.01	0.80	1.11	± 12.0 %
2300	39.5	1.67	4.77	4.77	4.77	0.75	1.25	± 12.0 %
2450	39.2	1.80	4.60	4.60	4.60	0.57	1.49	± 12.0 %
2600	39.0	1.96	4.40	4.40	4.40	0.72	1.30	± 12.0 %

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.19	6.19	6.19	0.80	1.23	± 12.0 %
900	55.0	1.05	6.07	6.07	6.07	0.53	1.41	± 12.0 %
1810	53.3	1.52	4.89	4.89	4.89	0.63	1.46	± 12.0 %
1950	53.3	1.52	4.86	4.86	4.86	0.44	1.86	± 12.0 %
2300	52.9	1.81	4.48	4.48	4.48	0.80	1.29	± 12.0 %
2450	52.7	1.95	4.34	4.34	4.34	0.72	1.14	± 12.0 %
2600	52.5	2.16	4.06	4.06	4.06	0.80	1.08	± 12.0 %

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
2600	39.0	1.96	6.80	6.80	6.80	0.36	0.93	± 12.0 %
5250	35.9	4.71	4.63	4.63	4.63	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.20	4.20	4.20	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.34	4.34	4.34	0.40	1.80	± 13.1 %

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)
2600	52.5	2.16	6.84	6.84	6.84	0.78	0.62	± 12.0 %
5250	48.9	5.36	4.06	4.06	4.06	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.78	3.78	3.78	0.45	1.90	± 13.1 %
5750	48.3	5.94	3.81	3.81	3.81	0.50	1.90	± 13.1 %

Table 3.2-3 Probe EX3DV4 SN: 3592 (Cal issued: 11/10/2014)

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

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

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

4.0 SAR MEASUREMENT SYSTEM VERIFICATION

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

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

4.1 System accuracy verification for head adjacent use

Dipole Validation						
F (MHz)	Measured Date	Dielectric Parameters		Liquid Temp. (°C)	Scan Type	SAR 1g/10g (W/Kg)
		Ɛr	σ [s/m]			
750	4/23/2015	42.1	0.91	21.6	Area Scan/Fast SAR	8.04/5.38
					Zoom Scan/Full SAR	7.90/5.21
	Limits:	41.9	0.89		Dipole: 1021	8.28/5.42
835	4/20/2015	41.6	0.89	21.6	Area Scan/Fast SAR	9.64/6.40
					Zoom Scan/Full SAR	9.62/6.42
	Limits:	41.5	0.90		Dipole: 446	9.28/6.06
1800	4/14/2015	38.3	1.46	20.7	Area Scan/Fast SAR	36.6/19.7
					Zoom Scan/Full SAR	35.9/19.1
	Limits:	40.0	1.40		Dipole: 2d020	38.5/20.2
1900	4/9/2015	38.4	1.41	21.5	Area Scan/Fast SAR	37.9/19.9
					Zoom Scan/Full SAR	37.1/19.8
	4/13/2015	38.4	1.40	21.8	Area Scan/Fast SAR	38.6/20.3
					Zoom Scan/Full SAR	37.6/20.1
	4/27/2015	38.0	1.42	21.5	Area Scan/Fast SAR	38.2/20.2
					Zoom Scan/Full SAR	37.6/20.1
	Limits:	40.0	1.40		Dipole: 545	39.6/20.8
2450	4/6/2015	38.5	1.85	21.8	Area Scan/Fast SAR	54.5/25.

						9
					Zoom Scan/Full SAR	55.1/25.6
	Limits:	39.2	1.80		Dipole: 791	51.6/24.0
2600	4/7/2015	37.9	2.02	21.8	Area Scan/Fast SAR	57.5/26.1
					Zoom Scan/Full SAR	56.6/25.5
	Limits:	39.0	1.96		Dipole: 1033	56.1/25.0
5200	4/27/2015	34.3	4.83	21.5		
					Zoom Scan/Full SAR	85.2/24.7
	Limits:	36.0	4.66		Dipole: 1033	79.4/22.6
5500	4/27/2015	34.2	5.11	21.5		
					Zoom Scan/Full SAR	90.9/25.9
	Limits:	35.6	4.96		Dipole: 1033	84.4/23.9
5800	4/27/2015	33.6	5.46	21.5		
					Zoom Scan/Full SAR	86.4/24.7
	Limits:	35.3	5.27		Dipole: 1033	79.4/22.6

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

5.0 PHANTOM DESCRIPTION

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

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

Left side head
Right side head
Flat phantom

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

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

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

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

Figure 5.0-1 SAM Twin Phantom

6.0 TISSUE DIELECTRIC PROPERTIES

6.1 Composition of tissue simulant

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

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

Table 6.1-1 Tissue simulant recipe

6.1.1 Equipment

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

Table 6.1.1-1 Tissue simulant preparation equipment

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

Dielectric Parameters						
Band (MHZ)	Tissue Type	Measured Date	F (MHz)	Dielectric Parameters		Liquid Temp. (°C)
				Ɛr	σ [s/m]	
750	Head	4/23/2015	705	42.8	0.87	21.6
			715	42.7	0.88	
			750	42.1	0.91	
			775	41.8	0.93	
			790	41.6	0.95	
		Limits:	750	41.9	0.89	
	Muscle	4/23/2001 5	705	54.3	0.91	21.6
			715	54.2	0.92	
			750	53.8	0.95	
			775	53.5	0.98	
			790	53.3	0.99	
		Limits:	750	55.5	0.96	

835	Head	4/20/2015	815	41.8	0.86	21.6
			825	41.7	0.87	
			835	41.6	0.89	
			850	41.4	0.90	
			865	41.2	0.91	
		Limits:	835	41.5	0.90	
	Muscle	4/20/2015	815	53.7	0.94	21.5
			825	53.6	0.96	
			835	53.6	0.97	
			850	53.4	0.98	
		Limits:	835	55.2	0.97	
1800	Head	4/14/2015	1710	38.6	1.36	20.7
			1750	38.5	1.40	
			1800	38.3	1.46	
		Limits:	1800	40.0	1.40	
	Muscle	4/14/2015	1710	51.9	1.49	20.8
			1750	51.7	1.54	
			1800	51.6	1.60	
		Limits:	1800	53.3	1.52	
1900	Head	4/9/2015	1850	38.7	1.36	21.5
			1900	38.4	1.41	
			1910	38.4	1.42	
			1980	38.1	1.49	
		4/13/2015	1850	38.6	1.35	21.8
			1900	38.4	1.40	
			1910	38.4	1.41	
			1980	38.2	1.48	
		4/27/2015	1850	38.3	1.37	21.5
			1900	38.04	1.42	
			1910	38	1.44	
			1980	37.7	1.51	
		Limits:	1900	40.0	1.40	
	Muscle	4/9/2015	1850	51.7	1.49	21.5
			1900	51.5	1.54	
			1910	51.4	1.54	
		4/13/2015	1850	51.9	1.48	21.8
			1900	51.7	1.53	
			1910	51.7	1.54	
		4/27/2015	1850	51.7	1.52	21.5
			1900	51.4	1.57	
			1910	51.5	1.59	
		Limits:	1900	53.3	1.52	
2450	Head	4/6/2015	2410	38.61	1.80	21.8
			2450	38.52	1.85	
			2480	38.41	1.88	
		Limits:	2450	39.2	1.80	

	Muscle	4/6/2015	2410	50.56	1.95	21.8
			2450	50.48	2.00	
			2480	50.35	2.04	
		Limits:	2450	52.7	1.95	
2600	Head	4/7/2015	2500	38.3	1.90	21.8
			2570	38	1.99	
			2600	37.9	2.02	
		Limits:	2600	39.0	1.96	
	Muscle	4/7/2015	2500	50.8	2.13	21.5
			2570	50.6	2.22	
			2600	50.5	2.26	
		Limits:	2600	52.5	2.16	
5200	Head	4/27/2015	5180	34.37	4.81	21.5
			5200	34.34	4.83	
			5280	34.20	4.93	
		Limits:	5200	36.0	4.66	
	Muscle	4/27/2015	5180	46.93	5.44	21.5
			5200	46.89	5.47	
			5280	46.75	5.57	
		Limits:	5200	49.0	5.30	
5500	Head	4/27/2015	5500	34.17	5.11	21.5
			5600	33.97	5.22	
		Limits:	5500	35.6	4.96	
	Muscle	4/27/2015	5500	46.35	5.78	21.5
			5600	46.18	5.92	
		Limits:	5500	48.6	5.65	
5800	Head	4/27/2015	5745	33.67	5.39	21.5
			5800	33.58	5.46	
		Limits:	5800	35.3	5.27	
	Muscle	4/27/2015	5745	45.96	6.03	21.5
			5800	45.83	6.10	
		Limits:	5800	48.2	6.00	

Table 6.2-1 Electrical parameters of tissue simulating liquid

6.2.2 Test Configuration

Dielectric Probe Kit

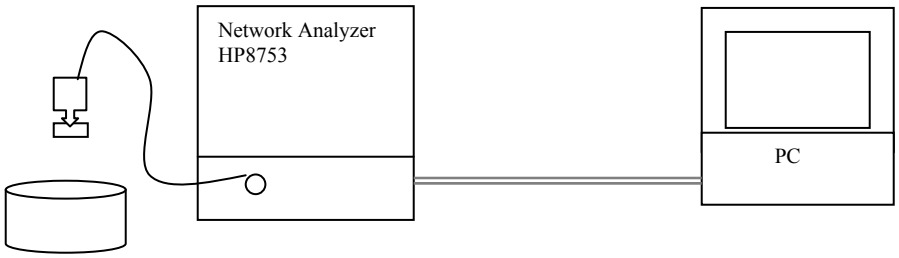

Figure 6.2.2-1 Test configuration

6.2.3 Procedure

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

7.0 SAR SAFETY LIMITS

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

Table 7.0-1 SAR safety limits for Controlled / Uncontrolled environment

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

Table 7.0-2 SAR safety limits

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

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

8.0 DEVICE POSITIONING

8.1 Device holder for SAM Twin Phantom

The Device was positioned for all test configurations using the DASY5 holder. The device holder facilitates the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately and with repeatability positioned according to FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

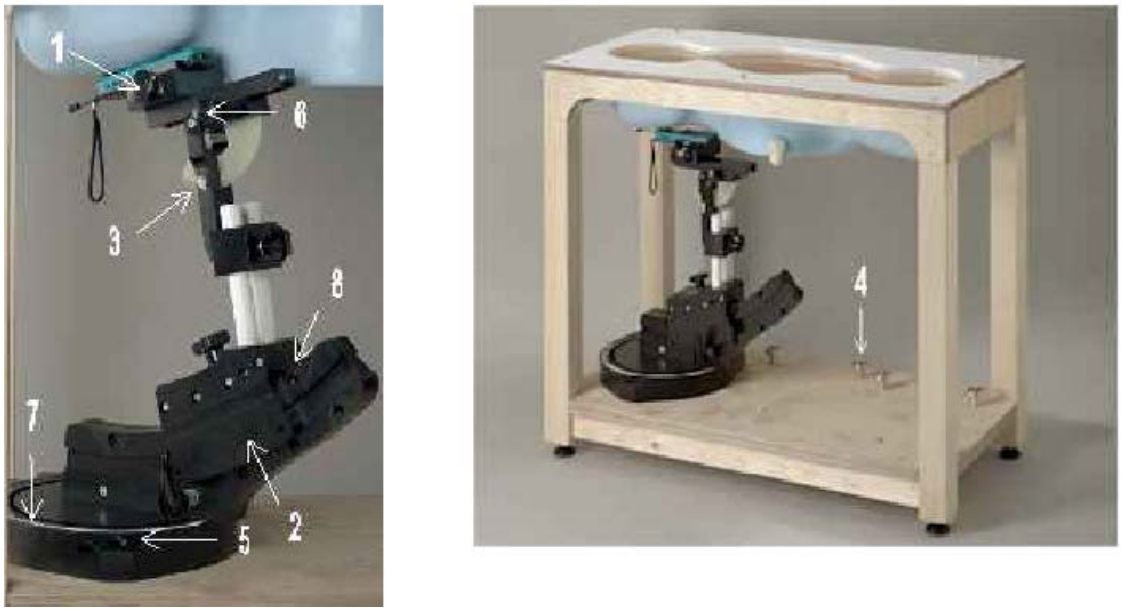

Figure 8.1-1 Device Holder

1. Put the phone in the clamp mechanism (1) and hold it straight while tightening. (Curved phones or phones with asymmetrical ear pieces should be positioned so that the earpiece is in the symmetry plane of the clamp).
2. Adjust the sliding carriage (2) to 90°. Then adjust the phone holder angle (3) until the reference line of the phone is horizontal (parallel to the flat phantom bottom). The phone reference line is defined as the front tangential line between the earpiece and the center of the device bottom (or the center of the flip hinge). For devices with parallel front and backsides, the phone holder angle (3) is 0°.
3. Place the device holder at the desired phantom section and move it securely against the positioning pins (4). The screw in front of the turning plate can be applied for correct positioning (5). (Do not tighten it too strongly).
4. Shift the phone clamp (6) so that the earpiece is exactly below the ear marking of the phantom. The phone is now correctly positioned in the holder for all standard phantom measurements, even after changing the phantom or phantom section.
5. Adjust the device position angles to the desired measurement position.
6. After fixing the device angles, move the phone fixture up until the phone touches the ear marking. (The point of contact depends on the design of the device and the positioning angle).

8.2 Description of the test positioning

8.2.1 Test Positions of Device Relative to Head

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

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

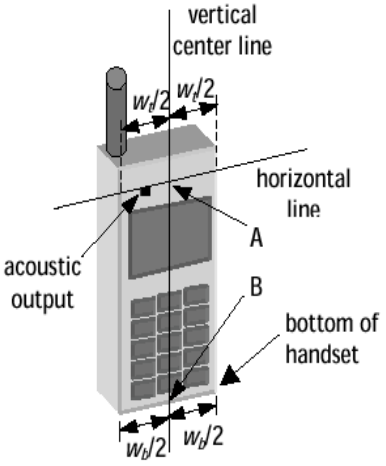

Figure 8.2.1-1 Handset vertical and horizontal reference lines – fixed case

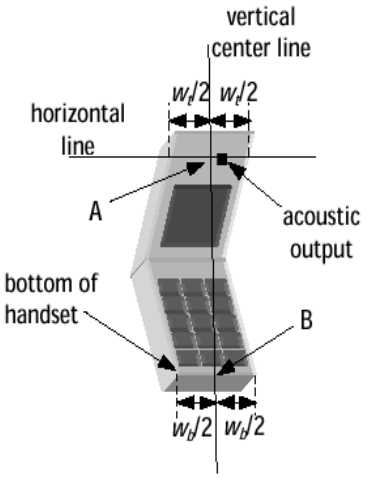

Figure 8.2.1-2 Handset vertical and horizontal reference lines – "clam-shell"

Definition of the "cheek" position

1) Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover.
2) Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width *wt* of the handset at the level of the acoustic output (point A on Figures 8.2.1-1 and 8.2.1-2), and the midpoint of the width *wb* of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 8.2.1-1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 8.2.1-2), especially for clamshell handsets, handsets with flip pieces, and other irregularly shaped handsets.
3) Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 8.2.1-3), such that the plane defined by the vertical center line and the horizontal center line is in a plane approximately parallel to the sagittal plane of the phantom.
4) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.
5) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is the plane normal to MB ("*mouth-back*") - NF ("*neck-front*") including the line MB (reference plane).
6) Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF.
7) While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the ear (cheek).

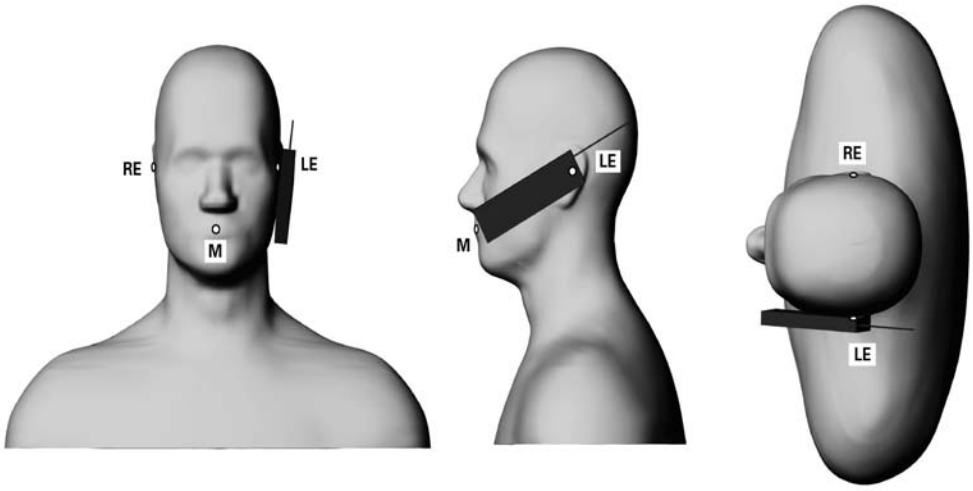

Figure 8.2.1-3 Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

Definition of the "Tilted" Position

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

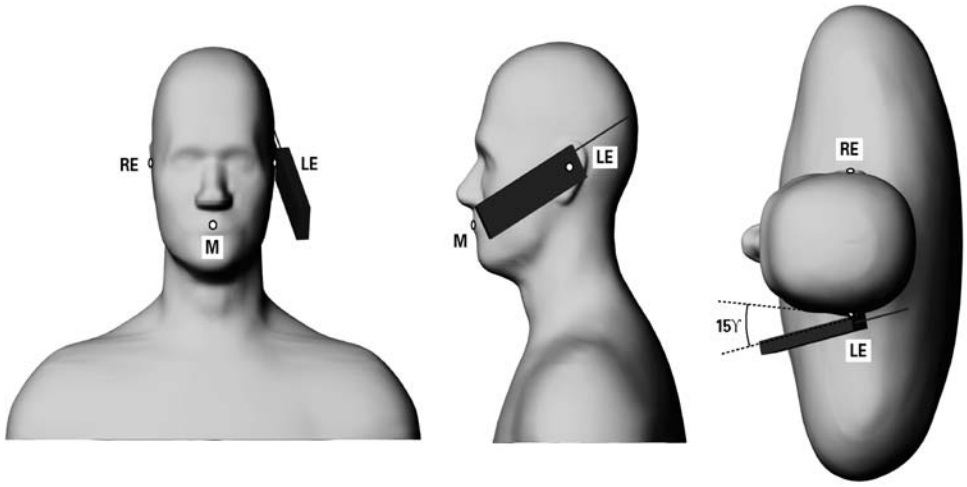

Figure 8.2.1-4 Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.2 Body-worn Configuration

Body-worn configurations, as shown in appendix E, have been tested with the device for RF exposure compliance. The device was tested with a holster and/or a minimum separation distance. The device was tested with 15 mm BLACKBERRY recommended separation distance to allow typical after-market holster to be used. For holster testing the holster case and the belt clip was placed against the flat section of the phantom. A headset was then connected to the device to simulate hands-free operation in a body worn holster configuration. BLACKBERRY body-worn holsters with belt-clip have been designed to maintain ~ 19-20 mm separation distance from body.

8.2.3 Limb/Hand Configuration

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

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

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

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

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

9.0 HIGH LEVEL EVALUATION

9.1 Maximum search

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

9.2 Extrapolation

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

9.3 Boundary correction

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

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

The 1g and 10g peak evaluations are done using a minimum predefined cube of 5x5x7 (≤2 GHz) / 7x7x7 (2-3 GHz) / 7x7x12 (5-6 GHz) scan. The cube's (x,y) parameters will extend if the maxima is found to be outside the zoom scan boundary to ensure the absolute peak value is recorded. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30x30x30mm (<3 GHz) / 24x24x22mm (5-6 GHz) with 7.5mm (≤2 GHz) / 5mm (2-3 GHz) / 4mm (5-6 GHz) resolution in (x,y) and 5mm (<3 GHz) / 2mm (5-6 GHz) resolution in z axis amounts to 175 (≤2 GHz) / 343 (2-3 GHz) / 588 (5-6 GHz) measurement points. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is then moved around until the highest averaged SAR is found. This last procedure is repeated for a 10 g cube. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

10.0 MEASUREMENT UNCERTAINTY

DASY5 Uncertainty Budget
(0.3 - 3 GHz range)

Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Modulation Response[m]	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Power Scaling[p]	±0%	R	$\sqrt{3}$	1	1	±0.0%	±0.0%	∞
Phantom and Setup								
Phantom Uncertainty	±6.1%	R	$\sqrt{3}$	1	1	±3.5%	±3.5%	∞
SAR correction	±1.9%	R	$\sqrt{3}$	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)[DAK]	±2.5%	R	$\sqrt{3}$	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.) [DAK]	±2.5%	R	$\sqrt{3}$	0.26	0.26	±0.3%	±0.4%	∞
Temp. unc. - Conductivity [BB]	±3.4%	R	$\sqrt{3}$	0.78	0.71	±1.5%	±1.4%	∞
Temp. unc. - Permittivity [BB]	±0.4%	R	$\sqrt{3}$	0.23	0.26	±0.1%	±0.1%	∞
Combined Std. Uncertainty						±11.2%	±11.1%	361
Expanded STD Uncertainty						**±22.3%**	**±22.2%**	

Table 10.0-1 Worst-Case uncertainty budget for DASY5 assessed according to IEEE P1528-2013. Source: Schmid & Partner Engineering AG.

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

Relative DASY5 Uncertainty Budget for Fast SAR Tests
(0.3 - 3 GHz range)

Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.0%	N	1	0	0			
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Modulation Response	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	0	0			
Response Time	±0.8%	R	$\sqrt{3}$	0	0			
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	0	0			
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Spatial x-y-Resolution	±10.0%	R	$\sqrt{3}$	1	1	±5.8%	±5.8%	∞
Fast SAR z-Approximation	±7.0%	R	$\sqrt{3}$	1	1	±4.0%	±4.0%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Power Scaling	±0%	R	$\sqrt{3}$	0	0			
Phantom and Setup								
Phantom Uncertainty	±6.1%	R	$\sqrt{3}$	1	1	±3.5%	±3.5%	∞
SAR correction	±1.9%	R	$\sqrt{3}$	0	0			
Liquid Conductivity (mea.)	±2.5%	R	$\sqrt{3}$	0	0			
Liquid Permittivity (mea.)	±2.5%	R	$\sqrt{3}$	0	0			
Temp. unc. - Conductivity	±3.4%	R	$\sqrt{3}$	0	0			
Temp. unc. - Permittivity	±0.4%	R	$\sqrt{3}$	0	0			
Combined Std. Uncertainty						±11.4%	±11.4%	748
Expanded STD Uncertainty						**±22.7%**	**±22.7%**	

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

DASY5 Uncertainty Budget
(3 - 6 GHz range)

Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.55 %	N	1	1	1	±6.55 %	±6.55 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	$\sqrt{3}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±2.0 %	R	$\sqrt{3}$	1	1	±1.2 %	±1.2 %	∞
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Modulation Response[m]	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Probe Positioning	±6.7 %	R	$\sqrt{3}$	1	1	±3.9 %	±3.9 %	∞
Max. SAR Eval.	±4.0 %	R	$\sqrt{3}$	1	1	±2.3 %	±2.3 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %	∞
Power Scaling[p]	±0 %	R	$\sqrt{3}$	1	1	±0.0 %	±0.0 %	∞
Phantom and Setup								
Phantom Uncertainty	±6.6 %	R	$\sqrt{3}$	1	1	±3.8 %	±3.8 %	∞
SAR correction	±1.9 %	R	$\sqrt{3}$	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.)[DAK]	±2.5 %	R	$\sqrt{3}$	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.)[DAK]	±2.5 %	R	$\sqrt{3}$	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity[BB]	±3.4 %	R	$\sqrt{3}$	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity[BB]	±0.4 %	R	$\sqrt{3}$	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±12.3 %	±12.2 %	748
Expanded STD Uncertainty						**±24.6 %**	**±24.5 %**	

Table 10.0-3 Worst-Case uncertainty budget for DASY52 assessed according to IEEE P1528-2013.
Source: Schmid & Partner Engineering AG.

11.0 TEST RESULTS

11.1 Conducted power results at maximum transmit power

GSM/EDGE/GPRS/DTM With Full Power On Rev 1						
Mode	**Freq. (MHz)**	**Channel**	**Max burst averaged conducted power (dBm) CS1 (GMSK)**	**Max burst averaged conducted power (dBm) MCS1 (GMSK)**	**Max burst averaged conducted power (dBm) MCS5 (8-PSK)**	
2-slots EDGE/GPRS 850 MHz	824.2	128	29.3	29.3	24.5	
	836.8	190	29.3	29.3	24.5	
	848.8	251	29.3	29.3	24.3	
2-slots DTM 850 MHz	824.2	128	29.3	29.3	29.3	
	836.8	190	29.3	29.3	29.2	
	848.8	251	29.3	29.3	29.2	
3-slots EDGE/GPRS 850 MHz	824.2	128	28.1	28.1	23.4	
	836.8	190	28.1	28.1	23.4	
	848.8	251	28.1	28.1	23.2	
3-slots DTM 850 MHz	824.2	128	28.2	28.1	28.1	
	836.8	190	28.1	28.1	28.1	
	848.8	251	28.1	28.1	28.1	
4-slots EDGE/GPRS 850 MHz	824.2	128	27.0	27.0	22.2	
	836.8	190	27.1	27.1	22.2	
	848.8	251	27.0	27.0	22.0	
2-slots EDGE/GPRS 1900MHz	1850.2	512	28.2	28.2	23.3	
	1880.0	661	28.1	28.1	23.1	
	1909.8	810	28.0	28.0	23.0	
2-slots DTM 1900MHz	1850.2	512	28.1	28.1	28.1	27.9
	1880.0	661	28.0	28.1	28.1	27.9
	1909.8	810	28.0	28.0	28.1	27.9
3-slots EDGE/GPRS 1900MHz	1850.2	512	25.3	25.3	22.2	
	1880.0	661	25.0	25.0	22.1	
	1909.8	810	25.0	25.0	22.0	
3-slots DTM 1900MHz	1850.2	512	25.1	25.2	25.2	24.9
	1880.0	661	25.0	25.0	25.0	24.7
	1909.8	810	25.0	25.0	25.0	24.7
4-slots EDGE/GPRS 1900MHz	1850.2	512	24.5	24.5	20.7	
	1880.0	661	24.4	24.4	20.8	
	1909.8	810	24.2	24.2	20.7	

Mode	Freq. (MHz)	Channel	Max burst averaged conducted power (dBm)

1-slot GSM (**CS GMSK**) 850 MHz	824.2	128	32.5
	836.8	190	32.4
	848.8	251	32.2
1-slot GSM (**CS GMSK**) 1900 MHz	1850.2	512	29.5
	1880.0	661	29.3
	1909.8	810	29.4

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

Calculation Of Time Based Average Power Per Slot 835MHz On Rev 1					
Mode	**Freq. (MHz)**	**Channel**	**Slot average power (measured) (dBm) CS1**	**# of slots**	**Time based average power (calculated) (dBm) CS1**
1-slot GMSK 850 MHz	824.2	128	32.5	1	**23.5**
	836.8	190	32.4	1	23.4
	848.8	251	32.2	1	23.2
2-slots GMSK 850 MHz	824.2	128	29.3	2	23.3
	836.8	190	29.3	2	23.3
	848.8	251	29.3	2	23.3
3-slots GMSK 850 MHz	824.2	128	28.1	3	23.8
	836.8	190	28.1	3	23.8
	848.8	251	28.1	3	23.8
4-slots GMSK 850 MHz	824.2	128	27	4	24.0
	836.8	190	27.1	4	**24.1**
	848.8	251	27	4	24.0
2-slots DTM 850 MHz	824.2	128	29.3	2	23.3
	836.8	190	29.3	2	23.3
	848.8	251	29.3	2	23.3
3-slots DTM 850 MHz	824.2	128	27	3	22.7
	836.8	190	27.1	3	22.8
	848.8	251	27	3	22.7

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

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

Calculation Of Time Based Average Power Per Slot 1900 MHz On Rev 1-00					
Mode	**Freq. (MHz)**	**Channel**	**Slot average power (measured) (dBm) CS1**	**# of slots**	**Time based average power (calculated) (dBm) CS1**
1-slot	1850.2	512	29.5	1	20.5
GMSK	1880.0	661	29.3	1	20.3
1900 MHz	1909.8	810	29.4	1	20.4
2-slots	1850.2	512	28.2	2	**22.2**
GMSK	1880.0	661	28.1	2	22.1
1900 MHz	1909.8	810	28	2	22.0
3-slots	1850.2	512	25.3	3	21.0
GMSK	1880.0	661	25	3	20.7
1900 MHz	1909.8	810	25	3	20.7
4-slots	1850.2	512	24.5	4	21.5
GMSK	1880.0	661	24.4	4	21.4
1900 MHz	1909.8	810	24.2	4	21.2
2-slots	1850.2	512	28.1	2	**22.1**
DTM	1880.0	661	28	2	22.0
1900MHz	1909.8	810	28	2	22.0
3-slots	1850.2	512	25.1	3	20.8
DTM	1880.0	661	25	3	20.7
1900MHz	1909.8	810	25	3	20.7

11.1-1c GSM/EDGE/GPRS/DTM 1900 calculation of time based average power per slot on Rev 1-00

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.”

GSM/EDGE/GPRS/DTM With Full Power On Rev 2-02					
Mode	**Freq. (MHz)**	**Channel**	**Max burst averaged conducted power (dBm) CS1 (GMSK)**	**Max burst averaged conducted power (dBm) MCS1 (GMSK)**	**Max burst averaged conducted power (dBm) MCS5 (8-PSK)**
2-slots EDGE/GPRS 850 MHz	824.2	128	29.7	-	24.9
	836.8	190	29.8	-	25.0
	848.8	251	29.6	-	24.8
3-slots EDGE/GPRS 850 MHz	824.2	128	28.4	-	23.7
	836.8	190	28.6	-	23.7
	848.8	251	28.4	-	23.6
4-slots EDGE/GPRS 850 MHz	824.2	128	27.5	-	22.4
	836.8	190	27.6	-	22.3
	848.8	251	27.5	-	22.2
2-slots EDGE/GPRS 1900MHz	1850.2	512	28.6	-	23.6
	1880.0	661	28.4	-	23.6
	1909.8	810	28.4	-	23.6
3-slots EDGE/GPRS 1900MHz	1850.2	512	25.6	-	22.4
	1880.0	661	25.6	-	22.1
	1909.8	810	25.4	-	22.3
4-slots EDGE/GPRS 1900MHz	1850.2	512	25.9	-	22.4
	1880.0	661	25.8	-	22.3
	1909.8	810	25.7	-	22.1

Mode	**Freq. (MHz)**	**Channel**	**Max burst averaged conducted power (dBm)**
1-slot GSM (**CS GMSK**) 850 MHz	824.2	128	32.9
	836.8	190	33.3
	848.8	251	33.1
1-slot GSM (**CS GMSK**) 1900 MHz	1850.2	512	30.8
	1880.0	661	30.7
	1909.8	810	30.7

Table 11.1-1d GSM/EDGE/GPRS/DTM conducted power measurements for normal mode on Rev 2-02

Calculation Of Time Based Average Power Per Slot 835MHz On Rev 2-02					
Mode	**Freq. (MHz)**	**Channel**	**Slot average power (measured) (dBm) CS1**	**# of slots**	**Time based average power (calculated) (dBm) CS1**
1-slot	824.2	128	32.9	1	23.9
GMSK	836.8	190	33.3	1	24.3
850 MHz	848.8	251	33.1	1	24.1
2-slots	824.2	128	29.7	2	23.7
GMSK	836.8	190	29.8	2	23.8
850 MHz	848.8	251	29.6	2	23.6
3-slots	824.2	128	28.4	3	24.1
GMSK	836.8	190	28.6	3	24.3
850 MHz	848.8	251	28.4	3	24.1
4-slots	824.2	128	27.5	4	24.5
GMSK	836.8	190	27.6	4	**24.6**
850 MHz	848.8	251	27.5	4	24.5

11.1-1e GSM/EDGE/GPRS/DTM 850 calculation of time based average power per slot on Rev 2-02

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

Calculation Of Time Based Average Power Per Slot 1900MHz On Rev 2-02					
Mode	**Freq. (MHz)**	**Channel**	**Slot average power (measured) (dBm) CS1**	**# of slots**	**Time based average power (calculated) (dBm) CS1**
1-slot	1850.2	512	30.8	1	21.8
GMSK	1880.0	661	30.7	1	21.7
1900 MHz	1909.8	810	30.7	1	21.7
2-slots	1850.2	512	28.6	2	22.6
GMSK	1880.0	661	28.4	2	22.4
1900 MHz	1909.8	810	28.4	2	22.4
3-slots	1850.2	512	25.6	3	21.3
GMSK	1880.0	661	25.6	3	21.3
1900 MHz	1909.8	810	25.4	3	21.1
4-slots	1850.2	512	25.9	4	**22.9**
GMSK	1880.0	661	25.8	4	22.8
1900 MHz	1909.8	810	25.7	4	22.7

11.1-1f GSM/EDGE/GPRS/DTM 1900 calculation of time based average power per slot on Rev 2-02

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."

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	24.46	24.49	24.40
Rel99	12.2kbps, Voice, AMR, SRB 3.4 kbps	24.48	24.50	24.38
HSUPA	1	23.47	23.59	23.16
HSUPA	2	22.59	22.59	22.50
HSUPA	3	22.38	22.00	21.64
HSUPA	4	22.61	23.09	22.78
HSUPA	5	22.72	23.17	23.19
HSDPA+	1	23.51	23.55	23.41
HSDPA+	2	23.50	23.57	23.39
HSDPA+	3	23.05	23.06	22.90
HSDPA+	4	23.02	23.07	23.02
	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	23.70	23.87	24.00
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	23.75	23.90	24.02
HSUPA	1	23.03	23.01	22.92
HSUPA	2	21.92	21.94	21.59
HSUPA	3	21.33	21.57	21.33
HSUPA	4	22.08	22.43	22.25
HSUPA	5	21.96	22.13	22.99
HSDPA+	1	22.97	22.93	22.97
HSDPA+	2	22.83	22.95	23.05
HSDPA+	3	22.42	22.57	22.66
HSDPA+	4	22.34	22.55	22.58
	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	23.91	24.15	23.94
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	24.00	24.20	24.00
HSUPA	1	22.34	22.73	22.98
HSUPA	2	21.88	22.29	22.09
HSUPA	3	21.48	21.81	21.79
HSUPA	4	21.99	22.76	22.26
HSUPA	5	22.77	22.33	22.78
HSDPA+	1	23.02	23.12	22.89
HSDPA+	2	23.24	23.23	22.95
HSDPA+	3	22.57	22.67	22.51
HSDPA+	4	22.58	22.75	22.49

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

WCDMA With Reduced Power For Hotspot Mode				
	Band	**FDD II (1900)**		
	Freq (MHz)	1852.4	1880.0	1907.6
	Channel	9262	9400	9538
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	22.14	22.19	22.00
Rel99	12.2kbps, Voice, AMR, SRB 3.4 kbps	21.97	22.05	21.91
HSUPA	1	20.35	20.40	20.33
HSDPA+	1	20.89	21.06	20.90

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

LTE Band 2 With Full Power						
Band	**BW (MHz)**	**Mod.**	**Channel**	**RB**	**Offset**	**Max. avg. conducted power (dBm)**
2	20	QPSK	18700	1	LOW	23.23
2	20	QPSK	18700	1	MID	23.27
2	20	QPSK	18700	1	HIGH	23.38
2	20	QPSK	18700	50	LOW	22.29
2	20	QPSK	18700	50	HIGH	22.30
2	20	QPSK	18700	100	LOW	22.34
2	20	Q16	18700	1	LOW	22.30
2	20	Q16	18700	1	MID	22.33
2	20	Q16	18700	1	HIGH	22.42
2	20	Q16	18700	75	LOW	21.32
2	20	Q16	18700	75	HIGH	21.40
2	20	Q16	18700	100	LOW	21.37
2	20	QPSK	18900	1	LOW	23.31
2	20	QPSK	18900	1	MID	23.39
2	20	QPSK	18900	1	HIGH	23.34
2	20	QPSK	18900	50	LOW	22.36
2	20	QPSK	18900	50	HIGH	22.35
2	20	QPSK	18900	100	LOW	22.43
2	20	Q16	18900	1	LOW	22.23
2	20	Q16	18900	1	MID	22.32
2	20	Q16	18900	1	HIGH	22.36
2	20	Q16	18900	75	LOW	21.40
2	20	Q16	18900	75	HIGH	21.33
2	20	Q16	18900	100	LOW	21.36

2	20	QPSK	19100	1	LOW	23.40
2	20	QPSK	19100	1	MID	23.29
2	20	QPSK	19100	1	HIGH	23.02
2	20	QPSK	19100	50	LOW	22.36
2	20	QPSK	19100	50	HIGH	22.28
2	20	QPSK	19100	100	LOW	22.30
2	20	Q16	19100	1	LOW	22.87
2	20	Q16	19100	1	MID	22.20
2	20	Q16	19100	1	HIGH	22.12
2	20	Q16	19100	75	LOW	21.26
2	20	Q16	19100	75	HIGH	21.26
2	20	Q16	19100	100	LOW	21.23
2	15	QPSK	18900	1	LOW	23.33
2	15	QPSK	18900	1	MID	23.30
2	15	QPSK	18900	1	HIGH	23.26
2	15	QPSK	18900	36	LOW	22.38
2	15	QPSK	18900	36	HIGH	22.40
2	15	QPSK	18900	75	LOW	22.49
2	15	Q16	18900	1	LOW	22.63
2	15	Q16	18900	1	MID	22.69
2	15	Q16	18900	1	HIGH	22.69
2	15	Q16	18900	16	LOW	22.35
2	15	Q16	18900	16	HIGH	22.33
2	15	Q16	18900	75	LOW	21.43
2	10	QPSK	18900	1	LOW	23.23
2	10	QPSK	18900	1	MID	23.39
2	10	QPSK	18900	1	HIGH	23.35
2	10	QPSK	18900	25	LOW	22.38
2	10	QPSK	18900	25	HIGH	22.32
2	10	QPSK	18900	50	LOW	22.40
2	10	Q16	18900	1	LOW	22.31
2	10	Q16	18900	1	MID	22.27
2	10	Q16	18900	1	HIGH	22.65
2	10	Q16	18900	30	LOW	21.31
2	10	Q16	18900	30	HIGH	21.38
2	10	Q16	18900	50	LOW	21.39
2	5	QPSK	18900	1	LOW	23.31
2	5	QPSK	18900	1	MID	23.33
2	5	QPSK	18900	1	HIGH	23.25
2	5	QPSK	18900	10	LOW	22.40
2	5	QPSK	18900	10	HIGH	22.37
2	5	QPSK	18900	25	LOW	22.43
2	5	Q16	18900	1	LOW	22.24

2	5	Q16	18900	1	MID	22.25
2	5	Q16	18900	1	HIGH	22.34
2	5	Q16	18900	8	LOW	22.41
2	5	Q16	18900	8	HIGH	22.53
2	5	Q16	18900	25	LOW	21.49
2	3	QPSK	18900	1	LOW	23.35
2	3	QPSK	18900	1	MID	23.37
2	3	QPSK	18900	1	HIGH	23.42
2	3	QPSK	18900	6	LOW	22.42
2	3	QPSK	18900	6	HIGH	22.39
2	3	QPSK	18900	15	LOW	22.44
2	3	Q16	18900	1	LOW	22.42
2	3	Q16	18900	1	MID	22.50
2	3	Q16	18900	1	HIGH	22.39
2	3	Q16	18900	4	LOW	22.46
2	3	Q16	18900	4	HIGH	22.58
2	3	Q16	18900	15	LOW	21.37
2	1.4	QPSK	18900	1	LOW	23.37
2	1.4	QPSK	18900	1	MID	23.33
2	1.4	QPSK	18900	1	HIGH	23.35
2	1.4	QPSK	18900	3	LOW	23.47
2	1.4	QPSK	18900	3	HIGH	23.46
2	1.4	QPSK	18900	6	LOW	22.45
2	1.4	Q16	18900	1	LOW	22.53
2	1.4	Q16	18900	1	MID	22.47
2	1.4	Q16	18900	1	HIGH	22.51
2	1.4	Q16	18900	5	LOW	22.48
2	1.4	Q16	18900	5	HIGH	22.35
2	1.4	Q16	18900	6	LOW	21.37

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

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	21.23
2	20	QPSK	18700	1	MID	21.24
2	20	QPSK	18700	1	HIGH	21.36
2	20	QPSK	18700	50	LOW	21.26
2	20	QPSK	18700	50	HIGH	21.23
2	20	QPSK	18700	100	LOW	21.26
2	20	Q16	18700	1	LOW	21.27
2	20	Q16	18700	1	MID	21.34
2	20	Q16	18700	1	HIGH	21.44
2	20	Q16	18700	75	LOW	21.37
2	20	Q16	18700	75	HIGH	21.40
2	20	Q16	18700	100	LOW	21.32
2	20	QPSK	18900	1	LOW	21.33
2	20	QPSK	18900	1	MID	21.37
2	20	QPSK	18900	1	HIGH	21.33
2	20	QPSK	18900	50	LOW	21.27
2	20	QPSK	18900	50	HIGH	21.27
2	20	QPSK	18900	100	LOW	21.33
2	20	Q16	18900	1	LOW	21.29
2	20	Q16	18900	1	MID	21.28
2	20	Q16	18900	1	HIGH	21.28
2	20	Q16	18900	75	LOW	21.35
2	20	Q16	18900	75	HIGH	21.32
2	20	Q16	18900	100	LOW	21.38
2	20	QPSK	19100	1	LOW	21.36
2	20	QPSK	19100	1	MID	21.24
2	20	QPSK	19100	1	HIGH	21.20
2	20	QPSK	19100	50	LOW	21.22
2	20	QPSK	19100	50	HIGH	21.23
2	20	QPSK	19100	100	LOW	21.17
2	20	Q16	19100	1	LOW	21.81
2	20	Q16	19100	1	MID	21.66
2	20	Q16	19100	1	HIGH	21.66
2	20	Q16	19100	75	LOW	21.26
2	20	Q16	19100	75	HIGH	21.25
2	20	Q16	19100	100	LOW	21.26
2	15	QPSK	18900	1	LOW	21.24

2	15	QPSK	18900	1	MID	21.30
2	15	QPSK	18900	1	HIGH	21.23
2	15	QPSK	18900	36	LOW	21.36
2	15	QPSK	18900	36	HIGH	21.25
2	15	QPSK	18900	75	LOW	21.42
2	15	Q16	18900	1	LOW	21.63
2	15	Q16	18900	1	MID	21.69
2	15	Q16	18900	1	HIGH	21.66
2	15	Q16	18900	16	LOW	21.27
2	15	Q16	18900	16	HIGH	21.23
2	15	Q16	18900	75	LOW	21.41
2	10	QPSK	18900	1	LOW	21.20
2	10	QPSK	18900	1	MID	21.25
2	10	QPSK	18900	1	HIGH	21.21
2	10	QPSK	18900	25	LOW	21.32
2	10	QPSK	18900	25	HIGH	21.25
2	10	QPSK	18900	50	LOW	21.32
2	10	Q16	18900	1	LOW	21.62
2	10	Q16	18900	1	MID	21.64
2	10	Q16	18900	1	HIGH	21.59
2	10	Q16	18900	30	LOW	21.28
2	10	Q16	18900	30	HIGH	21.36
2	10	Q16	18900	50	LOW	21.39
2	5	QPSK	18900	1	LOW	21.27
2	5	QPSK	18900	1	MID	21.28
2	5	QPSK	18900	1	HIGH	21.24
2	5	QPSK	18900	10	LOW	21.30
2	5	QPSK	18900	10	HIGH	21.33
2	5	QPSK	18900	25	LOW	21.38
2	5	Q16	18900	1	LOW	21.25
2	5	Q16	18900	1	MID	21.22
2	5	Q16	18900	1	HIGH	21.21
2	5	Q16	18900	8	LOW	21.43
2	5	Q16	18900	8	HIGH	21.45
2	5	Q16	18900	25	LOW	21.41
2	3	QPSK	18900	1	LOW	21.32
2	3	QPSK	18900	1	MID	21.23
2	3	QPSK	18900	1	HIGH	21.28
2	3	QPSK	18900	6	LOW	21.30
2	3	QPSK	18900	6	HIGH	21.36
2	3	QPSK	18900	15	LOW	21.31
2	3	Q16	18900	1	LOW	21.32
2	3	Q16	18900	1	MID	21.65

2	3	Q16	18900	1	HIGH	21.68
2	3	Q16	18900	4	LOW	21.47
2	3	Q16	18900	4	HIGH	21.51
2	3	Q16	18900	15	LOW	21.42
2	1.4	QPSK	18900	1	LOW	21.29
2	1.4	QPSK	18900	1	MID	21.28
2	1.4	QPSK	18900	1	HIGH	21.29
2	1.4	QPSK	18900	3	LOW	21.42
2	1.4	QPSK	18900	3	HIGH	21.41
2	1.4	QPSK	18900	6	LOW	21.35
2	1.4	Q16	18900	1	LOW	21.48
2	1.4	Q16	18900	1	MID	21.45
2	1.4	Q16	18900	1	HIGH	21.51
2	1.4	Q16	18900	5	LOW	21.31
2	1.4	Q16	18900	5	HIGH	21.29
2	1.4	Q16	18900	6	LOW	21.41

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

LTE Band 4 With Full Power						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
4	20	QPSK	20050	1	LOW	23.02
4	20	QPSK	20050	1	MID	23.05
4	20	QPSK	20050	1	HIGH	23.15
4	20	QPSK	20050	50	LOW	22.16
4	20	QPSK	20050	50	HIGH	22.12
4	20	QPSK	20050	100	LOW	22.18
4	20	Q16	20050	1	LOW	21.97
4	20	Q16	20050	1	MID	21.96
4	20	Q16	20050	1	HIGH	22.10
4	20	Q16	20050	75	LOW	21.13
4	20	Q16	20050	75	HIGH	21.06
4	20	Q16	20050	100	LOW	21.07
4	20	QPSK	20175	1	LOW	23.01
4	20	QPSK	20175	1	MID	23.22
4	20	QPSK	20175	1	HIGH	23.09
4	20	QPSK	20175	50	LOW	22.18
4	20	QPSK	20175	50	HIGH	22.09
4	20	QPSK	20175	100	LOW	22.13
4	20	Q16	20175	1	LOW	22.53
4	20	Q16	20175	1	MID	22.64
4	20	Q16	20175	1	HIGH	22.01
4	20	Q16	20175	75	LOW	21.22
4	20	Q16	20175	75	HIGH	21.17
4	20	Q16	20175	100	LOW	21.08
4	20	QPSK	20300	1	LOW	22.98
4	20	QPSK	20300	1	MID	23.09
4	20	QPSK	20300	1	HIGH	23.25
4	20	QPSK	20300	50	LOW	21.98
4	20	QPSK	20300	50	HIGH	22.22
4	20	QPSK	20300	100	LOW	22.05
4	20	Q16	20300	1	LOW	22.07
4	20	Q16	20300	1	MID	22.18
4	20	Q16	20300	1	HIGH	22.33
4	20	Q16	20300	75	LOW	21.08
4	20	Q16	20300	75	HIGH	21.24
4	20	Q16	20300	100	LOW	21.04
4	15	QPSK	20175	1	LOW	22.92

4	15	QPSK	20175	1	MID	23.09
4	15	QPSK	20175	1	HIGH	22.92
4	15	QPSK	20175	36	LOW	22.22
4	15	QPSK	20175	36	HIGH	22.13
4	15	QPSK	20175	75	LOW	22.19
4	15	Q16	20175	1	LOW	22.27
4	15	Q16	20175	1	MID	22.15
4	15	Q16	20175	1	HIGH	21.93
4	15	Q16	20175	16	LOW	22.10
4	15	Q16	20175	16	HIGH	21.95
4	15	Q16	20175	75	LOW	21.18
4	10	QPSK	20175	1	LOW	23.09
4	10	QPSK	20175	1	MID	23.05
4	10	QPSK	20175	1	HIGH	22.97
4	10	QPSK	20175	25	LOW	22.15
4	10	QPSK	20175	25	HIGH	22.16
4	10	QPSK	20175	50	LOW	22.25
4	10	Q16	20175	1	LOW	22.40
4	10	Q16	20175	1	MID	22.47
4	10	Q16	20175	1	HIGH	22.35
4	10	Q16	20175	30	LOW	21.11
4	10	Q16	20175	30	HIGH	21.15
4	10	Q16	20175	50	LOW	21.17
4	5	QPSK	20175	1	LOW	23.07
4	5	QPSK	20175	1	MID	23.09
4	5	QPSK	20175	1	HIGH	23.17
4	5	QPSK	20175	10	LOW	22.17
4	5	QPSK	20175	10	HIGH	22.19
4	5	QPSK	20175	25	LOW	22.20
4	5	Q16	20175	1	LOW	22.02
4	5	Q16	20175	1	MID	22.18
4	5	Q16	20175	1	HIGH	22.18
4	5	Q16	20175	8	LOW	22.19
4	5	Q16	20175	8	HIGH	22.25
4	5	Q16	20175	25	LOW	21.23
4	3	QPSK	20175	1	LOW	23.19
4	3	QPSK	20175	1	MID	23.06
4	3	QPSK	20175	1	HIGH	23.05
4	3	QPSK	20175	6	LOW	22.24
4	3	QPSK	20175	6	HIGH	22.21
4	3	QPSK	20175	15	LOW	22.24
4	3	Q16	20175	1	LOW	22.52
4	3	Q16	20175	1	MID	22.46

4	3	Q16	20175	1	HIGH	22.44
4	3	Q16	20175	4	LOW	22.16
4	3	Q16	20175	4	HIGH	22.21
4	3	Q16	20175	15	LOW	21.23
4	1.4	QPSK	20175	1	LOW	23.13
4	1.4	QPSK	20175	1	MID	23.11
4	1.4	QPSK	20175	1	HIGH	23.24
4	1.4	QPSK	20175	3	LOW	23.18
4	1.4	QPSK	20175	3	HIGH	23.28
4	1.4	QPSK	20175	6	LOW	22.26
4	1.4	Q16	20175	1	LOW	22.35
4	1.4	Q16	20175	1	MID	22.24
4	1.4	Q16	20175	1	HIGH	22.30
4	1.4	Q16	20175	5	LOW	22.15
4	1.4	Q16	20175	5	HIGH	22.14
4	1.4	Q16	20175	6	LOW	21.20

Table 11.1-4 LTE band 4 conducted power measurements

LTE Band 5 With Full Power						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
5	10	QPSK	20450	1	LOW	23.47
5	10	QPSK	20450	1	MID	23.33
5	10	QPSK	20450	1	HIGH	23.35
5	10	QPSK	20450	25	LOW	22.34
5	10	QPSK	20450	25	HIGH	22.33
5	10	QPSK	20450	50	LOW	22.34
5	10	Q16	20450	1	LOW	22.41
5	10	Q16	20450	1	MID	22.32
5	10	Q16	20450	1	HIGH	22.30
5	10	Q16	20450	30	LOW	21.33
5	10	Q16	20450	30	HIGH	21.34
5	10	Q16	20450	50	LOW	21.36
5	10	QPSK	20525	1	LOW	23.20
5	10	QPSK	20525	1	MID	23.15
5	10	QPSK	20525	1	HIGH	23.03
5	10	QPSK	20525	25	LOW	22.30
5	10	QPSK	20525	25	HIGH	22.26
5	10	QPSK	20525	50	LOW	22.31
5	10	Q16	20525	1	LOW	22.20
5	10	Q16	20525	1	MID	22.18
5	10	Q16	20525	1	HIGH	22.22
5	10	Q16	20525	30	LOW	21.37
5	10	Q16	20525	30	HIGH	21.36
5	10	Q16	20525	50	LOW	21.26
5	10	QPSK	20600	1	LOW	23.21
5	10	QPSK	20600	1	MID	23.09
5	10	QPSK	20600	1	HIGH	23.04
5	10	QPSK	20600	25	LOW	22.25
5	10	QPSK	20600	25	HIGH	22.15
5	10	QPSK	20600	50	LOW	22.15
5	10	Q16	20600	1	LOW	22.18
5	10	Q16	20600	1	MID	22.45
5	10	Q16	20600	1	HIGH	22.48
5	10	Q16	20600	30	LOW	21.25
5	10	Q16	20600	30	HIGH	21.16
5	10	Q16	20600	50	LOW	21.16
5	5	QPSK	20525	1	LOW	23.30

5	5	QPSK	20525	1	MID	23.28
5	5	QPSK	20525	1	HIGH	23.32
5	5	QPSK	20525	10	LOW	22.24
5	5	QPSK	20525	10	HIGH	22.28
5	5	QPSK	20525	25	LOW	22.22
5	5	Q16	20525	1	LOW	22.83
5	5	Q16	20525	1	MID	22.74
5	5	Q16	20525	1	HIGH	22.39
5	5	Q16	20525	8	LOW	22.27
5	5	Q16	20525	8	HIGH	22.22
5	5	Q16	20525	25	LOW	21.19
5	3	QPSK	20525	1	LOW	23.25
5	3	QPSK	20525	1	MID	23.22
5	3	QPSK	20525	1	HIGH	23.13
5	3	QPSK	20525	6	LOW	22.29
5	3	QPSK	20525	6	HIGH	22.26
5	3	QPSK	20525	15	LOW	22.26
5	3	Q16	20525	1	LOW	22.25
5	3	Q16	20525	1	MID	22.55
5	3	Q16	20525	1	HIGH	22.58
5	3	Q16	20525	4	LOW	22.43
5	3	Q16	20525	4	HIGH	22.25
5	3	Q16	20525	15	LOW	21.28
5	1.4	QPSK	20525	1	LOW	23.21
5	1.4	QPSK	20525	1	MID	23.18
5	1.4	QPSK	20525	1	HIGH	23.16
5	1.4	QPSK	20525	3	LOW	23.25
5	1.4	QPSK	20525	3	HIGH	23.23
5	1.4	QPSK	20525	6	LOW	22.35
5	1.4	Q16	20525	1	LOW	22.41
5	1.4	Q16	20525	1	MID	22.33
5	1.4	Q16	20525	1	HIGH	22.34
5	1.4	Q16	20525	5	LOW	22.22
5	1.4	Q16	20525	5	HIGH	22.21
5	1.4	Q16	20525	6	LOW	21.29

Table 11.1-5 LTE band 5 conducted power measurements

LTE Band 7 With Full Power on Rev 1						
Band	**BW**	**Mod.**	**Channel**	**RB**	**Offset**	**Max. avg.**

	(MHz)					conducted power (dBm)
7	20	QPSK	20850	1	LOW	23.00
7	20	QPSK	20850	1	MID	23.00
7	20	QPSK	20850	1	HIGH	22.91
7	20	QPSK	20850	50	LOW	20.00
7	20	QPSK	20850	50	HIGH	20.02
7	20	QPSK	20850	100	LOW	19.90
7	20	Q16	20850	1	LOW	22.01
7	20	Q16	20850	1	MID	21.92
7	20	Q16	20850	1	HIGH	21.88
7	20	Q16	20850	75	LOW	19.04
7	20	Q16	20850	75	HIGH	19.01
7	20	Q16	20850	100	LOW	18.89
7	20	QPSK	21100	1	LOW	22.89
7	20	QPSK	21100	1	MID	22.85
7	20	QPSK	21100	1	HIGH	22.97
7	20	QPSK	21100	50	LOW	19.81
7	20	QPSK	21100	50	HIGH	19.80
7	20	QPSK	21100	100	LOW	19.81
7	20	Q16	21100	1	LOW	22.39
7	20	Q16	21100	1	MID	22.32
7	20	Q16	21100	1	HIGH	21.92
7	20	Q16	21100	75	LOW	18.77
7	20	Q16	21100	75	HIGH	18.72
7	20	Q16	21100	100	LOW	18.78
7	20	QPSK	21350	1	LOW	22.89
7	20	QPSK	21350	1	MID	22.96
7	20	QPSK	21350	1	HIGH	22.87
7	20	QPSK	21350	50	LOW	19.86
7	20	QPSK	21350	50	HIGH	19.80
7	20	QPSK	21350	100	LOW	19.73
7	20	Q16	21350	1	LOW	21.92
7	20	Q16	21350	1	MID	21.98
7	20	Q16	21350	1	HIGH	21.94
7	20	Q16	21350	75	LOW	18.83
7	20	Q16	21350	75	HIGH	18.74
7	20	Q16	21350	100	LOW	18.72
7	15	QPSK	21100	1	LOW	22.82
7	15	QPSK	21100	1	MID	22.70
7	15	QPSK	21100	1	HIGH	22.74
7	15	QPSK	21100	36	LOW	21.85

7	15	QPSK	21100	36	HIGH	21.82
7	15	QPSK	21100	75	LOW	21.80
7	15	Q16	21100	1	LOW	22.15
7	15	Q16	21100	1	MID	22.41
7	15	Q16	21100	1	HIGH	21.70
7	15	Q16	21100	16	LOW	21.81
7	15	Q16	21100	16	HIGH	21.76
7	15	Q16	21100	75	LOW	20.75
7	10	QPSK	21100	1	LOW	22.69
7	10	QPSK	21100	1	MID	22.66
7	10	QPSK	21100	1	HIGH	22.78
7	10	QPSK	21100	25	LOW	21.83
7	10	QPSK	21100	25	HIGH	21.83
7	10	QPSK	21100	50	LOW	21.81
7	10	Q16	21100	1	LOW	22.12
7	10	Q16	21100	1	MID	21.66
7	10	Q16	21100	1	HIGH	21.72
7	10	Q16	21100	30	LOW	20.74
7	10	Q16	21100	30	HIGH	20.72
7	10	Q16	21100	50	LOW	20.74
7	5	QPSK	21100	1	LOW	22.87
7	5	QPSK	21100	1	MID	22.70
7	5	QPSK	21100	1	HIGH	22.72
7	5	QPSK	21100	10	LOW	21.80
7	5	QPSK	21100	10	HIGH	21.77
7	5	QPSK	21100	25	LOW	21.81
7	5	Q16	21100	1	LOW	21.91
7	5	Q16	21100	1	MID	21.86
7	5	Q16	21100	1	HIGH	21.88
7	5	Q16	21100	8	LOW	21.79
7	5	Q16	21100	8	HIGH	21.81
7	5	Q16	21100	25	LOW	20.76

Table 11.1-6a LTE band 7 conducted power measurements for normal mode on Rev 1

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

LTE Band 7 With Reduced Power For Hotspot Mode On Rev 1						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
7	20	QPSK	20850	1	LOW	19.46
7	20	QPSK	20850	1	MID	19.37
7	20	QPSK	20850	1	HIGH	19.30
7	20	QPSK	20850	50	LOW	19.42
7	20	QPSK	20850	50	HIGH	19.41
7	20	QPSK	20850	100	LOW	19.38
7	20	Q16	20850	1	LOW	19.42
7	20	Q16	20850	1	MID	19.36
7	20	Q16	20850	1	HIGH	19.30
7	20	Q16	20850	75	LOW	19.06
7	20	Q16	20850	75	HIGH	19.00
7	20	Q16	20850	100	LOW	18.91
7	20	QPSK	21100	1	LOW	19.35
7	20	QPSK	21100	1	MID	19.24
7	20	QPSK	21100	1	HIGH	19.37
7	20	QPSK	21100	50	LOW	19.20
7	20	QPSK	21100	50	HIGH	19.14
7	20	QPSK	21100	100	LOW	19.18
7	20	Q16	21100	1	LOW	19.80
7	20	Q16	21100	1	MID	19.68
7	20	Q16	21100	1	HIGH	19.85
7	20	Q16	21100	75	LOW	18.75
7	20	Q16	21100	75	HIGH	18.75
7	20	Q16	21100	100	LOW	18.75
7	20	QPSK	21350	1	LOW	19.23
7	20	QPSK	21350	1	MID	19.31
7	20	QPSK	21350	1	HIGH	19.22
7	20	QPSK	21350	50	LOW	19.24
7	20	QPSK	21350	50	HIGH	19.18
7	20	QPSK	21350	100	LOW	19.13
7	20	Q16	21350	1	LOW	19.34
7	20	Q16	21350	1	MID	19.38
7	20	Q16	21350	1	HIGH	19.35
7	20	Q16	21350	75	LOW	18.79
7	20	Q16	21350	75	HIGH	18.69
7	20	Q16	21350	100	LOW	18.68
7	15	QPSK	21100	1	LOW	19.12

7	15	QPSK	21100	1	MID	19.07
7	15	QPSK	21100	1	HIGH	19.07
7	15	QPSK	21100	36	LOW	19.18
7	15	QPSK	21100	36	HIGH	19.14
7	15	QPSK	21100	75	LOW	19.17
7	15	Q16	21100	1	LOW	19.49
7	15	Q16	21100	1	MID	19.48
7	15	Q16	21100	1	HIGH	19.49
7	15	Q16	21100	16	LOW	19.19
7	15	Q16	21100	16	HIGH	19.11
7	15	Q16	21100	75	LOW	19.17
7	10	QPSK	21100	1	LOW	19.11
7	10	QPSK	21100	1	MID	19.07
7	10	QPSK	21100	1	HIGH	19.08
7	10	QPSK	21100	25	LOW	19.17
7	10	QPSK	21100	25	HIGH	19.14
7	10	QPSK	21100	50	LOW	19.19
7	10	Q16	21100	1	LOW	19.49
7	10	Q16	21100	1	MID	19.49
7	10	Q16	21100	1	HIGH	19.49
7	10	Q16	21100	30	LOW	19.16
7	10	Q16	21100	30	HIGH	19.15
7	10	Q16	21100	50	LOW	19.17
7	5	QPSK	21100	1	LOW	19.14
7	5	QPSK	21100	1	MID	19.09
7	5	QPSK	21100	1	HIGH	19.13
7	5	QPSK	21100	10	LOW	19.15
7	5	QPSK	21100	10	HIGH	19.15
7	5	QPSK	21100	25	LOW	19.20
7	5	Q16	21100	1	LOW	19.13
7	5	Q16	21100	1	MID	19.08
7	5	Q16	21100	1	HIGH	19.14
7	5	Q16	21100	8	LOW	19.30
7	5	Q16	21100	8	HIGH	19.29
7	5	Q16	21100	25	LOW	19.30

Table 11.1-6b LTE band 7 conducted power measurements for Hotspot mode on Rev 1

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

LTE Band 7 With Full Power On Rev 2						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
7	20	QPSK	20850	1	LOW	22.67
7	20	QPSK	20850	1	MID	22.47
7	20	QPSK	20850	1	HIGH	22.43
7	20	QPSK	20850	50	LOW	19.99
7	20	QPSK	20850	50	HIGH	20.00
7	20	QPSK	20850	100	LOW	20.05
7	20	Q16	20850	1	LOW	21.72
7	20	Q16	20850	1	MID	21.48
7	20	Q16	20850	1	HIGH	21.45
7	20	Q16	20850	75	LOW	18.96
7	20	Q16	20850	75	HIGH	19.02
7	20	Q16	20850	100	LOW	19.07
7	20	QPSK	21100	1	LOW	22.21
7	20	QPSK	21100	1	MID	22.11
7	20	QPSK	21100	1	HIGH	22.22
7	20	QPSK	21100	50	LOW	19.92
7	20	QPSK	21100	50	HIGH	19.82
7	20	QPSK	21100	100	LOW	19.90
7	20	Q16	21100	1	LOW	21.21
7	20	Q16	21100	1	MID	21.09
7	20	Q16	21100	1	HIGH	21.19
7	20	Q16	21100	75	LOW	18.85
7	20	Q16	21100	75	HIGH	18.77
7	20	Q16	21100	100	LOW	18.79
7	20	QPSK	21350	1	LOW	22.33
7	20	QPSK	21350	1	MID	22.40
7	20	QPSK	21350	1	HIGH	22.49
7	20	QPSK	21350	50	LOW	20.01
7	20	QPSK	21350	50	HIGH	20.03
7	20	QPSK	21350	100	LOW	19.99
7	20	Q16	21350	1	LOW	21.78
7	20	Q16	21350	1	MID	21.81
7	20	Q16	21350	1	HIGH	21.89
7	20	Q16	21350	75	LOW	18.94
7	20	Q16	21350	75	HIGH	18.95
7	20	Q16	21350	100	LOW	18.96
7	15	QPSK	21100	1	LOW	22.23

7	15	QPSK	21100	1	MID	22.13
7	15	QPSK	21100	1	HIGH	22.16
7	15	QPSK	21100	36	LOW	21.22
7	15	QPSK	21100	36	HIGH	21.18
7	15	QPSK	21100	75	LOW	21.18
7	15	Q16	21100	1	LOW	21.56
7	15	Q16	21100	1	MID	21.45
7	15	Q16	21100	1	HIGH	21.55
7	15	Q16	21100	16	LOW	21.21
7	15	Q16	21100	16	HIGH	21.22
7	15	Q16	21100	75	LOW	20.23
7	10	QPSK	21100	1	LOW	22.08
7	10	QPSK	21100	1	MID	22.00
7	10	QPSK	21100	1	HIGH	22.13
7	10	QPSK	21100	25	LOW	21.20
7	10	QPSK	21100	25	HIGH	21.17
7	10	QPSK	21100	50	LOW	21.15
7	10	Q16	21100	1	LOW	21.46
7	10	Q16	21100	1	MID	21.42
7	10	Q16	21100	1	HIGH	21.54
7	10	Q16	21100	30	LOW	20.21
7	10	Q16	21100	30	HIGH	20.19
7	10	Q16	21100	50	LOW	20.22
7	5	QPSK	21100	1	LOW	22.13
7	5	QPSK	21100	1	MID	22.09
7	5	QPSK	21100	1	HIGH	22.10
7	5	QPSK	21100	10	LOW	21.17
7	5	QPSK	21100	10	HIGH	21.11
7	5	QPSK	21100	25	LOW	21.17
7	5	Q16	21100	1	LOW	21.06
7	5	Q16	21100	1	MID	21.02
7	5	Q16	21100	1	HIGH	21.06
7	5	Q16	21100	8	LOW	21.26
7	5	Q16	21100	8	HIGH	21.25
7	5	Q16	21100	25	LOW	20.29

Table 11.1-6c LTE band 7 conducted power measurements for normal mode on Rev 2

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

LTE Band 7 With Reduced Power On Rev 2						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted power (dBm)
7	20	QPSK	20850	1	LOW	18.38
7	20	QPSK	20850	1	MID	18.24
7	20	QPSK	20850	1	HIGH	18.27
7	20	QPSK	20850	50	LOW	18.12
7	20	QPSK	20850	50	HIGH	18.23
7	20	QPSK	20850	100	LOW	18.25
7	20	Q16	20850	1	LOW	18.33
7	20	Q16	20850	1	MID	18.19
7	20	Q16	20850	1	HIGH	18.21
7	20	Q16	20850	75	LOW	18.14
7	20	Q16	20850	75	HIGH	18.25
7	20	Q16	20850	100	LOW	18.29
7	20	QPSK	21100	1	LOW	18.23
7	20	QPSK	21100	1	MID	18.11
7	20	QPSK	21100	1	HIGH	18.22
7	20	QPSK	21100	50	LOW	18.11
7	20	QPSK	21100	50	HIGH	18.07
7	20	QPSK	21100	100	LOW	18.07
7	20	Q16	21100	1	LOW	18.69
7	20	Q16	21100	1	MID	18.56
7	20	Q16	21100	1	HIGH	18.68
7	20	Q16	21100	75	LOW	18.13
7	20	Q16	21100	75	HIGH	18.08
7	20	Q16	21100	100	LOW	18.13
7	20	QPSK	21350	1	LOW	18.21
7	20	QPSK	21350	1	MID	18.26
7	20	QPSK	21350	1	HIGH	18.30
7	20	QPSK	21350	50	LOW	18.24
7	20	QPSK	21350	50	HIGH	18.24
7	20	QPSK	21350	100	LOW	18.23
7	20	Q16	21350	1	LOW	18.27
7	20	Q16	21350	1	MID	18.39
7	20	Q16	21350	1	HIGH	18.37
7	20	Q16	21350	75	LOW	18.21
7	20	Q16	21350	75	HIGH	18.23
7	20	Q16	21350	100	LOW	18.22
7	15	QPSK	21100	1	LOW	18.09

7	15	QPSK	21100	1	MID	17.98
7	15	QPSK	21100	1	HIGH	18.07
7	15	QPSK	21100	36	LOW	18.10
7	15	QPSK	21100	36	HIGH	18.04
7	15	QPSK	21100	75	LOW	18.07
7	15	Q16	21100	1	LOW	18.40
7	15	Q16	21100	1	MID	18.31
7	15	Q16	21100	1	HIGH	18.42
7	15	Q16	21100	16	LOW	18.08
7	15	Q16	21100	16	HIGH	18.15
7	15	Q16	21100	75	LOW	18.12
7	10	QPSK	21100	1	LOW	18.07
7	10	QPSK	21100	1	MID	17.97
7	10	QPSK	21100	1	HIGH	18.06
7	10	QPSK	21100	25	LOW	18.12
7	10	QPSK	21100	25	HIGH	18.07
7	10	QPSK	21100	50	LOW	18.07
7	10	Q16	21100	1	LOW	18.42
7	10	Q16	21100	1	MID	18.37
7	10	Q16	21100	1	HIGH	18.45
7	10	Q16	21100	30	LOW	18.10
7	10	Q16	21100	30	HIGH	18.06
7	10	Q16	21100	50	LOW	18.10
7	5	QPSK	21100	1	LOW	18.04
7	5	QPSK	21100	1	MID	17.99
7	5	QPSK	21100	1	HIGH	18.03
7	5	QPSK	21100	10	LOW	18.14
7	5	QPSK	21100	10	HIGH	18.08
7	5	QPSK	21100	25	LOW	18.11
7	5	Q16	21100	1	LOW	17.99
7	5	Q16	21100	1	MID	17.93
7	5	Q16	21100	1	HIGH	17.96
7	5	Q16	21100	8	LOW	18.20
7	5	Q16	21100	8	HIGH	18.17
7	5	Q16	21100	25	LOW	18.21

Table 11.1-6d LTE band 7 conducted power measurements for Hotspot mode on Rev 2

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

LTE Band 13 With Full Power						
Band	**BW**	**Mod.**	**Channel**	**RB**	**Offset**	**Max. avg.**

	(MHz)					conducted power (dBm)
13	10	QPSK	23230	1	LOW	23.57
13	10	QPSK	23230	1	MID	23.52
13	10	QPSK	23230	1	HIGH	23.73
13	10	QPSK	23230	25	LOW	22.62
13	10	QPSK	23230	25	HIGH	22.62
13	10	QPSK	23230	50	LOW	22.63
13	10	Q16	23230	1	LOW	22.59
13	10	Q16	23230	1	MID	22.54
13	10	Q16	23230	1	HIGH	23.02
13	10	Q16	23230	30	LOW	21.57
13	10	Q16	23230	30	HIGH	21.53
13	10	Q16	23230	50	LOW	21.56
13	10	QPSK	23230	1	LOW	23.65
13	10	QPSK	23230	1	MID	23.45
13	10	QPSK	23230	1	HIGH	23.69
13	10	QPSK	23230	25	LOW	22.62
13	10	QPSK	23230	25	HIGH	22.62
13	10	QPSK	23230	50	LOW	22.63
13	10	Q16	23230	1	LOW	22.96
13	10	Q16	23230	1	MID	22.91
13	10	Q16	23230	1	HIGH	23.03
13	10	Q16	23230	30	LOW	21.57
13	10	Q16	23230	30	HIGH	21.54
13	10	Q16	23230	50	LOW	21.57
13	10	QPSK	23230	1	LOW	23.57
13	10	QPSK	23230	1	MID	23.45
13	10	QPSK	23230	1	HIGH	23.75
13	10	QPSK	23230	25	LOW	22.61
13	10	QPSK	23230	25	HIGH	22.63
13	10	QPSK	23230	50	LOW	22.63
13	10	Q16	23230	1	LOW	22.75
13	10	Q16	23230	1	MID	22.55
13	10	Q16	23230	1	HIGH	23.01
13	10	Q16	23230	30	LOW	21.56
13	10	Q16	23230	30	HIGH	21.54
13	10	Q16	23230	50	LOW	21.55
13	5	QPSK	23205	1	LOW	23.67
13	5	QPSK	23205	1	MID	23.63
13	5	QPSK	23205	1	HIGH	23.62
13	5	QPSK	23205	10	LOW	22.89

13	5	QPSK	23205	10	HIGH	22.66
13	5	QPSK	23205	25	LOW	22.66
13	5	Q16	23205	1	LOW	23.21
13	5	Q16	23205	1	MID	23.10
13	5	Q16	23205	1	HIGH	23.04
13	5	Q16	23205	8	LOW	22.64
13	5	Q16	23205	8	HIGH	22.62
13	5	Q16	23205	25	LOW	21.50
13	5	QPSK	23230	1	LOW	23.59
13	5	QPSK	23230	1	MID	23.55
13	5	QPSK	23230	1	HIGH	23.58
13	5	QPSK	23230	10	LOW	22.62
13	5	QPSK	23230	10	HIGH	22.60
13	5	QPSK	23230	25	LOW	22.63
13	5	Q16	23230	1	LOW	22.65
13	5	Q16	23230	1	MID	22.60
13	5	Q16	23230	1	HIGH	22.62
13	5	Q16	23230	8	LOW	22.62
13	5	Q16	23230	8	HIGH	22.61
13	5	Q16	23230	25	LOW	21.54
13	5	QPSK	23255	1	LOW	23.65
13	5	QPSK	23255	1	MID	23.65
13	5	QPSK	23255	1	HIGH	23.78
13	5	QPSK	23255	10	LOW	22.60
13	5	QPSK	23255	10	HIGH	22.62
13	5	QPSK	23255	25	LOW	22.59
13	5	Q16	23255	1	LOW	22.72
13	5	Q16	23255	1	MID	22.65
13	5	Q16	23255	1	HIGH	22.86
13	5	Q16	23255	8	LOW	22.62
13	5	Q16	23255	8	HIGH	22.71
13	5	Q16	23255	25	LOW	21.55

Table 11.1-8 LTE band 13 conducted power measurements

LTE Band 17 With Full Power						
Band	BW (MHz)	Mod.	Channel	RB	Offset	Max. avg. conducted

						power (dBm)
17	10	QPSK	23780	1	LOW	22.76
17	10	QPSK	23780	1	MID	22.86
17	10	QPSK	23780	1	HIGH	22.67
17	10	QPSK	23780	25	LOW	21.84
17	10	QPSK	23780	25	HIGH	21.88
17	10	QPSK	23780	50	LOW	21.90
17	10	Q16	23780	1	LOW	22.12
17	10	Q16	23780	1	MID	22.14
17	10	Q16	23780	1	HIGH	21.72
17	10	Q16	23780	30	LOW	20.86
17	10	Q16	23780	30	HIGH	20.89
17	10	Q16	23780	50	LOW	20.92
17	10	QPSK	23790	1	LOW	22.75
17	10	QPSK	23790	1	MID	22.86
17	10	QPSK	23790	1	HIGH	22.75
17	10	QPSK	23790	25	LOW	21.86
17	10	QPSK	23790	25	HIGH	21.74
17	10	QPSK	23790	50	LOW	21.87
17	10	Q16	23790	1	LOW	21.87
17	10	Q16	23790	1	MID	21.77
17	10	Q16	23790	1	HIGH	21.64
17	10	Q16	23790	30	LOW	20.90
17	10	Q16	23790	30	HIGH	20.92
17	10	Q16	23790	50	LOW	20.85
17	10	QPSK	23800	1	LOW	22.82
17	10	QPSK	23800	1	MID	22.73
17	10	QPSK	23800	1	HIGH	22.77
17	10	QPSK	23800	25	LOW	21.85
17	10	QPSK	23800	25	HIGH	21.74
17	10	QPSK	23800	50	LOW	21.87
17	10	Q16	23800	1	LOW	22.21
17	10	Q16	23800	1	MID	22.10
17	10	Q16	23800	1	HIGH	21.80
17	10	Q16	23800	30	LOW	20.86
17	10	Q16	23800	30	HIGH	20.85
17	10	Q16	23800	50	LOW	20.87
17	5	QPSK	23790	1	LOW	22.91
17	5	QPSK	23790	1	MID	22.86
17	5	QPSK	23790	1	HIGH	22.82
17	5	QPSK	23790	10	LOW	21.87
17	5	QPSK	23790	10	HIGH	21.90

17	5	QPSK	23790	25	LOW	21.92
17	5	Q16	23790	1	LOW	22.02
17	5	Q16	23790	1	MID	22.35
17	5	Q16	23790	1	HIGH	22.30
17	5	Q16	23790	8	LOW	21.83
17	5	Q16	23790	8	HIGH	21.88
17	5	Q16	23790	25	LOW	20.88

Table 11.1-9 LTE band 17 conducted power measurements

Channel	Freq (MHz)	Mode	Conducted Avg. Transmit Power (dBm)
0	2402	DH5	9.4
39	2441		9.5
78	2480		9.4
0	2402	2-DH5	9.4
39	2441		9.5
78	2480		9.3
0	2402	3-DH5	9.4
39	2441		9.5
78	2480		9.4

Table 11.1-10 Bluetooth conducted power measurements

802.11b/g/n With Full Power (FCC Band Edge Reduction) On Rev 1-00								
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	17.58	2412	1	16.30	2412	1	15.4
2437	6	17.70	2437	6	18.50	2437	6	16.8
2462	11	17.12	2462	11	15.54	2462	11	15.6
2472	13	12.03	2472	13	10.82	2472	13	10.8

Table 11.1-11a 802.11 b/g/n modulation type/data rate vs. conducted power on Rev 1-00

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

802.11b/g/n With Full Power (R&TTE No Band Edge Reduction) On Rev 1-00								
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	17.6	2412	1	18.2	2412	1	16.5
2437	6	17.7	2437	6	18.6	2437	6	16.9
2462	11	17.2	2462	11	18.1	2462	11	16.4
2472	13	17.5	2472	13	17.8	2472	13	16.0
802.11b @ 5.5 Mbps								
f (MHz)	Chan	Max. average conducted power (dBm)						
2412	1	18.2						
2437	6	18.2						
2462	11	17.6						
2472	13	17.9						

802.11g			802.11b		
Data Rate (Mbps)	Mod.	Channel 6 Max. average conducted power (dBm)	Data Rate (Mbps)	Mod.	Channel 6 Max. average conducted power (dBm)
6	BPSK	18.6	1	BPSK	17.7
9	BPSK	18.5	2	DQPSK	18.0
12	QPSK	18.5	5.5	CCK	18.2
18	QPSK	18.5	11	CCK	18.0
24	16-QAM	16.0			

36	16-QAM	16.0			
48	64-QAM	16.1			
54	64-QAM	16.0			

802.11n (20 MHz BW)		
Data Rate (Mbps)	**Mod.**	**Channel 6**
		Max. average conducted power (dBm)
6.5	MCS0	16.9
13	MCS1	16.9
19.5	MCS2	16.8
26	MCS3	15.2
39	MCS4	15.1
52	MCS5	15.1
58.5	MCS6	14.1
65	MCS7	14.2

Table 11.1-11b 802.11 b/g/n modulation type/data rate vs. conducted power on Rev 1-00

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

802.11b/g/n With Full Power (US Band Edge Reduction) On Rev 3-00		
802.11b @ 1Mbps		
f (MHz)	**Chan**	**Max. average conducted power (dBm)**
2412	1	14.50
2437	6	14.73
2462	11	14.10

Table 11.1-11c 802.11 b/g/n modulation type/data rate vs. conducted power on Rev 3-00

Note: SAR measurements were performed on 802.11b using hardware Rev 1-00 at higher transmitting power levels before power reduction was implemented on hardware Rev 3-00. Since SAR results on the Rev 1-00 device are higher and more conservative, no additional SAR testing was done on 802.11b.

802.11b/g/n With Full Power (R&TTE No Band Edge) On Rev 3-00		
802.11b @ 1Mbps		
f (MHz)	**Chan**	**Max. average conducted power (dBm)**
2412	1	14.51
2437	6	14.78
2462	11	14.06
2472	13	14.20
802.11b		
f (MHz)	**Data Rate Mbps**	**Max. average conducted power (dBm)**
2437	1	14.78
2437	2	14.82
2437	5.5	14.77
2437	11	14.70

Table 11.1-11d 802.11 b/g/n modulation type/data rate vs. conducted power on Rev 3-00

Note: SAR measurements were performed on 802.11b using hardware Rev 1-00 at higher transmitting power levels before power reduction was implemented on hardware Rev 3-00. Since SAR results on the Rev 1-00 device are higher and more conservative, no additional SAR testing was done on 802.11b.

802.11 a/n With Full Power (FCC Band Edge Reduction)								
802.11a (U-NII-1) 6Mbps			802.11a (U-NII-2A) 6Mbps			802.11a (U-NII-2C) 6Mbps		
f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)
5180	36	16.3	5260	52	18.2	5500	100	17.0
5200	40	16.2	5280	56	18.1	5520	104	19.3
5220	44	16.1	5300	60	18.1	5540	108	19.3
5240	48	15.9	5320	64	18.0	5560	112	19.3
						5580	116	19.3
						5600	120	19.3
						5620	124	19.3
						5640	128	19.2
						5660	132	19.2
						5680	136	19.0
						5700	140	14.2
						802.11a (U-NII-3) 6Mbps		
						f (MHz)	Chan	Max. average conducted power (dBm)
						5745	149	16.5
						5765	153	19.1
						5785	157	19.0
						5805	161	18.9
						5825	165	18.5

Table 11.1-12a 802.11 a/n modulation type/data rate vs. conducted power

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

802.11 a/n With Full Power (R&TTE No Band Edge Reduction)								
802.11a (U-NII-1) 6Mbps			802.11a (U-NII-2A) 6Mbps			802.11a (U-NII-2C) 6Mbps		
f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)
5180	36	18.2	5260	52	18.1	5500	100	19.2
5200	40	18.1	5280	56	18.0	5520	104	19.3
5220	44	18.2	5300	60	18.1	5540	108	19.3
5240	48	18.1	5320	64	18.0	5560	112	19.3
						5580	116	19.3
						5600	120	19.4
						5620	124	19.2
						5640	128	19.2
						5660	132	19.1
						5680	136	19.1
						5700	140	19.1
						802.11a (U-NII-3) 6Mbps		
						f (MHz)	Chan	Max. average conducted power (dBm)
						5745	149	19.2
						5765	153	19.1
						5785	157	19.0
						5805	161	18.9
						5825	165	18.8

		802.11a (U-NII-1)	802.11a (U-NII-2A)	802.11a (U-NII-2C)	802.11a (U-NII-3)
Data Rate (Mbits)	Mod.	Channel 44 Max. average conducted power (dBm)	Channel 60 Max. average conducted power (dBm)	Channel 120 Max. average conducted power (dBm)	Channel 157 Max. average conducted power (dBm)
6	BPSK	18.2	18.1	19.4	19.0
9	BPSK	18.0	18.0	19.3	19.0
12	QPSK	18.1	18.1	19.3	18.9
18	QPSK	18.1	18.1	19.1	18.9
24	16-QAM	17.5	17.5	18.8	18.3
36	16-QAM	17.1	17.1	18.2	18.0
48	64-QAM	16.1	16.1	17.3	17.2
54	64-QAM	16.0	16.0	17.3	17.2
802.11n (20 MHz BW)					

	(U-NII-1)	(U-NII-2A)	(U-NII-2C)	(U-NII-3)
Mod.	Channel 44	Channel 60	Channel 120	Channel 157
	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)
MCS0	18.3	18.1	19.2	19.0
MCS1	18.3	18.1	19.2	18.9
MCS2	18.3	18.1	19.2	19.0
MCS3	17.6	17.6	18.8	18.4
MCS4	17.1	17.2	18.5	18.1
MCS5	16.2	16.1	17.3	17.2
MCS6	16.3	16.1	17.1	17.1
MCS7	15.0	15.2	16.1	16.1
802.11n (40 MHz BW)				
	(U-NII-1)	(U-NII-2A)	(U-NII-2C)	(U-NII-3)
Mod.	Channel 44	Channel 60	Channel 120	Channel 157
	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)
MCS0	17.4	17.3	18.5	18.4
MCS1	17.4	17.3	18.5	18.2
MCS2	17.4	17.4	18.4	18.2
MCS3	17.4	17.3	18.4	18.2

Table 11.1-12b 802.11 a/n modulation type/data rate vs. conducted power

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

802.11 a/n With Reduced Power For Hotspot Mode On Rev 1-00								
802.11a (U-NII-1) 6Mbps			802.11a (U-NII-2A) 6Mbps			802.11a (U-NII-2C) 6Mbps		
f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)
5180	36	16.0	5260	52		5500	100	
5200	40	16.0	5280	56		5520	104	
5220	44	16.0	5300	60		5540	108	
5240	48	16.0	5320	64		5560	112	
						5580	116	
						5600	120	
						5620	124	
						5640	128	
						5660	132	
						5680	136	
						5700	140	
						802.11a (U-NII-3) 6Mbps		
						f (MHz)	Chan	Max. average conducted power (dBm)
						5745	149	17.1
						5765	153	17.0
						5785	157	16.7
						5805	161	16.6
						5825	165	16.6

		802.11a (U-NII-1)	802.11a (U-NII-2A)	802.11a (U-NII-2C)	802.11a (U-NII-3)
Data Rate (Mbits)	Mod.	Channel 36 Max. average conducted power (dBm)	Channel Max. average conducted power (dBm)	Channel Max. average conducted power (dBm)	Channel 149 Max. average conducted power (dBm)
6	BPSK	16.0			17.1
9	BPSK	15.9			17.0
12	QPSK	16.0			17.0
18	QPSK	16.0			17.1
24	16-QAM	15.9			17.0
36	16-QAM	15.9			17.0
48	64-QAM	16.0			17.1
54	64-QAM	16.0			17.0

802.11n (20 MHz BW)				
	(U-NII-1)	(U-NII-2A)	(U-NII-2C)	(U-NII-3)
Mod.	Channel 36	Channel	Channel	Channel 149
	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)
MCS0	16.0			17.1
MCS1	16.0			17.0
MCS2	15.9			17.0
MCS3	16.0			17.0
MCS4	16.0			17.1
MCS5	16.0			17.1
MCS6	16.0			17.0
MCS7	15.0			16.2
802.11n (40 MHz BW)				
	(U-NII-1)	(U-NII-2A)	(U-NII-2C)	(U-NII-3)
Mod.	Channel 36	Channel	Channel	Channel 149
	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)
MCS0	16.0			17.1
MCS1	15.9			17.0
MCS2	16.0			17.0
MCS3	16.0			17.0

Table 11.1-12c 802.11 a/n modulation type/data rate vs. conducted power for Hotspot mode on Rev 1-00

802.11 a/n With Reduced Power For Hotspot Mode		
802.11a (U-NII-3) 6Mbps		
f (MHz)	**Chan**	**Max. average conducted power (dBm)**
5745	149	15.60
5765	153	15.56
5785	157	15.46
5805	161	15.33
5825	165	15.11
802.11a (U-NII-3)		
Data Rate (Mbits)	**Mod.**	**Channel 149**
		Max. average conducted power (dBm)
6	BPSK	15.60
9	BPSK	15.70
12	QPSK	15.44
24	16-QAM	15.10
54	64-QAM	13.67
802.11n (20 MHz BW)		
	(U-NII-3)	
Mod.	**Channel 149**	
	Max. average conducted power (dBm)	
MCS0	15.58	
MCS3	15.10	
MCS5	14.80	
MCS7	13.72	

Table 11.1-12d 802.11 a/n modulation type/data rate vs. conducted power for Hotspot mode on Rev 3-00

Note: SAR measurements were performed on 802.11a Hotspot mode using hardware Rev 1-00 at higher transmitting power levels before power reduction was implemented on hardware Rev 3-00. Since SAR results on the Rev 1-00 device are higher and more conservative, no additional SAR testing was done on 802.11a Hotspot mode.

802.11ac With Full Power (FCC Band Edge)									
BW (MHz)	**802.11ac (U-NII-1) MCS0**			**802.11ac (U-NII-2A) MCS0**			**802.11ac (U-NII-2C) MCS0**		
	f (MHz)	**Chan**	**Max. average conducted power (dBm)**	**f (MHz)**	**Chan**	**Max. average conducted power (dBm)**	**f (MHz)**	**Chan**	**Max. average conducted power (dBm)**
20	5180	36	16.2	5260	52	18.2	5500	100	17.8
	5200	40	16.0	5280	56	18.1	5520	104	19.1
	5220	44	16.0	5300	60	18.1	5540	108	19.2
	5240	48	15.8	5320	64	17.5	5560	112	19.2
							5580	116	19.2
							5600	120	19.2
							5620	124	19.2
							5640	128	19.2
							5660	132	19.1
							5680	136	18.9
							5700	140	13.9
							802.11ac (U-NII-3) MCS0		
							f (MHz)	**Chan**	**Max. average conducted power (dBm)**
							5745	149	15.4
							5765	153	15.3
							5785	157	15.2
							5805	161	15.0
							5825	165	14.8

Table 11.1-12e 802.11 ac modulation type/data rate vs. conducted power

802.11ac With Full Power (Non-US No Band Edge)									
BW (MHz)	802.11ac (U-NII-1) MCS0			802.11ac (U-NII-2A) MCS0			802.11ac (U-NII-2C) MCS0		
	f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)	f (MHz)	Chan	Max. average conducted power (dBm)
20	5180	36	18.4	5260	52	18.2	5500	100	19.2
	5200	40	18.2	5280	56	18.1	5520	104	19.2
	5220	44	18.2	5300	60	18.1	5540	108	19.2
	5240	48	18.1	5320	64	18.0	5560	112	19.2
							5580	116	19.3
							5600	120	19.3
							5620	124	19.3
							5640	128	19.2
							5660	132	19.1
							5680	136	19.0
							5700	140	19.0
							802.11ac (U-NII-3) MCS0		
							f (MHz)	Chan	Max. average conducted power (dBm)
							5745	149	19.1
							5765	153	19.0
							5785	157	18.9
							5805	161	18.8
							5825	165	18.7

BW (MHz)	Data Rate (Mbits)	802.11ac (U-NII-1)	802.11ac (U-NII-2A)	802.11ac (U-NII-2C)	802.11ac (U-NII-3)
		Channel 44	Channel 60	Channel 120	Channel 157
		Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)
20	MCS0	18.2	18.1	19.3	18.9
	MCS1	18.1	18.1	19.2	18.7
	MCS2	18.1	18.0	19.1	18.6
	MCS3	17.6	17.4	18.8	18.2
	MCS4	16.9	16.9	18.1	18.0
	MCS5	15.9	15.9	16.9	16.8
	MCS6	15.9	15.9	16.8	16.8
	MCS7	15.0	14.8	15.9	15.9
	MCS8	13.0	13.0	14.0	13.9
	MCS9	7.3	7.2	8.3	8.2

BW (MHz)	Data Rate (Mbits)	802.11ac (U-NII-1)	802.11ac (U-NII-2A)	802.11ac (U-NII-2C)	802.11ac (U-NII-3)
		Channel 44	Channel 60	Channel 120	Channel 157
		Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)	Max. average conducted power (dBm)
40	MCS0	17.2	17.1	18.3	18.0
	MCS1	17.1	17.1	18.3	18.0
	MCS2	17.2	17.1	18.1	17.9
	MCS3	17.1	17.1	18.2	17.9
BW (MHz)	**Data Rate (Mbits)**	**802.11ac (U-NII-1)**	**802.11ac (U-NII-2A)**	**802.11ac (U-NII-2C)**	**802.11ac (U-NII-3)**
		Channel 44	**Channel 60**	**Channel 120**	**Channel 157**
		Max. average conducted power (dBm)	**Max. average conducted power (dBm)**	**Max. average conducted power (dBm)**	**Max. average conducted power (dBm)**
80	MCS0	17.0	16.9	18.1	17.7
	MCS1	17.1	16.9	18.1	17.8
	MCS2	16.7	16.8	17.9	17.6

Table 11.1-12f 802.11 ac modulation type/data rate vs. conducted power

11.2 SAR measurement results at highest power for each exposure condition

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

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

Note 2: Only Middle channel was tested when 1g reported SAR ≤ 0.8 W/Kg or 3dB lower than the limit. Low, Middle and High channels were tested on the worst case position regardless of the SAR level.

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

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

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

Note 5a: For 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.

Note 7: Device was tested with 15 mm BLACKBERRY recommended separation distance to allow typical after-market holster to be used.

Note 8: 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.

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	25	23.65	22.86	-0.05	0.288	0.284	0.345	0.341
				23790	710.0	25	23.65	22.86	-0.08	0.283		0.339	
				23800	711.0	0	23.65	22.82	-0.19	0.275		0.333	
			25	23780	709.0	25	22.7	21.88	0.00	0.234		0.283	
				23790	710.0	0	22.7	21.86					
				23800	711.0	0	22.7	21.85					
			50	23780	709.0	0	22.7	21.90	-0.03	0.229		0.275	
Right 15° Tilt	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	0.06	0.107		0.128	
				23800	711.0								
Left Cheek	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	0.28	0.142	0.145	0.170	0.174
				23800	711.0								
			25	23780	709.0								
				23790	710.0								
				23800	711.0								
			50										
Left 15° Tilt	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	0.03	0.062		0.074	
				23800	711.0								

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

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	25	23.65	22.86	0.02	0.554	0.550	0.665	0.660
				23790	710.0	25	23.65	22.86	0.05	0.543		0.651	
				23800	711.0	0	23.65	22.82	0.06	0.544		0.659	
			25	23780	709.0	25	22.7	21.88	0.02	0.442		0.534	
				23790	710.0	0	22.7	21.86					
				23800	711.0	0	22.7	21.85					
			50	23780	709.0	0	22.7	21.90	-0.01	0.441		0.530	
10mm Front	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	0.00	0.534	0.555	0.641	0.666
				23800	711.0								
10mm Left	QPSK	10.0	1	23780	709.0								
				23790	710.0								
				23800	711.0								
10mm Right	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	-0.13	0.383		0.459	
				23800	711.0								
10mm Bottom	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	0.03	0.210		0.252	
				23800	711.0								

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

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	25	23.65	22.86	-0.06	0.368	0.390	0.441	0.468
				23790	710.0	25	23.65	22.86	0.02	0.363		0.435	
				23800	711.0	0	23.65	22.82	0.02	0.355		0.430	
			25	23780	709.0	25	22.7	21.88	0.07	0.289		0.349	
				23790	710.0	0	22.7	21.86					
				23800	711.0	0	22.7	21.85					
			50	23780	709.0	0	22.7	21.90	0.09	0.287		0.345	
15mm Front	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	0.07	0.340		0.408	
				23800	711.0								
Holster Back	QPSK	10.0	1	23780	709.0								
				23790	710.0	25	23.65	22.86	0.03	0.276		0.331	
				23800	711.0								

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

Threshold 1 For This Band:	0.424	
Max FAST SAR For Band:	0.554	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.555	
Additional Full SAR Required:		NO

Table 11.2-1d Fast SAR testing thresholds for LTE Band 17

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	49	23.75	23.73	-0.15	0.341	0.339	0.343	0.341
				23279	786.9								
			25	23180	777.0								
				23230	782.0	25	22.7	22.62	-0.10	0.302		0.308	
				23279	786.9								
			50	23230	782.0	0	22.7	22.63	0.13	0.291		0.296	
Right 15° Tilt	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	0.03	0.103		0.103	
				23279	786.9								
Left Cheek	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	0.15	0.178	0.184	0.179	0.185
				23279	786.9								
			25	23180	777.0								
				23230	782.0								
				23279	786.9								
			50										
Left 15° Tilt	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	-0.04	0.095		0.095	
				23279	786.9								

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

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	49	23.75	23.73	-0.05	0.600	0.598	0.603	0.601
				23279	786.9								
			25	23180	777.0								
				23230	782.0	25	22.7	22.62	-0.02	0.498	0.500	0.507	0.509
				23279	786.9								
			50	23230	782.0	0	22.7	22.63	-0.03	0.489		0.497	
10mm Front	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	-0.02	0.641	0.646	0.644	0.649
				23279	786.9								
10mm Left	QPSK	10.0	1	23180	777.0								
				23230	782.0								
				23279	786.9								
10mm Right	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	-0.10	0.360		0.362	
				23279	786.9								
10mm Bottom	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	0.04	0.272		0.273	
				23279	786.9								

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

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	49	23.75	23.73	0.10	0.459	0.460	0.461	0.462
				23279	786.9								
			25	23180	777.0								
				23230	782.0	25	22.7	22.62	0.01	0.381		0.388	
				23279	786.9								
			50	23230	782.0	0	22.7	22.63	0.00	0.368		0.374	
15mm Front	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	-0.01	0.463	0.467	0.465	0.469
				23279	786.9								
Holster Back	QPSK	10.0	1	23180	777.0								
				23230	782.0								
				23279	786.9								
Holster Front	QPSK	10.0	1	23180	777.0								
				23230	782.0	49	23.75	23.73	0.03	0.286		0.287	
				23279	786.9								

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

Threshold 1 For This Band:	0.491	
Max FAST SAR For Band:	0.641	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.646	
Additional Full SAR Required:		NO

Table 11.2-2d Fast SAR testing thresholds for LTE Band 13

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	0	23.7	23.47	0.04	0.374		0.394	
				20525	836.5	0	23.7	23.20	-0.02	0.389	0.393	0.436	0.441
				20600	844.0	0	23.7	23.21	-0.02	0.349		0.391	
			25	20450	829.0	0	22.7	22.34	-0.08	0.331		0.360	
				20525	836.5								
				20600	844.0								
			50										
Right 15° Tilt	QPSK	10.0	1	20450	829.0	0	23.7	23.47	0.06	0.110		0.116	
				20525	836.5								
				20600	844.0								
Left Cheek	QPSK	10.0	1	20450	829.0	0	23.7	23.47	-0.03	0.181	0.183	0.191	0.193
				20525	836.5								
				20600	844.0								
			25	20450	829.0								
				20525	836.5								
				20600	844.0								
			50										
Left 15° Tilt	QPSK	10.0	1	20450	829.0	0	23.7	23.47	0.090	0.088		0.093	
				20525	836.5								
				20600	844.0								

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

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	0	23.7	23.47	-0.01	0.573		0.604	
				20525	836.5	0	23.7	23.20	0.07	0.581	0.586	0.652	0.658
				20600	844.0	0	23.7	23.21	0.06	0.535		0.599	
			25	20450	829.0	0	22.7	22.34	0.01	0.481		0.523	
				20525	836.5								
				20600	844.0								
			50										
10mm Front	QPSK	10.0	1	20450	829.0	0	23.7	23.47	-0.01	0.532		0.561	
				20525	836.5								
				20600	844.0								
10mm Right	QPSK	10.0	1	20450	829.0	0	23.7	23.47	0.00	0.377		0.398	
				20525	836.5								
				20600	844.0								
10mm Bottom	QPSK	10.0	1	20450	829.0	0	23.7	23.47	0.01	0.331		0.349	
				20525	836.5								
				20600	844.0								

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

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	0	23.7	23.47	0.02	0.426		0.449	
				20525	836.5	0	23.7	23.20	0.00	0.448	0.443	0.503	0.497
				20600	844.0	0	23.7	23.21	0.01	0.392		0.439	
			25	20450	829.0	0	22.7	22.34	-0.01	0.359		0.390	
				20525	836.5								
				20600	844.0								
			50										
15mm Front	QPSK	10.0	1	20450	829.0	0	23.7	23.47	0.03	0.375		0.395	
				20525	836.5								
				20600	844.0								
Holster Back	QPSK	10.0	1	20450	829.0	0	23.7	23.47	0.14	0.264		0.278	
				20525	836.5								
				20600	844.0								

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

Threshold 1 For This Band:	0.445	
Max FAST SAR For Band:	0.581	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.586	
Additional Full SAR Required:		NO

Table 11.2-3d Fast SAR testing thresholds for LTE Band 5

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	33.1	32.5	-0.14	0.447		0.513	
		190	836.6	33.1	32.4	-0.04	0.508	0.532	0.597	0.625
		251	848.8	33.1	32.2	0.00	0.470		0.578	
Right 15° Tilt	1	128	824.2							
		190	836.6	33.1	32.4	0.03	0.149		0.175	
		251	848.8							
Left Cheek	1	128	824.2							
		190	836.6	33.1	32.4	-0.09	0.210	0.216	0.247	0.254
		251	848.8							
Left 15° Tilt	1	128	824.2							
		190	836.6	33.1	32.4	-0.01	0.101		0.119	
		251	848.8							

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

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	4	128	824.2	28.8	27.0	-0.03	0.771		1.17	
		190	836.6	28.8	27.1	-0.16	0.773	0.777	1.14	1.15
		251	848.8	28.8	27.0	-0.04	0.706		1.07	
10mm Front	4	128	824.2	28.8	27.0	-0.08	0.624		0.944	
		190	836.6	28.8	27.1	-0.10	0.666		0.985	
		251	848.8	28.8	27.0	-0.12	0.638		0.966	
10mm Right	4	128	824.2							
		190	836.6	28.8	27.1	-0.08	0.370		0.547	
		251	848.8							
10mm Bottom	4	128	824.2							
		190	836.6	28.8	27.1	0.05	0.293		0.433	
		251	848.8							

Table 11.2-4b SAR testing results GSM /GPRS/DTM 850 hotspot configuration

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	4	128	824.2	28.8	27.0	0.00	0.543		0.822	
		190	836.6	28.8	27.1	-0.04	0.544	0.544	0.805	0.805
		251	848.8	28.8	27.0	0.00	0.486		0.736	
15mm Front	4	128	824.2							
		190	836.6	28.8	27.1	-0.04	0.497		0.735	
		251	848.8							
Holster Back	4	128	824.2							
		190	836.6	28.8	27.1	0.11	0.378		0.559	
		251	848.8							

Table 11.2-4c SAR testing results for GSM/GPRS/DTM 850 body-worn configuration

Threshold 1 For This Band:	0.592	
Max FAST SAR For Band:	0.773	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.777	
Additional Full SAR Required:		NO

Table 11.2-4d Fast SAR testing thresholds for GSM/GPRS/DTM 850

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	24.7	24.5	-0.16	0.499	0.472	0.523	0.494
	4182	836.4	24.7	24.5	0.00	0.464		0.486	
	4233	846.6	24.7	24.4	0.01	0.422		0.452	
Right 15° Tilt	4132	826.4							
	4182	836.4	24.7	24.5	-0.04	0.140		0.147	
	4233	846.6							
Left Cheek	4132	826.4							
	4182	836.4	24.7	24.5	-0.11	0.228	0.236	0.239	0.247
	4233	846.6							
Left 15° Tilt	4132	826.4							
	4182	836.4	24.7	24.5	0.10	0.102		0.107	
	4233	846.6							

Table 11.2-5a SAR testing results for UMTS band V head configuration

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	24.7	24.5	-0.11	0.865	0.854	0.906	0.894
	4182	836.4	24.7	24.5	0.03	0.817		0.856	
	4233	846.6	24.7	24.4	0.11	0.756		0.810	
10mm Front	4132	826.4							
	4182	836.4	24.7	24.5	0.02	0.723		0.757	
	4233	846.6							
10mm Right	4132	826.4							
	4182	836.4	24.7	24.5	-0.15	0.444		0.465	
	4233	846.6							
10mm Bottom	4132	826.4							
	4182	836.4	24.7	24.5	0.02	0.436		0.457	
	4233	846.6							
10mm + Headset	4132	826.4							
	4182	836.4							
	4233	846.6							
Repeat Scans – 10mm Back									
2nd Scan	4132	826.4	24.7	24.5	0.00	0.897	0.905	0.939	0.948

Table 11.2-5b SAR testing results UMTS band V hotspot configuration

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	24.7	24.5	0.02	0.614	0.615	0.643	0.644
	4182	836.4	24.7	24.5	0.02	0.585		0.613	
	4233	846.6	24.7	24.4	0.01	0.533		0.571	
15mm Front	4132	826.4							
	4182	836.4	24.7	24.5	0.04	0.505		0.529	
	4233	846.6							
Holster Back	4132	826.4							
	4182	836.4	24.7	24.5	-0.06	0.380		0.398	
	4233	846.6							

Table 11.2-5c SAR testing results for UMTS band V body-worn configuration

Threshold 1 For This Band:	0.687	
Max FAST SAR For Band:	0.897	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.905	
Additional Full SAR Required:		NO

Table 11.2-5d Fast SAR testing thresholds for UMTS band V

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	23.9	23.15	0.00	0.493		0.586	
				20175	1732.5	50	23.9	23.22	-0.04	0.512	0.483	0.599	0.565
				20300	1745.0	99	23.9	23.25	-0.04	0.458		0.532	
			50	20050	1720.0								
				20175	1732.5								
				20300	1745.0	50	22.9	22.22	-0.01	0.374		0.437	
			100	20050	1720.0								
Right 15° Tilt	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	-0.09	0.228		0.265	
Left Cheek	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	0.07	0.262		0.304	
			50	20050	1720.0								
				20175	1732.5								
				20300	1745.0								
			100										
Left 15° Tilt	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	0.05	0.205		0.238	

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

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 SAR	FULL SAR	FAST SAR	FULL SAR
10mm Back	QPSK	20.0	1	20050	1720.0	99	23.9	23.15	-0.01	0.802		0.953	
				20175	1732.5	50	23.9	23.22	0.08	0.806		0.943	
				20300	1745.0	99	23.9	23.25	-0.04	0.919	0.901	1.07	1.05
			50	20050	1720.0	0	22.9	22.16	-0.04	0.739		0.876	
				20175	1732.5	0	22.9	22.18	0.08	0.728		0.859	
				20300	1745.0	50	22.9	22.22	-0.02	0.828		0.968	
			100	20050	1720.0	0	22.9	22.18	-0.03	0.660		0.779	
10mm Front	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	0.00	0.626		0.727	
10mm Right	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	0.04	0.534		0.620	
10mm Bottom	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	-0.05	0.473		0.549	
Repeat Scans - 10mm Back													
2nd Scan	QPSK	20.0	1	20300	1745.0	99	23.9	23.25	-0.11	0.921	0.947	1.07	1.10

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

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	23.9	23.15	-0.01	0.399		0.474	
				20175	1732.5	50	23.9	23.22	-0.03	0.404		0.472	
				20300	1745.0	99	23.9	23.25	-0.03	0.453	0.457	0.526	0.531
			50	20050	1720.0								
				20175	1732.5								
				20300	1745.0	50	22.9	22.22	0.03	0.349		0.408	
			100	20050	1720.0								
15mm Front	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	-0.04	0.393		0.456	
Holster Back	QPSK	20.0	1	20050	1720.0								
				20175	1732.5								
				20300	1745.0	99	23.9	23.25	0.01	0.311		0.361	

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

Threshold 1 For This Band:	0.705	
Max FAST SAR For Band:	0.921	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.947	
Additional Full SAR Required:		NO

Table 11.2-6d Fast SAR testing thresholds for LTE Band 4

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	24.7	23.70	-0.02	0.711	0.684	0.895	**0.861**
	1413	1732.6	24.7	23.87	0.07	0.698		0.845	
	1513	1752.6	24.6	24.00	0.00	0.586		0.673	
Right 15° Tilt	1312	1712.4							
	1413	1732.6	24.7	23.87	0.01	0.291		0.352	
	1513	1752.6							
Left Cheek	1312	1712.4							
	1413	1732.6	24.7	23.87	-0.05	0.346	0.360	0.419	0.436
	1513	1752.6							
Left 15° Tilt	1312	1712.4							
	1413	1732.6	24.7	23.87	0.10	0.290		0.351	
	1513	1752.6							

Table 11.2-7a SAR testing results for UMTS band IV head configuration

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	24.7	23.70	-0.06	0.753		0.948	
	1413	1732.6	24.7	23.87	-0.08	0.797		0.965	
	1513	1752.6	24.6	24.00	-0.01	1.11	1.13	1.27	1.30
10mm Front	1312	1712.4	24.7	23.70	-0.13	0.757		0.953	
	1413	1732.6	24.7	23.87	-0.05	0.743		0.899	
	1513	1752.6	24.6	24.00	-0.05	0.770		0.884	
10mm Left	1312	1712.4							
	1413	1732.6							
	1513	1752.6							
10mm Right	1312	1712.4							
	1413	1732.6	24.7	23.87	0.02	0.543		0.657	
	1513	1752.6							
10mm Bottom	1312	1712.4	24.7	23.70	-0.05	0.798		1.00	
	1413	1732.6	24.7	23.87	-0.02	0.755		0.914	
	1513	1752.6	24.6	24.00	-0.03	0.713		0.819	
10mm + Headset	1312	1712.4							
	1413	1732.6							
	1513	1752.6							
Repeat Scans – 10mm Back									
2nd Scan	1513	1752.6	24.6	24.00	-0.03	1.09	1.14	1.25	1.31

Table 11.2-7b SAR testing results UMTS band IV hotspot configuration

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	24.7	23.70	0.02	0.568		0.715	
	1413	1732.6	24.7	23.87	0.08	0.581	0.579	0.703	0.701
	1513	1752.6	24.6	24.00	-0.01	0.574		0.659	
15mm Front	1312	1712.4							
	1413	1732.6	24.7	23.87	0.02	0.499		0.604	
	1513	1752.6							
Holster Back	1312	1712.4							
	1413	1732.6	24.7	23.87	-0.06	0.363		0.439	
	1513	1752.6							

Table 11.2-7c SAR testing results for UMTS band IV body-worn configuration

Threshold 1 For This Band:	0.850	
Max FAST SAR For Band:	1.11	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	1.14	
Additional Full SAR Required:		YES

Table 11.2-7d Fast SAR testing thresholds for UMTS band IV

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	99	23.9	23.38	0.14	0.338		0.381	
				18900	1880.0	50	24	23.39	0.10	0.351		0.404	
				19100	1900.0	0	23.9	23.4	0.09	0.362	0.349	0.406	0.392
			50	18700	1860.0								
				18900	1880.0	0	23	22.36	-0.09	0.315		0.365	
				19100	1900.0								
			100										
Right 15° Tilt	QPSK	20.0	1	18700	1860.0								
				18900	1880.0								
				19100	1900.0	0	23.9	23.4	-0.18	0.117		0.131	
Left Cheek	QPSK	20.0	1	18700	1860.0								
				18900	1880.0								
				19100	1900.0	0	23.9	23.4	0.10	0.166		0.186	
			50	18700	1860.0								
				18900	1880.0								
				19100	1900.0								
			100										
Left 15° Tilt	QPSK	20.0	1	18700	1860.0								
				18900	1880.0								
				19100	1900.0	0	23.9	23.4	0.04	0.114		0.128	

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

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 (dB)**	**1g SAR (W/Kg)**			
										Extrapolated		**Reported**	
							Declared	**Measured**		**FAST SAR**	**FULL SAR**	**FAST SAR**	**FULL SAR**
10mm Back	QPSK	20.0	1	18700	1860.0	99	21.5	21.36	-0.16	0.540	0.600	0.558	0.620
				18900	1880.0	50	21.5	21.37	-0.02	0.545	0.555	0.562	0.572
				19100	1900.0	0	21.5	21.36	-0.02	0.543	0.572	0.561	0.591
			50	18700	1860.0	0	21.5	21.26	0.03	0.562	0.591	0.594	0.625
				18900	1880.0								
				19100	1900.0								
			100	18700	1860.0								
			100	18900	1880.0								
			100	19100	1900.0								
10mm Front	QPSK	20.0	1	18700	1860.0								
				18900	1880.0	50	21.5	21.37	0.02	0.269		0.277	
				19100	1900.0								
10mm Left	QPSK	20.0	1	18700	1860.0								
				18900	1880.0								
				19100	1900.0								
10mm Right	QPSK	20.0	1	18700	1860.0								
				18900	1880.0	50	21.5	21.37	0.01	0.181		0.186	
				19100	1900.0								
10mm Bottom	QPSK	20.0	1	18700	1860.0								
				18900	1880.0	50	21.5	21.37	-0.05	0.213		0.219	
				19100	1900.0								
10mm + Headset	QPSK	20.0	1	18700	1860.0								
				18900	1880.0								
				19100	1900.0								
Additional Scans													
10mm Back	16 QAM	20.0	1	19100	1900.0	0	22	21.81	-0.05	0.541	0.569	0.565	0.594

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

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	99	23.9	23.38	-0.05	0.432	0.465	0.487	0.524
				18900	1880.0	50	24	23.39	0.05	0.431	0.443	0.496	0.510
				19100	1900.0	0	23.9	23.4	-0.03	0.453	0.469	0.508	0.526
			50	18700	1860.0								
				18900	1880.0	0	23	22.36	-0.02	0.364		0.422	
				19100	1900.0								
			100										
15mm Front	QPSK	20.0	1	18700	1860.0	99	23.9	23.38	-0.02	0.260		0.293	
				18900	1880.0								
				19100	1900.0								
Holster Back	QPSK	20.0	1	18700	1860.0	99	23.9	23.38	-0.05	0.283		0.319	
				18900	1880.0								
				19100	1900.0								

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

Threshold 1 For This Band:	0.430	
Max FAST SAR For Band:	0.562	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.600	
Additional Full SAR Required:		NO

Table 11.2-8d Fast SAR testing thresholds for LTE Band 2

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	2	512	1850.2	29	28.2	-0.07	0.270	0.260	0.325	0.313
		661	1880.0	29.5	28.1	0.03	0.215		0.297	
		810	1909.8	29.5	28	-0.09	0.162		0.229	
Right 15° Tilt	2	512	1850.2							
		661	1880.0	29.5	28.1	-0.07	0.075		0.104	
		810	1909.8							
Left Cheek	2	512	1850.2							
		661	1880.0	29.5	28.1	0.22	0.159		0.219	
		810	1909.8							
Left 15° Tilt	2	512	1850.2							
		661	1880.0	29.5	28.1	0.04	0.078		0.108	
		810	1909.8							

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

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - GSM/EDGE/DTM 1900 MHz Rev 1										
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	2	512	1850.2	29	28.2	-0.17	0.703	0.768	0.948	1.04
		661	1880.0	29.5	28.1	-0.05	0.635	0.670	0.877	0.925
		810	1909.8	29.5	28	0.12	0.562	0.579	0.794	0.818
10mm Front	2	512	1850.2							
		661	1880.0	29.5	28.1	-0.04	0.248		0.342	
		810	1909.8							
10mm Right	2	512	1850.2							
		661	1880.0	29.5	28.1	-0.02	0.221		0.305	
		810	1909.8							
10mm Bottom	2	512	1850.2							
		661	1880.0	29.5	28.1	0.00	0.298		0.411	
		810	1909.8							

Table 11.2-9b SAR testing results GSM/GPRS/DTM 1900 hotspot configuration

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - GSM/EDGE/DTM 1900 MHz Rev 2-02										
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
Rev 2-02										
10mm Back	4	512	1850.2	27	25.9	-0.13	0.776	0.835	1.00	1.08
		661	1880.0	27	25.8					
		810	1909.8	27	25.7					

Table 11.2-9c SAR testing results GSM/GPRS/DTM 1900 hotspot configuration Rev 2-02

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	2	512	1850.2	29.5	28.2	0.00	0.320	0.338	0.432	0.456
		661	1880.0	29.5	28.1	0.06	0.263		0.363	
		810	1909.8	29.5	28	0.02	0.225		0.318	
15mm Front	2	512	1850.2							
		661	1880.0	29.5	28.1	0.02	0.147		0.203	
		810	1909.8							
Holster Back	2	512	1850.2							
		661	1880.0	29.5	28.1	-0.17	0.148	0.151	0.204	0.210
		810	1909.8							

Table 11.2-9d SAR testing results for GSM/GPRS/DTM 1900 body-worn configuration

Threshold 1 For This Band:	0.596	
Max FAST SAR For Band:	0.779	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.841	
Additional Full SAR Required:		NO

Table 11.2-9e Fast SAR testing thresholds for GSM/EDGE/DTM 1900

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	24.8	23.91	-0.07	0.500	0.494	0.614	0.606
	9400	1880.0	24.8	24.15	0.12	0.442	0.427	0.513	0.496
	9538	1907.6	24.7	23.94	-0.10	0.349	0.336	0.416	0.400
Right 15° Tilt	9262	1852.4							
	9400	1880.0	24.8	24.15	0.06	0.158		0.184	
	9538	1907.6							
Left Cheek	9262	1852.4							
	9400	1880.0	24.8	24.15	0.10	0.348		0.404	
	9538	1907.6							
Left 15° Tilt	9262	1852.4							
	9400	1880.0	24.8	24.15	-0.05	0.161		0.187	
	9538	1907.6							

Table 11.2-10a SAR testing results for UMTS band II head configuration

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	22.5	22.14	-0.02	0.723	0.732	0.785	0.795
	9400	1880.0	22.5	22.19	-0.11	0.640	0.689	0.687	0.740
	9538	1907.6	22.5	22.00	-0.02	0.614	0.622	0.689	0.698
10mm Front	9262	1852.4							
	9400	1880.0	22.5	22.19	0.05	0.329		0.353	
	9538	1907.6							
10mm Right	9262	1852.4							
	9400	1880.0	22.5	22.19	0.09	0.271		0.291	
	9538	1907.6							
10mm Bottom	9262	1852.4							
	9400	1880.0	22.5	22.19	-0.01	0.337		0.362	
	9538	1907.6							

Table 11.2-10b SAR testing results UMTS band II hotspot configuration

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	24.8	23.91	-0.03	0.559	0.566	0.686	0.695
	9400	1880.0	24.8	24.15	0.26	0.529		0.614	
	9538	1907.6	24.7	23.94	-0.11	0.475		0.566	
15mm Front	9262	1852.4							
	9400	1880.0	24.8	24.15	0.03	0.271		0.315	
	9538	1907.6							
Holster Back	9262	1852.4							
	9400	1880.0	24.8	24.15	-0.01	0.316		0.367	
	9538	1907.6							

Table 11.2-10c SAR testing results for UMTS band II body-worn configuration

Threshold 1 For This Band:	0.554	
Max FAST SAR For Band:	0.723	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.732	
Additional Full SAR Required:		NO

Table 11.2-10d Fast SAR testing thresholds for UMTS band II

Measured/Extrapolated SAR Values - Head - 802.11b DSSS 2450 MHz											
Position	Data Rate (Mbps)	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Duty Factor (%)	1g SAR (W/Kg)				
							Extrapolated		Reported		FULL SAR at 100% DF
				Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR	
Right Cheek	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.151	0.156	0.204	0.210	0.221
		11	2462.0								
Right 15° Tilt	5.5	1	2412.0	19.5	18.2	95.0	0.174	0.194	0.235	0.262	0.275
		6	2437.0	19.5	18.2	95.0	0.157	0.165	0.212	0.223	0.234
		11	2462.0	19.5	17.6	95.0	0.135	0.148	0.209	0.229	0.241
Left Cheek	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.058	0.066	0.078	0.089	0.093
		11	2462.0								
Left 15° Tilt	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.077	0.085	0.104	0.115	0.121
		11	2462.0								

Table 11.2-11a SAR testing results for 802.11b DSSS head configuration

Note: 5.5 Mbps was tested over 1.0 Mbps because they share the same declared power, but the measured power for 5.5 Mbps was higher and allows for each channel to be within 2dB of the declared power.

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - 802.11b DSSS 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	5.5	1	2412.0	19.5	18.2	95.0	0.301	0.340	0.406	0.459	0.482
		6	2437.0	19.5	18.2	95.0	0.325	0.413	0.438	0.557	0.585
		11	2462.0	19.5	17.6	95.0	0.333	0.375	0.516	0.581	0.610
10mm Front	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.048	0.053	0.065	0.071	0.075
		11	2462.0								
10mm Left	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.084	0.086	0.113	0.116	0.122
		11	2462.0								
10mm Top	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.165	0.175	0.223	0.236	0.248
		11	2462.0								

Table 11.2-11b SAR testing results 802.11b DSSS hotspot configuration

Note: 5.5 Mbps was tested over 1.0 Mbps because they share the same declared power, but the measured power for 5.5 Mbps was higher and allows for each channel to be within 2dB of the declared power.

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - 802.11b DSSS 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	5.5	1	2412.0	19.5	18.2	95.0	0.135	0.145	0.182	0.196	0.205
		6	2437.0	19.5	18.2	95.0	0.142	0.159	0.192	0.214	0.225
		11	2462.0	19.5	17.6	95.0	0.130	0.140	0.201	0.217	0.228
15mm Front	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.027	0.030	0.036	0.040	0.042
		11	2462.0								
Holster Back	5.5	1	2412.0								
		6	2437.0	19.5	18.2	95.0	0.096	0.104	0.130	0.140	0.147
		11	2462.0								

Table 11.2-11c SAR testing results for 802.11b DSSS body-worn configuration

Note: 5.5 Mbps was tested over 1.0 Mbps because they share the same declared power, but the measured power for 5.5 Mbps was higher and allows for each channel to be within 2dB of the declared power.

Threshold 1 For This Band:	0.255	
Max FAST SAR For Band:	0.333	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.413	
Additional Full SAR Required:		NO

Table 11.2-11d Fast SAR testing thresholds for 802.11b DSSS

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	10.75	9.5	0.21	0.025	0.028	0.033	0.037
	78	2480.0							
Right 15° Tilt	0	2402.0							
	39	2441.0	10.75	9.5	-0.06	0.01	0.016	0.013	0.021
	78	2480.0							
Left Cheek	0	2402.0							
	39	2441.0	10.75	9.5	0.34	0.009	0.010	0.012	0.013
	78	2480.0							

Table 11.2-12a SAR testing results for Bluetooth head configuration

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	10.75	9.5	-0.19	0.036	0.040	0.048	0.053
	78	2480.0							

Table 11.2-12b SAR testing results Bluetooth hotspot configuration

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	10.75	9.5	0.03	0.016	0.017	0.021	0.023
	78	2480.0							

Table 11.2-12c SAR testing results for Bluetooth body-worn configuration

Threshold 1 For This Band:	0.028	
Max FAST SAR For Band:	0.036	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	0.040	
Additional Full SAR Required:		NO

Table 11.2-12d Fast SAR testing thresholds for Bluetooth

Measured/Extrapolated SAR Values - Head - LTE Band 7 2600 MHz (BW 20 MHz)													
Position	Mod.	BW (MHz)	RB#	Ch.	Freq. (MHz)	RB OFF	Declared Cond. Output Power (dBm)	Measured Cond. Output Power (dBm)	Power Drift (dB)	1g SAR (W/Kg)			
										Extrapolated		Reported	
										FAST SAR	FULL SAR	FAST SAR	FULL SAR
Right Cheek	QPSK	20.0	1	20850	2510.0	50	23	23.00	0.10	0.422	0.409	0.422	0.409
				21100	2535.0	99	23	22.97	-0.07	0.462	0.485	0.465	0.488
				21350	2560.0	50	23	22.96	0.14	0.457	0.474	0.461	0.478
			50	20850	2510.0	50	21	20.02	0.31	0.299	0.302	0.375	0.378
				21100	2535.0								
				21350	2560.0								
			100	20850	2510.0								
Right 15° Tilt	QPSK	20.0	1	20850	2510.0	50	23	23.00	-0.04	0.125	0.124	0.125	0.124
				21100	2535.0								
				21350	2560.0								
Left Cheek	QPSK	20.0	1	20850	2510.0	50	23	23.00	0.12	0.268	0.294	0.268	0.294
				21100	2535.0								
				21350	2560.0								
			50	20850	2510.0								
				21100	2535.0								
				21350	2560.0								
			100										
Left 15° Tilt	QPSK	20.0	1	20850	2510.0	50	23	23.00	0.10	0.133	0.137	0.133	0.137
				21100	2535.0								
				21350	2560.0								

Table 11.2-13a SAR testing results for LTE Band 7 (20MHz BW) head configuration

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	19.5	19.46	-0.19	1.43	1.41	1.44	1.42
				21100	2535.0	99	19.5	19.37	0.18	1.36	1.40	1.40	**1.44**
				21350	2560.0	50	19.5	19.31	-0.06	1.37	1.38	1.43	**1.44**
			50	20850	2510.0	0	19.5	19.42	0.08	1.34	1.39	1.36	1.42
				21100	2535.0	0	19.5	19.20	0.29	0.995	1.03	1.07	1.10
				21350	2560.0	0	19.5	19.24	0.16	0.986	1.02	1.05	1.08
			100	20850	2510.0	0	19.5	19.38	0.18	1.01	1.22	1.04	1.25
				21100	2535.0	0	19.5	19.18	0.07	1.10	1.17	1.18	1.26
				21350	2560.0	0	19.5	19.13	-0.19	1.18	1.24	1.28	1.35
10mm Front	QPSK	20.0	1	20850	2510.0	0	19.5	19.46	0.10	0.501		0.506	
				21100	2535.0								
				21350	2560.0								
10mm Left	QPSK	20.0	1	20850	2510.0								
				21100	2535.0								
				21350	2560.0								
10mm Right	QPSK	20.0	1	20850	2510.0	0	19.5	19.46	0.06	0.136		0.137	
				21100	2535.0								
				21350	2560.0								
10mm Bottom	QPSK	20.0	1	20850	2510.0	0	19.5	19.46	0.05	0.771		0.778	
				21100	2535.0								
				21350	2560.0								
10mm + Headset	QPSK	20.0	1	20850	2510.0								
				21100	2535.0								
				21350	2560.0	50	19.5	19.31	0.03	1.27	1.32	1.33	1.38

Repeat Scans - 10mm Back													
2nd Scan	QPSK	20.0	1	20850	2510.0	0	19.5	19.46	0.40	1.38	1.43	1.39	**1.44**

Table 11.2-13b SAR testing results LTE Band 7 (20MHz BW) hotspot configuration

Measured/Extrapolated SAR Values - Body-Worn - 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
15mm Back	QPSK	20.0	1	20850	2510.0	50	23	23.00	0.06	1.42	1.44	1.42	**1.44**
				21100	2535.0	99	23	22.97	0.10	1.41	1.43	1.42	**1.44**
				21350	2560.0	50	23	22.96	0.18	1.36	1.37	1.37	1.38
			50	20850	2510.0	50	21	20.02	0.18	0.705	0.713	0.883	0.893
				21100	2535.0	0	20.8	19.81	-0.14	0.659	0.673	0.828	0.845
				21350	2560.0	0	20.8	19.86	-0.08	0.688	0.698	0.854	0.867
			100	20850	2510.0	0	20.9	19.90	0.25	0.674	0.687	0.849	0.865
15mm Front	QPSK	20.0	1	20850	2510.0	50	23	23.00	0.00	0.535	0.544	0.535	0.544
				21100	2535.0								
				21350	2560.0								
Holster Back	QPSK	20.0	1	20850	2510.0	50	23	23.00	0.17	0.869	0.869	0.869	0.869
				21100	2535.0	99	23	22.97	0.27	0.871	0.884	0.877	0.890
				21350	2560.0	50	23	22.96	-0.20	0.853	0.862	0.861	0.870
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	20850	2510.0	50	23	23.00	0.32	1.41	1.44	1.41	**1.44**

Table 11.2-13c SAR testing results for LTE Band 7 (20MHz BW) body-worn configuration

Threshold 1 For This Band:	1.09	
Max FAST SAR For Band:	1.43	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	1.44	
Additional Full SAR Required:		YES

Table 11.2-13d Fast SAR testing thresholds for LTE Band 7

Measured/Extrapolated SAR Values - Head - 802.11a 5000 MHz															
Pos.	Sub Band	802.11 Mode	Data Rate (Mbps)	BW (MHz)	Ch.	Freq. (MHz)	Cond. Output Power (dBm)		Duty Factor (%)	1g SAR (W/Kg)				
										Extrapolated		Reported		FULL SAR at 100% DF
							Declared	Measured		FAST SAR	FULL SAR	FAST SAR	FULL SAR	
Right Cheek	U-NII-1	A	6	20	36	5180	20	18.2	96					
					40	5200	20	18.1	96					
					44	5220	20	18.2	96	0.011	0.034	0.017	0.051	0.054
					48	5240	20	18.1	96					
	U-NII-2A	A	6	20	52	5260	20	18.1	96					
					56	5280	20	18.0	96					
					60	5300	20	18.1	96	0.042	0.043	0.065	0.066	0.068
					64	5320	20	18.0	96					
	U-NII-2C	A	6	20	104	5520	20	19.3	96					
					116	5580	20	19.3	96	0.313	0.342	0.368	0.402	0.418
					124	5620	20	19.2	96					
					136	5680	20	19.1	96					
	U-NII-3	A	6	20	149	5745	20	19.2	96	0.348	0.345	0.418	0.415	0.431
					157	5785	20	19.0	96					
					165	5825	20	18.8	96					
Right 15° Tilt	U-NII-1	A	6	20										
	U-NII-2A	A	6	20										
	U-NII-2C	A	6	20										
	U-NII-3	A	6	20	149	5745	20	19.2	96	0.421	0.479	0.506	0.576	0.599
Left Cheek	U-NII-1	A	6	20	36	5180	20	18.2	96					
					40	5200	20	18.1	96					
					44	5220	20	18.2	96	0.041	0.041	0.062	0.062	0.065
					48	5240	20	18.1	96					
	U-NII-2A	A	6	20	52	5260	20	18.1	96					
					56	5280	20	18.0	96					
					60	5300	20	18.1	96	0.057	0.069	0.089	0.107	0.111
					64	5320	20	18.0	96					
	U-NII-2C	A	6	20	104	5520	20	19.3	96					
					116	5580	20	19.3	96	0.258	0.253	0.303	0.297	0.309
					124	5620	20	19.2	96					
					136	5680	20	19.1	96					
	U-NII-3	A	6	20	149	5745	20	19.2	96	0.303	0.320	0.364	0.385	0.400
					157	5785	20	19.0	96					
					165	5825	20	18.8	96					
Left 15° Tilt	U-NII-1	A	6	20										
	U-NII-2A	A	6	20										
	U-NII-2C	A	6	20										
	U-NII-3	A	6	20	149	5745	20	19.2	96	0.378	0.383	0.454	0.460	0.479

Table 11.2-14a SAR testing results for 802.11a OFDM head configuration

Measured/Extrapolated SAR Values - Hotspot (10mm Spacing) - 802.11 5000 MHz	

Pos.	Sub Band	802.11 Mode	Data Rate (Mbps)	BW (MHz)	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	
10mm Back	U-NII-1	A	6	20	36	5180	20	18.2	96					
					40	5200	20	18.1	96					
					44	5220	20	18.2	96	0.174	0.201	0.263	0.304	0.316
					48	5240	20	18.1	96					
	U-NII-2A	A	6	20	52	5260								
					56	5280								
					60	5300								
					64	5320								
	U-NII-2C	A	6	20	104	5520								
					116	5580								
					124	5620								
					136	5680								
	U-NII-3	A	6	20	149	5745	17.1	17.1	96	1.02	1.05	1.02	1.05	1.09
					153	5765	17.1	17.0	96	0.911	0.964	0.932	0.986	1.03
					157	5785	17.1	16.7	96	0.737	0.771	0.808	0.845	0.879
					165	5825	17.1	16.6	96	0.609	0.638	0.683	0.716	0.744
		N	MCS0	40	149	5745	17.1	17.1	96	1.00	1.02	1.00	1.02	1.06
10mm Front	U-NII-1	A	6	20										
	U-NII-2A	A	6	20										
	U-NII-2C	A	6	20										
	U-NII-3	A	6	20	149	5745	17.1	17.1	96	0.028	0.036	0.028	0.036	0.038
10mm Left	U-NII-1	A	6	20										
	U-NII-2A	A	6	20										
	U-NII-2C	A	6	20										
	U-NII-3	A	6	20	149	5745	17.1	17.1	96	0.257	0.252	0.257	0.252	0.262
10mm Top	U-NII-1	A	6	20										
	U-NII-2A	A	6	20										
	U-NII-2C	A	6	20										
	U-NII-3	A	6	20	149	5745	17.1	17.1	96	0.264	0.267	0.264	0.267	0.278
Repeat Scans - 10mm Back														
2nd Scan	U-NII-3	A	6	20	149	5745	17.1	17.1	96	1.01	1.03	1.01	1.03	1.07

Table 11.2-14b SAR testing results 802. .11a OFDM hotspot configuration

Note: 802.11n 40MHz bandwidth was spot checked as it shared the same declared power as 802.11a in hotspot mode.

Measured/Extrapolated SAR Values - Body-Worn (15mm Spacing) - 802.11an 5000 MHz	

Pos.	Sub Band	802.11 Mode	Data Rate (Mbps)	BW (MHz)	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	U-NII-1	A	6	20	36	5180	20	18.2	96					
					40	5200	20	18.1	96					
					44	5220	20	18.2	96	0.124	0.126	0.188	0.191	0.198
					48	5240	20	18.1	96					
	U-NII-2A	A	6	20	52	5260	20	18.1	96					
					56	5280	20	18.0	96					
					60	5300	20	18.1	96	0.346	0.354	0.536	0.548	0.570
					64	5320	20	18.0	96					
	U-NII-2C	A	6	20	104	5520	20	19.3	96	0.703	0.732	0.826	0.860	0.894
					116	5580	20	19.3	96	0.865	0.914	1.02	1.07	1.12
					124	5620	20	19.2	96					
					136	5680	20	19.1	96					
	U-NII-3	A	6	20	149	5745	20	19.2	96	0.595	0.618	0.715	0.743	0.773
					157	5785	20	19.0	96					
					165	5825	20	18.8	96					
15mm Front	U-NII-1	A	6	20										
	U-NII-2A	A	6	20										
	U-NII-2C	A	6	20	116	5580	20	19.3	96	0.03	0.030	0.035	0.035	0.037
	U-NII-3	A	6	20										
Holster Back	U-NII-1	A	6	20										
	U-NII-2A	A	6	20										
	U-NII-2C	A	6	20	116	5580	20	19.3	96	0.888	0.907	1.04	1.07	1.11
	U-NII-3	A	6	20										
Repeat Scans - 15mm Back														
2nd Scan	U-NII-2C	A	6	20	116	5580	20	19.3	96	0.882	0.910	1.04	1.07	1.11

Table 11.2-14c SAR testing results for 802.11a OFDM body-worn configuration

Threshold 1 For This Band:	0.734	
Max FAST SAR For Band:	1.02	
Threshold 2 For All Bands:	0.985	
Max FULL SAR For Band:	1.05	
Additional Full SAR Required:		YES

Table 11.2-14d Fast SAR testing thresholds for 802.11a OFDM

11.3 Simultaneous transmission analysis for SAR measurement results

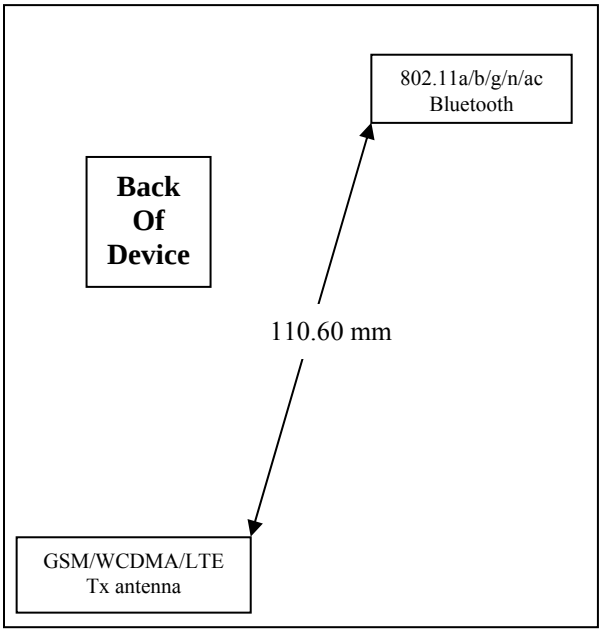

Figure 11.3-1 Back view of device showing closest distance between antenna pairs

Separate Transmitting Antenna		
Separate Antenna	**Technologies Utilized By Each Antenna**	
Antenna 1	GSM, WCDMA, LTE	
Antenna 2	Wi-Fi 2.4 GHz/5.0 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 11.3-1 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.

SAR Values Summation On The Same Test Position

Band	Config.	Licensed Transmitters		Wi-Fi 2.4/5.0GHz 1g avg. SAR (W/Kg)	Max Sum 1g avg. SAR (W/Kg)
		Position	1g avg. SAR (W/Kg)		
LTE Band 17	Head	Right Cheek	0.341	0.431	0.772
		Right Tilt	0.128	0.599	0.727
		Left Cheek	0.174	0.400	0.574
		Left Tilt	0.074	0.479	0.553
	Hotspot (10mm)	Back	0.660	1.09	**1.750**
		Front	0.666	0.074	0.740
		Left		0.262	0.262
		Right	0.459		0.459
		Top		0.278	0.278
		Bottom	0.252		0.252
	Body-worn	15mm Back	0.468	1.12	1.588
		15mm Front	0.408	0.041	0.449
		Holster Back	0.331	1.11	1.441
		Holster Front			0.000
LTE Band 13	Head	Right Cheek	0.341	0.431	0.772
		Right Tilt	0.103	0.599	0.702
		Left Cheek	0.185	0.400	0.585
		Left Tilt	0.095	0.479	0.574
	Hotspot (10mm)	Back	0.601	1.09	**1.691**
		Front	0.649	0.074	0.723
		Left		0.262	0.262
		Right	0.362		0.362
		Top		0.278	0.278
		Bottom	0.273		0.273
	Body-worn	15mm Back	0.462	1.12	1.582
		15mm Front	0.469	0.041	0.510
		Holster Back	0.287	1.11	1.397
		Holster Front			0.000
LTE Band 5	Head	Right Cheek	0.441	0.431	0.872
		Right Tilt	0.116	0.599	0.715
		Left Cheek	0.193	0.400	0.593
		Left Tilt	0.093	0.479	0.572
	Hotspot (10mm)	Back	0.658	1.09	**1.748**
		Front	0.561	0.074	0.635
		Left		0.262	0.262
		Right	0.398		0.398
		Top		0.278	0.278
		Bottom	0.349		0.349
	Body-worn	15mm Back	0.497	1.12	**1.617**
		15mm Front	0.395	0.041	0.436
		Holster Back	0.278	1.11	1.388
		Holster Front			0.000
GSM/DTM	Head	Right Cheek	0.655	0.431	1.086

850		Right Tilt	0.183	0.599	0.782
		Left Cheek	0.266	0.400	0.666
		Left Tilt	0.124	0.479	0.603
	Hotspot (10mm)	Back	1.17	1.09	**2.260**
		Front	0.985	0.074	1.059
		Left		0.262	0.262
		Right	0.547		0.547
		Top		0.278	0.278
		Bottom	0.433		0.433
	Body-worn	15mm Back	0.822	1.12	**1.942**
		15mm Front	0.735	0.041	0.776
		Holster Back	0.559	1.11	**1.669**
		Holster Front			0.000
WCDMA FDD V	Head	Right Cheek	0.494	0.431	0.925
		Right Tilt	0.147	0.599	0.746
		Left Cheek	0.247	0.400	0.647
		Left Tilt	0.107	0.479	0.586
	Hotspot (10mm)	Back	0.948	1.09	**2.038**
		Front	0.747	0.074	0.821
		Left		0.262	0.262
		Right	0.465		0.465
		Top		0.278	0.278
		Bottom	0.457		0.457
	Body-worn	15mm Back	0.644	1.12	**1.764**
		15mm Front	0.529	0.041	0.570
		Holster Back	0.398	1.11	1.508
		Holster Front			0.000
LTE Band 4	Head	Right Cheek	0.586	0.431	1.017
		Right Tilt	0.265	0.599	0.864
		Left Cheek	0.304	0.400	0.704
		Left Tilt	0.238	0.479	0.717
	Hotspot (10mm)	Back	1.10	1.09	**2.190**
		Front	0.727	0.074	0.801
		Left		0.262	0.262
		Right	0.620		0.620
		Top		0.278	0.278
		Bottom	0.549		0.549
	Body-worn	15mm Back	0.531	1.12	**1.651**
		15mm Front	0.456	0.041	0.497
		Holster Back	0.361	1.11	1.471
		Holster Front			0.000
WCDMA FDD IV	Head	Right Cheek	**0.861**	0.431	1.292
		Right Tilt	0.352	0.599	0.951
		Left Cheek	0.436	0.400	0.836
		Left Tilt	0.351	0.479	0.830
	Hotspot (10mm)	Back	1.31	1.09	**2.400**
		Front	0.953	0.074	1.027

		Left		0.262	0.262
		Right	0.657		0.657
		Top		0.278	0.278
		Bottom	1.00		1.000
	Body-worn	15mm Back	0.715	1.12	**1.835**
		15mm Front	0.604	0.041	0.645
		Holster Back	0.439	1.11	1.549
		Holster Front			0.000
LTE Band 2	Head	Right Cheek	0.404	0.431	0.835
		Right Tilt	0.131	0.599	0.730
		Left Cheek	0.186	0.400	0.586
		Left Tilt	0.128	0.479	0.607
	Hotspot (10mm)	Back	0.625	1.09	**1.715**
		Front	0.277	0.074	0.351
		Left		0.262	0.262
		Right	0.186		0.186
		Top		0.278	0.278
		Bottom	0.219		0.219
	Body-worn	15mm Back	0.526	1.12	**1.646**
		15mm Front	0.293	0.041	0.334
		Holster Back	0.319	1.11	1.429
		Holster Front			0.000
GSM/DTM 1900	Head	Right Cheek	0.351	0.431	0.782
		Right Tilt	0.104	0.599	0.703
		Left Cheek	0.219	0.400	0.619
		Left Tilt	0.108	0.479	0.587
	Hotspot (10mm)	Back	1.08	1.09	**2.170**
		Front	0.342	0.074	0.416
		Left		0.262	0.262
		Right	0.305		0.305
		Top		0.278	0.278
		Bottom	0.411		0.411
	Body-worn	15mm Back	0.456	1.12	1.576
		15mm Front	0.203	0.041	0.244
		Holster Back	0.210	1.11	1.320
		Holster Front			0.000
WCDMA FDD II	Head	Right Cheek	0.606	0.431	1.037
		Right Tilt	0.184	0.599	0.783
		Left Cheek	0.404	0.400	0.804
		Left Tilt	0.187	0.479	0.666
	Hotspot (10mm)	Back	0.795	1.09	**1.885**
		Front	0.353	0.074	0.427
		Left		0.262	0.262
		Right	0.291		0.291
		Top		0.278	0.278
		Bottom	0.362		0.362
	Body-worn	15mm Back	0.695	1.12	**1.815**

		15mm Front	0.315	0.041	0.356
		Holster Back	0.367	1.11	1.477
		Holster Front			0.000
LTE Band 7	Head	Right Cheek	0.280	0.431	0.711
		Right Tilt	0.071	0.599	0.670
		Left Cheek	0.165	0.400	0.565
		Left Tilt	0.076	0.479	0.555
	Hotspot (10mm)	Back	**1.44**	1.09	**2.530**
		Front	0.506	0.074	0.580
		Left		0.262	0.262
		Right	0.137		0.137
		Top		0.278	0.278
		Bottom	0.778		0.778
	Body-worn	15mm Back	**1.44**	1.12	**2.560**
		15mm Front	0.544	0.041	0.585
		Holster Back	0.890	1.11	**2.000**
		Holster Front			0.000

Table 11.3-2a Highest 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 17	10 mm device back	0.66	20.5	31.0	-207.8
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum	1.75	Coord. Delta (mm)		76.5	87.0	0.4
SAR SUM^1.5	2.32	Closest Distance (mm):				115.86
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 13	10 mm device back	0.601	11.5	33.5	-208.0
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum	1.691	Coord. Delta (mm)		67.5	89.5	0.2
SAR SUM^1.5	2.20	Closest Distance (mm):				112.11
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 5	10 mm device back	0.658	10.0	31.5	-208.1

2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum		1.748	Coord. Delta (mm)	66.0	87.5	0.1
SAR SUM^1.5			2.31	Closest Distance (mm):		109.60
Ratio			**0.02**			

Antenna	**Band**	**Position**	**1g SAR (W/Kg)**	**Coordinates (mm)**		
				X	**Y**	**Z**
1	GSM 850	10 mm device back	1.17	11.5	37.0	-207.9
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum		2.26	Coord. Delta (mm)	67.5	93.0	0.3
SAR SUM^1.5			3.40	Closest Distance (mm):		114.91
Ratio			**0.03**			

Antenna	**Band**	**Position**	**1g SAR (W/Kg)**	**Coordinates (mm)**		
				X	**Y**	**Z**
1	UMTS V	10 mm device back	0.948	2.5	34.0	-208.1
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum		2.038	Coord. Delta (mm)	58.5	90.0	0.1
SAR SUM^1.5			2.91	Closest Distance (mm):		107.35
Ratio			**0.03**			

Antenna	**Band**	**Position**	**1g SAR (W/Kg)**	**Coordinates (mm)**		
				X	**Y**	**Z**
1	LTE 4	10 mm device back	1.1	13.0	55.5	-207.6
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum		2.19	Coord. Delta (mm)	69.0	111.5	0.6
SAR SUM^1.5			3.24	Closest Distance (mm):		131.13
Ratio			**0.02**			

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	UMTS IV	10 mm device back	1.31	11.5	48.5	-207.6
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum	2.4	Coord. Delta (mm)		67.5	104.5	0.6
SAR SUM^1.5	3.72	Closest Distance (mm):				124.40
Ratio	**0.03**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 2	10 mm device back	0.625	27.0	50.0	-207.4
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum	1.715	Coord. Delta (mm)		83.0	106.0	0.8
SAR SUM^1.5	2.25	Closest Distance (mm):				134.64
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	GSM 1900	10 mm device back	1.08	11.5	57.5	-208.9
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum	2.17	Coord. Delta (mm)		67.5	113.5	-0.7
SAR SUM^1.5	3.20	Closest Distance (mm):				132.06
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	UMTS II	10 mm device back	0.795	18.0	55.5	-207.5
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum	1.885	Coord. Delta (mm)		74.0	111.5	0.7
SAR SUM^1.5	2.59	Closest Distance (mm):				133.83
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 7	10 mm device back	1.44	13.9	57.4	-207.9
2	802.11a	10 mm device back	1.09	-56.0	-56.0	-208.2
SAR Sum	2.53	Coord. Delta (mm)		69.9	113.4	0.3
SAR SUM^1.5		4.02	Closest Distance (mm):			133.20
Ratio		**0.03**				

Table 11.3-2b 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.

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 5	15mm Back	0.497	-0.5	30.0	-208.3
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	1.617	Coord. Delta (mm)		53.5	90.1	-0.1
SAR SUM^1.5		2.06	Closest Distance (mm):			104.78
Ratio		**0.02**				

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	GPRS 850	15mm Back	0.822	8.5	29.5	-208
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	1.942	Coord. Delta (mm)		62.5	89.6	0.2
SAR SUM^1.5		2.71	Closest Distance (mm):			109.25
Ratio		**0.02**				

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	GPRS 850	Holster Back	0.559	-3.5	30.5	-208.1
2	802.11a	Holster Back	1.11	-53.0	-53.0	-208.2
SAR Sum	1.669	Coord. Delta (mm)		49.5	83.5	0.1
SAR SUM^1.5		2.16	Closest Distance (mm):			97.09
Ratio		**0.02**				

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	UMTS V	15mm Back	0.644	-0.5	32.0	-208.2
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	1.764	Coord. Delta (mm)		53.5	92.1	0.0
SAR SUM^1.5		2.34	Closest Distance (mm):			106.51
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 4	15mm Back	0.531	11.5	48.5	-207.7
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	1.651	Coord. Delta (mm)		65.5	108.6	0.5
SAR SUM^1.5		2.12	Closest Distance (mm):			126.83
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	UMTS IV	15mm Back	0.715	-17.0	45.5	-208.1
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	1.835	Coord. Delta (mm)		37.0	105.6	0.1
SAR SUM^1.5		2.49	Closest Distance (mm):			111.90
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 2	15mm Back	0.526	17.5	55.5	-207.3
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	1.646	Coord. Delta (mm)		71.5	115.6	0.9
SAR SUM^1.5		2.11	Closest Distance (mm):			135.94
Ratio	**0.02**					

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	UMTS IV	15mm Back	0.695	18.0	55.5	-207.5
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	1.815	Coord. Delta (mm)		72.0	115.6	0.7
SAR SUM^1.5		2.45	Closest Distance (mm):			136.18
Ratio		**0.02**				

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 7	15mm Back	1.44	14.2	57.6	-207.8
2	802.11a	15mm Back	1.12	-54.0	-60.1	-208.2
SAR Sum	2.56	Coord. Delta (mm)		68.2	117.7	0.4
SAR SUM^1.5		4.10	Closest Distance (mm):			136.02
Ratio		**0.03**				

Antenna	Band	Position	1g SAR (W/Kg)	Coordinates (mm)		
				X	Y	Z
1	LTE 7	Holster Back	0.89	15.1	58.0	-207.7
2	802.11a	Holster Back	1.11	-53.0	-53.0	-208.2
SAR Sum	2	Coord. Delta (mm)		68.1	111.0	0.5
SAR SUM^1.5		2.83	Closest Distance (mm):			130.22
Ratio		**0.02**				

Table 11.3-2c Body-worn 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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