PCTEST ENGINEERING LABORATORY, INC.
6660-B Dobbin Road, Columbia, MD 21045 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
http://www.pctestlab.com

SAR EVALUATION REPORT

Applicant Name:
Pantech, Co. Ltd.
Pantech Building, I-2, DMC
Sangam-dong, Mapo-gu,
Seoul, KOREA 121-792

Date of Testing:
02/09/12 - 03/07/12
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1202100185.JYC

FCC ID: **JYCP8010**

APPLICANT: **Pantech, Co. Ltd.**

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model(s): P8010

Band & Mode	Tx Frequency	Conducted Power [dBm]	SAR		
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	33.35	0.34	1.02	1.02
WCDMA/HSPA 850	826.40 - 846.60 MHz	23.09	0.22	0.39	0.39
GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	29.75	0.36	0.54	0.54
WCDMA/HSPA 1900	1852.4 - 1907.6 MHz	23.06	0.66	0.62	0.62
LTE Band 17	706.5 - 713.5 MHz	23.32	0.18	0.42	0.42
LTE Band 5 (Cell)	826.5 - 846.5 MHz	23.05	0.37	0.45	0.45
LTE Band 4 (AWS)	1712.5 - 1752.5 MHz	22.98	0.65	0.73	0.73
LTE Band 2 (PCS)	1852.5 - 1907.5 MHz	23.47	0.55	0.43	0.44
2.4 GHz WLAN	2412 - 2462 MHz	17.70	0.29	0.15	0.15
5.8 GHz WLAN	5745 - 5825 MHz	9.05	N/A	N/A	N/A
5.2 GHz WLAN	5180 - 5240 MHz	9.99	N/A	N/A	N/A
5.3 GHz WLAN	5260 - 5320 MHz	9.70	N/A	N/A	N/A
5.5 GHz WLAN	5500 - 5700 MHz	9.70	N/A	N/A	N/A
Bluetooth	2402 - 2480 MHz	2.99	N/A		
Simultaneous SAR per KDB 690783 D01:			0.90	0.88	1.17

Note: Powers in the above table represent output powers for the SAR test configurations and may not represent the highest output powers for all configurations for each mode.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in FCC/OET Bulletin 65 Supplement C (2001), IEEE 1528-2003 and in applicable Industry Canada Radio Standards Specifications (RSS); for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President

TABLE OF CONTENTS

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Tx Frequency
GSM/GPRS/EDGE 850	824.20 - 848.80 MHz
WCDMA/HSPA 850	826.40 - 846.60 MHz
GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz
WCDMA/HSPA 1900	1852.4 - 1907.6 MHz
LTE Band 17	706.5 - 713.5 MHz
LTE Band 5 (Cell)	826.5 - 846.5 MHz
LTE Band 4 (AWS)	1712.5 - 1752.5 MHz
LTE Band 2 (PCS)	1852.5 - 1907.5 MHz
2.4 GHz WLAN	2412 - 2462 MHz
5.8 GHz WLAN	5745 - 5825 MHz
5.2 GHz WLAN	5180 - 5240 MHz
5.3 GHz WLAN	5260 - 5320 MHz
5.5 GHz WLAN	5500 - 5700 MHz
Bluetooth	2402 - 2480 MHz

1.2 DUT Antenna Locations

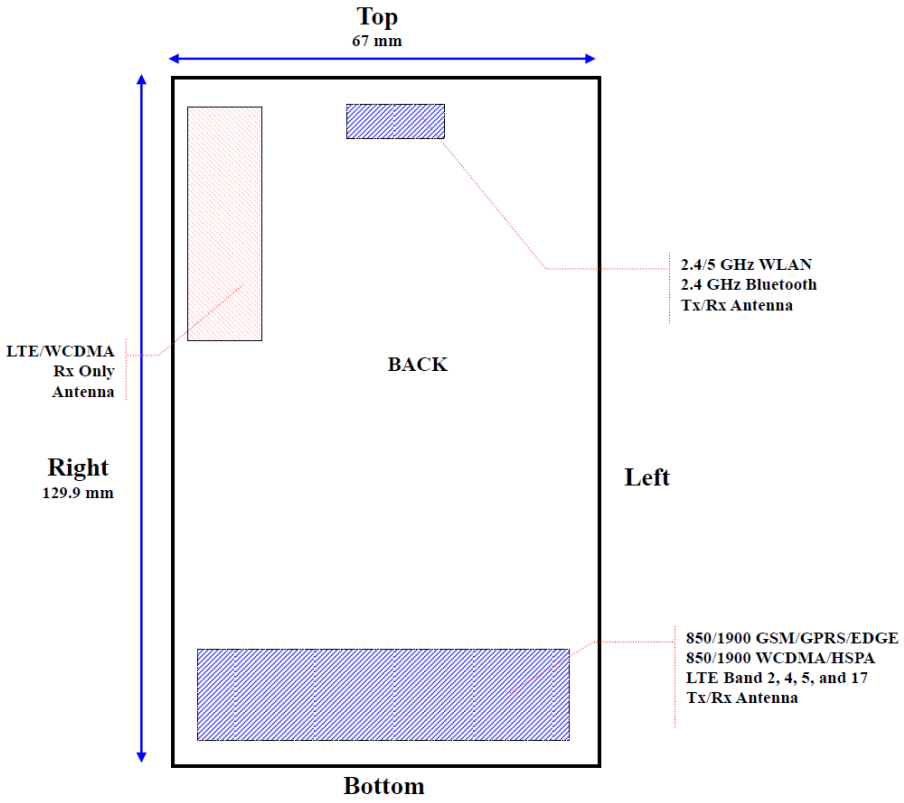


Figure 1-1
DUT Antenna Locations

Table 1-1
Mobile Hotspot Sides for SAR Testing

Mobile Hotspot Sides for SAR Testing						
Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
WCDMA 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
WCDMA 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 17	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06 guidance, page 2. The antenna document shows the distances between the transmit antennas and the edges of the device. When the wireless router mode is enabled, all 5 GHz bands are disabled. Therefore 5 GHz WIFI is not considered in this section.

1.3 Simultaneous Transmission Capabilities

According to KDB 648474, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-2 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

Figure 1-2
Simultaneous Transmission Paths

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to KDB 447498 3) procedures.

Table 1-2
Simultaneous Transmission Scenarios Transmission Supported by DUT

No.	Capable Transmit Configurations	Head	Body-Worn Accessory	Hot Spot	Note
		IEEE 1528, Supp C	Supp C	FCC KDB 941225 D06 edges/sides	
1	GSM 850/1900 MHz Voice + WiFi 2.4GHz	Yes	10 mm	-	
2	850/1900 WCDMA Voice + WiFi 2.4GHz	Yes	10 mm	-	
3	850/1900 MHz GPRS/EDGE Data + WIFI 2.4 GHz	-	-	Yes	2G Hotspot
4	850/1900 MHz WCDMA/HSPA Data + WIFI 2.4 GHz	Yes**	10 mm**	Yes**	3G Hotspot**
5	LTE Data + WIFI 2.4 GHz	Yes*	10 mm*	Yes	4G Hotspot
6	GSM 850/1900 MHz Voice + WiFi 5GHz	Yes	10 mm	-	5GHz Client only
7	850/1900 MHz WCDMA Voice + WIFI 5 GHz	Yes	10 mm	-	5GHz Client only
8	850/1900 MHz GPRS/EDGE Data + WiFi 5GHz				Blocked by S/W
9	850/1900 MHz WCDMA/HSPA Data + WIFI 5 GHz				Blocked by S/W
10	LTE Data + WIFI 5 GHz				Blocked by S/W
11	850/1900 MHz GSM/WCDMA Voice + LTE				Not Supported by H/W
12	850/1900 MHz GPRS/EDGE Data + LTE				Not Supported by H/W
13	850/1900 MHz WCDMA/HSPA Data + LTE				Not Supported by H/W
14	GSM/WCDMA Voice + WIFI + LTE				Not Supported by H/W

(*) = for VOIP 3rd party applications possibly installed and used by end-user
(**) = When the user utilizes multiple services in WCDMA 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the WCDMA+WLAN scenario also represents the WCDMA Voice/DATA + WLAN Hotspot scenario.

1.4 SAR Test Exclusions Applied

(A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using 5 GHz WIFI, only 2.4 GHz WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations in KDB 941225 D06.

The separation between the main antenna and the Bluetooth and WLAN antennas is 116.6 mm. RF Conducted Power of Bluetooth Tx is 1.991 mW (please reference the DSS EMC report filed for this EUT for a complete set of Bluetooth powers). RF Conducted Power of 2.4 GHz WLAN is 59.16 mW. RF Conducted Power of 5 GHz WLAN is 9.98 mW.

2.4 GHz and 5 GHz WIFI and Bluetooth share the same antenna path and cannot transmit simultaneously.

Per KDB Publication 648474, **Bluetooth and 5GHz WLAN SAR was not required** based on the maximum conducted power, the Bluetooth/WLAN to main antenna separation distance and Body-SAR of the main antenna.

(B) Licensed Transmitter(s)

This model does not support Simultaneous Voice and Data for the licensed transmitter in any modes except in WCDMA that allows Multi-RAB transmissions that share voice and data operations on a single physical channel.

GSM/GPRS/EDGE DTM is not supported. Therefore GSM Voice cannot transmit simultaneously with GPRS/EDGE Data.

Simultaneous Voice and LTE data ("SVLTE") cannot transmit simultaneously since they utilize the same transmission path as illustrated in **Figure 1-2**.

This device is only capable of QPSK HSUPA in the uplink, but is capable of HSPA+ in the downlink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01.

LTE SAR for the lower BWs was not tested since the maximum average output power of all channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and LTE SAR for the highest BW was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05.

1.5 Power Reduction for SAR

There is no power reduction for any band/mode implemented in this device for SAR purposes.

1.6 FCC Guidance Applied

- FCC OET Bulletin 65 Supplement C [June 2001]
- IEEE 1528-2003
- FCC KDB 941225 (2G/3G/4G and Hotspot)
- FCC KDB 248227 (802.11)
- FCC KDB 648474 (Simultaneous)
- FCC KDB 865664 (5 GHz)

1.7 Samples Used for SAR Testing

Several samples with identical hardware were used to facilitate SAR testing only.

Table 1-3
SAR Test Sample Serial Number

Mode/Band	Serial Number
GSM/GPRS/EDGE 850/1900	089C10135
WCDMA 850/1900	089C10135
LTE Band 2 (PCS)	089C10136
LTE Band 4 (AWS)	089C10215
LTE Band 5 (Cell)	089C10293
LTE Band 17	089C10160
2.4 GHz WLAN	089H10637

2 LTE CHECKLIST PER KDB 941225 D05

KDB 941225 Sec.	FCC ID:	JYCP8010		
	Form Factor	Portable Handset		
1)	Frequency Range of each LTE transmission band	BAND2: Tx (1852.5 - 1907.5 MHz) BADN5: Tx (826.5 - 846.5 MHz) BAND4: Tx (1712.5 - 1752.5 MHz) BAND17: Tx (706.5 - 713.5 MHz)		
2)	Channel Bandwidths (MHz)	Band2: 5MHz, 10 MHz Band5: 5MHz, 10 MHz Band4: 5MHz, 10 MHz Band17: 5MHz, 10 MHz		
3)	Channel Numbers and Frequencies (MHz)	Low	Mid	High
	LTE Band 2 and BW 5MHz	1852.5 MHz(18625)	1880 MHz(18900)	1907.5 MHz(19175)
	LTE Band 2 and BW 10MHz	1850 MHz (18650)	1880 MHz(18900)	1905 MHz (19150)
	LTE Band 5 and BW 5MHz	826.5 MHz (20425)	836.5 MHz (20525)	846.5 MHz (20625)
	LTE Band 5 and BW 10MHz	829 MHz (20450)	836.5 MHz (20525)	844 MHz (20600)
	LTE Band 4 and BW 5MHz	1712.5 MHz(19975)	1732.5 MHz(20175)	1752.5 MHz(20375)
	LTE Band 4 and BW 10MHz	1715MHz(20000)	1732.5MHz(20175)	1750 MHz(20350)
	LTE Band 17 and BW 5MHz	706.5MHz(23755)	710 MHz(23790)	713.5 MHz(23825)
	LTE Band 17 and BW 10MHz	709 MHz(23780)	710 MHz(23790)	711 MHz(23800)
4)(a)	UE Category	3		
(b)	Modulations Supported in UL	QPSK, 16QAM		
	LTE Transmitter and Antenna Implementation	GSM/WCDMA and LTE share the same antenna.		
5)	Description of LTE Tx and Ant. Implementation	1 Tx/Rx Ant, 1Rx Ant only		
6)	LTE Voice available	NO		
	Hotspot with LTE+WIFI	NO		
	Hotspot with LTE+WIFI with Voice	NO		
7)	LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5?	YES		
	A-MPR (Additional MPR) disabled for SAR Testing?	YES		
8)	Conducted power Table provided for 1RB (low and high offset), 50% RB (centered), 100% RB	YES		
9-10)	Non-LTE US Wireless Operating Modes/Bands	RF Exposure Configurations		
	850 MHz GSM	See Page 1		
	1900 MHz GSM			
	850 MHz WCDMA			
	1900 MHz WCDMA			
	2.4 GHz Bluetooth			
	2.4 GHz WI-FI			
	5 GHz Wi-Fi			
11)	Simultaneous Tx Conditions (Voice and Data Configurations)	See Section 1.3		
12)	Power Reduction used for SAR Compliance?	NO		
13	Describe Power Reduction (LTE Modes)	N/A		
14	SAR Test Plan	N/A		
15	SAR test data, preliminary	N/A		

3 INTRODUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [24]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

Equation 3-1
SAR Mathematical Equation

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho\, dv}\right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

4 SAR MEASUREMENT SETUP

4.1 Automated SAR Measurement System

Measurements are performed using the DASY automated dosimetric SAR assessment system. The DASY is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the SAM phantom containing the head or body equivalent material. The robot is a six-axis industrial robot, performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). See www.speag.com for more information about the specification of the SAR assessment system.

Figure 4-1
SAR Measurement System

Figure 4-2
Near-Field Probe

Table 4-1
Composition of the Tissue Equivalent Matter

Frequency (MHz)	835	835	1750	1750	1900	1900	2450	2450
Tissue	Head	Body	Head	Body	Head	Body	Head	Body
Ingredients (% by weight)								
Bactericide	0.1	0.1						
DGBE			47	31	44.92	29.44	7.99	26.7
HEC	1	1						
NaCl	1.45	0.94	0.4	0.2	0.18	0.39	0.16	0.1
Sucrose	57	44.9						
Triton X-100							19.97	
Water	40.45	53.06	52.6	68.8	54.9	70.17	71.88	73.2

See next page for 750 MHz Tissue Composition

Table 4-2
Composition of 750 MHz Head and Body Tissue Equivalent Matter

2 Composition / Information on ingredients	
The Item is composed of the following ingredients:	
H_2O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1 – 0.7% Relevant for safety; Refer to the respective Safety Data Sheet*.

Note: 750MHz liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MSL 750)**
Product No.	SL AAM 075 AA (Charge: 110606-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe (type DAK).

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

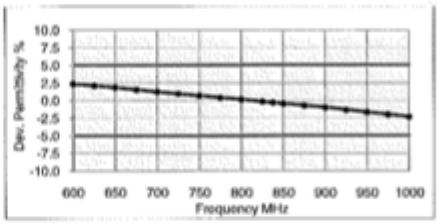
Ambient Condition	22°C ; 30% humidity
TSL Temperature	22°C
Test Date	8-Jun-11

Additional Information

TSL Density	1.212 g/cm^3
TSL Heat-capacity	3.006 kJ/(kg*K)

Results

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e"	sigma	eps	sigma	Δ-eps	Δ-sigma
600	57.4	24.88	0.83	56.1	0.95	2.4	-12.7
625	57.2	24.53	0.85	56.0	0.95	2.1	-10.6
650	57.0	24.18	0.87	55.9	0.96	1.8	-8.5
675	56.7	23.90	0.90	55.8	0.96	1.5	-6.3
700	56.4	23.61	0.92	55.7	0.96	1.2	-4.2
725	56.2	23.37	0.94	55.6	0.96	0.9	-2.0
750	**55.9**	**23.12**	**0.96**	**55.5**	**0.96**	**0.7**	**0.1**
775	55.7	22.95	0.99	55.4	0.97	0.4	2.5
800	55.4	22.78	1.01	55.3	0.97	0.1	4.6
825	55.2	22.61	1.04	55.2	0.98	-0.2	6.1
838	55.0	22.52	1.05	55.2	0.98	-0.3	6.7
850	54.9	22.44	1.06	55.2	0.99	-0.4	7.3
875	54.7	22.30	1.09	55.1	1.02	-0.7	6.5
900	54.5	22.17	1.11	55.0	1.05	-1.0	5.7
925	54.2	22.05	1.13	55.0	1.06	-1.3	6.8
950	54.0	21.94	1.16	54.9	1.08	-1.7	7.8
975	53.8	21.85	1.18	54.9	1.09	-2.0	9.0
1000	53.6	21.75	1.21	54.8	1.10	-2.3	10.2



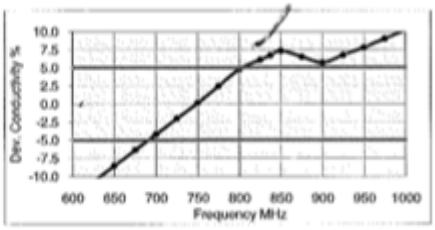


Figure 4-3
750MHz Body Tissue Equivalent Matter

Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HSL 750)**
Product No.	SL AAH 075 (Charge: 110601-1)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe (type DAK).

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

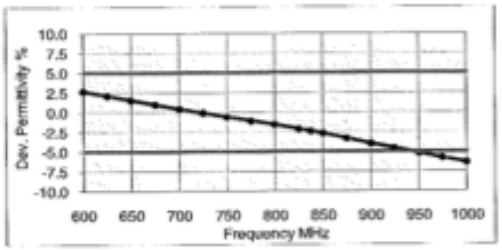
Ambient Condition	22°C ; 30% humidity
TSL Temperature	22°C
Test Date	8-Jun-11

Additional Information

TSL Density	1.284 g/cm^3
TSL Heat-capacity	2.701 kJ/(kg*K)

Results

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e"	sigma	eps	sigma	Δ-eps	Δ-sigma
600	43.9	23.01	0.77	42.7	0.88	2.7	-12.9
625	43.5	22.75	0.79	42.6	0.88	2.1	-10.5
650	43.1	22.49	0.81	42.5	0.89	1.5	-8.2
675	42.7	22.26	0.84	42.3	0.89	1.0	-5.9
700	42.4	22.03	0.86	42.2	0.89	0.4	-3.5
725	42.0	21.84	0.88	42.1	0.89	-0.1	-1.2
750	**41.7**	**21.65**	**0.90**	**41.9**	**0.89**	**-0.6**	**1.1**
775	41.4	21.50	0.93	41.8	0.90	-1.1	3.5
800	41.0	21.34	0.95	41.7	0.90	-1.6	5.9
825	40.7	21.19	0.97	41.6	0.91	-2.1	7.3
838	40.5	21.12	0.98	41.5	0.91	-2.4	8.0
850	40.4	21.05	1.00	41.5	0.92	-2.7	8.6
875	40.1	20.91	1.02	41.5	0.94	-3.3	7.9
900	39.8	20.77	1.04	41.5	0.97	-4.0	7.2
925	39.6	20.66	1.06	41.5	0.98	-4.6	8.2
950	39.3	20.55	1.09	41.4	0.99	-5.2	9.2
975	39.0	20.44	1.11	41.4	1.00	-5.8	10.3
1000	38.7	20.32	1.13	41.3	1.01	-6.4	11.4



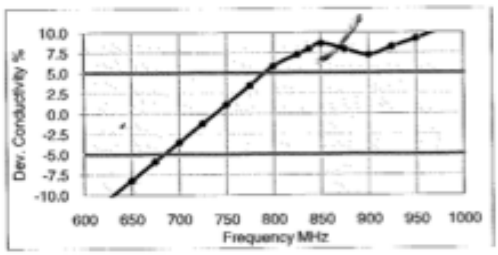


Figure 4-4
750MHz Head Tissue Equivalent Matter

5 DOSIMETRIC ASSESSMENT

5.1 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head interface and the horizontal grid resolution was 15mm and 15mm for frequencies < 3 GHz in the x and y directions respectively. When applicable, for frequencies above 3 GHz, a 10 mm by 10 mm resolution was used.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1 gram cube evaluation. SAR at this fixed point was measured and used as a reference value.

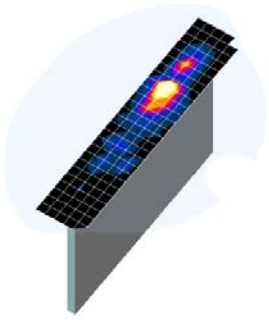


Figure 5-1
Sample SAR Area Scan

3. Based on the area scan data, the peak area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 32mm x 32mm x 30mm (fine resolution volume scan, zoom scan) was assessed by measuring at least 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

6 DEFINITION OF REFERENCE POINTS

6.1 EAR REFERENCE POINT

Figure 8-1 shows the front, back and side views of the SAM Twin Phantom. The point "M" is the reference point for the center of the mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 8-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 6-2). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

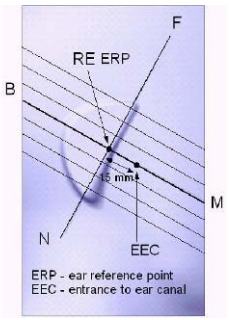


Figure 6-1
Close-Up Side view of ERP

6.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Figure 6-3). The "test device reference point" was than located at the same level as the center of the ear reference point. The test device was positioned so that the "vertical centerline" was bisecting the front surface of the handset at it's top and bottom edges, positioning the "ear reference point" on the outer surface of the both the left and right head phantoms on the ear reference point.

Figure 6-2
Front, back and side view of SAM Twin Phantom

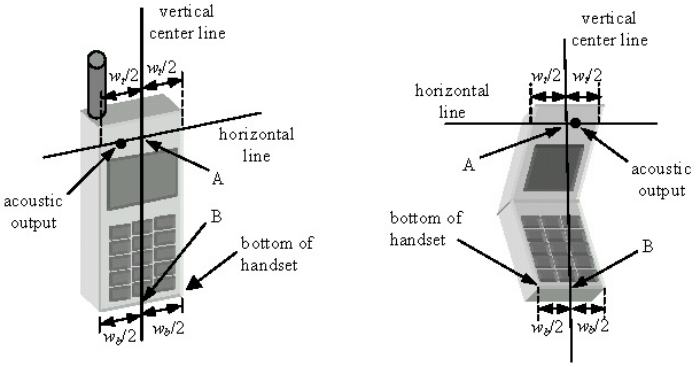


Figure 6-3
Handset Vertical Center & Horizontal Line Reference Points

7 TEST CONFIGURATION POSITIONS FOR HANDSETS

7.1 Device Holder

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02.

7.2 Positioning for Cheek/Touch

1. The test device was positioned with 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 7-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

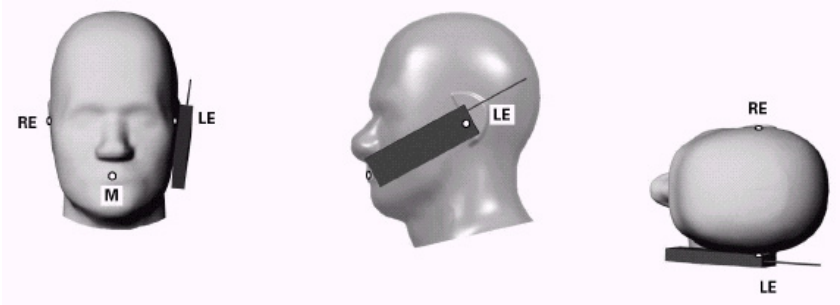


Figure 7-1 Front, Side and Top View of Cheek/Touch Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.
5. 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, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 7-2).

7.3 Positioning for Ear / 15º Tilt

With the test device aligned in the "Cheek/Touch Position":

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15degree.
2. The phone was then rotated around the horizontal line by 15 degree.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 7-2).

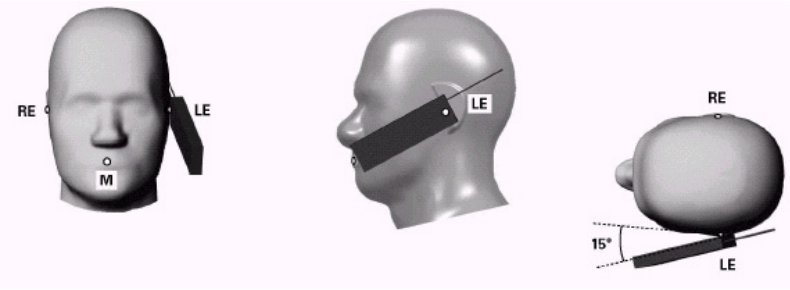


Figure 7-2 Front, Side and Top View of Ear/15º Tilt Position

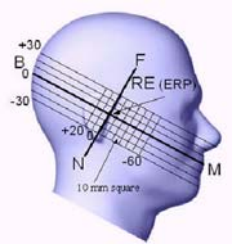


Figure 7-3
Side view w/ relevant markings

Figure 7-4 Body SAR Sample Photo
(Not Actual EUT)

7.4 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 7-4). A device with a headset output is tested with a headset connected to the device.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

7.5 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive internet connectivity through simultaneous transmission of WIFI in conjunction with a separate licensed transmitter. The FCC has provided guidance in KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device with antennas 2.5 cm or closer to the edge of the device, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn

accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. Therefore, SAR must be evaluated for each frequency transmission and mode separately and summed with the WIFI transmitter according to KDB 648474 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

8 FCC RF EXPOSURE LIMITS

8.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

8.2 Controlled Environment

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). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 8-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
SPATIAL PEAK SAR Brain	1.6	8.0
SPATIAL AVERAGE SAR Whole Body	0.08	0.4
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

9 FCC MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

9.1 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01 “SAR Measurement Procedures for 3G Devices” v02, October 2007.

The device was placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test were evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device was tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviated by more than 5%, the SAR test and drift measurements were repeated.

9.2 SAR Measurement Conditions for WCDMA

9.2.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1s”.

9.2.2 Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

9.2.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”.

9.2.4 SAR Measurements for Handsets with Rel 5 HSDPA

Body SAR for HSDPA is not required for handsets with HSDPA capabilities when the maximum average output power of each RF channel with HSDPA active is less than 0.25 dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is $\leq$ 75% of the SAR limit. Otherwise, SAR is measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration measured in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that resulted in the highest SAR in 12.2 kbps RMC mode for that RF channel.

The H-set used in FRC for HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HSPDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the applicable H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the FRC for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 2 ms to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors of βc=9 and βd=15, and power offset parameters of ΔACK= ΔNACK =5 and ΔCQI=2 is used. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the FRC.

9.2.5 SAR Measurements for Handsets with Rel 6 HSUPA

Body SAR for HSUPA is not required when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25 dB higher than as measured without HSUPA/HSDPA using 12.2 kbps RMC and maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise SAR is measured on the maximum output channel for the body exposure configuration produced highest SAR in 12.2 kbps RMC for that RF channel, using the additional procedures under "Release 6 HSPA data devices"

Head SAR for VOIP operations under HSPA is not required when maximum average output of each RF channel with HSPA is less than 0.25 dB higher than as measured using 12.2 kbps RMC. Otherwise SAR is measured using same HSPA configuration as used for body SAR.

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} can not be set directly; it is set by Absolute Grant Value.

9.3 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes following SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.

9.3.1 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1. See Section 10.2 for MPR targets.

9.3.2 A-MPR

A-MPR (Additional MPR) has been disabled by setting NS=1 in base station simulator for all SAR tests

9.3.3 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05:

a. Per Page 4, 3) A), QPSK with 50% RB is required for the highest bandwidth.
b. Per Page 4, footnote 2, when the maximum output power across high, mid., and low channels is < 0.5 dB, mid channel is tested. Low and high channel SAR tests are not required for QPSK, 50% RB allocation when the SAR is < 0.8 W/kg.
c. Per Page 4, 3) B), QPSK with 1 RB for both channel edges are required for the highest bandwidth.
d. Per Page 4, footnote 6, QPSK 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK. 1 RB low and high offset configurations are considered together for a single channel selection. Otherwise, SAR tests are performed on the channel that produced the highest SAR for QPSK with 50% RB.
e. Per Page 4, 3) B), I), when the SAR for QPSK 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
f. Per Page 4, 4) A), 16QAM with 50% RB is required for the highest bandwidth on the channel with the highest measured SAR for QPSK with 50% RB allocation.
g. Per Page 4, 4) A), I), when the SAR for 16 QAM, 50 % allocation tests is <1.45 W/kg, testing on the other channels is not required.
h. Per Page 4, 4) B) and Page 5 footnote 9, 16QAM with 1RB for both channel edges are required for the highest bandwidth on the highest output power channel for the 1 RB allocation when the average output power of the 1 RB allocation is >0.5 dB higher than the 50% allocation for 16 QAM. 1 RB low and high offset configurations are considered together for a single channel selection. Otherwise, SAR tests are performed on the channel that produced the highest SAR for 16 QAM with 50% RB.
i. Per Page 5, 4) B), I), when the SAR for 16 QAM 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
j. Per Page 4, 4), A) I) and Page 5, 4), A)I, 100% RB Allocation is not required to be tested when the SAR is not > 1.45 W/kg for the highest bandwidth.
k. Per Page 5, 5) B) I), smaller bandwidths are not required to be tested when SAR is not > 1.45 W/kg for the highest bandwidth and the maximum average output power of the smaller bandwidths across all channels and configurations is not more than 0.5 dB higher than the higher bandwidths.

9.4 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 for more details.

9.4.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond

to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.4.2 Frequency Channel Configurations [27]

For 2.4 GHz, the highest average RF output power channel between the low, mid and high channel at the lowest data rate was selected for SAR evaluation in 802.11b mode. 802.11g/n modes and higher data rates for 802.11b were additionally evaluated for SAR if the output power of the respective mode was 0.25 dB or higher than the powers of the SAR configurations tested in the 802.11b mode.

If the maximum extrapolated peak SAR of the zoom scan for the highest output channel was less than 1.6 W/kg or if the 1g averaged SAR was less than 0.8 W/kg, SAR testing was not required for the other test channels in the band.

10 RF CONDUCTED POWERS

10.1 GSM/WCDMA Conducted Powers

10.1.1 GSM Conducted Powers

		Maximum Burst-Averaged Output Power				
		Voice	*GPRS/EDGE Data (GMSK)*		*EDGE Data (8-PSK)*	
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
Cellular	128	33.18	33.41	**33.35**	26.65	26.55
	190	33.24	33.37	**33.27**	26.53	26.50
	251	33.22	33.33	**33.24**	26.64	26.45
PCS	512	29.49	29.58	**29.58**	26.24	26.15
	661	29.60	29.65	**29.75**	26.33	26.25
	810	29.50	29.70	**29.60**	26.30	26.20
		Calculated Maximum Frame-Averaged Output Power				
		Voice	*GPRS/EDGE Data (GMSK)*		*EDGE Data (8-PSK)*	
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
Cellular	128	24.15	24.38	**27.33**	17.62	20.53
	190	24.21	24.34	**27.25**	17.50	20.48
	251	24.19	24.30	**27.22**	17.61	20.43
PCS	512	20.46	20.55	**23.56**	17.21	20.13
	661	20.57	20.62	**23.73**	17.30	20.23
	810	20.47	20.67	**23.58**	17.27	20.18

Note:

1. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
2. The bolded GPRS modes were selected according to the highest frame-averaged output power table according to KDB 941225 D03.
3. CS1 coding scheme was used in GPRS output power measurements and SAR Testing, as a condition where GMSK modulation was ensured. It was investigated that CS1 - CS4 settings do not have any impact on the output levels in the GPRS modes.
4. MCS7 coding scheme was used to measure the output powers for EDGE since it was investigated that choosing MCS7 coding scheme will ensure 8-PSK modulation. It was investigated that MCS settings producing 8PSK Modulation do not impact on the output powers in EDGE mode.

GSM Class: B
GPRS Multislot class: 10 (max 2 Tx Uplink slots)
EDGE Multislot class: 10 (max 2 Tx Uplink slots)
DTM Multislot Class: N/A

10.1.2 HSPA Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	22.96	23.09	23.10	23.02	23.06	23.06	-
99		12.2 kbps AMR	22.98	23.04	23.07	23.01	23.00	22.97	-
6	HSDPA	Subtest 1	22.07	22.19	22.18	21.97	21.89	21.90	0
6		Subtest 2	22.17	22.32	22.34	21.98	22.00	22.02	0
6		Subtest 3	21.65	21.78	21.90	21.62	21.43	21.41	0.5
6		Subtest 4	21.63	21.77	21.94	21.54	21.38	21.46	0.5
6	HSUPA	Subtest 1	21.43	21.51	21.82	21.92	21.54	21.58	0
6		Subtest 2	19.21	19.32	19.32	19.26	19.08	19.23	2
6		Subtest 3	20.42	20.76	20.89	20.28	20.31	20.21	1
6		Subtest 4	21.61	21.80	21.77	21.13	21.48	21.46	2
6		Subtest 5	21.48	21.50	21.58	21.60	21.32	21.57	0

WCDMA SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

It is expected by the manufacturer that MPR for HSUPA subtest 4 may be as low as 0 dB according to the chipset implementation in this model.

Figure 10-1
Power Measurement Setup

10.2 LTE Conducted Powers

10.2.1 LTE Band 17

Table 10-1
LTE Band 17 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	706.5	23755	5	QPSK	1	0	23.11	0	0
	706.5	23755	5	QPSK	1	24	23.15	0	0
	706.5	23755	5	QPSK	12	6	22.30	1	0-1
	706.5	23755	5	QPSK	25	0	22.44	1	0-1
	706.5	23755	5	16-QAM	1	0	22.10	1	0-1
	706.5	23755	5	16-QAM	1	24	22.06	1	0-1
	706.5	23755	5	16-QAM	12	6	20.95	2	0-2
	706.5	23755	5	16-QAM	25	0	21.35	2	0-2
Mid	710.0	23790	5	QPSK	1	0	23.25	0	0
	710.0	23790	5	QPSK	1	24	23.14	0	0
	710.0	23790	5	QPSK	12	6	22.34	1	0-1
	710.0	23790	5	QPSK	25	0	22.44	1	0-1
	710.0	23790	5	16-QAM	1	0	22.11	1	0-1
	710.0	23790	5	16-QAM	1	24	22.11	1	0-1
	710.0	23790	5	16-QAM	12	6	20.91	2	0-2
	710.0	23790	5	16-QAM	25	0	21.28	2	0-2
High	713.5	23825	5	QPSK	1	0	23.15	0	0
	713.5	23825	5	QPSK	1	24	23.05	0	0
	713.5	23825	5	QPSK	12	6	22.35	1	0-1
	713.5	23825	5	QPSK	25	0	22.46	1	0-1
	713.5	23825	5	16-QAM	1	0	22.10	1	0-1
	713.5	23825	5	16-QAM	1	24	21.90	1	0-1
	713.5	23825	5	16-QAM	12	6	20.91	2	0-2
	713.5	23825	5	16-QAM	25	0	21.40	2	0-2

Table 10-2
LTE Band 17 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	709	23780	10	QPSK	1	0	23.16	0	0
	709	23780	10	QPSK	1	49	23.20	0	0
	709	23780	10	QPSK	25	12	22.48	1	0-1
	709	23780	10	QPSK	50	0	22.24	1	0-1
	709	23780	10	16QAM	1	0	21.97	1	0-1
	709	23780	10	16QAM	1	49	21.92	1	0-1
	709	23780	10	16QAM	25	12	21.71	1	0-2
	709	23780	10	16QAM	50	0	21.28	2	0-2
Mid	710.0	23790	10	QPSK	1	0	**23.32**	0	0
	710.0	23790	10	QPSK	1	49	**23.16**	0	0
	710.0	23790	10	QPSK	25	12	**22.47**	1	0-1
	710.0	23790	10	QPSK	50	0	22.35	1	0-1
	710.0	23790	10	16QAM	1	0	**21.94**	1	0-1
	710.0	23790	10	16QAM	1	49	**21.84**	1	0-1
	710.0	23790	10	16QAM	25	12	**21.79**	1	0-2
	710.0	23790	10	16QAM	50	0	21.22	2	0-2
High	711	23800	10	QPSK	1	0	23.20	0	0
	711	23800	10	QPSK	1	49	23.09	0	0
	711	23800	10	QPSK	25	12	22.46	1	0-1
	711	23800	10	QPSK	50	0	22.32	1	0-1
	711	23800	10	16QAM	1	0	21.90	1	0-1
	711	23800	10	16QAM	1	49	21.92	1	0-1
	711	23800	10	16QAM	25	12	21.75	1	0-2
	711	23800	10	16QAM	50	0	21.30	2	0-2

10.2.2 LTE Band 5 (Cell)

Table 10-3
LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	826.5	20425	5	QPSK	1	0	22.65	0	0
	826.5	20425	5	QPSK	1	24	22.61	0	0
	826.5	20425	5	QPSK	12	6	21.96	1	0-1
	826.5	20425	5	QPSK	25	0	22.17	1	0-1
	826.5	20425	5	16-QAM	1	0	21.58	1	0-1
	826.5	20425	5	16-QAM	1	24	21.51	1	0-1
	826.5	20425	5	16-QAM	12	6	20.86	2	0-2
	826.5	20425	5	16-QAM	25	0	21.34	2	0-2
Mid	836.5	20525	5	QPSK	1	0	22.98	0	0
	836.5	20525	5	QPSK	1	24	22.87	0	0
	836.5	20525	5	QPSK	12	6	22.11	1	0-1
	836.5	20525	5	QPSK	25	0	22.33	1	0-1
	836.5	20525	5	16-QAM	1	0	21.96	1	0-1
	836.5	20525	5	16-QAM	1	24	21.92	1	0-1
	836.5	20525	5	16-QAM	12	6	20.82	2	0-2
	836.5	20525	5	16-QAM	25	0	21.20	2	0-2
High	846.5	20625	5	QPSK	1	0	22.84	0	0
	846.5	20625	5	QPSK	1	24	22.78	0	0
	846.5	20625	5	QPSK	12	6	21.97	1	0-1
	846.5	20625	5	QPSK	25	0	22.07	1	0-1
	846.5	20625	5	16-QAM	1	0	21.95	1	0-1
	846.5	20625	5	16-QAM	1	24	21.80	1	0-1
	846.5	20625	5	16-QAM	12	6	20.85	2	0-2
	846.5	20625	5	16-QAM	25	0	21.34	2	0-2

Table 10-4
LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	829	20450	10	QPSK	1	0	22.97	0	0
	829	20450	10	QPSK	1	49	22.90	0	0
	829	20450	10	QPSK	25	12	22.20	1	0-1
	829	20450	10	QPSK	50	0	22.12	1	0-1
	829	20450	10	16QAM	1	0	21.88	1	0-1
	829	20450	10	16QAM	1	49	21.85	1	0-1
	829	20450	10	16QAM	25	12	21.80	1	0-2
	829	20450	10	16QAM	50	0	21.35	2	0-2
Mid	836.5	20525	10	QPSK	1	0	**23.04**	0	0
	836.5	20525	10	QPSK	1	49	**23.05**	0	0
	836.5	20525	10	QPSK	25	12	**22.30**	1	0-1
	836.5	20525	10	QPSK	50	0	22.17	1	0-1
	836.5	20525	10	16QAM	1	0	**21.90**	1	0-1
	836.5	20525	10	16QAM	1	49	**21.88**	1	0-1
	836.5	20525	10	16QAM	25	12	**21.84**	1	0-2
	836.5	20525	10	16QAM	50	0	21.27	2	0-2
High	844	20600	10	QPSK	1	0	23.00	0	0
	844	20600	10	QPSK	1	49	22.87	0	0
	844	20600	10	QPSK	25	12	22.38	1	0-1
	844	20600	10	QPSK	50	0	22.15	1	0-1
	844	20600	10	16QAM	1	0	21.90	1	0-1
	844	20600	10	16QAM	1	49	21.75	1	0-1
	844	20600	10	16QAM	25	12	21.95	1	0-2
	844	20600	10	16QAM	50	0	21.42	2	0-2

10.2.3 LTE Band 4 (AWS)

Table 10-5
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	1712.5	19975	5	QPSK	1	0	22.73	0	0
	1712.5	19975	5	QPSK	1	24	22.75	0	0
	1712.5	19975	5	QPSK	12	6	21.95	1	0-1
	1712.5	19975	5	QPSK	25	0	22.30	1	0-1
	1712.5	19975	5	16-QAM	1	0	21.69	1	0-1
	1712.5	19975	5	16-QAM	1	24	21.82	1	0-1
	1712.5	19975	5	16-QAM	12	6	20.67	2	0-2
	1712.5	19975	5	16-QAM	25	0	21.03	2	0-2
Mid	1732.5	20175	5	QPSK	1	0	22.85	0	0
	1732.5	20175	5	QPSK	1	24	22.95	0	0
	1732.5	20175	5	QPSK	12	6	21.94	1	0-1
	1732.5	20175	5	QPSK	25	0	22.23	1	0-1
	1732.5	20175	5	16-QAM	1	0	21.85	1	0-1
	1732.5	20175	5	16-QAM	1	24	21.93	1	0-1
	1732.5	20175	5	16-QAM	12	6	20.79	2	0-2
	1732.5	20175	5	16-QAM	25	0	21.21	2	0-2
High	1752.5	20375	5	QPSK	1	0	22.85	0	0
	1752.5	20375	5	QPSK	1	24	22.66	0	0
	1752.5	20375	5	QPSK	12	6	21.84	1	0-1
	1752.5	20375	5	QPSK	25	0	22.07	1	0-1
	1752.5	20375	5	16-QAM	1	0	21.83	1	0-1
	1752.5	20375	5	16-QAM	1	24	21.69	1	0-1
	1752.5	20375	5	16-QAM	12	6	20.84	2	0-2
	1752.5	20375	5	16-QAM	25	0	21.06	2	0-2

Table 10-6
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	1715	20000	10	QPSK	1	0	22.76	0	0
	1715	20000	10	QPSK	1	49	22.86	0	0
	1715	20000	10	QPSK	25	12	22.06	1	0-1
	1715	20000	10	QPSK	50	0	22.21	1	0-1
	1715	20000	10	16QAM	1	0	21.51	1	0-1
	1715	20000	10	16QAM	1	49	21.56	1	0-1
	1715	20000	10	16QAM	25	12	21.50	1	0-2
	1715	20000	10	16QAM	50	0	21.15	2	0-2
Mid	1732.5	20175	10	QPSK	1	0	**22.95**	0	0
	1732.5	20175	10	QPSK	1	49	**22.98**	0	0
	1732.5	20175	10	QPSK	25	12	**22.22**	1	0-1
	1732.5	20175	10	QPSK	50	0	22.20	1	0-1
	1732.5	20175	10	16QAM	1	0	**21.64**	1	0-1
	1732.5	20175	10	16QAM	1	49	**21.67**	1	0-1
	1732.5	20175	10	16QAM	25	12	**21.60**	1	0-2
	1732.5	20175	10	16QAM	50	0	21.22	2	0-2
High	1750	20350	10	QPSK	1	0	22.77	0	0
	1750	20350	10	QPSK	1	49	22.78	0	0
	1750	20350	10	QPSK	25	12	22.14	1	0-1
	1750	20350	10	QPSK	50	0	22.15	1	0-1
	1750	20350	10	16QAM	1	0	21.74	1	0-1
	1750	20350	10	16QAM	1	49	21.55	1	0-1
	1750	20350	10	16QAM	25	12	21.50	1	0-2
	1750	20350	10	16QAM	50	0	21.16	2	0-2

10.2.4 LTE Band 2 (PCS)

Table 10-7
LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	1852.5	18625	5	QPSK	1	0	23.21	0	0
	1852.5	18625	5	QPSK	1	24	23.20	0	0
	1852.5	18625	5	QPSK	12	6	22.46	1	0-1
	1852.5	18625	5	QPSK	25	0	22.53	1	0-1
	1852.5	18625	5	16-QAM	1	0	22.22	1	0-1
	1852.5	18625	5	16-QAM	1	24	22.23	1	0-1
	1852.5	18625	5	16-QAM	12	6	21.29	2	0-2
	1852.5	18625	5	16-QAM	25	0	21.53	2	0-2
Mid	1880.0	18900	5	QPSK	1	0	23.40	0	0
	1880.0	18900	5	QPSK	1	24	23.25	0	0
	1880.0	18900	5	QPSK	12	6	22.47	1	0-1
	1880.0	18900	5	QPSK	25	0	22.62	1	0-1
	1880.0	18900	5	16-QAM	1	0	22.32	1	0-1
	1880.0	18900	5	16-QAM	1	24	22.25	1	0-1
	1880.0	18900	5	16-QAM	12	6	21.35	2	0-2
	1880.0	18900	5	16-QAM	25	0	21.64	2	0-2
High	1907.5	19175	5	QPSK	1	0	23.28	0	0
	1907.5	19175	5	QPSK	1	24	23.11	0	0
	1907.5	19175	5	QPSK	12	6	22.42	1	0-1
	1907.5	19175	5	QPSK	25	0	22.52	1	0-1
	1907.5	19175	5	16-QAM	1	0	22.36	1	0-1
	1907.5	19175	5	16-QAM	1	24	22.20	1	0-1
	1907.5	19175	5	16-QAM	12	6	21.32	2	0-2
	1907.5	19175	5	16-QAM	25	0	21.60	2	0-2

Table 10-8
LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	Maximum MPR Allowed per 3GPP [dB]
Low	1855	18650	10	QPSK	1	0	23.23	0	0
	1855	18650	10	QPSK	1	49	23.33	0	0
	1855	18650	10	QPSK	25	12	22.59	1	0-1
	1855	18650	10	QPSK	50	0	22.48	1	0-1
	1855	18650	10	16QAM	1	0	22.08	1	0-1
	1855	18650	10	16QAM	1	49	22.12	1	0-1
	1855	18650	10	16QAM	25	12	21.58	2	0-2
	1855	18650	10	16QAM	50	0	21.50	2	0-2
Mid	1880.0	18900	10	QPSK	1	0	23.40	0	0
	1880.0	18900	10	QPSK	1	49	23.35	0	0
	1880.0	18900	10	QPSK	25	12	**22.61**	1	0-1
	1880.0	18900	10	QPSK	50	0	22.64	1	0-1
	1880.0	18900	10	16QAM	1	0	22.19	1	0-1
	1880.0	18900	10	16QAM	1	49	22.08	1	0-1
	1880.0	18900	10	16QAM	25	12	**21.68**	2	0-2
	1880.0	18900	10	16QAM	50	0	21.60	2	0-2
High	1905	19150	10	QPSK	1	0	**23.47**	0	0
	1905	19150	10	QPSK	1	49	**23.31**	0	0
	1905	19150	10	QPSK	25	12	22.58	1	0-1
	1905	19150	10	QPSK	50	0	22.54	1	0-1
	1905	19150	10	16QAM	1	0	**22.30**	1	0-1
	1905	19150	10	16QAM	1	49	**22.07**	1	0-1
	1905	19150	10	16QAM	25	12	21.60	2	0-2
	1905	19150	10	16QAM	50	0	21.62	2	0-2

10.2.5 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05:

1) Per Page 4, 3) A), QPSK with 50% RB is required for the highest bandwidth.
2) Per Page 4, footnote 2, when the maximum output power across high, mid., and low channels is < 0.5 dB, mid channel is tested. Low and high channel SAR tests are not required for QPSK, 50% RB allocation when the SAR is < 0.8 W/kg.
3) Per Page 4, 3) B), QPSK with 1 RB for both channel edges are required for the highest bandwidth.
4) Per Page 4, footnote 6, QPSK 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK. 1 RB low and high offset configurations are considered together for a single channel selection. Otherwise, SAR tests are performed on the channel that produced the highest SAR for QPSK with 50% RB.
5) Per Page 4, 3) B), I), when the SAR for QPSK 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
6) Per Page 4, 4) A), 16QAM with 50% RB is required for the highest bandwidth on the channel with the highest measured SAR for QPSK with 50% RB allocation.
7) Per Page 4, 4) A), I), when the SAR for 16 QAM, 50 % allocation tests is <1.45 W/kg, testing on the other channels is not required.
8) Per Page 4, 4) B) and Page 5 footnote 9, 16QAM with 1RB for both channel edges are required for the highest bandwidth on the highest output power channel for the 1 RB allocation when the average output power of the 1 RB allocation is >0.5 dB higher than the 50% allocation for 16 QAM. 1 RB low and high offset configurations are considered together for a single channel selection. Otherwise, SAR tests are performed on the channel that produced the highest SAR for 16 QAM with 50% RB.
9) Per Page 5, 4) B), I), when the SAR for 16 QAM 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
10) Per Page 4, 4), A) I) and Page 5, 4), A),I), 100% RB Allocation is not required to be tested when the SAR is not > 1.45 W/kg for the highest bandwidth.
11) Per Page 5, 5) B) I), smaller bandwidths are not required to be tested when SAR is not > 1.45 W/kg for the highest bandwidth and the maximum average output power of the smaller bandwidths across all channels and configurations is not more than 0.5 dB higher than the higher bandwidths.

Figure 10-2
Power Measurement Setup

10.3 WLAN Conducted Powers

Table 10-9
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1	17.03	17.00	17.03	17.05
802.11b	2437	6	17.34	17.34	17.41	17.37
802.11b	2462	11	**17.70**	17.71	17.72	17.70

Table 10-10
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	13.06	13.14	12.82	12.98	12.97	13.03	12.99	13.10
802.11g	2437	6	12.88	12.72	12.79	12.63	12.70	12.60	12.45	12.71
802.11g	2462	11	13.50	13.60	13.45	13.50	13.51	13.36	13.42	13.49

Table 10-11
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	2412	1	12.07	12.06	11.88	11.65	11.52	11.62	11.72	11.84
802.11n	2437	6	11.54	11.68	11.56	11.30	11.30	11.34	11.41	11.42
802.11n	2462	11	12.33	12.28	12.02	12.01	12.20	12.11	12.06	12.20

Table 10-12
IEEE 802.11a Average RF Power

Mode	Freq	Channel	Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11a	5180	36*	9.98	9.85	9.89	9.95	9.97	9.97	9.96	9.97
802.11a	5200	40	9.75	9.97	9.88	9.85	9.90	9.99	9.95	9.92
802.11a	5220	44	9.89	9.77	9.72	9.76	9.83	9.99	9.91	9.99
802.11a	5240	48*	9.68	9.80	9.70	9.77	9.80	9.92	9.96	9.98
802.11a	5260	52*	9.25	9.16	8.95	9.07	9.00	9.15	8.75	9.29
802.11a	5280	56	9.26	9.21	8.92	9.10	9.35	9.45	9.05	9.37
802.11a	5300	60	9.40	9.51	9.50	9.53	9.36	9.62	9.38	9.42
802.11a	5320	64*	9.45	9.67	9.35	9.54	9.70	9.70	9.54	9.68
802.11a	5500	100	9.40	9.64	9.50	9.53	9.63	9.50	9.51	9.60
802.11a	5520	104*	9.45	9.61	9.53	9.66	9.61	9.45	9.44	9.70
802.11a	5540	108	8.99	8.57	9.01	8.97	8.99	8.86	8.87	9.15
802.11a	5560	112	8.72	8.82	8.97	8.91	8.88	8.78	8.95	8.95
802.11a	5580	116*	8.67	8.85	8.90	8.80	8.78	8.60	8.90	8.92
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	8.78	8.90	8.91	8.85	8.91	8.95	8.92	8.95
802.11a	5680	136*	8.81	8.98	9.05	9.00	9.00	9.00	9.00	9.03
802.11a	5700	140	8.75	8.95	9.00	8.99	8.95	8.91	8.97	9.00
802.11a	5745	149*	8.92	8.92	8.69	8.82	8.98	9.02	8.71	8.77
802.11a	5765	153	8.99	9.01	8.85	8.85	8.95	9.05	8.75	8.82
802.11a	5785	157*	8.97	8.99	8.87	8.85	8.92	9.00	8.89	8.95
802.11a	5805	161*	8.95	8.89	8.79	8.78	8.86	8.99	8.97	8.90

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Band. (*) – indicates default channels per KDB Publication 248227. When the adjacent channels are higher in power then the default channels, these “required channels” are considered instead of the default channels for SAR testing.

Table 10-13
IEEE 802.11n Average RF Power

Mode	Freq	Channel	Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	5180	36*	7.85	7.84	7.91	7.94	8.01	7.70	7.88	7.75
802.11n	5200	40	7.78	7.67	7.80	7.81	7.83	7.84	7.73	7.70
802.11n	5220	44	7.71	7.80	7.84	7.66	7.70	7.76	7.81	7.76
802.11n	5240	48*	7.46	7.76	8.12	7.84	7.67	8.11	7.78	8.05
802.11n	5260	52*	8.00	7.95	8.18	8.05	8.08	7.95	7.90	7.99
802.11n	5280	56	8.68	8.63	8.50	8.04	8.73	8.57	8.60	8.42
802.11n	5300	60	8.58	8.08	8.47	8.17	8.64	8.02	8.63	8.06
802.11n	5320	64*	8.11	8.34	8.55	8.61	8.29	8.34	8.41	8.76
802.11n	5500	100	7.20	6.99	7.01	6.97	7.01	7.07	6.99	7.03
802.11n	5520	104*	7.22	7.27	7.12	7.14	7.01	7.10	6.96	7.08
802.11n	5540	108	7.18	6.64	6.94	6.64	6.97	7.18	6.96	6.75
802.11n	5560	112	7.13	7.19	7.11	6.89	7.18	6.72	6.71	7.15
802.11n	5580	116*	6.55	6.77	6.83	6.74	6.84	6.67	6.80	6.85
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	6.84	6.63	6.82	6.85	6.62	6.60	6.65	6.87
802.11n	5680	136*	6.57	6.80	6.62	6.61	6.89	6.66	6.59	6.90
802.11n	5700	140	6.80	6.70	6.86	6.83	6.70	6.91	6.87	6.92
802.11n	5745	149*	7.07	7.15	7.05	7.15	7.10	6.98	7.11	6.95
802.11n	5765	153	6.97	7.06	6.95	7.04	7.00	7.12	6.96	7.01
802.11n	5785	157*	6.98	7.04	7.06	7.13	7.14	7.07	7.03	7.03
802.11n	5805	161*	7.13	7.03	7.03	7.03	7.10	6.96	7.06	7.05

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Bands. (*) – indicates default channels per KDB Publication 248227. When the adjacent channels are higher in power then the default channels, these “required channels” are considered instead of the default channels for SAR testing.

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes:

- For 2.4 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
- For 5 GHz, per KDB 648474, when the maximum average output power is less than $2P_{Ref}$ (or 10 mW) and the antenna separation distance is greater than 5 cm, 5 GHz WLAN SAR testing is not required.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The bolded data rate and channel above were tested for SAR.

Figure 10-3
Power Measurement Setup

11 SYSTEM VERIFICATION

11.1 Tissue Verification

Table 11-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
02/16/2012	700H	23.4	680	0.852	43.59	0.885	42.273	-3.73%	3.12%
			695	0.870	43.36	0.886	42.193	-1.81%	2.77%
			710	0.882	43.06	0.887	42.113	-0.56%	2.25%
			725	0.893	42.96	0.888	42.033	0.56%	2.21%
			740	0.913	42.89	0.889	41.953	2.70%	2.23%
			755	0.930	42.56	0.891	41.876	4.38%	1.63%
02/13/2012	835H	21.3	820	0.856	40.72	0.898	41.571	-4.68%	-2.05%
			835	0.862	40.52	0.900	41.500	-4.22%	-2.36%
			850	0.883	40.42	0.916	41.500	-3.60%	-2.60%
02/16/2012	835H	24.0	820	0.900	43.41	0.898	41.571	0.22%	4.42%
			835	0.916	43.29	0.900	41.500	1.78%	4.31%
			850	0.930	43.08	0.916	41.500	1.53%	3.81%
02/16/2012	1750H	22.3	1710	1.372	39.58	1.348	40.136	1.78%	-1.39%
			1750	1.413	39.50	1.370	40.100	3.14%	-1.50%
			1790	1.449	39.29	1.394	40.020	3.95%	-1.82%
02/13/2012	1900H	23.1	1850	1.410	40.35	1.400	40.000	0.71%	0.88%
			1880	1.426	40.04	1.400	40.000	1.86%	0.10%
			1910	1.463	39.94	1.400	40.000	4.50%	-0.15%
02/14/2012	1900H	22.3	1850	1.352	39.83	1.400	40.000	-3.43%	-0.43%
			1880	1.361	39.67	1.400	40.000	-2.79%	-0.82%
			1910	1.404	39.45	1.400	40.000	0.29%	-1.37%
03/05/2012	2450H	22.3	2401	1.828	37.89	1.758	39.298	3.98%	-3.58%
			2450	1.883	37.72	1.800	39.200	4.61%	-3.78%
			2499	1.938	37.51	1.852	39.135	4.64%	-4.15%
02/15/2012	700B	20.9	680	0.934	57.45	0.956	56.069	-2.30%	2.46%
			695	0.948	57.10	0.957	55.985	-0.94%	1.99%
			710	0.956	56.89	0.958	55.901	-0.21%	1.77%
			725	0.976	56.82	0.960	55.817	1.67%	1.80%
			740	0.988	56.69	0.961	55.733	2.81%	1.72%
			755	1.006	56.63	0.963	55.649	4.47%	1.76%
02/13/2012	835B	19.9	820	0.955	54.30	0.969	55.284	-1.44%	-1.78%
			835	0.965	54.11	0.970	55.200	-0.52%	-1.97%
			850	0.977	53.98	0.988	55.154	-1.11%	-2.13%
02/15/2012	1750B	23.9	1710	1.424	51.56	1.460	53.540	-2.47%	-3.70%
			1750	1.459	51.46	1.490	53.430	-2.08%	-3.69%
			1790	1.503	51.35	1.510	53.330	-0.46%	-3.71%
02/09/2012	1900B	23.1	1850	1.513	53.34	1.520	53.300	-0.46%	0.08%
			1880	1.548	53.04	1.520	53.300	1.84%	-0.49%
			1910	1.582	53.02	1.520	53.300	4.08%	-0.53%
02/12/2012	1900B	21.9	1850	1.449	54.06	1.520	53.300	-4.67%	1.43%
			1880	1.479	54.04	1.520	53.300	-2.70%	1.39%
			1910	1.513	53.90	1.520	53.300	-0.46%	1.13%
03/07/2012	1900B	22.6	1850	1.487	51.07	1.520	53.300	-2.17%	-4.18%
			1880	1.527	50.97	1.520	53.300	0.46%	-4.37%
			1910	1.561	50.86	1.520	53.300	2.70%	-4.58%
03/06/2012	2450B	24.1	2401	1.819	50.64	1.903	52.765	-4.41%	-4.03%
			2450	1.881	50.51	1.950	52.700	-3.54%	-4.16%
			2499	1.948	50.31	2.019	52.638	-3.52%	-4.42%

Note: KDB Publication 450824 was ensured to be applied for probe calibration frequencies greater than or equal to 50 MHz of the DUT frequencies.

The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies (per IEEE 1528 6.6.1.2). The SAR test plots may slightly differ from the table above since the DASY software rounds to three significant digits.

11.2 Measurement Procedure for Tissue verification

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the sample which was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity , for example from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{\left[\ln(b/a)\right]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r^{'}\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where *Y* is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

11.3 Test System Verification

Prior to assessment, the system is verified to ±10% of the manufacturer SAR measurement on the reference dipole at the time of calibration.

Table 11-2
System Verification Results

Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	Deviation (%)
750	Head	02/16/2012	24.7	23.3	0.100	1003	3561	0.877	8.400	8.770	4.40%
835	Head	02/13/2012	23.2	21.3	0.100	4d026	3209	0.969	9.460	9.690	2.43%
835	Head	02/16/2012	23.8	22.8	0.100	4d026	3209	1.000	9.460	10.000	5.71%
1750	Head	02/16/2012	24.8	22.5	0.100	1008	3209	3.800	36.500	38.000	4.11%
1900	Head	02/13/2012	24.1	22.4	0.040	5d080	3561	1.590	39.900	39.750	-0.38%
1900	Head	02/14/2012	23.5	22.3	0.100	5d080	3213	3.880	39.900	38.800	-2.76%
2450	Head	03/05/2012	22.9	21.0	0.016	719	3258	0.853	53.800	53.313	-0.91%
750	Body	02/15/2012	24.8	22.8	0.100	1003	3209	0.876	8.720	8.760	0.46%
835	Body	02/13/2012	23.3	21.5	0.100	4d026	3209	1.010	9.660	10.100	4.55%
1750	Body	02/15/2012	23.2	22.2	0.100	1051	3213	3.710	37.000	37.100	0.27%
1900	Body	02/09/2012	23.9	22.1	0.100	5d080	3561	4.260	40.900	42.600	4.16%
1900	Body	02/12/2012	23.1	22.0	0.100	5d080	3213	4.010	40.900	40.100	-1.96%
1900	Body	03/07/2012	23.2	22.8	0.040	5d141	3022	1.630	41.400	40.750	-1.57%
2450	Body	03/06/2012	23.1	22.4	0.025	719	3258	1.360	51.300	54.400	6.04%

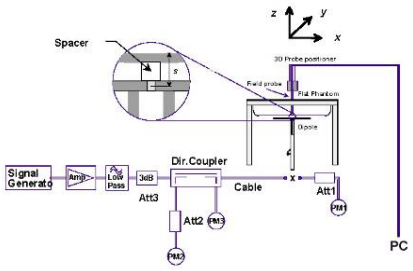


Figure 11-1
System Verification Setup Diagram

Figure 11-2
System Verification Setup Photo

12 SAR DATA SUMMARY

12.1 Standalone Head SAR Data

Table 12-1
GSM 850 Head SAR Results

MEASUREMENT RESULTS								
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	SAR (1g)
MHz	Ch.							(W/kg)
836.60	190	GSM 850	33.24	-0.01	Right	Touch	089C10135	0.298
836.60	190	GSM 850	33.24	-0.02	Right	Tilt	089C10135	0.206
836.60	190	GSM 850	33.24	-0.05	Left	Touch	089C10135	0.337
836.60	190	GSM 850	33.24	-0.09	Left	Tilt	089C10135	0.185
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram			

Table 12-2
WCDMA 850 Head SAR Results

MEASUREMENT RESULTS								
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	SAR (1g)
MHz	Ch.							(W/kg)
836.60	4183	WCDMA 850	23.09	-0.07	Right	Touch	089C10135	0.189
836.60	4183	WCDMA 850	23.09	-0.02	Right	Tilt	089C10135	0.141
836.60	4183	WCDMA 850	23.09	-0.01	Left	Touch	089C10135	0.218
836.60	4183	WCDMA 850	23.09	-0.03	Left	Tilt	089C10135	0.130
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram			

Table 12-3
GSM 1900 Head SAR Results

MEASUREMENT RESULTS								
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	SAR (1g)
MHz	Ch.							(W/kg)
1880.00	661	GSM 1900	29.60	0.08	Right	Touch	089C10135	0.361
1880.00	661	GSM 1900	29.60	0.04	Right	Tilt	089C10135	0.218
1880.00	661	GSM 1900	29.60	0.00	Left	Touch	089C10135	0.210
1880.00	661	GSM 1900	29.60	-0.05	Left	Tilt	089C10135	0.239
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram			

Table 12-4
WCDMA 1900 Head SAR Results

MEASUREMENT RESULTS								
FREQUENCY		Mode	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	SAR (1g)
MHz	Ch.							(W/kg)
1880.00	9400	WCDMA 1900	23.06	0.05	Right	Touch	089C10135	0.658
1880.00	9400	WCDMA 1900	23.06	0.02	Right	Tilt	089C10135	0.375
1880.00	9400	WCDMA 1900	23.06	-0.05	Left	Touch	089C10135	0.389
1880.00	9400	WCDMA 1900	23.06	0.07	Left	Tilt	089C10135	0.391
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram			

Table 12-5
LTE Band 17 Head SAR Results

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	# of RB	RB Offset	Device Serial Number	SAR (1g)
MHz	Ch.													(W/kg)
710.00	23790	Mid	LTE Band 17	10	22.47	0.12	1	Right	Touch	QPSK	25	12	089C10160	0.143
710.00	23790	Mid	LTE Band 17	10	23.32	-0.09	0	Right	Touch	QPSK	1	0	089C10160	0.147
710.00	23790	Mid	LTE Band 17	10	23.16	0.17	0	Right	Touch	QPSK	1	49	089C10160	**0.173**
710.00	23790	Mid	LTE Band 17	10	21.79	0.12	1	Right	Touch	16 QAM	25	12	089C10160	0.109
710.00	23790	Mid	LTE Band 17	10	21.94	0.14	1	Right	Touch	16 QAM	1	0	089C10160	0.126
710.00	23790	Mid	LTE Band 17	10	21.84	0.13	1	Right	Touch	16 QAM	1	49	089C10160	0.149
710.00	23790	Mid	LTE Band 17	10	22.47	0.15	1	Right	Tilt	QPSK	25	12	089C10160	0.091
710.00	23790	Mid	LTE Band 17	10	23.32	0.12	0	Right	Tilt	QPSK	1	0	089C10160	0.084
710.00	23790	Mid	LTE Band 17	10	23.16	0.05	0	Right	Tilt	QPSK	1	49	089C10160	**0.117**
710.00	23790	Mid	LTE Band 17	10	21.79	0.17	1	Right	Tilt	16 QAM	25	12	089C10160	0.066
710.00	23790	Mid	LTE Band 17	10	21.94	0.11	1	Right	Tilt	16 QAM	1	0	089C10160	0.074
710.00	23790	Mid	LTE Band 17	10	21.84	0.18	1	Right	Tilt	16 QAM	1	49	089C10160	0.094
710.00	23790	Mid	LTE Band 17	10	22.47	0.17	1	Left	Touch	QPSK	25	12	089C10160	0.157
710.00	23790	Mid	LTE Band 17	10	23.32	0.19	0	Left	Touch	QPSK	1	0	089C10160	0.166
710.00	23790	Mid	LTE Band 17	10	23.16	0.05	0	Left	Touch	QPSK	1	49	089C10160	**0.180**
710.00	23790	Mid	LTE Band 17	10	21.79	0.05	1	Left	Touch	16 QAM	25	12	089C10160	0.124
710.00	23790	Mid	LTE Band 17	10	21.94	0.16	1	Left	Touch	16 QAM	1	0	089C10160	0.122
710.00	23790	Mid	LTE Band 17	10	21.84	0.13	1	Left	Touch	16 QAM	1	49	089C10160	0.140
710.00	23790	Mid	LTE Band 17	10	22.47	0.20	1	Left	Tilt	QPSK	25	12	089C10160	0.088
710.00	23790	Mid	LTE Band 17	10	23.32	0.14	0	Left	Tilt	QPSK	1	0	089C10160	0.100
710.00	23790	Mid	LTE Band 17	10	23.16	0.15	0	Left	Tilt	QPSK	1	49	089C10160	**0.111**
710.00	23790	Mid	LTE Band 17	10	21.79	0.21	1	Left	Tilt	16 QAM	25	12	089C10160	0.080
710.00	23790	Mid	LTE Band 17	10	21.94	0.12	1	Left	Tilt	16 QAM	1	0	089C10160	0.070
710.00	23790	Mid	LTE Band 17	10	21.84	-0.14	1	Left	Tilt	16 QAM	1	49	089C10160	0.088
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**								**Head** **1.6 W/kg (mW/g)** averaged over 1 gram						

Table 12-6
LTE Band 5 (Cell) Head SAR Results

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	# of RB	RB Offset	Device Serial Number	SAR (1g)
MHz	Ch.													(W/kg)
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	0.01	1	Right	Touch	QPSK	25	12	089C10293	0.275
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	-0.02	0	Right	Touch	QPSK	1	0	089C10293	0.296
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	-0.01	0	Right	Touch	QPSK	1	49	089C10293	**0.301**
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	0.05	1	Right	Touch	16 QAM	25	12	089C10293	0.243
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	0.05	1	Right	Touch	16 QAM	1	0	089C10293	0.228
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	0.03	1	Right	Touch	16 QAM	1	49	089C10293	0.227
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	0.03	1	Right	Tilt	QPSK	25	12	089C10293	0.189
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	0.00	0	Right	Tilt	QPSK	1	0	089C10293	**0.211**
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	0.14	0	Right	Tilt	QPSK	1	49	089C10293	0.207
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	-0.08	1	Right	Tilt	16 QAM	25	12	089C10293	0.163
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	0.16	1	Right	Tilt	16 QAM	1	0	089C10293	0.157
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	-0.12	1	Right	Tilt	16 QAM	1	49	089C10293	0.135
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	0.03	1	Left	Touch	QPSK	25	12	089C10293	0.327
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	0.01	0	Left	Touch	QPSK	1	0	089C10293	0.340
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	0.04	0	Left	Touch	QPSK	1	49	089C10293	**0.372**
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	0.02	1	Left	Touch	16 QAM	25	12	089C10293	0.288
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	0.08	1	Left	Touch	16 QAM	1	0	089C10293	0.254
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	0.00	1	Left	Touch	16 QAM	1	49	089C10293	0.277
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	0.01	1	Left	Tilt	QPSK	25	12	089C10293	0.164
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	0.03	0	Left	Tilt	QPSK	1	0	089C10293	0.173
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	0.04	0	Left	Tilt	QPSK	1	49	089C10293	**0.187**
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	-0.01	1	Left	Tilt	16 QAM	25	12	089C10293	0.142
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	0.03	1	Left	Tilt	16 QAM	1	0	089C10293	0.128
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	0.04	1	Left	Tilt	16 QAM	1	49	089C10293	0.142

ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**	**Head** **1.6 W/kg (mW/g)** averaged over 1 gram

Table 12-7
LTE Band 4 (AWS) Head SAR Results

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	# of RB	RB Offset	Device Serial Number	SAR (1g)
MHz	Ch.													(W/kg)
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.03	1	Right	Touch	QPSK	25	12	089C10215	0.489
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	-0.06	0	Right	Touch	QPSK	1	0	089C10215	**0.654**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	0.00	0	Right	Touch	QPSK	1	49	089C10215	0.596
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	0.01	1	Right	Touch	16 QAM	25	12	089C10215	0.419
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	-0.21	1	Right	Touch	16 QAM	1	0	089C10215	0.443
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.09	1	Right	Touch	16 QAM	1	49	089C10215	0.451
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.10	1	Right	Tilt	QPSK	25	12	089C10215	0.294
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	0.08	0	Right	Tilt	QPSK	1	0	089C10215	0.313
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	-0.01	0	Right	Tilt	QPSK	1	49	089C10215	**0.353**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	-0.01	1	Right	Tilt	16 QAM	25	12	089C10215	0.225
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	0.06	1	Right	Tilt	16 QAM	1	0	089C10215	0.229
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.03	1	Right	Tilt	16 QAM	1	49	089C10215	0.245
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.05	1	Left	Touch	QPSK	25	12	089C10215	0.238
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	0.06	0	Left	Touch	QPSK	1	0	089C10215	0.281
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	0.06	0	Left	Touch	QPSK	1	49	089C10215	**0.300**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	0.04	1	Left	Touch	16 QAM	25	12	089C10215	0.211
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	0.00	1	Left	Touch	16 QAM	1	0	089C10215	0.275
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.14	1	Left	Touch	16 QAM	1	49	089C10215	0.158
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.10	1	Left	Tilt	QPSK	25	12	089C10215	0.243
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	0.10	0	Left	Tilt	QPSK	1	0	089C10215	0.290
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	0.18	0	Left	Tilt	QPSK	1	49	089C10215	**0.296**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	-0.08	1	Left	Tilt	16 QAM	25	12	089C10215	0.205
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	-0.19	1	Left	Tilt	16 QAM	1	0	089C10215	0.223
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.09	1	Left	Tilt	16 QAM	1	49	089C10215	0.217
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-8
LTE Band 2 (PCS) Head SAR Results

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	# of RB	RB Offset	Device Serial Number	SAR (1g)
MHz	Ch.													(W/kg)
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	-0.06	1	Right	Touch	QPSK	25	12	089C10136	0.408
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	0.02	0	Right	Touch	QPSK	1	0	089C10136	**0.551**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	-0.06	0	Right	Touch	QPSK	1	49	089C10136	0.522
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.00	2	Right	Touch	16 QAM	25	12	089C10136	0.325
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.14	1	Right	Touch	16 QAM	1	0	089C10136	0.439
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	-0.05	1	Right	Touch	16 QAM	1	49	089C10136	0.430
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	-0.02	1	Right	Tilt	QPSK	25	12	089C10136	0.213
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	0.05	0	Right	Tilt	QPSK	1	0	089C10136	**0.303**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	0.03	0	Right	Tilt	QPSK	1	49	089C10136	0.254
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.04	2	Right	Tilt	16 QAM	25	12	089C10136	0.171
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.01	1	Right	Tilt	16 QAM	1	0	089C10136	0.222
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	-0.03	1	Right	Tilt	16 QAM	1	49	089C10136	0.185
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	0.03	1	Left	Touch	QPSK	25	12	089C10136	0.229
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	0.05	0	Left	Touch	QPSK	1	0	089C10136	**0.296**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	-0.08	0	Left	Touch	QPSK	1	49	089C10136	0.264
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.00	2	Left	Touch	16 QAM	25	12	089C10136	0.183
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.04	1	Left	Touch	16 QAM	1	0	089C10136	0.242
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	0.08	1	Left	Touch	16 QAM	1	49	089C10136	0.210
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	-0.02	1	Left	Tilt	QPSK	25	12	089C10136	0.202
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	0.03	0	Left	Tilt	QPSK	1	0	089C10136	**0.247**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	-0.04	0	Left	Tilt	QPSK	1	49	089C10136	0.218
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.02	2	Left	Tilt	16 QAM	25	12	089C10136	0.179
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.07	1	Left	Tilt	16 QAM	1	0	089C10136	0.196
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	0.02	1	Left	Tilt	16 QAM	1	49	089C10136	0.168
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Note: LTE Band 2 (PCS) QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for 1 RB allocation when the average output power of the 1 RB allocation was >0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM. Otherwise, SAR tests are performed on the channel that produced the highest SAR for QPSK and 16 QAM 50% RB allocation.

Table 12-9
2.4 GHz WLAN Head SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	SAR (1g)
MHz	Ch.									(W/kg)
2462	11	IEEE 802.11b	DSSS	17.70	0.11	Right	Touch	089H10637	1	0.241
2462	11	IEEE 802.11b	DSSS	17.70	0.12	Right	Tilt	089H10637	1	0.291
2462	11	IEEE 802.11b	DSSS	17.70	0.02	Left	Touch	089H10637	1	0.187
2462	11	IEEE 802.11b	DSSS	17.70	0.03	Left	Tilt	089H10637	1	0.242
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Head 1.6 W/kg (mW/g) averaged over 1 gram				

12.2 Standalone Body-Worn SAR Data

Table 12-10
GSM/WCDMA Body-Worn SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Side	SAR (1g)
MHz	Ch.									(W/kg)
836.60	190	GSM 850	GSM	33.24	-0.02	1.0 cm	089C10135	1	back	0.523
824.20	128	GSM 850	GPRS	33.35	-0.15	1.0 cm	089C10135	2	back	0.922*
836.60	190	GSM 850	GPRS	33.27	-0.13	1.0 cm	089C10135	2	back	0.945*
848.80	251	GSM 850	GPRS	33.24	0.00	1.0 cm	089C10135	2	back	1.02*
836.60	4183	WCDMA 850	RMC	23.09	0.04	1.0 cm	089C10135	N/A	back	0.388*
1880.00	661	GSM 1900	GSM	29.60	-0.07	1.0 cm	089C10135	1	back	0.338
1880.00	661	GSM 1900	GPRS	29.75	-0.09	1.0 cm	089C10135	2	back	0.541*
1880.00	9400	WCDMA 1900	RMC	23.06	-0.04	1.0 cm	089C10135	N/A	back	0.62*
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram				

(*) – Indicates that hotspot SAR data was used for body-worn accessory evaluation per KDB Publication 941225 D06

Table 12-11
LTE Body-Worn SAR Results

MEASUREMENT RESULTS														
FREQUENCY			Mode	BW [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.													(W/kg)
710.00	23790	Mid	LTE Band 17	10	22.47	-0.04	1	089C10160	QPSK	25	12	1.0 cm	back	0.337*
710.00	23790	Mid	LTE Band 17	10	23.32	0.01	0	089C10160	QPSK	1	0	1.0 cm	back	0.36*
710.00	23790	Mid	LTE Band 17	10	23.16	0.13	0	089C10160	QPSK	1	49	1.0 cm	back	**0.415***
710.00	23790	Mid	LTE Band 17	10	21.79	-0.02	1	089C10160	16 QAM	25	12	1.0 cm	back	0.282*
710.00	23790	Mid	LTE Band 17	10	21.94	-0.07	1	089C10160	16 QAM	1	0	1.0 cm	back	0.26*
710.00	23790	Mid	LTE Band 17	10	21.84	0.06	1	089C10160	16 QAM	1	49	1.0 cm	back	0.315*
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	-0.02	1	089C10293	QPSK	25	12	1.0 cm	back	0.407*
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	-0.05	0	089C10293	QPSK	1	0	1.0 cm	back	**0.446***
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	-0.03	0	089C10293	QPSK	1	49	1.0 cm	back	0.434*
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	0.02	1	089C10293	16 QAM	25	12	1.0 cm	back	0.34*
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	-0.01	1	089C10293	16 QAM	1	0	1.0 cm	back	0.372*
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	0.04	1	089C10293	16 QAM	1	49	1.0 cm	back	0.368*
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.17	1	089C10215	QPSK	25	12	1.0 cm	back	0.679*
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	-0.04	0	089C10215	QPSK	1	0	1.0 cm	back	0.703*
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	-0.01	0	089C10215	QPSK	1	49	1.0 cm	back	**0.729***
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	-0.02	1	089C10215	16 QAM	25	12	1.0 cm	back	0.527*
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	0.03	1	089C10215	16 QAM	1	0	1.0 cm	back	0.553*
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.08	1	089C10215	16 QAM	1	49	1.0 cm	back	0.535*
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	-0.04	1	089C10136	QPSK	25	12	1.0 cm	back	0.347*
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	-0.12	0	089C10136	QPSK	1	0	1.0 cm	back	**0.431***
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	0.04	0	089C10136	QPSK	1	49	1.0 cm	back	0.364*
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.01	2	089C10136	16 QAM	25	12	1.0 cm	back	0.313*
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.02	1	089C10136	16 QAM	1	0	1.0 cm	back	0.327*
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	-0.03	1	089C10136	16 QAM	1	49	1.0 cm	back	0.274*
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram					

Note: LTE Band 2 (PCS) QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for 1 RB allocation when the average output power of the 1 RB allocation was >0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM. Otherwise, SAR tests are performed on the channel that produced the highest SAR for QPSK and 16 QAM 50% RB allocation.
(*) – Indicates that hotspot SAR data was used for body-worn accessory evaluation per KDB Publication 941225

Table 12-12
WLAN Body-Worn SAR Results

MEASUREMENT RESULTS										
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	SAR (1g)
MHz	Ch.									(W/kg)
2462	11	IEEE 802.11b	DSSS	17.70	0.09	1.0 cm	089H10637	1	back	0.146*
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram			

(*) – Indicates that hotspot SAR data was used for body-worn accessory evaluation per KDB Publication 941225

12.3 Standalone Wireless Router SAR Data

Table 12-13
GSM/WCDMA Hotspot SAR Data

MEASUREMENT RESULTS										
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Side	SAR (1g)
MHz	Ch.									(W/kg)
824.20	128	GSM 850	GPRS	33.35	-0.15	1.0 cm	089C10135	2	back	0.922
836.60	190	GSM 850	GPRS	33.27	-0.13	1.0 cm	089C10135	2	back	0.945
848.80	251	GSM 850	GPRS	33.24	0.00	1.0 cm	089C10135	2	back	**1.020**
836.60	190	GSM 850	GPRS	33.27	-0.02	1.0 cm	089C10135	2	front	0.767
836.60	190	GSM 850	GPRS	33.27	-0.14	1.0 cm	089C10135	2	bottom	0.114
836.60	190	GSM 850	GPRS	33.27	-0.05	1.0 cm	089C10135	2	right	0.711
824.20	128	GSM 850	GPRS	33.35	-0.01	1.0 cm	089C10135	2	left	0.629
836.60	190	GSM 850	GPRS	33.27	-0.04	1.0 cm	089C10135	2	left	0.872
848.80	251	GSM 850	GPRS	33.24	0.08	1.0 cm	089C10135	2	left	0.914
836.60	4183	WCDMA 850	RMC	23.09	0.04	1.0 cm	089C10135	N/A	back	**0.388**
836.60	4183	WCDMA 850	RMC	23.09	0.19	1.0 cm	089C10135	N/A	front	0.280
836.60	4183	WCDMA 850	RMC	23.09	-0.14	1.0 cm	089C10135	N/A	bottom	0.037
836.60	4183	WCDMA 850	RMC	23.09	-0.07	1.0 cm	089C10135	N/A	right	0.301
836.60	4183	WCDMA 850	RMC	23.09	0.02	1.0 cm	089C10135	N/A	left	0.355
1880.00	661	GSM 1900	GPRS	29.75	-0.09	1.0 cm	089C10135	2	back	**0.541**
1880.00	661	GSM 1900	GPRS	29.75	-0.07	1.0 cm	089C10135	2	front	0.408
1880.00	661	GSM 1900	GPRS	29.75	-0.20	1.0 cm	089C10135	2	bottom	0.224
1880.00	661	GSM 1900	GPRS	29.75	0.01	1.0 cm	089C10135	2	right	0.364
1880.00	661	GSM 1900	GPRS	29.75	0.08	1.0 cm	089C10135	2	left	0.153
1880.00	9400	WCDMA 1900	RMC	23.06	-0.04	1.0 cm	089C10135	N/A	back	**0.620**
1880.00	9400	WCDMA 1900	RMC	23.06	-0.08	1.0 cm	089C10135	N/A	front	0.544
1880.00	9400	WCDMA 1900	RMC	23.06	0.14	1.0 cm	089C10135	N/A	bottom	0.255
1880.00	9400	WCDMA 1900	RMC	23.06	0.09	1.0 cm	089C10135	N/A	right	0.416
1880.00	9400	WCDMA 1900	RMC	23.06	0.05	1.0 cm	089C10135	N/A	left	0.152
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**						**Body** **1.6 W/kg (mW/g)** averaged over 1 gram				

Table 12-14
LTE Band 17 Hotspot SAR Data

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.	High												(W/kg)
710.00	23790	Mid	LTE Band 17	10	22.47	-0.04	1	089C10160	QPSK	25	12	1.0 cm	back	0.337
710.00	23790	Mid	LTE Band 17	10	23.32	0.01	0	089C10160	QPSK	1	0	1.0 cm	back	0.360
710.00	23790	Mid	LTE Band 17	10	23.16	0.13	0	089C10160	QPSK	1	49	1.0 cm	back	**0.415**
710.00	23790	Mid	LTE Band 17	10	21.79	-0.02	1	089C10160	16 QAM	25	12	1.0 cm	back	0.282
710.00	23790	Mid	LTE Band 17	10	21.94	-0.07	1	089C10160	16 QAM	1	0	1.0 cm	back	0.260
710.00	23790	Mid	LTE Band 17	10	21.84	0.06	1	089C10160	16 QAM	1	49	1.0 cm	back	0.315
710.00	23790	Mid	LTE Band 17	10	22.47	-0.06	1	089C10160	QPSK	25	12	1.0 cm	front	0.246
710.00	23790	Mid	LTE Band 17	10	23.32	0.02	0	089C10160	QPSK	1	0	1.0 cm	front	0.260
710.00	23790	Mid	LTE Band 17	10	23.16	0.01	0	089C10160	QPSK	1	49	1.0 cm	front	**0.301**
710.00	23790	Mid	LTE Band 17	10	21.79	0.05	1	089C10160	16 QAM	25	12	1.0 cm	front	0.203
710.00	23790	Mid	LTE Band 17	10	21.94	-0.18	1	089C10160	16 QAM	1	0	1.0 cm	front	0.199
710.00	23790	Mid	LTE Band 17	10	21.84	0.02	1	089C10160	16 QAM	1	49	1.0 cm	front	0.239
710.00	23790	Mid	LTE Band 17	10	22.47	0.04	1	089C10160	QPSK	25	12	1.0 cm	bottom	0.040
710.00	23790	Mid	LTE Band 17	10	23.32	-0.09	0	089C10160	QPSK	1	0	1.0 cm	bottom	0.043
710.00	23790	Mid	LTE Band 17	10	23.16	-0.08	0	089C10160	QPSK	1	49	1.0 cm	bottom	**0.047**
710.00	23790	Mid	LTE Band 17	10	21.79	-0.04	1	089C10160	16 QAM	25	12	1.0 cm	bottom	0.034
710.00	23790	Mid	LTE Band 17	10	21.94	0.00	1	089C10160	16 QAM	1	0	1.0 cm	bottom	0.032
710.00	23790	Mid	LTE Band 17	10	21.84	0.02	1	089C10160	16 QAM	1	49	1.0 cm	bottom	0.035
710.00	23790	Mid	LTE Band 17	10	22.47	0.01	1	089C10160	QPSK	25	12	1.0 cm	right	0.159
710.00	23790	Mid	LTE Band 17	10	23.32	0.12	0	089C10160	QPSK	1	0	1.0 cm	right	0.165
710.00	23790	Mid	LTE Band 17	10	23.16	0.01	0	089C10160	QPSK	1	49	1.0 cm	right	**0.194**
710.00	23790	Mid	LTE Band 17	10	21.79	-0.06	1	089C10160	16 QAM	25	12	1.0 cm	right	0.130
710.00	23790	Mid	LTE Band 17	10	21.94	0.02	1	089C10160	16 QAM	1	0	1.0 cm	right	0.121
710.00	23790	Mid	LTE Band 17	10	21.84	0.01	1	089C10160	16 QAM	1	49	1.0 cm	right	0.149
710.00	23790	Mid	LTE Band 17	10	22.47	-0.03	1	089C10160	QPSK	25	12	1.0 cm	left	0.139
710.00	23790	Mid	LTE Band 17	10	23.32	-0.07	0	089C10160	QPSK	1	0	1.0 cm	left	0.143
710.00	23790	Mid	LTE Band 17	10	23.16	0.03	0	089C10160	QPSK	1	49	1.0 cm	left	**0.182**
710.00	23790	Mid	LTE Band 17	10	21.79	-0.02	1	089C10160	16 QAM	25	12	1.0 cm	left	0.116
710.00	23790	Mid	LTE Band 17	10	21.94	-0.13	1	089C10160	16 QAM	1	0	1.0 cm	left	0.105
710.00	23790	Mid	LTE Band 17	10	21.84	0.05	1	089C10160	16 QAM	1	49	1.0 cm	left	0.139
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**									**Body** **1.6 W/kg (mW/g)** averaged over 1 gram					

Table 12-15
LTE Band 5 (Cell) Hotspot SAR Data

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.													(W/kg)
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	-0.02	1	089C10293	QPSK	25	12	1.0 cm	back	0.407
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	-0.05	0	089C10293	QPSK	1	0	1.0 cm	back	**0.446**
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	-0.03	0	089C10293	QPSK	1	49	1.0 cm	back	0.434
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	0.02	1	089C10293	16 QAM	25	12	1.0 cm	back	0.340
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	-0.01	1	089C10293	16 QAM	1	0	1.0 cm	back	0.372
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	0.04	1	089C10293	16 QAM	1	49	1.0 cm	back	0.368
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	-0.03	1	089C10293	QPSK	25	12	1.0 cm	front	0.359
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	-0.03	0	089C10293	QPSK	1	0	1.0 cm	front	0.401
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	-0.02	0	089C10293	QPSK	1	49	1.0 cm	front	**0.405**
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	-0.03	1	089C10293	16 QAM	25	12	1.0 cm	front	0.316
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	-0.01	1	089C10293	16 QAM	1	0	1.0 cm	front	0.284
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	-0.01	1	089C10293	16 QAM	1	49	1.0 cm	front	0.282
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	-0.03	1	089C10293	QPSK	25	12	1.0 cm	bottom	**0.057**
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	-0.14	0	089C10293	QPSK	1	0	1.0 cm	bottom	0.050
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	0.19	0	089C10293	QPSK	1	49	1.0 cm	bottom	0.054
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	-0.16	1	089C10293	16 QAM	25	12	1.0 cm	bottom	0.052
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	-0.11	1	089C10293	16 QAM	1	0	1.0 cm	bottom	0.038
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	-0.11	1	089C10293	16 QAM	1	49	1.0 cm	bottom	0.043
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	0.02	1	089C10293	QPSK	25	12	1.0 cm	right	0.251
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	-0.01	0	089C10293	QPSK	1	0	1.0 cm	right	**0.348**
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	0.03	0	089C10293	QPSK	1	49	1.0 cm	right	0.334
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	-0.04	1	089C10293	16 QAM	25	12	1.0 cm	right	0.303
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	0.16	1	089C10293	16 QAM	1	0	1.0 cm	right	0.258
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	-0.12	1	089C10293	16 QAM	1	49	1.0 cm	right	0.245
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.30	0.03	1	089C10293	QPSK	25	12	1.0 cm	left	**0.399**
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.04	-0.04	0	089C10293	QPSK	1	0	1.0 cm	left	0.371
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.05	-0.01	0	089C10293	QPSK	1	49	1.0 cm	left	0.393
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.84	0.14	1	089C10293	16 QAM	25	12	1.0 cm	left	0.356
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.90	-0.05	1	089C10293	16 QAM	1	0	1.0 cm	left	0.283
836.50	20525	Mid	LTE Band 5 (Cell)	10	21.88	-0.12	1	089C10293	16 QAM	1	49	1.0 cm	left	0.299
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**									**Body** **1.6 W/kg (mW/g)** averaged over 1 gram					

Table 12-16
LTE Band 4 (AWS) Hotspot SAR Data

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.													(W/kg)
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.17	1	089C10215	QPSK	25	12	1.0 cm	back	0.679
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	-0.04	0	089C10215	QPSK	1	0	1.0 cm	back	0.703
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	-0.01	0	089C10215	QPSK	1	49	1.0 cm	back	**0.729**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	-0.02	1	089C10215	16 QAM	25	12	1.0 cm	back	0.527
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	0.03	1	089C10215	16 QAM	1	0	1.0 cm	back	0.553
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.08	1	089C10215	16 QAM	1	49	1.0 cm	back	0.535
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	0.08	1	089C10215	QPSK	25	12	1.0 cm	front	0.522
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	-0.01	0	089C10215	QPSK	1	0	1.0 cm	front	0.617
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	0.06	0	089C10215	QPSK	1	49	1.0 cm	front	**0.619**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	0.07	1	089C10215	16 QAM	25	12	1.0 cm	front	0.462
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	0.06	1	089C10215	16 QAM	1	0	1.0 cm	front	0.476
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	0.03	1	089C10215	16 QAM	1	49	1.0 cm	front	0.450
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.10	1	089C10215	QPSK	25	12	1.0 cm	bottom	0.283
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	0.19	0	089C10215	QPSK	1	0	1.0 cm	bottom	0.311
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	0.02	0	089C10215	QPSK	1	49	1.0 cm	bottom	**0.329**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	0.03	1	089C10215	16 QAM	25	12	1.0 cm	bottom	0.244
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	0.03	1	089C10215	16 QAM	1	0	1.0 cm	bottom	0.241
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	0.02	1	089C10215	16 QAM	1	49	1.0 cm	bottom	0.255
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.10	1	089C10215	QPSK	25	12	1.0 cm	right	0.253
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	0.02	0	089C10215	QPSK	1	0	1.0 cm	right	0.300
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	0.04	0	089C10215	QPSK	1	49	1.0 cm	right	**0.315**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	0.01	1	089C10215	16 QAM	25	12	1.0 cm	right	0.227
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	-0.21	1	089C10215	16 QAM	1	0	1.0 cm	right	0.224
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.03	1	089C10215	16 QAM	1	49	1.0 cm	right	0.230
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.22	-0.03	1	089C10215	QPSK	25	12	1.0 cm	left	0.102
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.95	0.19	0	089C10215	QPSK	1	0	1.0 cm	left	**0.113**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.98	0.04	0	089C10215	QPSK	1	49	1.0 cm	left	**0.113**
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.60	0.01	1	089C10215	16 QAM	25	12	1.0 cm	left	0.085
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.64	0.09	1	089C10215	16 QAM	1	0	1.0 cm	left	0.086
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.67	-0.12	1	089C10215	16 QAM	1	49	1.0 cm	left	0.085
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 12-17
LTE Band 2 (PCS) Hotspot SAR Data

MEASUREMENT RESULTS														
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.													(W/kg)
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	-0.04	1	089C10136	QPSK	25	12	1.0 cm	back	0.347
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	-0.12	0	089C10136	QPSK	1	0	1.0 cm	back	**0.431**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	0.04	0	089C10136	QPSK	1	49	1.0 cm	back	0.364
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.01	2	089C10136	16 QAM	25	12	1.0 cm	back	0.313
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.02	1	089C10136	16 QAM	1	0	1.0 cm	back	0.327
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	-0.03	1	089C10136	16 QAM	1	49	1.0 cm	back	0.274
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	-0.03	1	089C10136	QPSK	25	12	1.0 cm	front	0.369
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	0.15	0	089C10136	QPSK	1	0	1.0 cm	front	**0.441**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	-0.06	0	089C10136	QPSK	1	49	1.0 cm	front	0.379
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.05	2	089C10136	16 QAM	25	12	1.0 cm	front	0.322
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.03	1	089C10136	16 QAM	1	0	1.0 cm	front	0.337
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	0.00	1	089C10136	16 QAM	1	49	1.0 cm	front	0.290
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	-0.05	1	089C10136	QPSK	25	12	1.0 cm	bottom	0.186
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	0.05	0	089C10136	QPSK	1	0	1.0 cm	bottom	**0.241**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	0.01	0	089C10136	QPSK	1	49	1.0 cm	bottom	0.208
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.01	2	089C10136	16 QAM	25	12	1.0 cm	bottom	0.163
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.03	1	089C10136	16 QAM	1	0	1.0 cm	bottom	0.206
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	-0.02	1	089C10136	16 QAM	1	49	1.0 cm	bottom	0.172
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	0.08	1	089C10136	QPSK	25	12	1.0 cm	right	0.277
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	0.18	0	089C10136	QPSK	1	0	1.0 cm	right	**0.370**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	0.09	0	089C10136	QPSK	1	49	1.0 cm	right	0.347
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.00	2	089C10136	16 QAM	25	12	1.0 cm	right	0.243
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	-0.03	1	089C10136	16 QAM	1	0	1.0 cm	right	0.282
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	-0.01	1	089C10136	16 QAM	1	49	1.0 cm	right	0.271
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.61	0.16	1	089C10136	QPSK	25	12	1.0 cm	left	0.086
1905.00	19150	High	LTE Band 2 (PCS)	10	23.47	-0.06	0	089C10136	QPSK	1	0	1.0 cm	left	**0.115**
1905.00	19150	High	LTE Band 2 (PCS)	10	23.31	0.03	0	089C10136	QPSK	1	49	1.0 cm	left	0.095
1880.00	18900	Mid	LTE Band 2 (PCS)	10	21.68	0.17	2	089C10136	16 QAM	25	12	1.0 cm	left	0.077
1905.00	19150	High	LTE Band 2 (PCS)	10	22.30	0.04	1	089C10136	16 QAM	1	0	1.0 cm	left	0.091
1905.00	19150	High	LTE Band 2 (PCS)	10	22.07	0.06	1	089C10136	16 QAM	1	49	1.0 cm	left	0.077
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**									**Body** **1.6 W/kg (mW/g)** averaged over 1 gram					

Note: LTE Band 2 (PCS) QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for 1 RB allocation when the average output power of the 1 RB allocation was >0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM. Otherwise, SAR tests are performed on the channel that produced the highest SAR for QPSK and 16 QAM 50% RB allocation.

Table 12-18
WLAN Hotspot SAR Data

MEASUREMENT RESULTS										
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	SAR (1g)
MHz	Ch.									(W/kg)
2462	11	IEEE 802.11b	DSSS	17.70	0.09	1.0 cm	089H10637	1	back	0.146
2462	11	IEEE 802.11b	DSSS	17.70	-0.09	1.0 cm	089H10637	1	front	0.079
2462	11	IEEE 802.11b	DSSS	17.70	-0.11	1.0 cm	089H10637	1	top	0.115
2462	11	IEEE 802.11b	DSSS	17.70	0.04	1.0 cm	089H10637	1	left	0.033
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram				

12.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C [June 2001].
2. Batteries are fully charged for all readings. The standard battery was used.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Liquid tissue depth was at least 15.0 cm. To confirm the proper SAR liquid depth, the z-axis plots from the system verifications were included since the system verifications were performed using the same liquid, probe and DAE as the SAR tests in the same time period.
5. All samples tested were electrically identical per the applicant.
6. Per FCC/OET Bulletin 65 Supplement C and Public Notice DA-02-1438, if the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
7. Only the primary LTE/WCDMA/GSM Tx/Rx antenna was transmitting during testing. The secondary antenna was for receive-only and cannot transmit.

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore GSM voice was evaluated for body-worn SAR using headphone.
2. Per FCC guidance, GPRS Data Mode is additionally required for body-worn configuration. When the same wireless modes and device transmission configurations are required for body-worn accessories and hotspot mode (GPRS), it is not necessary to additionally test body-worn accessory SAR for the same device orientation. Therefore, the hotspot data for the back side configuration additionally shows body-worn compliance at the same distance.
3. Justification for reduced test configurations per KDB Publication 941225 D03: The source-based time-averaged output power was evaluated for all multi-slot operations. The worst-case SAR evaluation is reported for data mode.
4. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was tested because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.

WCDMA Notes:

1. WCDMA mode in Body SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 941225 D06, when the same wireless modes and device transmission configurations are required for body-worn accessories and hotspot mode, it is not necessary to additionally test body-worn accessory SAR for the same device orientation. Therefore, the hotspot data for the back side configuration shows body-worn compliance at the same distance.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Test Considerations for LTE handsets and Data Modems KDB 941225 D05 Publication. General test procedures can be found in Section 9.3.3.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled by setting NS=01 in the base station simulator for all SAR tests.
4. Per FCC KDB Publication 941225 D06, when the same wireless modes and device transmission configurations are required for body-worn accessories and hotspot mode, it is not necessary to additionally test body-worn accessory SAR for the same device orientation. Therefore, the hotspot data for the back side configuration shows body-worn compliance at the same distance.
5. LTE Band 4 (AWS) SAR was measured with a probe calibrated at 1750 MHz and is valid for measuring SAR from ± 50 MHz. The 1750MHz specific liquid was verified with specific probe calibration factors as required per FCC KDB Publication 450824 D01.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. WLAN transmission was verified using an uncalibrated spectrum analyzer.
3. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
4. Per FCC KDB Publication 941225 D06, when the same wireless modes and device transmission configurations are required for body-worn accessories and hotspot mode, it is not necessary to additionally test body-worn accessory SAR for the same device orientation. Therefore, the hotspot data for the back side configuration additionally shows body-worn compliance at the same distance.

Hotspot Notes:

1. Top Edge for the licensed transmitter was not tested since the antenna distance from the edge was greater than 2.5 cm per FCC KDB Publication 941225 D06 guidance (see Section 1.2).
2. Bottom and Right Edges for the WLAN transmitter were not tested since the antenna distance from the edge was greater than 2.5 cm per FCC KDB Publication 941225 D06 (see Section 1.2).
3. During SAR Testing for the Wireless Router conditions per KDB 941225 D06, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 7.5.)
4. For Hotspot SAR testing, transmission modes were evaluated separately for SAR. SAR evaluation requires a single frequency of measurement for valid measurements using the SAR probe and tissue which are calibrated for specific limited frequency ranges. Therefore, during SAR evaluation it was ensured that the WLAN transmission was disabled by the manufacturer to assess the standalone SAR. WLAN SAR was separately evaluated to account for the WLAN SAR for portable hotspot exposure conditions (see Section 7.5).

13 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

13.1 Introduction

The following procedures adopted from "FCC SAR Considerations for Cell Phones with Multiple Transmitters" FCC KDB Publication 648474 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

13.2 FCC Power Tables & Conditions

	2.45	5.15 - 5.35	5.47 - 5.85	GHz
P_{Ref}	12	6	5	mW
Device output power should be rounded to the nearest mW to compare with values specified in this table.				

Figure 13-1
Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	Routine evaluation required	SAR not required: Unlicensed only ○ when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas Licensed & Unlicensed ○ when the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas ○ when SAR to peak location separation ratio of simultaneous transmitting antenna pair is < 0.3 SAR required: Licensed & Unlicensed antenna pairs with SAR to peak location separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply
Unlicensed Transmitters	When there is no simultaneous transmission – ○ output ≤ 60/f: SAR not required ○ output > 60/f: stand-alone SAR required When there is simultaneous transmission – Stand-alone SAR not required when ○ output ≤ 2·P_{Ref} and antenna is ≥ 5.0 cm from other antennas ○ output ≤ P_{Ref} and antenna is ≥ 2.5 cm from other antennas ○ output ≤ P_{Ref} and antenna is < 2.5 cm from other antennas, each with either output power ≤ P_{Ref} or 1-g SAR < 1.2 W/kg Otherwise stand-alone SAR is required When stand-alone SAR is required ○ test SAR on highest output channel for each wireless mode and exposure condition ○ if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures	

Figure 13-2
SAR Evaluation Requirements for Multiple Transmitter Handsets

According to Figure 13-1 and Figure 13-2, **Bluetooth and 5GHz WLAN SAR was not required** (section 1.4). Therefore no further analysis is necessary to show compliance for simultaneous Tx scenarios with Bluetooth or 5GHz WLAN.

GSM/GPRS/EDGE DTM is not supported. Therefore GSM Voice cannot transmit simultaneously with GPRS/EDGE Data.

13.3 Head SAR Simultaneous Transmission Analysis

Table 13-1
2G/3G Simultaneous Transmission Scenario (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	WCDMA 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.298	0.241	**0.539**	Head SAR	Right Cheek	0.189	0.241	0.430
	Right Tilt	0.206	0.291	0.497		Right Tilt	0.141	0.291	**0.432**
	Left Cheek	0.337	0.187	0.524		Left Cheek	0.218	0.187	0.405
	Left Tilt	0.185	0.242	0.427		Left Tilt	0.130	0.242	0.372
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	WCDMA 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.361	0.241	**0.602**	Head SAR	Right Cheek	0.658	0.241	**0.899**
	Right Tilt	0.218	0.291	0.509		Right Tilt	0.375	0.291	0.666
	Left Cheek	0.210	0.187	0.397		Left Cheek	0.389	0.187	0.576
	Left Tilt	0.239	0.242	0.481		Left Tilt	0.391	0.242	0.633

The above tables represent a held to ear voice call potentially simultaneously operating with 2.4 GHz WLAN.

Table 13-2
4G Simultaneous Transmission Scenario (Held to Ear)

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.173	0.241	**0.414**	Head SAR	Right Cheek	0.301	0.241	0.542
	Right Tilt	0.117	0.291	0.408		Right Tilt	0.211	0.291	0.502
	Left Cheek	0.180	0.187	0.367		Left Cheek	0.372	0.187	**0.559**
	Left Tilt	0.111	0.242	0.353		Left Tilt	0.187	0.242	0.429
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.654	0.241	**0.895**	Head SAR	Right Cheek	0.551	0.241	**0.792**
	Right Tilt	0.353	0.291	0.644		Right Tilt	0.303	0.291	0.594
	Left Cheek	0.300	0.187	0.487		Left Cheek	0.296	0.187	0.483
	Left Tilt	0.296	0.242	0.538		Left Tilt	0.247	0.242	0.489

The above tables represent a LTE VoIP call (when hotspot is enabled) potentially simultaneously operating with 2.4 GHz WLAN.

13.4 Body-Worn Simultaneous Transmission Analysis

Table 13-3
2G/3G Simultaneous Transmission Scenario (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.523	0.146	0.669
Back Side	WCDMA 850	0.388	0.146	0.534
Back Side	GSM 1900	0.338	0.146	0.484
Back Side	WCDMA 1900	0.620	0.146	**0.766**

The above tables represent a body-worn voice call potentially simultaneously operating with 2.4 GHz WLAN.

Table 13-4
4G Simultaneous Transmission Scenario (Body-Worn at 1.0 cm)

Configuration	Mode	4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	LTE Band 17	0.415	0.146	0.561
Back Side	LTE Band 5 (Cell)	0.446	0.146	0.592
Back Side	LTE Band 4 (AWS)	0.729	0.146	**0.875**
Back Side	LTE Band 2 (PCS)	0.431	0.146	0.577

The above tables represent a body-worn LTE VoIP call (when hotspot is enabled) potentially simultaneously operating with 2.4 GHz WLAN.

13.5 Hotspot SAR Simultaneous Transmission Analysis

Table 13-5
Simultaneous Transmission Scenario (Hotspot at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.020	0.146	**1.166**
	Front	0.767	0.079	0.846
	Top	-	0.115	0.115
	Bottom	0.114	-	0.114
	Right	0.711	-	0.711
	Left	0.914	0.033	0.947

Simult Tx	Configuration	WCDMA 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.388	0.146	**0.534**
	Front	0.280	0.079	0.359
	Top	-	0.115	0.115
	Bottom	0.037	-	0.037
	Right	0.301	-	0.301
	Left	0.355	0.033	0.388

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.541	0.146	**0.687**
	Front	0.408	0.079	0.487
	Top	-	0.115	0.115
	Bottom	0.224	-	0.224
	Right	0.364	-	0.364
	Left	0.153	0.033	0.186

Simult Tx	Configuration	WCDMA 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.620	0.146	**0.766**
	Front	0.544	0.079	0.623
	Top	-	0.115	0.115
	Bottom	0.255	-	0.255
	Right	0.416	-	0.416
	Left	0.152	0.033	0.185

Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.415	0.146	**0.561**
	Front	0.301	0.079	0.380
	Top	-	0.115	0.115
	Bottom	0.047	-	0.047
	Right	0.194	-	0.194
	Left	0.182	0.033	0.215

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.446	0.146	**0.592**
	Front	0.405	0.079	0.484
	Top	-	0.115	0.115
	Bottom	0.057	-	0.057
	Right	0.348	-	0.348
	Left	0.399	0.033	0.432

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.729	0.146	**0.875**
	Front	0.619	0.079	0.698
	Top	-	0.115	0.115
	Bottom	0.329	-	0.329
	Right	0.315	-	0.315
	Left	0.113	0.033	0.146

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.431	0.146	**0.577**
	Front	0.441	0.079	0.520
	Top	-	0.115	0.115
	Bottom	0.241	-	0.241
	Right	0.370	-	0.370
	Left	0.115	0.033	0.148

Note: Per FCC KDB Publication 941225 D06, the edges with antennas more than 2.5 cm are not required to be evaluated for SAR ("-"). The above tables represent a portable hotspot condition.

Additionally, WCDMA/HSPA hotspot may be active during voice WDCMA mode because, in WCDMA, both voice and data use the same physical channel. When doing multiple services (multi-Radio Access Bearer or multi-RAB), the power control will be based on a physical control channel (dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the WCDMA+WLAN sum also represents the WCDMA Voice + WCDMA/HSPA + WLAN scenario.

13.6 Simultaneous Transmission Conclusion

The above numerical summed SAR was below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. No volumetric SAR summation is required per FCC KDB Publication 648474.

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/10/2011	Annual	10/10/2012	3613A00315
Agilent	E5515C	Wireless Communications Test Set	10/10/2011	Annual	10/10/2012	GB46110872
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/21/2011	Annual	4/21/2012	JP38020182
Agilent	E5515C	Wireless Communications Test Set	10/20/2011	Annual	10/20/2012	GB46310798
Agilent	E5515C	Wireless Communications Test Set	10/14/2011	Annual	10/14/2012	GB41450275
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/8/2011	Annual	4/8/2012	MY45470194
Agilent	8648D	Signal Generator	4/5/2011	Annual	4/5/2012	3629U00687
Agilent	E5515C	Wireless Communications Tester	4/21/2011	Annual	4/21/2012	US41140256
Agilent	E5515C	Wireless Communications Test Set	2/14/2012	Annual	2/14/2013	GB43304447
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	CBT		CBT	21910
Anritsu	ML2438A	Power Meter	10/13/2011	Annual	10/13/2012	1070030
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	5821
Anritsu	ML2438A	Power Meter	2/14/2012	Annual	2/14/2013	98150041
Anritsu	MA2481A	Power Sensor	10/11/2011	Annual	10/12/2012	003670
Anritsu	ML2438A	Power Meter	2/14/2012	Annual	2/14/2013	1190013
Anritsu	MT8820C	Radio Communication Tester	11/11/2011	Annual	11/11/2012	6200901190
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	5442
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	8013
Anritsu	ML2495A	Power Meter	10/13/2011	Annual	10/13/2012	1039008
Anritsu	MA2411B	Pulse Sensor	10/13/2011	Annual	10/13/2012	1027293
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	5318
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	2400
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331330
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331323
Gigatronics	8651A	Universal Power Meter	10/12/2011	Annual	10/12/2012	8650319
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/12/2011	Annual	10/12/2012	1833460
Index SAR	IXTL-010	Dielectric Measurement Kit	N/A		N/A	N/A
Index SAR	IXTL-030	30MM TEM line for 6 GHz	N/A		N/A	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT		CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT		CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT		CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT		CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT		CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT		CBT	N/A
Narda	BW-S3W2	Attenuator (3dB)	CBT		CBT	120
Narda	4772-3	Attenuator (3dB)	CBT		CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	6/3/2011	Annual	6/3/2012	N/A
Pasternack	PE2209-10	Bidirectional Coupler	6/3/2011	Annual	6/3/2012	N/A
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	11/30/2011	Annual	11/30/2012	101699
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	8/25/2011	Annual	8/25/2012	100976
Rohde & Schwarz	CMU200	Base Station Simulator	6/1/2011	Annual	6/1/2012	833855/0010
Rohde & Schwarz	SMIQ03B	Signal Generator	4/6/2011	Annual	4/6/2012	DE27259
Rohde & Schwarz	NRVD	Dual Channel Power Meter	4/8/2011	Biennial	4/8/2013	101695
Rohde & Schwarz	CMU200	Base Station Simulator	4/19/2011	Annual	4/19/2012	107826
SPEAG	DAK-3.5	Dielectric Assessment Kit	12/1/2011	Annual	12/1/2012	1031
SPEAG	D1750V2	1750 MHz SAR Dipole	5/24/2011	Annual	5/24/2012	1051
SPEAG	D1900V2	1900 MHz SAR Dipole	7/11/2011	Annual	7/11/2012	5d141
SPEAG	ES3DV3	SAR Probe	4/18/2011	Annual	4/18/2012	3209
SPEAG	EX3DV4	SAR Probe	7/27/2011	Annual	7/27/2012	3561
SPEAG	ES3DV3	SAR Probe	3/24/2011	Annual	3/24/2012	3213
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/19/2011	Annual	5/19/2012	859
SPEAG	D750V3	750 MHz Dipole	1/27/2012	Annual	1/27/2013	1003
SPEAG	ES3DV2	SAR Probe	8/25/2011	Annual	8/25/2012	3022
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/20/2011	Annual	4/20/2012	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/18/2012	Annual	1/18/2013	1272
SPEAG	D1765V2	1765 MHz SAR Dipole	6/16/2011	Annual	6/16/2012	1008
SPEAG	D835V2	835 MHz SAR Dipole	12/21/2011	Annual	12/21/2012	4d119
SPEAG	DAE3	Dasy Data Acquisition Electronics	11/9/2011	Annual	11/9/2012	455
SPEAG	ES3DV3	SAR Probe	2/21/2012	Annual	2/21/2013	3258
SPEAG	D2450V2	2450 MHz SAR Dipole	8/19/2011	Annual	8/19/2012	719
SPEAG	D1900V2	1900 MHz SAR Dipole	7/22/2011	Annual	7/22/2012	5d080
SPEAG	D835V2	835 MHz SAR Dipole	8/15/2011	Annual	8/15/2012	4d026
VWR	36934-158	Wall-Mounted Thermometer	1/21/2011	Biennial	1/21/2013	111286460
VWR	61220-416	Long Stem Thermometer	7/1/2011	Biennial	7/1/2013	111642834
VWR	36934-158	Wall-Mounted Thermometer	5/26/2010	Biennial	5/26/2012	101718589
VWR	61220-416	Long Stem Thermometer	7/1/2011	Biennial	7/1/2013	111642941

Note:

1. CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

2. All equipment was used during recommended calibration period (when applicable).

15 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.0	N	1	1.0	1.0	6.0	6.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)				RSS			12.1	11.7	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)				k=2			24.2	23.5	

The above measurement uncertainties are according to IEEE Std. 1528-2003

16 CONCLUSION

16.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

17 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, June 2001.

[6] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices.

[7] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[8] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[9] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.

[10] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[11] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[12] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[13] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[14] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[15] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[16] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[17] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[18] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.

[19] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[20] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[21] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

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

[23] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 4, March 2010.

[24] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2009

[25] FCC Public Notice DA-02-1438. Office of Engineering and Technology Announces a Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65, June 19, 2002

[26] FCC SAR Measurement Procedures for 3G Devices KDB Publication 941225

[27] SAR Measurement procedures for IEEE 802.11a/b/g KDB Publication 248227

[28] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publication 648474

[29] FCC Application Note for SAR Probe Calibration and System Verification Consideration for Measurements at 150 MHz – 3 GHz, KDB Publication 450824

[30] FCC SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens, KDB Publication 616217

[31] FCC SAR Measurement Requirements for 3 – 6 GHz, KDB Publication 865664

[32] FCC Mobile Portable RF Exposure Procedure, KDB Publication 447498

[33] FCC SAR Procedures for Dongle Transmitters, KDB Publication 447498

[34] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[35] FCC SAR Test Considerations for LTE Handsets and Data Modems, KDB Publication 941225.

[36] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

[37] FCC Hot Spot SAR v01, KDB Publication 941225 D06.