SAMSUNG ELECTRONICS Co., Ltd.,
Regulatory Compliance Group
IT R&D Center

416, Maetan-3dong,
Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea 443-742

TEST REPORT ON SAR

Model Tested:	**GT-I9300**
FCC ID (Requested):	**A3LGTI9300A**
Job No:	**FJ-095**
Report No:	**FJ-095-S1**

- Abstract –

This document reports on SAR Tests carried out in accordance with FCC/OET Bulletin 65, Supplement C(June 2001).

Prepared By

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Authorized By

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Contents

1. GENERAL INFORMATION

Test Dates :	Mar.28, 2012 ~ May.11,2012
Manufacturer :	SAMSUNG ELECTRONICS Co., Ltd.
Address :	416 Maetan3-Dong, Suwon City, Korea
Test Standard :	§2.1093; FCC/OET Bulletin 65, Supplement C(June 2001)
	Licensed Portable Transmitter Held to Ear (PCE)
FCC Classification :	Digital Transmitter System (DTS)
	Unlicensed National Information Infrastructure Tx (UNII)
Tested for :	FCC/TCB Certification

2. DESCRIPTION OF DEVICE

Test Sample :	850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Mobile Phone with WLAN and Bluetooth
Model Number :	GT-I9300
Serial Number :	Identical prototype (S/N : # FJ-095-A)
Tx Freq. Range :	824.2 ~ 848.8 MHz (GSM850), 1850.20 ~ 1909.80 MHz (GSM1900)
	826.4 ~ 846.6 MHz (WCDMA850), 1852.4 ~ 1907.6 MHz (WCDMA1900)
	2412 ~ 2462 MHz (2.4GHz WLAN)
	2402 ~ 2480 MHz (Bluetooth)
Rx Freq. Range :	869.2 ~ 893.8 MHz (GSM850), 1930.20 ~ 1989.80 MHz (GSM1900)
	871.4 ~ 891.6 MHz (WCDMA850), 1932.4 ~ 1987.6 MHz (WCDMA1900)
	2412 ~ 2462 MHz (2.4GHz WLAN)
	2402 ~ 2480 MHz (Bluetooth)
Antenna Manufacturer :	Tyco Electronics
	Model No.: 2108386-1
Antenna Dimensions :	64.24 X 15.46 X 5.1 (mm)
Separation distance between Main and Bluetooth antenna :	87.27mm

3. DESCRIPTION OF TEST EQUIPMENT

3.1 SAR Measurement Setup

Robotic System

Measurements are performed using the DASY4 (or DASY5) automated dosimetric assessment system. Which is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Stäubli), robot controller, measurement server, Samsung computer, near-field probe, probe alignment sensor, and the SAM twin phantom containing the brain 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 Fig. 3.1).

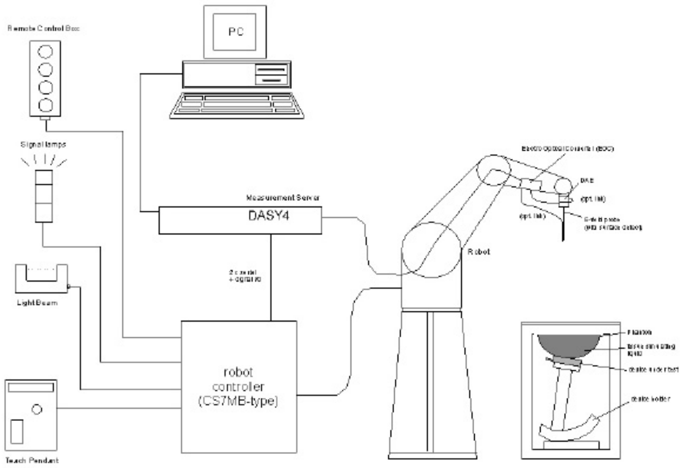

Figure 3.1 SAR Measurement System Setup

System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control is used to drive the robot motors. The PC consists of the Samsung computer with Windows XP system and SAR Measurement Software DASY4 (or DASY5), LCD monitor, mouse and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the measurement server.

System Electronics

The DAE4(or DAE3) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

3.2 E-field Probe

The SAR measurement were conducted with the dosimetric probe ES3DV2, ES3DV3, EX3DV4 and ET3DV6, designed in the classical triangular configuration (see Fig.3.3) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig.3.2). The approach is stopped at reaching the maximum.

Figure 3.2 DAE System

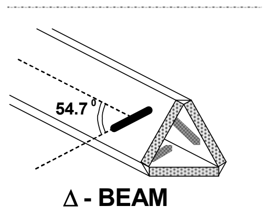

Figure 3.3 Triangular Probe Configuration

Probe Specifications

Construction: Symmetrical design with triangular core
Interleaved sensors
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration: Basic Broad Band Calibration in air: 10-3000 MHz
Conversion Factors (CF) for HSL 900 and HSL 1800

Additional CF for other liquids and frequencies upon request

Frequency: 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Directivity: **[ES3DV3], [ET3DV6]**
± 0.2 dB in HSL (rotation around probe axis)
± 0.3 dB in tissue material (rotation normal to probe axis)

[EX3DV4]
± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in tissue material (rotation normal to probe axis)

Dynamic Range: **[ES3DV3], [ET3DV6]**
5μW/g to > 100mW/g; Linearity: ± 0.2dB
[EX3DV4]

10 μW/g to > 100 mW/g; Linearity: ± 0.2 dB

Dimensions

[ES3DV3], [ES3DV2]

Overall length: 330 mm (Tip: 20 mm)

Tip diameter: 3.9 mm (Body: 12 mm)

Distance from probe tip to dipole centers: 2.1 mm

[EX3DV4]

Overall length: 330 mm (Tip: 20 mm)

Tip diameter: 2.5 mm (Body: 12 mm)

Typical distance from probe tip to dipole centers: 1 mm

[ET3DV6]

Overall length: 330mm

Tip length: 16mm

Body diameter: 12mm

Tip diameter: 6.8mm

Distance from probe tip to dipole centers: 2.7mm

[ES3DV3] ,[ES3DV2]

[EX3DV4]

Application

[ES3DV3], [ES3DV2]

General dosimetry up to 5 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

[EX3DV4]

High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields).Only probe which enables compliance testing for frequencies up to

6 GHz with precision of better 30 %.

[ET3DV6]

General dosimetry up to 3 GHz

Compliance tests of mobile phones

Fast automatic scanning in arbitrary phantoms

[ET3DV6]

Optical Surface Detection

[ET3DV6]

± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces

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3.3 Phantom

SAM Twin Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid.

Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. (See Figure 3.5)

Figure3.5 SAM Twin Phantom

SAM Twin Phantom Specification

Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, EN 50361:2001 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid.
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Height: 810 mm; Length: 1000 mm; Width: 500 mm

Modular Flat Phantom

The Modular Flat Phantom V5.1 is constructed of a fiberglass shell integrated in a wooden table. Also It consists of three identical flat phantoms (modules) which can be installed and removed separately without emptying the liquid, as well as a wooden support.. It enables the dosimetric evaluation of body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid.

Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. (See Figure 3.6)

Figure 3.6 Modular Flat

Modular Flat Phantom Specification

Construction	The shell corresponds to the specifications of IEEE 1528-2003. It enables the dosimetric evaluation of body mounted usage above 800 MHz at the flat phantom region. A cover prevents evaporation of the liquid
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 10 liters
Dimension	Wooden support - Height: 810 mm; Length: 830 mm; Width: 500 mm Each Module - Height:190 mm; Length: 200 mm; width: 300 mm

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3.4 Brain Simulating Mixture Characterization

The brain mixtures consist of a viscous gel using hydroxethylcellullose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue.

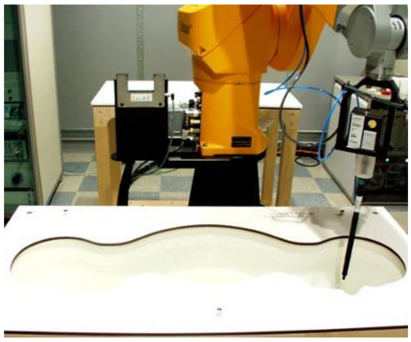

Figure 3.7 Simulated Tissue

Table 3.1 Composition of the Tissue Equivalent Matter

INGREDIENTS	835MHz Brain	835MHz Muscle	1900MHz Brain	1900MHz Muscle	2450MHz Brain	2450MHz Muscle
WATER	40.29%	50.75%	55.24%	70.23%	62.7%	73.2%
SUGAR	57.90%	48.21%	-	-	-	-
SALT	1.38%	0.94%	0.24%	0.21%	-	0.04%
TWEEN20	-	-	44.52%	29.56%	37.3%	26.76%
BACTERIACIDE	0.18%	0.10%	-	-	-	-
HEC	0.25%	-	-	-	-	-
Dielectric Constant Target	41.50	55.20	40.00	53.30	39.2	52.7
Conductivity Target (S/m)	0.900	0.970	1.400	1.520	1.80	1.95

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3.5 Device Holder for Transmitters

In combination with the Twin SAM Phantom V4.0, the Mounting Device (see Fig. 3.7) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately and repeatedly be positioned according to the EN 50360:2001 and FCC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

*Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configuration. To produce worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Figure 3.8 Device Holder

3.6 Validation Dipole

The reference dipole should have a return loss better than –20 dB (measured in the setup) at the resonant frequency to reduce the uncertainty in the power measurement.

Frequency	835, 1900, 2450MHz
Return Loss	< -20 dB at specified validation position
Dimensions	D835V2: dipole length: 161 mm; overall height: 330 mm D1900V2: dipole length: 68 mm; overall height: 300 mm D2450V2: dipole length: 51.8 mm; overall height: 300 mm

Note:

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibration in KDB 450824

Model name(S/N)	Configuration	Frequency	Parameters				
		MHz	Date of Cal	Return Loss(dB)	Deviation (%)	Impedance (Ω)	Deviation (%)
D2450V2(708)	Head	2450	2011.04.19	-28.9	-	53.7	-
			2011.04.28	-27.5	-4.84%	50.6	-5.77%
	Body	2450	2011.04.19	-41.3	-	50.8	-
			2011.04.28	-37.67	-8.79%	49.21	-3.13%

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3.7 Equipment Calibration

Table 3.3 Test Equipment Calibration

Type	Calibration Due Date	Serial No.
SPEAG E-Field Probe EX3DV4	May.24, 2012	3537
SPEAG DAE4	Feb.21, 2013	670
SPEAG E-Field Probe EX3DV4	Fev.21, 2013	3520
SPEAG DAE4	Sep.21, 2012	533
SPEAG Validation Dipole D835V2	Nov.18, 2013	4d111
SPEAG Validation Dipole D1900V2	Jan.26, 2014	5d023
SPEAG Validation Dipole D2450V2	Apr.19, 2013	708
Stäubli Robot RX90BL	Not Required	F05/51G6A1/A/01
SPEAG SAM Twin Phantom V4.0	Not Required	TP-1364
SPEAG SAM Twin Phantom V4.0	Not Required	TP-1604
SPEAG SAM Twin Phantom V4.0	Not Required	TP-1248
Modular Phantom	Not Required	MP-1010
Modular Phantom	Not Required	MP-1007
E4421B Signal Generator	Oct.12, 2012	MY41000654
BBS3Q7ELU Power Amp	Oct.12, 2012	1007D/C0035
E4419B Power meter	Oct.12, 2012	GB41293847
HP-8753ES Network Analyzer	Apr.16, 2013	US39173712
HP85070C Dielectric Probe Kit	Not Required	US99360087
Digital thermo-hygrometer	Feb.09, 2013	1367
Digital thermo-hygrometer	Feb.09, 2013	SK-L200TH
E4419B Power meter	Feb.25, 2013	MY45103291
E9300B Power sensor	Mar.04, 2013	MY41496209
E9300B Power sensor	Mar.04, 2013	MY41496085
DASY4 S/W (ver 4.7)	Not Required	-
8560E Spectrum Analyzer	Sep.16, 2012	3635A02452
778D Dual Directional Coupler	Dec.02, 2012	50189
777D Dual Directional Coupler	Feb.23, 2013	07523
772D Dual Directional Coupler	Mar.04, 2013	ZA200100954
Pre-Amplifier 84498B	Dec.09, 2012	3008A00691
Base Station Simulator	Dec.19, 2012	GB46490112
Communication tester(E5515C)	Nov.27, 2012	GB42230535
11636B	Jul.05, 2012	51942

NOTE:
The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Validation measurement is performed by Samsung Lab. before each test. (see § 7.2) The brain simulating material is calibrated by Samsung using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material. (see § 7.1)

4. SAR MEASUREMENT PROCEDURE

The evaluation was performed using the following procedure.

STEP 1

The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed location point was measured and used as a reference value.

STEP 2

The SAR distribution at the exposed side of the head was measured at a distance of 3.9mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20mm x 20mm. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

STEP 3

Around this point, a volume of 32mm x 32mm x 30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the center of the dipoles is 2.7mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluated the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 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 integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

STEP 4

The SAR value at the same location as in step 1 was again measured.
(If the value changed by more than 5%, the evaluation is repeated.)

STEP 5

For 5GHz testing finer resolution zoom scans were performed as specified by FCC SAR Measurement Requirements for 3 -6 GHz, KDB pub 865664. The 5GHz zoom scan requires a minimum volume of 24mm x 24mm x 20mm and 7 x 7 x 11 points.

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5. DESCRIPTION OF TEST POSITION

5.1 SAM Phantom Shape

Figure 5.1 shows the front, back and side views of SAM. The point “M” is the reference point for the center of mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5.2.

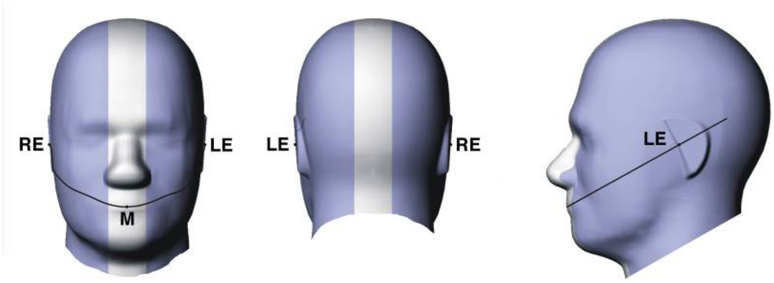

Figure 5.1 Front, back and side view of SAM

The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 5.3). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines should be marked on the external phantom shell to facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs.

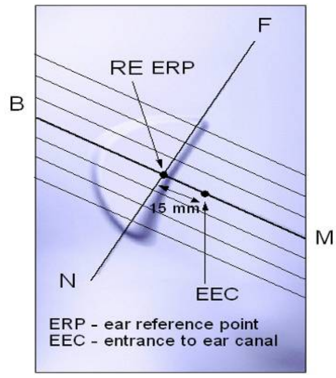

Figure 5.2 Close up side view

5.2 “cheek” Position

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 Fig. 5.4). The “test device reference point” was than located at the same level as the center of the eat reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at it’s tip 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

Step 1

The test device was positioned with the handset close to the surface of the phantom such that point A is on the

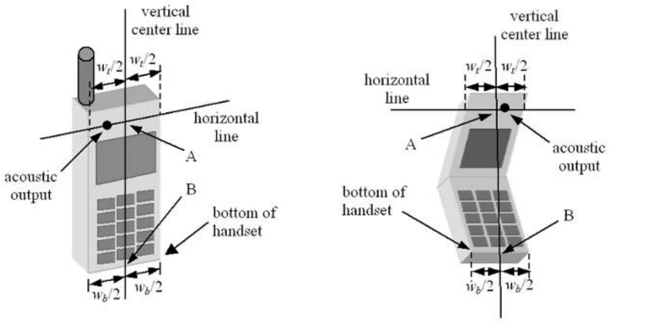

Figure 5.4 Handset vertical and horizontal reference lines

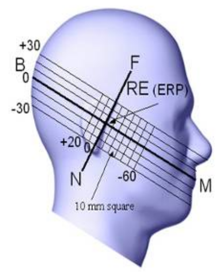

Figure 5.3 Side view of the phantom showing relevant markings

(virtual) extension of the line passing through points RE and LE on the phantom (see Figure 5.5), 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

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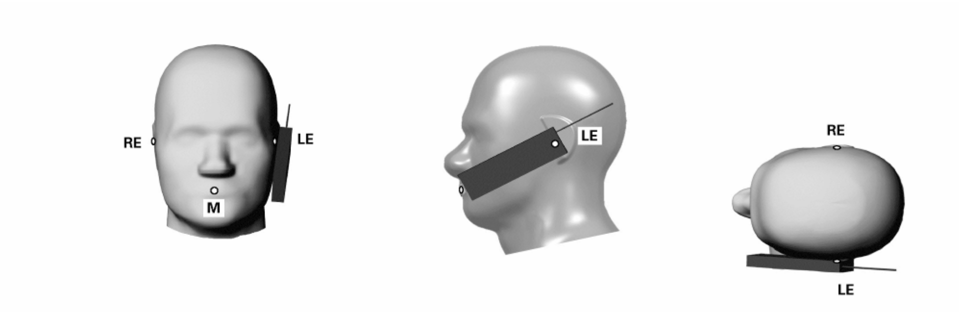

Figure 5.5 Front, Side and Top View of Cheek/Touch Position

Step 2

The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.

Step 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).

Step 4

Rotate the handset around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.

Step 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 5.2.

5.3 "tilted" Position

With the test device aligned in the "cheek" position :

Step 1

Repeat steps 1 to 5 of 5.2 to place the device in the "Cheek/Touch Position"

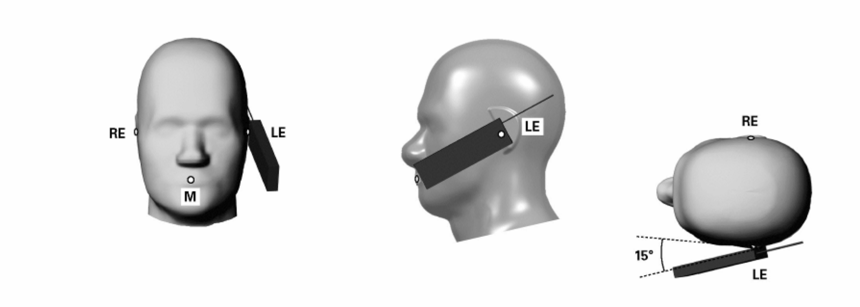

Figure 5.6 Front, side and Top View of Ear/Tilt 15° Position

Step 2

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 15 degree.

Step 3

The phone was then rotated around the horizontal line by 15 degree.

Step 4

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.

5.4 Body Holster/Belt Clip 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 5.7). A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that 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 supplied with the device, the device is tested with each accessory that contains unique metallic component. If multiple accessory 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 where a separation distance between the back of the device and the flat phantom is used.

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. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory(ies), Including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worst-case positioning is then documented and used to perform Body SAR testing.
In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and cautions statements must be included in the user's manual.

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5.5 FCC Personal Wireless Router Configurations

5.5.1 Personal Wireless Router

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 for handsets greater than 9cm x 5cm where SAR test considerations are based on a composite test separation distance of 10mm from the edges, front and back of the device with antennas 2.5cm 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 test.

5.5.2 SAR test Setup for Personal Wireless Router Features

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 connot 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.

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Mode	Back	Front	Top	Bottom	Left	Right
GPRS850	Yes	Yes	No	Yes	Yes	Yes
GPRS1900	Yes	Yes	No	Yes	Yes	Yes
WCDMA850	Yes	Yes	No	Yes	Yes	Yes
WCDMA1900	Yes	Yes	No	Yes	Yes	Yes
WIFI	Yes	Yes	Yes	No	No	Yes

Table 5-1 Mobile Hotspot Sides for SAR testing

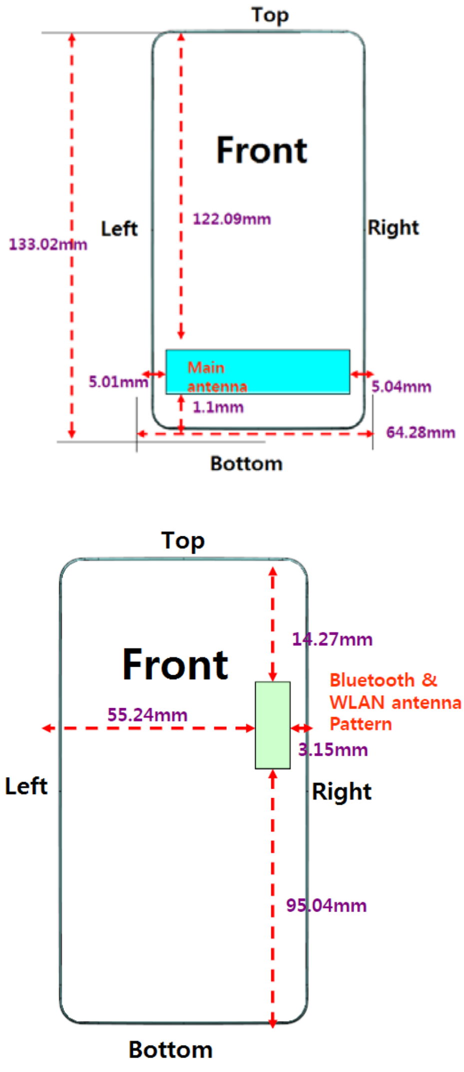

Figure 5.7 Identification of Sides for SAR testing

Note : Particular DUT edges were not necessary to be evaluated for Wireless Router SAR if the edges were greater than 2.5cm from the transmitting antenna according to FCC KDB Publication 941225 D06 guidance.

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6. MEASUREMENT UNCERTAINTY

Table 6.1 Uncertainty Budget at 835MHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	c_i	Standard uncertainty (±%)	v_i^2 or v_{eff}
Measurement System						
Probe Calibration	11.00	normal	2.000	1	5.50	∞
Axial Isotropy	4.70	rectangular	1.732	0.7	1.90	∞
Hemispherical Isotropy	9.60	rectangular	1.732	0.7	3.88	∞
Linearity	4.70	rectangular	1.732	1	2.71	∞
System Detection Limits	0.25	rectangular	1.732	1	0.14	∞
Boundary effects	1.00	rectangular	1.732	1	0.58	∞
Readout electronics	0.30	normal	1.000	1	0.30	∞
Response time	0.80	rectangular	1.732	1	0.46	∞
RF ambient conditions	3.00	rectangular	1.732	1	1.73	∞
Integration time	1.73	rectangular	1.732	1	1.00	∞
Mechanical constrains of robot	1.50	rectangular	1.732	1	0.87	∞
Probe positioning	2.90	rectangular	1.732	1	1.67	∞
Extrapolation and integration	1.00	rectangular	1.732	1	0.58	∞
Test Sample Related						
Test Sample positioning	1.12	normal	1.000	1	1.12	14
Device holded uncertainty	3.44	normal	1.000	1	3.44	∞
Power Drift	5.00	rectangular	1.732	1	2.89	∞
Phantom and Setup						
Modular Phantom uncertainty	5.62	normal	1.000	1	5.62	2
Phantom uncertainty	4.00	rectangular	1.732	1	2.31	∞
Liquid conductivity (deviation from target)	5.00	rectangular	1.732	0.64	1.85	∞
Liquid conductivity (measurement error)	0.38	normal	1.000	0.64	0.24	∞
Liquid permittivity (deviation from target)	5.00	rectangular	1.732	0.6	1.73	∞
Liquid permittivity (measurement error)	5.44	normal	1.000	0.6	3.26	∞
Combined Standard Uncertainty		Normal	-	-	**11.84**	**172776**
Extended Standard Uncertainty(K=2.00)					**23.69**	**172776**

Table 6.2 Uncertainty Budget at 1900MHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	c_i	Standard uncertainty (±%)	v_i^2 or v_{eff}
Measurement System						
Probe Calibration	12.00	normal	2.000	1	6.00	∞
Axial Isotropy	4.70	rectangular	1.732	0.7	1.90	∞
Hemispherical Isotropy	9.60	rectangular	1.732	0.7	3.88	∞
Linearity	4.70	rectangular	1.732	1	2.71	∞
System Detection Limits	0.25	rectangular	1.732	1	0.14	∞
Boundary effects	1.00	rectangular	1.732	1	0.58	∞
Readout electronics	0.30	normal	1.000	1	0.30	∞
Response time	0.80	rectangular	1.732	1	0.46	∞
RF ambient conditions	3.00	rectangular	1.732	1	1.73	∞
Integration time	0.00	rectangular	1.732	1	0.00	∞
Mechanical constrains of robot	1.50	rectangular	1.732	1	0.87	∞
Probe positioning	2.90	rectangular	1.732	1	1.67	∞
Extrapolation and integration	1.00	rectangular	1.732	1	0.58	∞
Test Sample Related						
Test Sample positioning	1.50	normal	1.000	1	1.50	14
Device holded uncertainty	3.44	normal	1.000	1	3.44	∞
Power Drift	5.00	rectangular	1.732	1	2.89	∞
Phantom and Setup						
Modular Phantom uncertainty	6.02	normal	1.000	1	6.02	2
Phantom uncertainty	4.00	rectangular	1.732	1	2.31	∞
Liquid conductivity (deviation from target)	5.00	rectangular	1.732	0.64	1.85	∞
Liquid conductivity (measurement error)	1.84	normal	1.000	0.64	1.18	∞
Liquid permittivity (deviation from target)	5.00	rectangular	1.732	0.6	1.73	∞
Liquid permittivity (measurement error)	4.54	normal	1.000	0.6	2.73	∞
Combined Standard Uncertainty		Normal	-	-	**12.24**	**62037**
Extended Standard Uncertainty(K=2.00)					**24.48**	**62037**

Table 6.3 Uncertainty Budget at 2450MHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	c_i	Standard uncertainty (±%)	v_i^2 or v_{eff}
Measurement System						
Probe Calibration	12.00	normal	2.000	1	6.00	∞
Axial Isotropy	4.70	rectangular	1.732	0.7	1.90	∞
Hemispherical Isotropy	9.60	rectangular	1.732	0.7	3.88	∞
Linearity	4.70	rectangular	1.732	1	2.71	∞
System Detection Limits	0.25	rectangular	1.732	1	0.14	∞
Boundary effects	1.00	rectangular	1.732	1	0.58	∞
Readout electronics	0.30	normal	1.000	1	0.30	∞
Response time	0.80	rectangular	1.732	1	0.46	∞
RF ambient conditions	3.00	rectangular	1.732	1	1.73	∞
Integration time	0.00	rectangular	1.732	1	0.00	∞
Mechanical constrains of robot	1.50	rectangular	1.732	1	0.87	∞
Probe positioning	2.90	rectangular	1.732	1	1.67	∞
Extrapolation and integration	1.00	rectangular	1.732	1	0.58	∞
Test Sample Related						
Test Sample positioning	4.22	normal	1.000	1	4.22	14
Device holded uncertainty	3.44	normal	1.000	1	3.44	∞
Power Drift	5.00	rectangular	1.732	1	2.89	∞
Phantom and Setup						
Modular Phantom uncertainty	2.32	Normal	1.0001	1	2.32	2
Phantom uncertainty	4.00	rectangular	1.732	1	2.31	∞
Liquid conductivity (deviation from target)	5.00	rectangular	1.732	0.64	1.85	∞
Liquid conductivity (measurement error)	2.04	normal	1.000	0.64	1.30	∞
Liquid permittivity (deviation from target)	5.00	rectangular	1.732	0.6	1.73	∞
Liquid permittivity (measurement error)	4.27	normal	1.000	0.6	2.56	∞
Combined Standard Uncertainty		Normal	-	-	**11.57**	**792**
Extended Standard Uncertainty(K=2.00)					**23.15**	**792**

7. SYSTEM VERIFICATION

7.1 Tissue Verification

Table 7.1 MEASURED TISSUE PARAMETERS

	835MHz Head		835MHz Body		1900MHz Head		1900MHz Body		2450MHz Head		2450MHz Body	
	Target	Measured	Target	Measured	Target	Measured	Target	Measured	Target	Measured	Target	Measured
Date	Mar.28, 2012		Mar.28, 2012		Mar.29, 2012		Mar.29, 2012		May.11, 2012		May.11, 2012	
Liquid Temperature(°C)	22.1		22.2		22.3		22.2		22.2		22.2	
Dielectric Constant: å'	41.5	40.6	55.2	53.6	40	38.9	53.3	51.9	39.2	37.2	52.7	51.1
Conductivity:	0.9	0.89	0.97	0.98	1.4	1.38	1.52	1.5	1.8	1.86	1.95	1.95
Tissue Batch Number	835DF4001C		835B1001U		1900F4001Q		1900B2002K		2450MF4001F		2450B2001D	

7.2 Test System Validation

Prior to assessment, the system is verified to the ±10% of the specification at 835MHz, 1900MHz and 2450MHz by using the system validation kit(s). (see Appendix D, Graphic Plot Attached)

Table 7.2 System Validation Results

System Validation Kit	Tissue	Targeted SAR_{1g} (mW/g)	Normalized SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)	Deviation (%)	Date	Liquid Temperature(°C)	Ambient Temperature(°C)	Input Power (mW)
4d111	835MHz Brain	9.43	9.77	0.977	3.61%	Mar.28, 2012	22.1	22.4	100
4d111	835MHz Body	9.54	9.75	0.975	2.20%	Mar.28, 2012	22.0	22.3	100
5d023	1900MHz Brain	39.0	40.3	4.03	3.33%	Mar.29, 2012	22.4	22.6	100
5d023	1900MHz Body	38.8	40	4.0	3.09%	Mar.29, 2012	22.2	22.4	100
708	2450MHz Brain	55.8	54.5	5.45	-2.33%	May.11, 2012	21.9	22.2	100
708	2450MHz Body	51.2	49.4	4.94	-3.52%	May.11, 2012	21.7	22.0	100

*Validation was normalized to 1W.

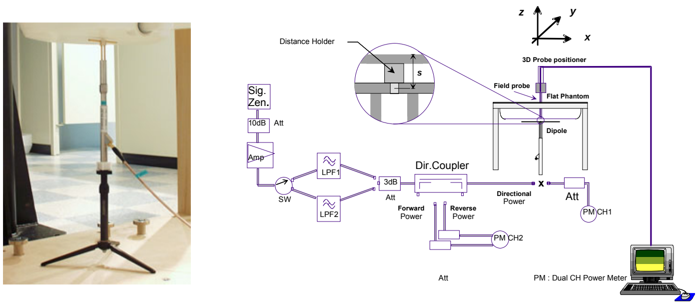

Figure 7.1 Dipole Validation Test Setup

8. SAR MEASUREMENT RESULTS

Procedures Used To Establish Test Signal

The handset was placed into simulated call mode using base station simulator. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR. When test modes are not available or inappropriate for testing a handset, the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

SAR Measurement Conditions for WCDMA

These procedures were followed according to FCC "SAR Measurement Procedures for 3G Devices"v02, October 2007.

Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the ge neral descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR wit h TPC (transmit power control) set to all "1s". Results for all applicable physical channel co nfigurations (DPCCH, DPDCHn and spreading codes) should be tabulated in the test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations should be clearly identified.

Head SAR Measurements

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 ¼ dB higher than that measured in 12.2kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4kbps SRB (signaling radio bearer) using the exposure configuration that results in the highest SAR for that RF channel in 12.2 RMC.

Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all "1s". SAR for other spreading codes and multiple DPDCHn, when supported by the DUT, are not required when the maximum average outputs of each RF channel, for each spreading code and DPDCHn configuration, are less than ¼ dB higher than those measured in 12.2 RMC. Otherwise, SAR is measured on the maximum output channel with an applicable RMC configuration for the corresponding spreading code or DPDCHn using the exposure configuration that results in the highest SAR with 12.2 RMC. When more than 2 DPDCHn are supported by the DUT, it may be necessary to configure the additional DPDCHn for the DUT using FTM(Factory Test Mode) with parameters similar to those used in 384 kbps and 768 kbps RMC.

Table 8.1 Max. Power Output Table for GT-I9300

Operating Band	Channel	HSPA Inactive		HSPA Active
		12.2 kbps RMC	12.2 kbps AMR	12.2 kbps RMC
WCDMA 850 (dBm)	4132	22.58	22.6	22.57
	4183	22.58	22.59	22.55
	4233	22.48	22.48	22.46
WCDMA 1900 (dBm)	9262	22.71	22.69	22.70
	9400	22.54	22.53	22.53
	9538	22.63	22.55	22.63

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Table 8.2 HSPA Max. Power Output Table for GT-I9300

WCDMA 850 (dBm)	HSDPA	4132	4183	4233	MPR
	Subtest1	22.57	22.55	22.46	0.0
	Subtest2	22.38	22.37	22.26	0.0
	Subtest3	22.13	22.12	22.01	0.5
	Subtest4	21.87	21.87	21.77	0.5
	HSUPA	4132	4183	4233	MPR
	Subtest1	21.61	21.62	21.52	0
	Subtest2	20.34	20.44	20.17	2
	Subtest3	21.39	21.41	21.29	1
	Subtest4	20.53	20.52	20.53	2
	Subtest5	21.48	21.52	21.40	0
WCDMA 1900 (dBm)	HSDPA	9262	9400	9538	MPR
	Subtest1	22.70	22.53	22.63	0.0
	Subtest2	22.48	22.35	22.39	0.0
	Subtest3	22.25	22.11	22.15	0.5
	Subtest4	22.02	21.85	21.91	0.5
	HSUPA	9262	9400	9538	MPR
	Subtest1	21.75	21.62	21.61	0
	Subtest2	20.78	20.6	20.43	2
	Subtest3	21.54	21.34	21.41	1
	Subtest4	20.83	20.63	20.67	2
	Subtest5	22.03	21.45	21.52	0

- End of page –

The handset is battery operated. Each SAR measurement was taken with a fully charged battery. In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power. If a conducted power deviation of more than 5% occurred, the test was repeated. And all Tx conducted power were also investigated for Body SAR Measurement.

Table 8.3 GPRS Power Table for GT-I9300

Band	Channel	Voice	GPRS/EDGE (GMSK)				EDGE (8-PSK)			
		GSM(dBm) CS(1 Tx)	1Tx (dBm)	2Tx (dBm)	3Tx (dBm)	4Tx (dBm)	1Tx (dBm)	2Tx (dBm)	3Tx (dBm)	4Tx (dBm)
850	128	32.52	32.52	29.57	28.56	29.59	26.92	26.91	26.92	24.09
	190	32.5	32.5	29.62	28.6	29.62	26.95	26.96	26.93	24.1
	251	32.47	32.47	29.63	28.64	29.64	26.96	26.94	26.95	24.1
1900	512	29.54	29.54	27.1	25.61	27.11	25.77	25.75	25.71	22.69
	661	29.47	29.47	27.15	25.67	27.15	25.78	25.76	25.72	22.71
	810	29.46	29.46	27.17	25.7	27.19	25.8	25.78	25.77	22.67

Table 8.4 Calculated Frame-Averaged Output Power Table for GT-I9300

Band	Channel	Voice	GPRS/EDGE (GMSK)				EDGE (8-PSK)			
		GSM(dBm) CS(1 Tx)	1Tx (dBm)	2Tx (dBm)	3Tx (dBm)	4Tx (dBm)	1Tx (dBm)	2Tx (dBm)	3Tx (dBm)	4Tx (dBm)
850	128	23.49	23.49	23.55	24.30	26.58	17.89	20.89	22.66	21.08
	190	23.47	23.47	23.60	24.34	26.61	17.92	20.94	22.67	21.09
	251	23.44	23.44	23.61	24.38	26.63	17.93	20.92	22.69	21.09
1900	512	20.51	20.51	21.08	21.35	24.10	16.74	19.73	21.45	19.68
	661	20.44	20.44	21.13	21.41	24.14	16.75	19.74	21.46	19.70
	810	20.43	20.43	21.15	21.44	24.18	16.77	19.76	21.51	19.66

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. 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 setting do not have any impact on the output levels in the GPRS modes.
3. 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. Other MCS levels that produce 8-PSK do not affect output power.
4. The conducted powers are reported and measured by base station simulator E5515C when the equipment was calibrated.

GSM Class : B

GPRS Multislot Class : 12 (max 4 Tx Uplink slots)

EDGE Multislot Class : 12 (max 4 Tx Uplink slots)

DTM Multislot Class : N/A

- End of page –

Table 8.5 802.11b Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1	13.22	13.32	13.34	13.33
802.11b	2437	6	13.52	13.63	13.59	13.52
802.11b	2462	**11**	**13.79**	13.84	13.76	13.73

Table 8.6 802.11g 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	12.29	12.31	12.26	12.28	12.21	12.23	12.28	12.28
802.11g	2437	6	12.54	12.53	12.54	12.54	12.43	12.52	12.45	12.49
802.11g	2462	11	12.71	12.73	12.74	12.66	12.70	12.65	12.67	12.68

Table 8.7 802.11n Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6.5/7.2	13/14.4	19.5/21.7	26/28.9	39/43.4	52/57.8	58.5/65	65/72.2
802.11n	2412	1	12.23	12.15	12.12	12.24	12.09	12.15	12.22	12.24
802.11n	2437	6	12.43	12.40	12.45	12.39	12.38	12.40	12.41	12.46
802.11n	2462	11	12.57	12.58	12.59	12.55	12.59	12.53	12.63	12.61

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Simultaneous Transmission

Refer to the FCC OET document, 'SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas' (Feb 2008)

Table 8.11 Output Power Thresholds for Unlicensed Transmitters

	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				

Table 8.12 Summary of SAR Evaluation Requirements for Cell phones with Multiple Transmitters

<table>
<tr><th></th><th>Individual Transmitter</th><th>Simultaneous Transmission</th></tr>
<tr><td>Licensed Transmitters</td><td><u>Routine evaluation required</u></td><td rowspan="2">SAR not required:
<u>Unlicensed only</u>
o when stand-alone 1-g SAR is not required and antenna is > 5 cm from other antennas
<u>Licensed & Unlicensed</u>
o when the sum of the 1-g SAR is <1.6 W/kg for all simultaneous transmitting antennas
o when SAR to antenna separation ratio of simultaneous transmitting antenna pair is < 0.3

SAR required:
<u>Licensed & Unlicensed</u>
antenna pairs with SAR to antenna separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in standalone 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</td></tr>
<tr><td>Unlicensed Transmitters</td><td>When there is no simultaneous transmission –
o output < 60/f: SAR not required
o output ≥ 60/f: stand-alone SAR required

When there is simultaneous transmission –
<u>Stand-alone SAR not required when</u>
O output ≤ 2.P_{Ref} and antenna is > 5.0 cm from other antennas
O output ≤ PRef and antenna is ≥ 2.5 cm from other antennas
O output ≤ PRef and antenna is < 2.5 cm from other antennas, each with either output power ≤ PRef or 1-g SAR < 1.2 W/kg
<u>Otherwise stand-alone SAR is required</u>

When stand-alone SAR is required
o test SAR on highest output channel for each wireless mode and exposure condition

o if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures</td></tr>
</table>

Table 8.13 Simultaneous Transmission Summation for Held to Ear Voice Call (2.4GHz WLAN)

Simult Tx	Configuration	GSM850 SAR(W/Kg)	2.4GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Simult Tx	Configuration	GSM1900 SAR(W/Kg)	2.4GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Head SAR	Right Cheek	0.140	0.068	0.208	Head SAR	Right Cheek	0.231	0.068	0.299
	Right Tilt	0.082	0.052	0.134		Right Tilt	0.153	0.052	0.205
	Left Cheek	0.119	0.138	0.257		Left Cheek	0.284	0.138	0.422
	Left Tilt	0.075	0.1	0.175		Left Tilt	0.161	0.1	0.261
Simult Tx	**Configuration**	**WCDMA850 SAR(W/Kg)**	**2.4GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**	**Simult Tx**	**Configuration**	**WCDMA1900 SAR(W/Kg)**	**2.4GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**
Head SAR	Right Cheek	0.129	0.068	0.197	Head SAR	Right Cheek	0.371	0.068	0.439
	Right Tilt	0.039	0.052	0.091		Right Tilt	0.319	0.052	0.371
	Left Cheek	0.135	0.138	0.273		Left Cheek	0.490	0.138	0.628
	Left Tilt	0.068	0.1	0.168		Left Tilt	0.267	0.1	0.367

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

Table 8.14 Simultaneous Transmission Summation for Held to Ear Voice Call (5.2GHz WLAN)

Simult Tx	Configuration	GSM850 SAR(W/Kg)	5.2GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Simult Tx	Configuration	GSM1900 SAR(W/Kg)	5.2GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Head SAR	Right Cheek	0.140	0.001	0.141	Head SAR	Right Cheek	0.231	0.001	0.232
	Right Tilt	0.082	0.005	0.087		Right Tilt	0.153	0.005	0.158
	Left Cheek	0.119	0.000	0.119		Left Cheek	0.284	0.000	0.284
	Left Tilt	0.075	0.014	0.089		Left Tilt	0.161	0.014	0.175
Simult Tx	**Configuration**	**WCDMA850 SAR(W/Kg)**	**5.2GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**	**Simult Tx**	**Configuration**	**WCDMA1900 SAR(W/Kg)**	**5.2GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**
Head SAR	Right Cheek	0.129	0.001	0.13	Head SAR	Right Cheek	0.371	0.001	0.372
	Right Tilt	0.039	0.005	0.044		Right Tilt	0.319	0.005	0.324
	Left Cheek	0.135	0.000	0.135		Left Cheek	0.490	0.000	0.49
	Left Tilt	0.068	0.014	0.082		Left Tilt	0.267	0.014	0.281

The above tables represent a held to ear voice call with 5.2GHz WLAN.

Table 8.15 Simultaneous Transmission Summation for Held to Ear Voice Call (5.3GHz WLAN)

Simult Tx	Configuration	GSM850 SAR(W/Kg)	5.3GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Simult Tx	Configuration	GSM1900 SAR(W/Kg)	5.3GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Head SAR	Right Cheek	0.140	0.026	0.166	Head SAR	Right Cheek	0.231	0.026	0.257
	Right Tilt	0.082	0.034	0.116		Right Tilt	0.153	0.034	0.187
	Left Cheek	0.119	0.026	0.145		Left Cheek	0.284	0.026	0.31
	Left Tilt	0.075	0.072	0.147		Left Tilt	0.161	0.072	0.233
Simult Tx	**Configuration**	**WCDMA850 SAR(W/Kg)**	**5.3GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**	**Simult Tx**	**Configuration**	**WCDMA1900 SAR(W/Kg)**	**5.3GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**
Head SAR	Right Cheek	0.129	0.026	0.155	Head SAR	Right Cheek	0.371	0.026	0.397
	Right Tilt	0.039	0.034	0.073		Right Tilt	0.319	0.034	0.353
	Left Cheek	0.135	0.026	0.161		Left Cheek	0.490	0.026	0.516
	Left Tilt	0.068	0.072	0.14		Left Tilt	0.267	0.072	0.339

The above tables represent a held to ear voice call with 5.3GHz WLAN.

Table 8.15 Simultaneous Transmission Summation for Held to Ear Voice Call (5.5GHz WLAN)

Simult Tx	Configuration	GSM850 SAR(W/Kg)	5.5GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Simult Tx	Configuration	GSM1900 SAR(W/Kg)	5.5GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Head SAR	Right Cheek	0.140	0.025	0.165	Head SAR	Right Cheek	0.231	0.025	0.256
	Right Tilt	0.082	0.031	0.113		Right Tilt	0.153	0.031	0.184
	Left Cheek	0.119	0.015	0.134		Left Cheek	0.284	0.015	0.299
	Left Tilt	0.075	0.026	0.101		Left Tilt	0.161	0.026	0.187
Simult Tx	**Configuration**	**WCDMA850 SAR(W/Kg)**	**5.5GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**	**Simult Tx**	**Configuration**	**WCDMA1900 SAR(W/Kg)**	**5.5GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**
Head SAR	Right Cheek	0.129	0.025	0.154	Head SAR	Right Cheek	0.371	0.025	0.396
	Right Tilt	0.039	0.031	0.07		Right Tilt	0.319	0.031	0.35
	Left Cheek	0.135	0.015	0.15		Left Cheek	0.490	0.015	0.505
	Left Tilt	0.068	0.026	0.094		Left Tilt	0.267	0.026	0.293

The above tables represent a held to ear voice call with 5.5GHz WLAN.

Table 8.16 Simultaneous Transmission Summation for Held to Ear Voice Call (5.8GHz WLAN)

Simult Tx	Configuration	GSM850 SAR(W/Kg)	5.8GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Simult Tx	Configuration	GSM1900 SAR(W/Kg)	5.8GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Head SAR	Right Cheek	0.140	0.017	0.157	Head SAR	Right Cheek	0.231	0.017	0.248
	Right Tilt	0.082	0.015	0.097		Right Tilt	0.153	0.015	0.168
	Left Cheek	0.119	0.031	0.15		Left Cheek	0.284	0.031	0.315
	Left Tilt	0.075	0.011	0.086		Left Tilt	0.161	0.011	0.172
Simult Tx	Configuration	WCDMA850 SAR(W/Kg)	5.8GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Simult Tx	Configuration	WCDMA1900 SAR(W/Kg)	5.8GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Head SAR	Right Cheek	0.129	0.017	0.146	Head SAR	Right Cheek	0.371	0.017	0.388
	Right Tilt	0.039	0.015	0.054		Right Tilt	0.319	0.015	0.334
	Left Cheek	0.135	0.031	0.166		Left Cheek	0.490	0.031	0.521
	Left Tilt	0.068	0.011	0.079		Left Tilt	0.267	0.011	0.278

The above tables represent a held to ear voice call with 5.8GHz WLAN.

Table 8.17 Simultaneous Transmission Summation for 2G&3G voice and 2.4GHz WLAN(Body-Worn)

Configuration	Mode	2G&3G SAR (W/Kg)	WIFI SAR	Σ SAR
Back	GSM850	0.755	0.231	0.986
Back	GSM1900	1.02	0.231	1.251
Back	WCDMA850	0.374	0.231	0.605
Back	WCDMA1900	0.712	0.231	0.943

The above tables represent a body worn voice call with 2.4GHz WLAN.

- End of page –

Table 8.18 Simultaneous Transmission Summation for 2G&3G voice and 5GHz WLAN(Body-Worn)

Configuration	Mode	2G&3G SAR (W/Kg)	5.2GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Configuration	Mode	2G&3G SAR (W/Kg)	5.3GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Back	GSM850	0.755	0.219	0.974	Back	GSM850	0.755	0.872	1.627
Back	GSM1900	1.02	0.219	1.239	Back	GSM1900	1.02	0.872	1.892
Back	WCDMA850	0.374	0.219	0.593	Back	WCDMA850	0.374	0.872	1.246
Back	WCDMA1900	0.712	0.219	0.931	Back	WCDMA1900	0.712	0.872	1.584
Configuration	**Mode**	**2G&3G SAR (W/Kg)**	**5.5GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**	**Configuration**	**Mode**	**2G&3G SAR (W/Kg)**	**5.8GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**
Back	GSM850	0.755	0.541	1.296	Back	GSM850	0.755	0.402	1.157
Back	GSM1900	1.02	0.541	1.561	Back	GSM1900	1.02	0.402	1.422
Back	WCDMA850	0.374	0.541	0.915	Back	WCDMA850	0.374	0.402	0.776
Back	WCDMA1900	0.712	0.541	1.296	Back	WCDMA1900	0.712	0.402	1.114

The above tables represent a body worn voice call with 5GHz WLAN.

Table 8.19 Simultaneous Transmission Summation for 2G&3G Data and 2.4GHz WLAN(Hotspot)

Simult Tx	Configuration	GPRS850 SAR(W/Kg)	2.4GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Simult Tx	Configuration	GPRS1900 SAR(W/Kg)	2.4GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)
Body SAR	Back	0.755	0.231	0.986	Body SAR	Back	1.02	0.231	1.251
	Front	0.231	0.03	0.261		Front	0.793	0.03	0.823
	Left	0.228	-	0.228		Left	0.535	-	0.535
	Right	0.281	0.135	0.416		Right	0.267	0.135	0.402
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.017	-	0.017		Bottom	0.475	-	0.475
Simult Tx	**Configuration**	**WCDMA850 SAR(W/Kg)**	**2.4GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**	**Simult Tx**	**Configuration**	**WCDMA1900 SAR(W/Kg)**	**2.4GHz WIFI SAR (W/Kg)**	**Σ SAR (W/Kg)**
Body SAR	Back	0.374	0.231	0.605	Body SAR	Back	0.712	0.231	0.943
	Front	0.120	0.03	0.15		Front	0.772	0.03	0.802
	Left	0.130	-	0.13		Left	0.567	-	0.567
	Right	0.167	0.135	0.302		Right	0.226	0.135	0.361
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.011	-	0.011		Bottom	0.328	-	0.328

Note :

1. Per FCC KDB Publication941225 D06, the edges with antennas more than 2.5cm are not required to be evaluated for SAR(”-“). The above tables represent a portable hotspot condition.

2. Refer to the partial report for 5GHz WLAN SAR testing.

Multiple Antenna/Transmission Information for GT-I9300

The separation between the main antenna and the Bluetooth and WLAN antennas is 87.27mm.

RF Conducted Power of Bluetooth Tx is 8.65 dBm.

RF Conducted Power of WLAN is 15.12 dBm.

Simultaneous Transmission Conclusion

Based on the output power, antenna separation distance, and Body SAR of the dominant transmitter, a stand-alone Bluetooth SAR test is not required while for WLAN it is required.

Simultaneous transmission SAR is not required because the SAR to peak location separation ratio is <0.3

Table 8.19 SAR to Peak Location Separation Ratio for GSM850 & 5.3GHz

Test Position	GSM850 (W/Kg)	5.3GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Distance (cm)	SPLSR
Back	0.755	0.872	1.627	8.4	0.194

Band	X (m)	Y (m)	Z (m)
GSM850	-0.062	0.128	-0.205
5.3GHz Wifi	-0.049	0.045	-0.206

Separation Distance = SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2

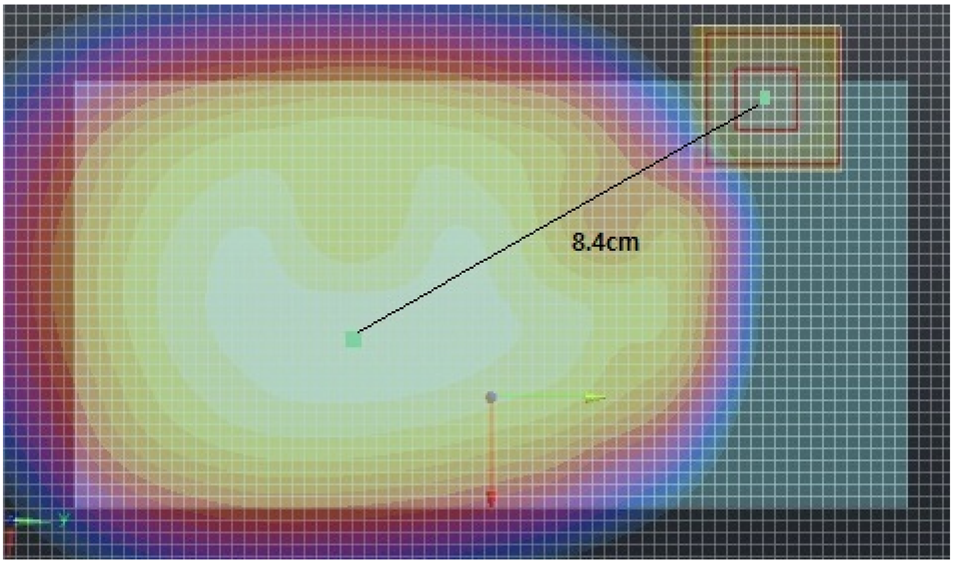

Figure8.1 Separaion Distance for GSM850 & 5.3GHz

Table 8.20 SAR to Peak Location Separation Ratio for GSM1900 & 5.3GHz

Test Position	GSM1900 (W/Kg)	5.3GHz WIFI SAR (W/Kg)	Σ SAR (W/Kg)	Distance (cm)	SPLSR
Back	1.02	0.872	1.892	10.9	0.174

Band	X (m)	Y (m)	Z (m)
GSM1900	-0.073	0.151	-0.205
5.3GHz Wifi	-0.049	0.045	-0.206

Separation Distance = SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

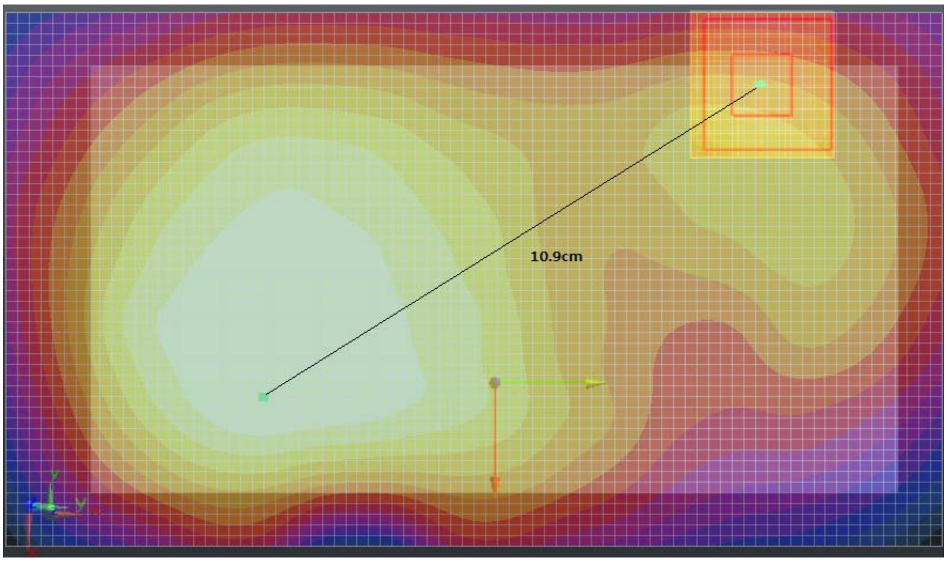

Figure8.2 Separaion Distance for GSM1900 & 5.3GHz

8.1 GSM850 Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End						
836.6	190	GSM850	32.52	32.51	Right	Cheek/Touch	Intenna	Standard	-0.004	**0.140**
836.6	190	GSM850	32.49	32.48	Right	Ear/Tilt 15°	Intenna	Standard	-0.199	0.082
836.6	190	GSM850	32.49	32.52	Left	Cheek/Touch	Intenna	Standard	0.019	0.119
836.6	190	GSM850	32.54	32.55	Left	Ear/Tilt 15°	Intenna	Standard	0.006	0.075
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ Manu. Test Codes ☒ Base Station Simulator
6. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

8.2 GPRS850 Body SAR Results

Frequency		Mode	Conducted		Separation Distance	Test Position	Antenna Type	Battery	Tx GPRS Slots	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End							
836.6	190	GPRS850	29.63	29.62	1.0 cm	Back	Intenna	Standard	2	0.119	0.376
836.6	190	GPRS850	28.61	28.63	1.0 cm	Back	Intenna	Standard	3	-0.017	0.450
836.6	190	GPRS850	29.62	29.62	1.0 cm	Back	Intenna	Standard	4	-0.032	**0.755**
836.6	190	GPRS850	29.61	29.64	1.0 cm	Front	Intenna	Standard	4	-0.008	0.231
836.6	190	GPRS850	29.59	29.58	1.0 cm	Left	Intenna	Standard	4	0.056	0.228
836.6	190	GPRS850	29.63	29.62	1.0 cm	Right	Intenna	Standard	4	-0.076	0.281
836.6	190	GPRS850	29.62	29.61	1.0 cm	Bottom	Intenna	Standard	4	-0136	0.017
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram					

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ With Holster ☒ Without Holster
6. Justification for reduced test configurations: This model supports GPRS CLASS "12" (4Tx) So the burst power and timing period is more than 2dB higher in GPRS mode than in GSM850 mode. Hence, the GSM850 mode was not measured.
7. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
8. Top Edge for the licensed transmitter was not tested since the antenna distance from the edge was greater than 2.5cm per FCC KDB Publication 941225 D06 guidance
9. 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.
10. 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 and front side configuration additionally shows body-worn compliance.

8.3 GSM1900 Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End						
1880	661	GSM1900	29.53	29.51	Right	Cheek/Touch	Intenna	Standard	0.154	0.231
1880	661	GSM1900	29.51	29.54	Right	Ear/Tilt 15°	Intenna	Standard	-0.007	0.153
1880	661	GSM1900	29.49	29.48	Left	Cheek/Touch	Intenna	Standard	0.044	**0.284**
1880	661	GSM1900	29.46	29.50	Left	Ear/Tilt 15°	Intenna	Standard	0.099	0.161
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ Manu. Test Codes ☒ Base Station Simulator
6. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

8.4 GPRS1900 Body SAR Results

Frequency		Mode	Conducted		Separation Distance	Test Position	Antenna Type	Battery	Tx GPRS Slots	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End							
1880	661	GPRS1900	27.21	27.17	1.0 cm	Back	Intenna	Standard	2	0.154	0.469
1880	661	GPRS1900	25.66	25.68	1.0 cm	Back	Intenna	Standard	3	-0.188	0.513
1880	661	GPRS1900	27.16	27.16	1.0 cm	Back	Intenna	Standard	4	-0.155	0.921
1850.2	512	GPRS1900	27.10	27.11	1.0 cm	Back	Intenna	Standard	4	-0.170	**1.02**
1909.8	810	GPRS1900	27.20	27.19	1.0 cm	Back	Intenna	Standard	4	0.069	0.828
1880	661	GPRS1900	27.14	27.15	1.0 cm	Front	Intenna	Standard	4	-0.191	0.793
1880	661	GPRS1900	27.11	27.15	1.0 cm	Left	Intenna	Standard	4	-0.192	0.535
1880	661	GPRS1900	27.15	27.14	1.0 cm	Right	Intenna	Standard	4	0.007	0.267
1880	661	GPRS1900	27.16	27.14	1.0 cm	Bottom	Intenna	Standard	4	-0.099	0.475
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram					

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ With Holster ☒ Without Holster
6. Justification for reduced test configurations: This model supports GPRS CLASS "12" (4Tx) So the burst power and timing period is more than 2dB higher in GPRS mode than in GSM1900 mode. Hence, the GSM1900 mode was not measured.
7. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
8. Top Edge for the licensed transmitter was not tested since the antenna distance from the edge was greater than 2.5cm per FCC KDB Publication 941225 D06 guidance
9. 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.
10. 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.

8.5 WCDMA850 Head SAR Results

Frequency		Mode	Conducted Power		Side	Test Position	Antenna Type	Battery	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End						
836.6	4183	WCDMA850	22.56	22.54	Right	Cheek/Touch	Intenna	Standard	0.077	0.129
836.6	4183	WCDMA850	22.54	22.53	Right	Ear/Tilt 15°	Intenna	Standard	-0.139	0.039
836.6	4183	WCDMA850	22.56	22.54	Left	Cheek/Touch	Intenna	Standard	0.133	**0.135**
836.6	4183	WCDMA850	22.53	22.52	Left	Ear/Tilt 15°	Intenna	Standard	0.022	0.068
ANSI / IEEE C95.1 1992 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure / General Population**						**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ Manu. Test Codes ☒ Base Station Simulator
6. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
7. WCDMA mode was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01. HSPA SAR was not required since the average output 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.

8.6 WCDMA850 Body SAR Results

Frequency		Mode	Conducted Power		Separation Distance	Test Position	Antenna Type	Battery	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End						
836.6	4183	WCDMA850	22.54	22.56	1.0 cm	Back	Intenna	Standard	-0.191	**0.374**
836.6	4183	WCDMA850	22.52	22.51	1.0 cm	Front	Intenna	Standard	0.009	0.120
836.6	4183	WCDMA850	22.52	22.52	1.0 cm	Left	Intenna	Standard	0.061	0.130
836.6	4183	WCDMA850	22.54	22.54	1.0 cm	Right	Intenna	Standard	-0.189	0.167
836.6	4183	WCDMA850	22.56	22.54	1.0 cm	Bottom	Intenna	Standard	-0.193	0.011
ANSI / IEEE C95.1 1992 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure / General Population**						**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ With Holster ☒ Without Holster
6. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
7. Top Edge for the licensed transmitter was not tested since the antenna distance from the edge was greater than 2.5cm per FCC KDB Publication 941225 D06 guidance
8. 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.
9. 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.
10. WCDMA mode was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01. HSPA SAR was not required since the average output 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.

8.7 WCDMA1900 Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End						
1880	9400	WCDMA1900	22.53	22.57	Right	Cheek/Touch	Intenna	Standard	-0.110	0.371
1880	9400	WCDMA1900	22.57	22.57	Right	Ear/Tilt 15°	Intenna	Standard	0.084	0.319
1880	9400	WCDMA1900	22.53	22.52	Left	Cheek/Touch	Intenna	Standard	0.040	**0.490**
1880	9400	WCDMA1900	22.53	22.56	Left	Ear/Tilt 15°	Intenna	Standard	-0.010	0.267
ANSI / IEEE C95.1 1992 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure / General Population**						**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ Manu. Test Codes ☒ Base Station Simulator
6. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
7. WCDMA mode was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01. HSPA SAR was not required since the average output 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.

8.8 WCDMA1900 Body SAR Results

Frequency		Mode	Conducted		Separation Distance	Test Position	Antenna Type	Battery	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End						
1880	9400	WCDMA1900	22.52	22.56	1.0 cm	Back	Intenna	Standard	0.022	0.712
1880	9400	WCDMA1900	22.54	22.56	1.0 cm	Front	Intenna	Standard	-0.043	**0.772**
1880	9400	WCDMA1900	22.53	22.54	1.0 cm	Left	Intenna	Standard	-0.029	0.567
1880	9400	WCDMA1900	22.56	22.54	1.0 cm	Right	Intenna	Standard	0.004	0.226
1880	9400	WCDMA1900	22.60	22.58	1.0 cm	Bottom	Intenna	Standard	-0.129	0.328
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ With Holster ☒ Without Holster
6. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
7. Top Edge for the licensed transmitter was not tested since the antenna distance from the edge was greater than 2.5cm per FCC KDB Publication 941225 D06 guidance
8. 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.
9. 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.
10. WCDMA mode was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01. HSPA SAR was not required since the average output 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.

8.9 2.4GHz 802.11b Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	Data Rate (Mbps)	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End							
2462	11	IEEE 802.11b	13.75	13.73	Right	Cheek/Touch	Intenna	Standard	1	0.065	0.068
2462	11	IEEE 802.11b	13.76	13.73	Right	Ear/Tilt 15°	Intenna	Standard	1	0.064	0.052
2462	11	IEEE 802.11b	13.71	13.74	Left	Cheek/Touch	Intenna	Standard	1	0.159	**0.138**
2462	11	IEEE 802.11b	13.79	13.81	Left	Ear/Tilt 15°	Intenna	Standard	1	0.033	0.100
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram					

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☒ Manu. Test Codes ☐ Base Station Simulator
7. Justification for reduced test configurations for WIFI channels per KDB 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b mode.
8. WLAN Transmission was verified using a spectrum analyzer.
9. Since the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6W/Kg and the 1g averaged SAR is <0.8W/Kg, SAR testing on other default (and corresponding required) channels was not required.

8.10 2.4GHz 802.11b Body SAR Results

Frequency		Mode	Conducted		Separation Distance	Test Position	Antenna Type	Battery	Data Rate (Mbps)	Drift (dB)	SAR Level (W/kg)
MHz	Ch		Start	End							
2462	11	IEEE 802.11b	13.74	13.76	1.0 cm	Back	Intenna	Standard	1	-0.113	**0.231**
2462	11	IEEE 802.11b	13.75	13.76	1.0 cm	Front	Intenna	Standard	1	-0.030	0.030
2462	11	IEEE 802.11b	13.75	13.77	1.0 cm	Right	Intenna	Standard	1	0.144	0.135
2462	11	IEEE 802.11b	13.72	13.74	1.0 cm	Top	Intenna	Standard	1	0.169	0.023
ANSI / IEEE C95.1 1992 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure / General Population**						**1.6W/kg (mW/g)** averaged over 1 gram					

NOTES:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plot.
3. Liquid tissue depth is 15.2 ± 0.2cm
4. Battery is fully charged for all readings.
5. Test Configuration ☐ With Holster ☒ Without Holster
6. Justification for reduced test configurations for WIFI channels per KDB 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b mode.
7. Left and Bottom edge for WLAN transmitter were not tested since the antenna distance from the edge was greater than 2.5cm per FCC KDB Publication 941225 D06 guidance
8. WLAN Transmission was verified using a spectrum analyzer.
9. Since the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6W/Kg and the 1g averaged SAR is <0.8W/Kg, SAR testing on other default (and corresponding required) channels was not required.

9. CONCLUSION

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The test 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 innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

The highest reported SAR values are as follows:
GSM850: Head: 0.140W/Kg : Body-worn: 0.755W/Kg : Hotspot: 0.755 W/Kg
GSM1900: Head: 0.284W/Kg : Body-worn: 1.02W/Kg : Hotspot: 1.02 W/Kg
WCDMA850: Head: 0.135W/Kg : Body-worn: 0.374W/Kg : Hotspot: 0.374W/Kg
WCDMA1900: Head: 0.490W/Kg : Body-worn: 0.772W/Kg : Hotspot: 0.772W/Kg
2.4GHz WLAN: Head: 0.138W/Kg : Body-worn: 0.231W/Kg : Hotspot: 0.231W/Kg

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APPENDIX A

SAR Definition

Specific Absorption Rate (SAR) 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 (p). It is also defined as the rate of RF energy absorption pet unit mass at a point in an absorbing body (see Fig. A.1) .

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{pdv}\right)$$

Figure A.1 SAR Mathematical Equation

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

$$\text{SAR} = \sigma E^2 / p$$

Where :

σ = conductivity of the tissue-simulant material (S/m)

p = mass density of the tissue-simulant material (kg/m^3)

E = Total RMS electric field strength (V/m)

Note: The primary factors that control rate or energy absorption were found to be the wavelength of the incident field in relations 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.

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APPENDIX B

Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in **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** with an accuracy better than +/-10%. The spherical isotropy was evaluated with the procedure described in **K. Pokovic, T.Schmid, N. Kuster, *E-field Probe with improved isotropy in brain simulating liquids*, Proceedings of the ELMAR, Zadar, June 23-25, 1996, pp. 172-175** and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz (see Fig. B.1), and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

Temperature Assessment

E-field temperature correlation calibration is performed in a flat phantom flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe (see Fig. B.2).

$$\text{SAR} = C\frac{\Delta T}{\Delta t}$$

where:

Δt = exposure time (30 seconds)

C = heat capacity of tissue (brain or muscle).

ΔT = temperature increase due to RF exposure.

SAR is proportional to ΔT/ Δt, the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E-field;

$$\text{SAR} = \frac{|E|^2 \cdot \sigma}{p}$$

where:

σ = simulated tissue conductivity

p = Tissue density (1.25 g/cm^3 for brain tissue)

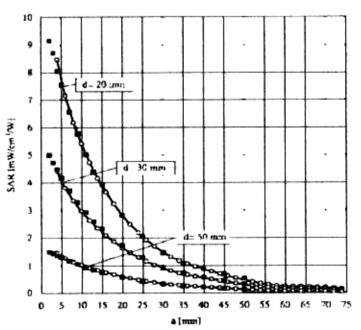

Figure B.1. E-Field and Temperature measurements at 900MHz

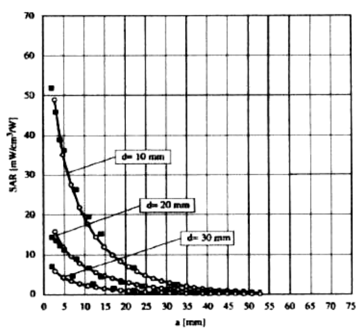

Figure B.2. E-Field and temperature measurements at 1.9GHz

APPENDIX C

ANSI/IEEE C95.1 – 2005 RF EXPOSURE LIMITS

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.

Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is the 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 C.1 Safety Limits for Partial Body Exposure

	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)
SPATIAL PEAK SAR[1] Brain	1.60	8.00
SPATIAL PEAK SAR[2] Whole Body	0.08	0.40
SPATIAL PEAK SAR[3] Hands,Feet,Ankles, Wrists	4.00	20.00

[1] The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as 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.