SAR TEST REPORT

(Mobile Phone)

REPORT NO.: SA110705C18-1

MODEL NO.: PH98100

FCC ID: NM8PH98100

RECEIVED: Jun. 27, 2011

TESTED: Jul. 01 ~ Jul. 07, 2011
Aug. 08 ~ Aug. 09, 2011

ISSUED: Aug. 11, 2011

APPLICANT: HTC Corporation

ADDRESS: 6-3, Baoquang Rd., Xindian City, Taipei County, Taiwan

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	NA	Aug. 11, 2011

1. CERTIFICATION

PRODUCT:	Smartphone
MODEL NO.:	PH98100
FCC ID:	NM8PH98100
BRAND:	hTC
APPLICANT:	HTC Corporation
TESTED:	Jul. 01 ~ Jul. 07, 2011 Aug. 08 ~ Aug. 09, 2011
STANDARDS:	**FCC Part 2 (Section 2.1093)** **FCC OET Bulletin 65 Supplement C (01-01)** **IEEE 1528-2003** **RSS-102 Issue 4 (2010-03)**

The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report.

PREPARED BY : Pettie Chen , **DATE:** Aug. 11, 2011

Pettie Chen / Specialist

APPROVED BY : Gary Chang , **DATE:** Aug. 11, 2011

Gary Chang / Technical Manager

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

EUT	Smartphone
MODEL NO.	PH98100
FCC ID	NM8PH98100
CLASSIFICATION	Portable device, production unit
UPLINK MODULATION TYPE	CDMA2000 : QPSK, OQPSK, HPSK LTE : QPSK, 16QAM
TX FREQUENCY RANGE	CDMA BC0 : 824.7 MHz ~ 848.31 MHz CDMA BC1 : 1851.25 MHz ~ 1908.75 MHz LTE Band 13 : 777 MHz ~ 787 MHz
MAXIMUM CONDUCTED OUTPUT POWER	CDMA2000 BC0 : 23.72 dBm CDMA2000 BC1 : 23.75 dBm LTE Band 13 : 22.96 dBm
ANTENNA TYPE	Fixed internal antenna
DATA CABLE	Refer to Note as below
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Refer to Note as below

NOTE:

1. The EUT were powered by the following adapters, battery & accessories:

NO.	PRODUCT	BRAND	MODEL	DESCRIPTION
1	Power Adapter	hTC	TC U250	I/P: 100-240Vac, 50-60Hz, 200mA O/P: 5Vdc, 1A Manufacturer: Emerson
2			TC U250	I/P: 100-240Vac, 50-60Hz, 200mA O/P: 5Vdc, 1A Manufacturer: Delta
3	Battery 1	hTC	BH98100, BTR6425B	Rating: 3.8Vdc, 1620mAh, 6.15Whr
4	Extend Battery 2	hTC	BG05200, BTE6425B	Rating: 3.7Vdc, 2750mAh, 10.17Whr
5	USB cable	hTC	DC T500	1.25m shielded cable without core
6	Earphone	hTC	RC E160	1.25m shielded cable without core
7	beats earphone	hTC	RC E180	1.30m shielded cable without core

2. MEID: 99000033******.
3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 SUMMARY OF PEAK SAR RESULTS

STANDALONE SAR			
Band		Position	SAR_{1g} (W/kg)
Ant-1 (1xRTT)	CDMA2000 BC0	Head	0.518
		Body (Body Worn)	0.553
		Body (Hotspot)	0.553
	CDMA2000 BC1	Head	1.07
		Body (Body Worn)	1.04
		Body (Hotspot)	1.04
Ant-2 (EVDO)	CDMA2000 BC0	Head	1.25
		Body (Body Worn)	1.01
		Body (Hotspot)	1.12
	CDMA2000 BC1	Head	0.605
		Body (Body Worn)	0.27
		Body (Hotspot)	0.547
Ant-3 (LTE)	LTE Band 13	Head	0.756
		Body (Body Worn)	0.615
		Body (Hotspot)	0.644

SIMULTANEOUS TRANSMISSION SAR			
Band	Test Position	Channel	Multi-Band SAR_{1g} (W/kg)
CDMA2000 BC0 EVDO	Body (Left Edge)	777	1.4
CDMA2000 BC1 1x		600	
802.11b		6	

2.3 TEST CONFIGURATION

The EUT is a dual transmitter Simultaneous Voice and Data device that contains two independent WWAN transmitters with the capabilities listed in Table 2.1. The first transmitter supports a CDMA2000 1x call (e.g. voice, SMS) and the second transmitter supports a CDMA2000 EVDO or LTE data call. A simultaneous CDMA 1x voice and CDMA EVDO data connection is referred to as “SVDO” while a simultaneous CDMA 1x voice and LTE data connection is referred to as “SVLTE”. The transmitters are independent in respect to the RF chains as each transmitter has dedicated RF circuitry (PA, RF filtering) and a unique transmit antenna. The device also contains an additional antenna associated with receiver diversity or unlicensed transmitters. The LTE UL MIMO configuration is 1x2 (1 UL antenna and 2 DL RX antennas).

Although the RF circuits are independent for both transmitters, the chipset solution incorporated SVDO/SVLTE implementation does include electrical connections between the voice and data transmitters such that the device can coordinate the transmit power of both transmitters. That said, the transmitters operate independently in the sense that they independently support voice or data connection without interaction between the modems or signaling from the WWAN network.

Table 2.1 EUT Technology Support

Mode	WWAN Technology	Supported Frequency Band(s) (MHz)	Channel BW (MHz)
Voice	CDMA2000 1x	Band Class 0: 824-848 Band Class I: 1850-1910	1.23 MHz 1.25 MHz
Data	CDMA2000 1xEvDO Rev.A	Band Class 0: 824-848 Band Class I: 1850-1910	1.23 MHz 1.25 MHz
Data	LTE	Band 13 (Upper 700 MHz): 777-787	10 MHz
Data	802.11a/b/g/n	2.45 GHz / 5GHz	40 MHz max

Table 2.2 Definition of Antennas

Antenna	Antenna Use	Technologies	TX Bands
1	Voice 1x TX/ RX+ LTE diversity (RX only)	1x	850/1900
2	EVDO Data TX/RX	EVDO	850/1900
3	LTE Data TX/RX	LTE	700
4	WLAN/BT	802.11 + Bluetooth	2400 MHz / 5GHz

Confirming the LTE transmitter follows 3GPP standards, is category 3, BW 10MHz, Band 13, and supports QPSK / 16QAM modulations. Tested per 3GPP 36.521 maximum transmit procedures for both QPSK / 16QAM.

Table 2.3 Simultaneous Transmission Possibilities

Simultaneous TX Combination	Configuration	Head SAR	Body SAR
1	CDMA850 Voice + DO850 Data + WLAN/BT	Yes	Body-Worn: Yes Hotspot: Yes
2	CDMA850 Voice + DO1900 Data + WLAN/BT	Yes	Body-Worn: Yes Hotspot: Yes
3	CDMA850 Voice + LTE700 Data + WLAN/BT	Yes	Body-Worn: Yes Hotspot: Yes
4	CDMA1900 Voice + DO850 Data + WLAN/BT	Yes	Body-Worn: Yes Hotspot: Yes
5	CDMA1900 Voice + DO1900 Data + WLAN/BT	Yes	Body-Worn: Yes Hotspot: Yes
6	CDMA1900 Voice + LTE700 Data + WLAN/BT	Yes	Body-Worn: Yes Hotspot: Yes
7	CDMA850 Voice + DO850 Data	Yes	Body-Worn: Yes Hotspot: No
8	CDMA850 Voice + DO1900 Data	Yes	Body-Worn: Yes Hotspot: No
9	CDMA850 Voice + LTE700 Data	Yes	Body-Worn: Yes Hotspot: No
10	CDMA1900 Voice + DO850 Data	Yes	Body-Worn: Yes Hotspot: No
11	CDMA1900 Voice + DO1900 Data	Yes	Body-Worn: Yes Hotspot: No
12	CDMA1900 Voice + LTE700 Data	Yes	Body-Worn: Yes Hotspot: No
13	CDMA850 Voice + WLAN/BT	Yes	Body-Worn: Yes Hotspot: No
14	CDMA1900 Voice + WLAN/BT	Yes	Body-Worn: Yes Hotspot: No
15	DO850 Data + WLAN/BT	No	Body-Worn: Yes Hotspot: Yes
16	DO1900 Data + WLAN/BT	No	Body-Worn: Yes Hotspot: Yes
17	LTE700 Data + WLAN/BT	No	Body-Worn: Yes Hotspot: Yes

LTE Maximum Power Reduction in accordance with 3GPP 36.101: Power reduction in accordance to 3GPP is active all times during LTE operation.

Modulation	Channel bandwidth / Transmission bandwidth configuration (RB)	MPR (dB)
	10MHz	
QPSK	> 12	1
16QAM	<=12	1
16QAM	> 12	2

Note: MPR is according to the standard and implemented in the circuit (mandatory).

In addition, the device is compliant with A-MPR requirements defined in 36.101 section 6.2.4 that may be required to meet 3GPP Adjacent Channel Leakage Ratio (“ACLR”) requirements. A-MPR was disabled for all FCC compliance testing.

1. In the SVDO modes, CDMA 1x and EV DO can transmit at maximum power level simultaneously.
2. In the SVLTE modes, CDMA 1x and LTE can transmit at maximum power level simultaneously.

SAR measurements were tested under maximum power level for CDMA 1x, CDMA EVDO and LTE technologies.

The WLAN and BT cannot transmit simultaneously, so there is no co-location test requirement for WLAN and BT.

The device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

For WWAN SAR testing, the DUT is in CDMA2000 or LTE link mode, and the crest factor is 1.

This device supports WiFi hotspot function, so body SAR was tested under 1 cm for the surfaces/slide edges where a transmitting antenna is within 2.5 cm from the edge.

2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, this product must comply with the requirements of the following standards:

FCC 47 CFR Part 2 (2.1093)

FCC OET Bulletin 65, Supplement C (01- 01)

RSS-102 Issue 4 (2010-03)

IEEE 1528-2003

FCC KDB 648474 D01 v01r05

FCC KDB 941225 D01 v02

FCC KDB 941225 D05 v01

FCC KDB 941225 D06 v01

All test items have been performed and recorded as per the above standards.

2.5 GENERAL INOFRMATION OF THE SAR SYSTEM

DASY5 (**Software DASY52, Version 52.6**) consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY5 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

EX3DV4 ISOTROPIC E-FIELD PROBE

CONSTRUCTION	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
FREQUENCY	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
DIRECTIVITY	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
DYNAMIC RANGE	10 μW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μW/g)
DIMENSIONS	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
APPLICATION	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%.

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference "APPENDIX D" for the Calibration Certification Report.

TWIN SAM V4.0

CONSTRUCTION	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 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. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
SHELL THICKNESS	2 ± 0.2 mm
FILLING VOLUME	Approx. 25 liters
DIMENSIONS	Height: 810 mm; Length: 1000 mm; Width: 500 mm

SYSTEM VALIDATION KITS:

CONSTRUCTION	Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor
CALIBRATION	Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions
FREQUENCY	750, 835, 1900
RETURN LOSS	> 20 dB at specified validation position
POWER CAPABILITY	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
OPTIONS	Dipoles for other frequencies or solutions and other calibration conditions upon request

DEVICE HOLDER FOR SAM TWIN PHANTOM

CONSTRUCTION The device holder for the Mobile Phone device is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The 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. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered. The device holder for the portable device makes up of the polyethylene foam. The dielectric parameters of material close to the dielectric parameters of the air.

DATA ACQUISITION ELECTRONICS

CONSTRUCTION The data acquisition electronics (DAE3) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplex, 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 as well as an optical uplink for commands and the clock. The mechanical probe is mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

2.6 TEST EQUIPMENT

FOR SAR MEASURENENT

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	SAM Phantom	S & P	QD000 P40 CA	TP-1485	NA	NA
2	Signal Generator	Agilent	E8257C	MY43320668	Dec. 27, 2010	Dec. 26, 2011
3	E-Field Probe	S & P	EX3DV4	3650	Jan. 24, 2011	Jan. 23, 2012
	E-Field Probe	S & P	EX3DV4	3632	Jan. 19, 2011	Jan. 18, 2012
4	DAE	S & P	DAE 3	510	Oct. 04, 2010	Oct. 03, 2011
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D750V3	1013	May 25, 2011	May 24, 2012
			D835V2	4d021	Mar. 23, 2011	Mar. 22, 2012
			D1900V2	5d022	Jan. 26, 2011	Jan. 25, 2012

NOTE: Before starting the measurement, all test equipment shall be warmed up for 30min.

FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E8358A	US41480538	Dec. 30, 2010	Dec. 29, 2011
2	Dielectric Probe	Agilent	85070D	US01440176	NA	NA

NOTE:

1. Before starting, all test equipment shall be warmed up for 30min.
2. The tolerance (k=1) specified by Agilent for general dielectric measurements, deriving from inaccuracies in the calibration data, analyzer drift, and random errors, are usually ±2.5% and ±5% for measured permittivity and conductivity, respectively. However, the tolerances for the conductivity is smaller for material with large loss tangents, i.e., less than ±2.5% (k=1). It can be substantially smaller if more accurate methods are applied.

2.7 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY5 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the micro-volt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters:	- Frequency	F
	- Crest factor	Cf
Media parameters:	- Conductivity	σ
	- Density	ρ

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \bullet \frac{cf}{dcp_i}$$

V_i	=compensated signal of channel i	(i = x, y, z)
U_i	=input signal of channel I	(i = x, y, z)
Cf	=crest factor of exciting field	(DASY parameter)
dcp_i	=diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\text{E-fieldprobes: } E_i = \sqrt{\frac{V_1}{Norm_i \cdot ConvF}}$$

$$\text{H-fieldprobes: } H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

V_i	=compensated signal of channel I	(i = x, y, z)
$Norm_i$	=sensor sensitivity of channel i µV/(V/m)2 for E-field Probes	(i = x, y, z)
ConvF	= sensitivity enhancement in solution	
a_{ij}	= sensor sensitivity factors for H-field probes	
F	= carrier frequency [GHz]	
E_i	= electric field strength of channel i in V/m	
H_i	= magnetic field strength of channel i in A/m	

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

SAR	= local specific absorption rate in mW/g
E_{tot}	= total field strength in V/m
σ	= conductivity in [mho/m] or [Siemens/m]
ρ	= equivalent tissue density in g/cm3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid. The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1 g and 10 g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within -2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 7x7x9 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The routines are verified and optimized for the grid dimensions used in these cube measurements. The first procedure is an extrapolation (incl. boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

2.8 DESCRIPTION OF SUPPORT UNITS

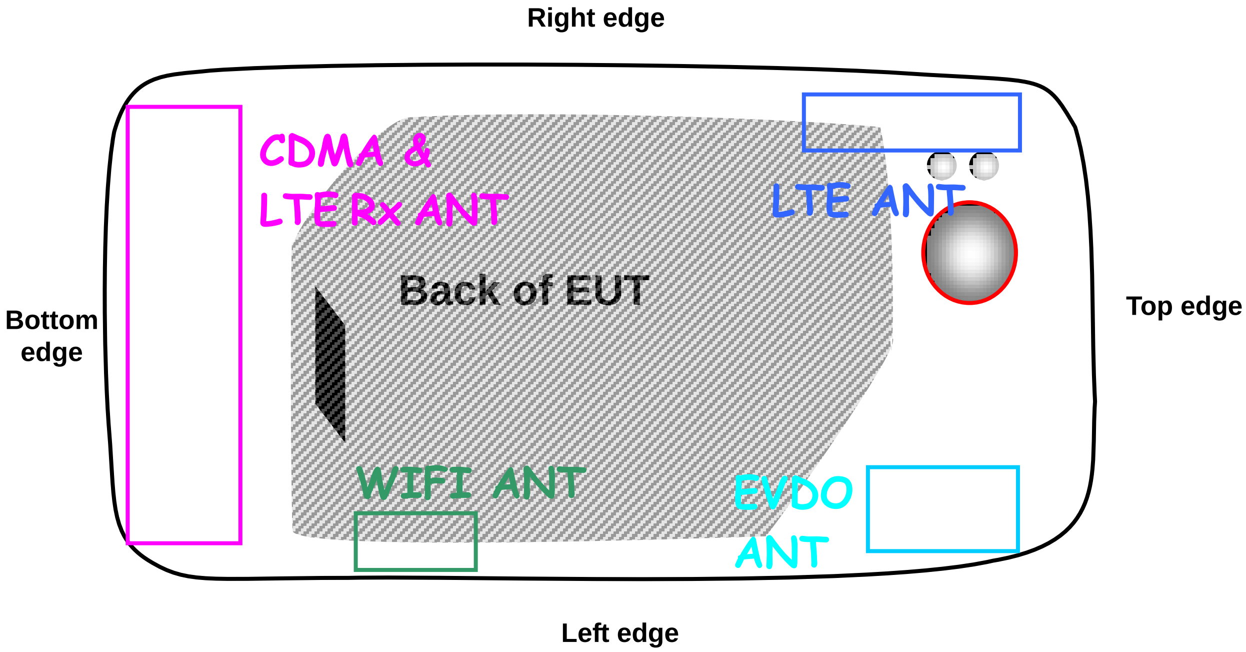
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.
1	Universal Radio Communication Tester	R&S	CMU200	101372
2	Universal Radio Communication Tester	Anritsu	MT8820C	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

3. DESCRIPTION OF ANTENNA LOCATION



<Evaluation for Hotspot SAR>

CDMA mode:

Top side is not tested since the distance between antenna and top edge is > 2.5 cm.

EVDO mode:

Right edge and bottom edge are not tested since the distance between antenna and right edge and bottom edge are > 2.5 cm.

LTE mode:

Left edge and bottom edge are not tested since the distance between antenna and left edge and bottom edge are > 2.5 cm.

4. DESCRIPTION OF TEST POSITION

4.1 DESCRIPTION OF TEST POSITION

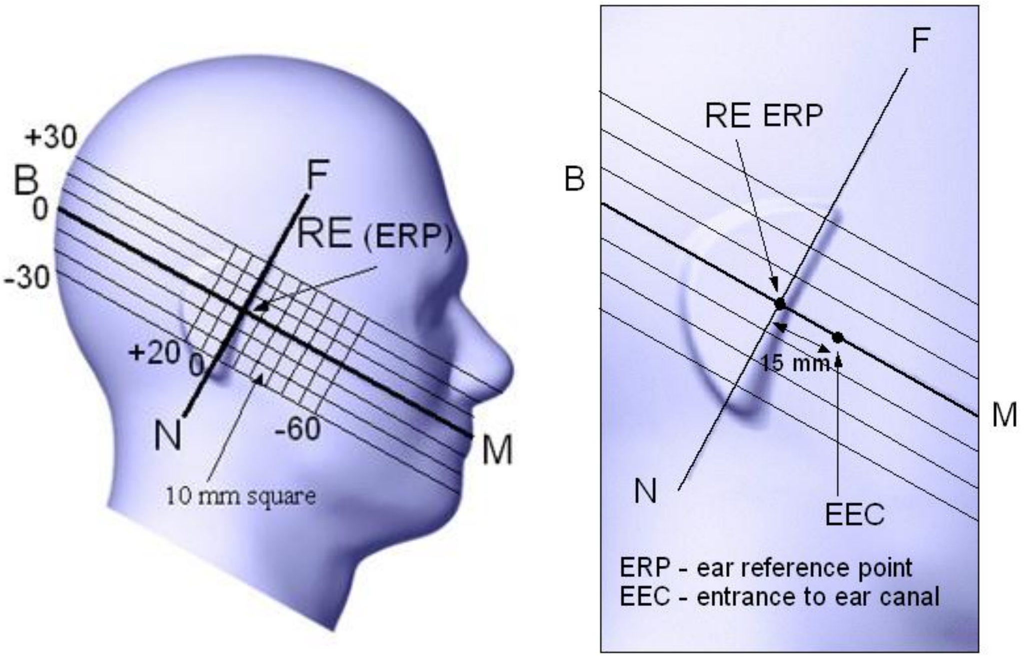


FIGURE 3.1

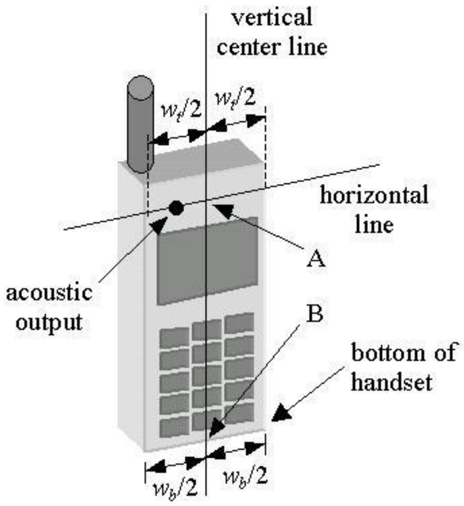


FIGURE 3.1a

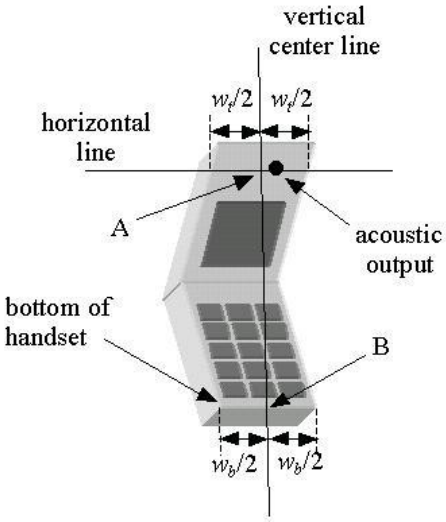
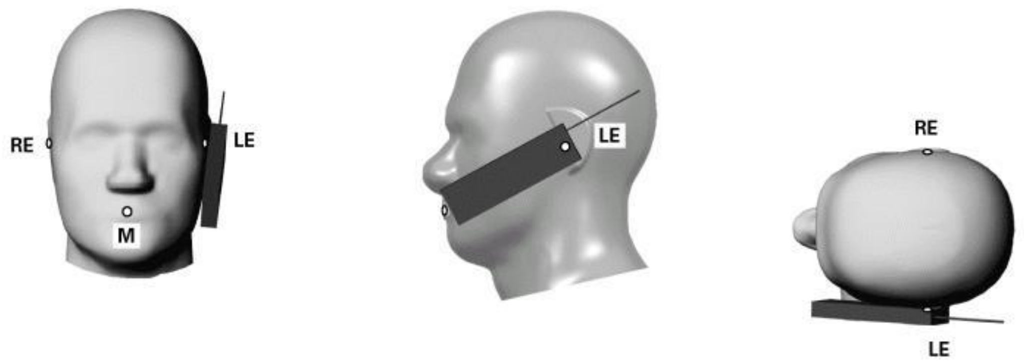


FIGURE 3.1b

4.1.1 TOUCH/CHEEK TEST POSITION

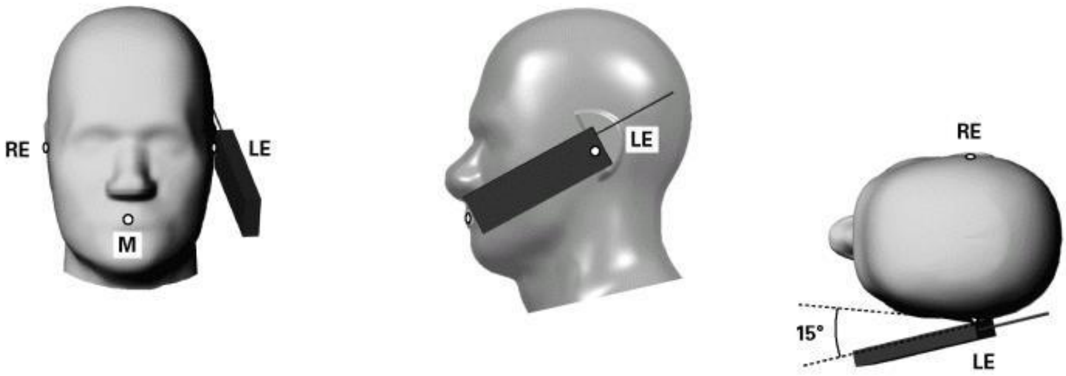
The head position in Figure 3.1, the ear reference points ERP are 15mm above entrance to ear canal along the B-M line. The line N-F (Neck-Front) is perpendicular to the B-M (Back Mouth) line. The handset device in Figure 3.1a and 3.1b, The vertical centerline pass through two points on the front side of handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A) and the midpoint of the width Wb of the bottom of the handset (point B). The vertical centerline is perpendicular to the horizontal line and pass through the center of the acoustic output. The point A touches the ERP and the vertical centerline of the handset is parallel to the B-M line. While maintaining the point A contact with the ear(ERP), rotate the handset about the line NF until any point on handset is in contact with the cheek of the phantom



TOUCH/CHEEK POSITION FIGURE

4.1.2 TILT TEST POSITION

Adjust the device in the cheek position. While maintaining a point of the handset contact in the ear, move the bottom of the handset away from the mouth by an angle of 15 degrees.



TILT POSITION FIGURE

4.1.3 BODY-WORN CONFIGURATION

The handset device attached the belt clip or the holster. The keypad face of the handset is against with the bottom of the flat phantom face and the bottom of the keypad face contact to the bottom of the flat phantom.

When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only accessory that dictates the closest spacing to the body must be tested.

If the device supports WiFi hotspot function, the body SAR will test under 1 cm for the surfaces/slide edges where a transmitting antenna is within 2.5 cm from the edge.

5. RECIPES FOR TISSUE SIMULATING LIQUIDS

For the measurement of the field distribution inside the SAM phantom, the phantom must be filled with 25 litters of tissue simulation liquid.

The following ingredients are used：

- **WATER-** Deionized water (pure H20), resistivity _16 M - as basis for the liquid
- **SUGAR-** Refined sugar in crystals, as available in food shops - to reduce relative permittivity
- **SALT-** Pure NaCl - to increase conductivity
- **CELLULOSE-** Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20_C),
  CAS # 54290 - to increase viscosity and to keep sugar in solution
- **PRESERVATIVE-** Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS # 55965-84-9 - to prevent the spread of bacteria and molds
- **DGMBE-** Diethylenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS # 112-34-5 - to reduce relative permittivity

THE RECIPES FOR 750MHZ SIMULATING LIQUID TABLE

INGREDIENT	HEADSIMULATING LIQUID 750MHz (HSL-750)	BODY SIMULATING LIQUID 750MHz (MSL-750)
Water	41%	52%
Sugar	57%	47%
Cellulose	0.3%	0%
Salt	1.5%	0.9%
Preventol	0.2%	0.1%

THE RECIPES FOR 835MHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID 835MHz (HSL-835)	MUSCLE SIMULATING LIQUID 835MHz (MSL-835)
Water	40.28%	50.07%
Cellulose	2.41%	NA
Salt	1.38%	0.94%
Preventtol D-7	0.18%	0.09%
Sugar	57.97%	48.2%
Dielectric Parameters at 22℃	f = 835MHz ε= 41.5 ± 5% σ= 0.9 ± 5% S/m	f= 835MHz ε= 55.2 ± 5% σ= 0.97 ± 5% S/m

THE RECIPES FOR 1900MHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID 1900MHz (HSL-1900)	MUSCLE SIMULATING LIQUID 1900MHz (MSL-1900)
Water	55.24%	70.16%
DGMBE	44.45%	29.44%
Salt	0.306%	00.39%
Dielectric Parameters at 22℃	f= 1900MHz ε= 40.0 ± 5% σ= 1.40 ± 5% S/m	f= 1900MHz ε= 53.3 ± 5% σ= 1.52 ± 5% S/m

Testing the liquids using the Agilent Network Analyzer E8358A and Agilent Dielectric Probe Kit 85070D.The testing procedure is following as

1. Turn Network Analyzer on and allow at least 30 min. warm up.
2. Mount dielectric probe kit so that interconnecting cable to Network Analyzer will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature (±1°).
4. Set water temperature in Agilent-Software (Calibration Setup).
5. Perform calibration.
6. Validate calibration with dielectric material of known properties (e.g. polished ceramic slab with >8mm thickness ε'=10.0, ε''=0.0). If measured parameters do not fit within tolerance, repeat calibration (±0.2 for ε': ±0.1 for ε'').
7. Conductivity can be calculated from ε'' by $\sigma = \omega \varepsilon_0 \varepsilon'' = \varepsilon'' f\ [GHz] / 18$.
8. Measure liquid shortly after calibration. Repeat calibration every hour.

9. Stir the liquid to be measured. Take a sample (~50ml) with a syringe from the center of the liquid container.
10. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
11. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
12. Perform measurements.
13. Adjust medium parameters in DASY5 for the frequencies necessary for the measurements ('Setup Config', select medium (e.g. Brain 900 MHz) and press 'Option'-button.

Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900 MHz).

FOR SIMULATING LIQUID

LIQUID TYPE		HSL-750			
SIMULATING LIQUID TEMP.		21.6			
TEST DATE		Jul. 05, 2011			
TESTED BY		Morrison Huang			
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**	**LIMIT(%)**
750.0	Permittivity (ε)	41.94	43.38	3.43	±5
782.0		41.78	43.12	3.20	
750.0	Conductivity (σ) S/m	0.89	0.88	-1.12	
782.0		0.9	0.90	0.00	

LIQUID TYPE	HSL-750				
SIMULATING LIQUID TEMP.	22.4				
TEST DATE	Aug. 09, 2011				
TESTED BY	Morrison Huang				
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
750.0	Permittivity (ε)	41.94	43.12	2.74	±5
782.0		41.78	42.89	2.59	
750.0	Conductivity (σ) S/m	0.89	0.86	-3.49	
782.0		0.9	0.88	-2.27	

LIQUID TYPE	MSL-750				
SIMULATING LIQUID TEMP.	21.7				
TEST DATE	Jul. 06, 2011				
TESTED BY	Morrison Huang				
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
750.0	Permittivity (ε)	55.53	54.73	-1.44	±5
782.0		55.41	54.41	-1.80	
750.0	Conductivity (σ) S/m	0.96	0.97	1.04	
782.0		0.97	0.99	2.06	

LIQUID TYPE	MSL-750				
SIMULATING LIQUID TEMP.	22.4				
TEST DATE	Aug. 09, 2011				
TESTED BY	Morrison Huang				
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
750.0	Permittivity (ε)	55.53	54.42	-2.00	±5
782.0		55.41	54.13	-2.31	
750.0	Conductivity (σ) S/m	0.96	0.94	-2.08	
782.0		0.97	0.96	-1.03	

LIQUID TYPE		HSL-835		
SIMULATING LIQUID TEMP.		21.5		
TEST DATE		Jul. 01, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
824.7	Permittivity (ε)	41.55	42.99	3.47
835.0		41.50	42.88	3.33
836.5		41.50	42.81	3.16
848.3		41.50	42.69	2.87
824.7	Conductivity (σ) S/m	0.90	0.90	0.00
835.0		0.90	0.91	1.11
836.5		0.90	0.92	2.22
848.3		0.91	0.93	2.20

LIQUID TYPE		HSL-835		
SIMULATING LIQUID TEMP.		22.1		
TEST DATE		Aug. 08, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
824.7	Permittivity (ε)	41.55	42.84	3.10
835.0		41.50	42.63	2.72
836.5		41.50	42.51	2.43
848.3		41.50	42.44	2.27
824.7	Conductivity (σ) S/m	0.90	0.90	0.00
835.0		0.90	0.90	0.00
836.5		0.90	0.91	1.11
848.3		0.91	0.92	1.10

LIQUID TYPE		MSL-835		
SIMULATING LIQUID TEMP.		21.2		
TEST DATE		Jul. 02, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
824.7	Permittivity (ε)	55.24	57.05	3.28
835.0		55.20	56.82	2.93
836.5		55.20	56.75	2.81
848.3		55.16	56.63	2.66
824.7	Conductivity (σ) S/m	0.97	0.98	1.03
835.0		0.97	0.99	2.06
836.5		0.97	0.99	2.06
848.3		0.99	1.00	1.01

LIQUID TYPE		MSL-835		
SIMULATING LIQUID TEMP.		22.2		
TEST DATE		Aug. 08, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
824.7	Permittivity (ε)	55.24	57.05	3.28
835.0		55.20	56.41	2.19
836.5		55.20	56.27	1.94
848.3		55.16	56.01	1.54
824.7	Conductivity (σ) S/m	0.97	0.98	1.03
835.0		0.97	0.96	-1.03
836.5		0.97	0.99	2.06
848.3		0.99	1.02	3.03

LIQUID TYPE		HSL-1900		
SIMULATING LIQUID TEMP.		21.3		
TEST DATE		Jul. 03, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**
1851.25	Permittivity (ε)	40.00	41.37	3.42
1880		40.00	41.30	3.25
1900		40.00	41.25	3.13
1908.75		40.00	41.21	3.03
1851.25	Conductivity (σ) S/m	1.40	1.39	-0.71
1880		1.40	1.42	1.43
1900		1.40	1.43	2.14
1908.75		1.40	1.45	3.57

LIQUID TYPE		HSL-1900		
SIMULATING LIQUID TEMP.		22.1		
TEST DATE		Aug. 08, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**
1851.25	Permittivity (ε)	40.00	41.37	3.38
1880		40.00	41.12	2.80
1900		40.00	40.98	2.45
1908.75		40.00	41.21	3.03
1851.25	Conductivity (σ) S/m	1.40	1.39	-0.71
1880		1.40	1.38	-1.43
1900		1.40	1.40	0.00
1908.75		1.40	1.45	3.57

LIQUID TYPE		MSL-1900		
SIMULATING LIQUID TEMP.		21.3		
TEST DATE		Jul. 04, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
1851.25	Permittivity (ε)	53.30	54.69	2.61
1880		53.30	54.55	2.35
1900		53.30	54.49	2.23
1908.75		53.30	54.34	1.95
1851.25	Conductivity (σ) S/m	1.52	1.50	-1.32
1880		1.52	1.53	0.66
1900		1.52	1.54	1.32
1908.75		1.52	1.56	2.63

LIQUID TYPE		MSL-1900		
SIMULATING LIQUID TEMP.		21.3		
TEST DATE		Aug. 08, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
1851.25	Permittivity (ε)	53.30	54.69	2.61
1880		53.30	54.29	1.86
1900		53.30	54.05	1.41
1908.75		53.30	54.34	1.95
1851.25	Conductivity (σ) S/m	1.52	1.50	-1.32
1880		1.52	1.49	-1.97
1900		1.52	1.51	-0.66
1908.75		1.52	1.56	2.63

6. SYSTEM VALIDATION

The system validation was performed in the flat phantom with equipment listed in the following table. Since the SAR value is calculated from the measured electric field, dielectric constant and conductivity of the body tissue and the SAR is proportional to the square of the electric field. So, the SAR value will be also proportional to the RF power input to the system validation dipole under the same test environment. In our system validation test, 250mW RF input power was used.

6.1 TEST PROCEDURE

Before you start the system performance check, need only to tell the system with which components (probe, medium, and device) are performing the system performance check; the system will take care of all parameters. The dipole must be placed beneath the flat phantom section of the SAM Twin Phantom with the correct distance holder in place. The distance holder should touch the phantom surface with a light pressure at the reference marking (little cross) and be oriented parallel to the long side of the phantom. Accurate positioning is not necessary, since the system will search for the peak SAR location, except that the dipole arms should be parallel to the surface. The device holder for the EUT can be left in place but should be rotated away from the dipole.

1.The ”Power Reference Measurement” and ”Power Drift Measurement” jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the amplifier output power. If it is too high (above ±0.1 dB), the system performance check should be repeated; some amplifiers have very high drift during warm-up. A stable amplifier gives drift results in the DASY system below ±0.02 dB.

2.The ”Surface Check” job tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ±0.1mm). In that case it is better to abort the system performance check and stir the liquid.

3. The ”Area Scan” job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable. If a finer graphic is desired, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result.

4. The ”Zoom Scan” job measures the field in a volume around the peak SAR value assessed in the previous ”Area Scan” job (for more information see the application note on SAR evaluation).

About the validation dipole positioning uncertainty, the constant and low loss dielectric spacer is used to establish the correct distance between the top surface of the dipole and the bottom surface of the phantom, the error component introduced by the uncertainty of the distance between the liquid (i.e., phantom shell) and the validation dipole in the DASY5 system is less than ±0.1mm.

$$SAR_{tolerance}[\%] = 100 \times (\frac{(a+d)^2}{a^2} - 1)$$

As the closest distance is 10mm, the resulting tolerance $SAR_{tolerance}$[%] is <2%.

6.2 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	REQUIRED SAR1g (mW/g)	MEASURED SAR1g (mW/g)	DEVIATION (%)	SEPARATION DISTANCE	TESTED DATE
HSL 750	8.39	8.20	-2.26	15mm	Jul. 05, 2011
HSL 750	8.39	8.24	-1.79	15mm	Aug. 09, 2011
MSL 750	8.93	8.68	-2.80	15mm	Jul. 06, 2011
MSL 750	8.93	8.32	-6.83	15mm	Aug. 09, 2011
HSL 835	9.65	9.64	-0.10	15mm	Jul. 01, 2011
HSL 835	9.65	9.08	-5.91	15mm	Aug. 08, 2011
MSL 835	10.1	9.84	-2.57	15mm	Jul. 02, 2011
MSL 835	10.1	9.76	-3.37	15mm	Aug. 08, 2011
HSL 1900	40.9	39.60	-3.18	10mm	Jul. 03, 2011
HSL 1900	40.9	38.80	-5.13	10mm	Aug. 08, 2011
MSL 1900	40.9	42.00	2.69	10mm	Jul. 04, 2011
MSL 1900	40.9	41.20	0.73	10mm	Aug. 08, 2011
TESTED BY	Morrison Huang				

NOTE:

1. Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Above table shows the target SAR and measured SAR after normalized to 1W input power.

2. Please see Appendix for the photo of system validation test.

6.3 SYSTEM VALIDATION UNCERTAINTIES

In the table below, the system validation uncertainty with respect to the analytically assessed SAR value of a dipole source as given in the IEEE 1528 standard is given. This uncertainty is smaller than the expected uncertainty for mobile phone measurements due to the simplified setup and the symmetric field distribution.

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C_i)		Standard Uncertainty (±%)		(v_i)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	5.50	Normal	1	1	1	5.50	5.50	∞
Axial Isotropy	0.25	Rectangular	$\sqrt{3}$	0.7	0.7	0.10	0.10	∞
Hemispherical Isotropy	1.30	Rectangular	$\sqrt{3}$	0.7	0.7	0.53	0.53	∞
Boundary effects	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	0.30	Rectangular	$\sqrt{3}$	1	1	0.17	0.17	∞
System Detection Limits	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	9
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	9
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Test sample related								
Sample positioning	1.90	Normal	1	1	1	1.90	1.90	4
Device holder uncertainty	2.80	Normal	1	1	1	2.80	2.80	4
Output power variation-SAR drift measurement	4.50	Rectangular	$\sqrt{3}$	1	1	2.60	2.60	1
Dipole Related								
Dipole Axis to Liquid Distance	1.60	Rectangular	$\sqrt{3}$	1	1	0.92	0.92	4
Input Power Drift	4.30	Rectangular	$\sqrt{3}$	1	1	2.48	2.48	1
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	$\sqrt{3}$	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	4.12	Normal	1	0.64	0.43	2.64	1.77	9
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	4.32	Normal	1	0.6	0.49	2.59	2.12	9
Combined Standard Uncertainty						**9.68**	**9.20**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**19.35**	**18.41**	

7. TEST RESULTS

7.1 TEST PROCEDURES

The EUT makes a phone call to the communication simulator station. Establish the simulation communication configuration rather the actual communication. Then the EUT could continuous the transmission mode. Adjust the PCL of the base station could controlled the EUT to transmitted the maximum output power. The base station also could control the transmission channel. The SAR value was calculated via the 3D spline interpolation algorithm that has been implemented in the software of DASY5 SAR measurement system manufactured and calibrated by SPEAG. According to the IEEE 1528, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

• Power reference measurement

• Verification of the power reference measurement

• Area scan

• Zoom scan

• Power reference measurement

In the zoom scan, the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is 2.0 mm and maintained at a constant distance of ±1.0 mm during a zoom scan to determine peak SAR locations. The distance is 2mm between the first measurement point and the bottom surface of the phantom.

The measurement time is 0.5 s at each point of the zoom scan. The probe boundary effect compensation shall be applied during the SAR test. Because of the tip of the probe to the Phantom surface separated distances are longer than half a tip probe diameter.

In the area scan, the separation distance is 2mm between the each measurement point and the phantom surface. The scan size shall be included the transmission portion of the EUT. The measurement time is the same as the zoom scan. At last the reference power drift shall be less than ±5%.

7.2 DESCRIPTION OF TEST CONDITION

TEST DATE	TISSUE TYPE / FREQ.	TEMPERATURE(°C)		HUMIDITY (%RH)	TESTED BY
		AIMBENT	LIQUID		
Jul. 05, 2011	HSL 750	22.7	21.6	59	Morrison Huang
Aug. 09, 2011	HSL 750	22.0	22.4	52	Morrison Huang
Jul. 06, 2011	MSL 750	22.3	21.7	58	Morrison Huang
Aug. 09, 2011	MSL 750	22.0	22.4	56	Morrison Huang
Jul. 01, 2011	HSL 835	22.6	21.5	60	Morrison Huang
Aug. 08, 2011	HSL 835	22.2	22.1	55	Morrison Huang
Jul. 02, 2011	MSL 835	22.1	21.2	61	Morrison Huang
Aug. 08, 2011	MSL 835	22.3	22.2	56	Morrison Huang
Jul. 03, 2011	HSL 1900	21.4	22.1	58	Morrison Huang
Aug. 08, 2011	HSL 1900	22.4	21.3	59	Morrison Huang
Jul. 04, 2011	MSL 1900	22.2	21.3	57	Morrison Huang
Aug. 08, 2011	MSL 1900	22.1	22.5	52	Morrison Huang

7.3 MEASURED CONDUCTED POWER OF DUT

Band	CDMA2000 BC0			CDMA2000 BC1		
Channel	1013	384	777	25	600	1175
Frequency (MHz)	824.70	836.52	848.31	1851.25	1880.00	1908.75
Ant-1 RC1+SO2	23.65	23.71	23.64	23.57	23.75	23.06
Ant-1 RC1+SO55	23.62	23.68	23.60	23.55	23.72	23.02
Ant-1 RC3+SO2	23.56	23.66	23.60	23.53	23.66	22.96
Ant-1 RC3+SO55	23.54	23.64	23.56	23.51	23.64	22.93
Ant-1 RC3+SO32 (FCH)	23.50	23.60	23.50	23.43	23.57	22.87
Ant-1 RC3+SO32 (SCH)	23.46	23.57	23.45	23.40	23.49	22.84
Ant-2 RTAP 153.6	23.71	23.72	23.61	23.45	23.64	23.30
Ant-2 RETAP 4096	23.33	23.58	23.55	23.34	23.57	23.42

Band	LTE Band 13				
Modulation	RB Size	RB Offset	Power (dBm)	MPR Target	Note
Ant-3 QPSK	1	0	22.88	0	-
Ant-3 QPSK	1	49	22.96	0	-
Ant-3 QPSK	25	13	22.34	1	MPR Enabled
Ant-3 QPSK	50	0	22.22	1	MPR Enabled
Ant-3 16QAM	1	0	22.32	1	MPR Enabled
Ant-3 16QAM	1	49	22.51	1	MPR Enabled
Ant-3 16QAM	25	13	21.54	2	MPR Enabled
Ant-3 16QAM	50	0	21.30	2	MPR Enabled

7.4 MEASURED SAR RESULTS

<Head SAR>

Plot No.	Band	Mode	Test Position	Channel	Ant Status	Battery	SAR_{1g} (W/kg)
9	CDMA2000 BC0	RC3+SO55	Right Cheek	384	1(Voice)	1	0.447
10	CDMA2000 BC0	RC3+SO55	Right Tilted	384	1(Voice)	1	0.219
11	**CDMA2000 BC0**	**RC3+SO55**	**Left Cheek**	**384**	**1(Voice)**	**1**	**0.518**
12	CDMA2000 BC0	RC3+SO55	Left Tilted	384	1(Voice)	1	0.301
53	CDMA2000 BC0	RC3+SO55	Left Cheek	384	1(Voice)	2	0.489
1	CDMA2000 BC0	RTAP 153.6	Right Cheek	1013	2(Data)	1	1.03
2	CDMA2000 BC0	RTAP 153.6	Right Cheek	384	2(Data)	1	1.22
3	**CDMA2000 BC0**	**RTAP 153.6**	**Right Cheek**	**777**	**2(Data)**	**1**	**1.25**
4	CDMA2000 BC0	RTAP 153.6	Right Tilted	384	2(Data)	1	0.669
5	CDMA2000 BC0	RTAP 153.6	Left Cheek	1013	2(Data)	1	0.722
6	CDMA2000 BC0	RTAP 153.6	Left Cheek	384	2(Data)	1	0.832
7	CDMA2000 BC0	RTAP 153.6	Left Cheek	777	2(Data)	1	0.868
8	CDMA2000 BC0	RTAP 153.6	Left Tilted	384	2(Data)	1	0.424
51	CDMA2000 BC0	RTAP 153.6	Right Cheek	777	2(Data)	2	0.901
52	CDMA2000 BC0	RTAP 153.6	Left Cheek	777	2(Data)	2	0.542
30	CDMA2000 BC1	RC3+SO55	Right Cheek	25	1(Voice)	1	0.959
31	**CDMA2000 BC1**	**RC3+SO55**	**Right Cheek**	**600**	**1(Voice)**	**1**	**1.07**
32	CDMA2000 BC1	RC3+SO55	Right Cheek	1175	1(Voice)	1	1.05
33	CDMA2000 BC1	RC3+SO55	Right Tilted	600	1(Voice)	1	0.419
34	CDMA2000 BC1	RC3+SO55	Left Cheek	25	1(Voice)	1	0.753
35	CDMA2000 BC1	RC3+SO55	Left Cheek	600	1(Voice)	1	0.841
36	CDMA2000 BC1	RC3+SO55	Left Cheek	1175	1(Voice)	1	0.807
37	CDMA2000 BC1	RC3+SO55	Left Tilted	600	1(Voice)	1	0.242
56	CDMA2000 BC1	RC3+SO55	Right Cheek	600	1(Voice)	2	0.652
26	**CDMA2000 BC1**	**RTAP 153.6**	**Right Cheek**	**600**	**2(Data)**	**1**	**0.605**
27	CDMA2000 BC1	RTAP 153.6	Right Tilted	600	2(Data)	1	0.322
28	CDMA2000 BC1	RTAP 153.6	Left Cheek	600	2(Data)	1	0.358
29	CDMA2000 BC1	RTAP 153.6	Left Tilted	600	2(Data)	1	0.296
55	CDMA2000 BC1	RTAP 153.6	Right Cheek	600	2(Data)	2	0.581

<Head SAR>

Plot No.	Band	Mode	Test Position	Channel	Ant Status	Battery	RB	Offset	SAR_{1g} (W/kg)
60	LTE Band 13	QPSK	Right Cheek	23230	3(Data)	1	25	13	0.319
61	LTE Band 13	QPSK	Right Cheek	23230	3(Data)	1	1	0	0.342
62	LTE Band 13	QPSK	Right Cheek	23230	3(Data)	1	1	49	0.352
63	LTE Band 13	QPSK	Right Tilted	23230	3(Data)	1	25	13	0.319
64	LTE Band 13	QPSK	Right Tilted	23230	3(Data)	1	1	0	0.345
65	LTE Band 13	QPSK	Right Tilted	23230	3(Data)	1	1	49	0.338
66	LTE Band 13	QPSK	Left Cheek	23230	3(Data)	1	25	13	0.671
67	**LTE Band 13**	**QPSK**	**Left Cheek**	**23230**	**3(Data)**	**1**	**1**	**0**	**0.756**
68	LTE Band 13	QPSK	Left Cheek	23230	3(Data)	1	1	49	0.733
69	LTE Band 13	QPSK	Left Tilted	23230	3(Data)	1	25	13	0.586
70	LTE Band 13	QPSK	Left Tilted	23230	3(Data)	1	1	0	0.642
71	LTE Band 13	QPSK	Left Tilted	23230	3(Data)	1	1	49	0.616
108	LTE Band 13	QPSK	Left Cheek	23230	3(Data)	2	1	0	0.449
72	LTE Band 13	16QAM	Right Cheek	23230	3(Data)	1	25	13	0.3
73	LTE Band 13	16QAM	Right Cheek	23230	3(Data)	1	1	0	0.319
74	LTE Band 13	16QAM	Right Cheek	23230	3(Data)	1	1	49	0.302
75	LTE Band 13	16QAM	Right Tilted	23230	3(Data)	1	25	13	0.26
76	LTE Band 13	16QAM	Right Tilted	23230	3(Data)	1	1	0	0.277
77	LTE Band 13	16QAM	Right Tilted	23230	3(Data)	1	1	49	0.258
78	LTE Band 13	16QAM	Left Cheek	23230	3(Data)	1	25	13	0.467
79	LTE Band 13	16QAM	Left Cheek	23230	3(Data)	1	1	0	0.504
80	LTE Band 13	16QAM	Left Cheek	23230	3(Data)	1	1	49	0.453
81	LTE Band 13	16QAM	Left Tilted	23230	3(Data)	1	25	13	0.5
82	**LTE Band 13**	**16QAM**	**Left Tilted**	**23230**	**3(Data)**	**1**	**1**	**0**	**0.544**
83	LTE Band 13	16QAM	Left Tilted	23230	3(Data)	1	1	49	0.486
109	LTE Band 13	16QAM	Left Tilted	23230	3(Data)	2	1	0	0.438

<Body SAR: Body Worn Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ant Status	Battery	SAR_{1g} (W/kg)
21	CDMA2000 BC0	RC3+SO32	Front Face	1.0	384	1(Voice)	1	0.408
22	**CDMA2000 BC0**	**RC3+SO32**	**Back Face**	**1.0**	**384**	**1(Voice)**	**1**	**0.553**
13	CDMA2000 BC0	RTAP 153.6	Front Face	1.0	384	2(Data)	1	0.388
14	CDMA2000 BC0	RTAP 153.6	Back Face	1.0	1013	2(Data)	1	0.634
15	CDMA2000 BC0	RTAP 153.6	Back Face	1.0	384	2(Data)	1	0.908
16	**CDMA2000 BC0**	**RTAP 153.6**	**Back Face**	**1.0**	**777**	**2(Data)**	**1**	**1.01**
42	CDMA2000 BC1	RC3+SO32	Front Face	1.0	25	1(Voice)	1	1.03
43	**CDMA2000 BC1**	**RC3+SO32**	**Front Face**	**1.0**	**600**	**1(Voice)**	**1**	**1.04**
44	CDMA2000 BC1	RC3+SO32	Front Face	1.0	1175	1(Voice)	1	0.955
45	CDMA2000 BC1	RC3+SO32	Back Face	1.0	600	1(Voice)	1	0.461
38	CDMA2000 BC1	RTAP 153.6	Front Face	1.0	600	2(Data)	1	0.179
39	**CDMA2000 BC1**	**RTAP 153.6**	**Back Face**	**1.0**	**600**	**2(Data)**	**1**	**0.27**

<Body SAR: Body Worn Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ant Status	Battery	RB	Offset	SAR_{1g} (W/kg)
84	LTE Band 13	QPSK	Front Face	1.0	23230	3(Data)	1	25	13	0.383
85	LTE Band 13	QPSK	Front Face	1.0	23230	3(Data)	1	1	0	0.444
86	LTE Band 13	QPSK	Front Face	1.0	23230	3(Data)	1	1	49	0.404
87	LTE Band 13	QPSK	Back Face	1.0	23230	3(Data)	1	25	13	0.544
88	**LTE Band 13**	**QPSK**	**Back Face**	**1.0**	**23230**	**3(Data)**	**1**	**1**	**0**	**0.615**
89	LTE Band 13	QPSK	Back Face	1.0	23230	3(Data)	1	1	49	0.564
96	LTE Band 13	16QAM	Front Face	1.0	23230	3(Data)	1	25	13	0.19
97	LTE Band 13	16QAM	Front Face	1.0	23230	3(Data)	1	1	0	0.215
98	LTE Band 13	16QAM	Front Face	1.0	23230	3(Data)	1	1	49	0.197
99	LTE Band 13	16QAM	Back Face	1.0	23230	3(Data)	1	25	13	0.315
100	LTE Band 13	16QAM	Back Face	1.0	23230	3(Data)	1	1	0	0.356
101	**LTE Band 13**	**16QAM**	**Back Face**	**1.0**	**23230**	**3(Data)**	**1**	**1**	**49**	**0.483**

<Body SAR: Hotspot Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ant Status	Battery	SAR_{1g} (W/kg)
21	CDMA2000 BC0	RC3+SO32	Front Face	1.0	384	1(Voice)	1	0.408
22	**CDMA2000 BC0**	**RC3+SO32**	**Back Face**	**1.0**	**384**	**1(Voice)**	**1**	**0.553**
23	CDMA2000 BC0	RC3+SO32	Right Edge	1.0	384	1(Voice)	1	0.427
24	CDMA2000 BC0	RC3+SO32	Left Edge	1.0	384	1(Voice)	1	0.196
25	CDMA2000 BC0	RC3+SO32	Bottom Edge	1.0	384	1(Voice)	1	0.056
54	CDMA2000 BC0	RC3+SO32	Back Face	1.0	384	1(Voice)	2	0.544
13	CDMA2000 BC0	RTAP 153.6	Front Face	1.0	384	2(Data)	1	0.388
14	CDMA2000 BC0	RTAP 153.6	Back Face	1.0	1013	2(Data)	1	0.634
15	CDMA2000 BC0	RTAP 153.6	Back Face	1.0	384	2(Data)	1	0.908
16	CDMA2000 BC0	RTAP 153.6	Back Face	1.0	777	2(Data)	1	1.01
17	CDMA2000 BC0	RTAP 153.6	Top Edge	1.0	384	2(Data)	1	0.031
18	CDMA2000 BC0	RTAP 153.6	Left Edge	1.0	1013	2(Data)	1	0.879
19	CDMA2000 BC0	RTAP 153.6	Left Edge	1.0	384	2(Data)	1	1.07
20	**CDMA2000 BC0**	**RTAP 153.6**	**Left Edge**	**1.0**	**777**	**2(Data)**	**1**	**1.12**
59	CDMA2000 BC0	RTAP 153.6	Left Edge	1.0	777	2(Data)	2	1.04
42	CDMA2000 BC1	RC3+SO32	Front Face	1.0	25	1(Voice)	1	1.03
43	**CDMA2000 BC1**	**RC3+SO32**	**Front Face**	**1.0**	**600**	**1(Voice)**	**1**	**1.04**
44	CDMA2000 BC1	RC3+SO32	Front Face	1.0	1175	1(Voice)	1	0.955
45	CDMA2000 BC1	RC3+SO32	Back Face	1.0	600	1(Voice)	1	0.461
46	CDMA2000 BC1	RC3+SO32	Right Edge	1.0	25	1(Voice)	1	0.687
47	CDMA2000 BC1	RC3+SO32	Right Edge	1.0	600	1(Voice)	1	0.959
48	CDMA2000 BC1	RC3+SO32	Right Edge	1.0	1175	1(Voice)	1	0.807
49	CDMA2000 BC1	RC3+SO32	Left Edge	1.0	600	1(Voice)	1	0.242
50	CDMA2000 BC1	RC3+SO32	Bottom Edge	1.0	600	1(Voice)	1	0.593
58	CDMA2000 BC1	RC3+SO32	Front Face	1.0	600	1(Voice)	2	0.77
38	CDMA2000 BC1	RTAP 153.6	Front Face	1.0	600	2(Data)	1	0.179
39	CDMA2000 BC1	RTAP 153.6	Back Face	1.0	600	2(Data)	1	0.27
40	CDMA2000 BC1	RTAP 153.6	Top Edge	1.0	600	2(Data)	1	0.079
41	**CDMA2000 BC1**	**RTAP 153.6**	**Left Edge**	**1.0**	**600**	**2(Data)**	**1**	**0.547**
57	CDMA2000 BC1	RTAP 153.6	Left Edge	1.0	600	2(Data)	2	0.398

<Body SAR: Hotspot Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Ch.	Ant Status	Battery	RB	Offset	SAR_{1g} (W/kg)
84	LTE Band 13	QPSK	Front Face	1.0	23230	3(Data)	1	25	13	0.383
85	LTE Band 13	QPSK	Front Face	1.0	23230	3(Data)	1	1	0	0.444
86	LTE Band 13	QPSK	Front Face	1.0	23230	3(Data)	1	1	49	0.404
87	LTE Band 13	QPSK	Back Face	1.0	23230	3(Data)	1	25	13	0.544
88	LTE Band 13	QPSK	Back Face	1.0	23230	3(Data)	1	1	0	0.615
89	LTE Band 13	QPSK	Back Face	1.0	23230	3(Data)	1	1	49	0.564
90	LTE Band 13	QPSK	Top Edge	1.0	23230	3(Data)	1	25	13	0.379
91	LTE Band 13	QPSK	Top Edge	1.0	23230	3(Data)	1	1	0	0.455
92	LTE Band 13	QPSK	Top Edge	1.0	23230	3(Data)	1	1	49	0.419
93	LTE Band 13	QPSK	Right Edge	1.0	23230	3(Data)	1	25	13	0.58
94	**LTE Band 13**	**QPSK**	**Right Edge**	**1.0**	**23230**	**3(Data)**	**1**	**1**	**0**	**0.644**
95	LTE Band 13	QPSK	Right Edge	1.0	23230	3(Data)	1	1	49	0.573
110	LTE Band 13	QPSK	Right Edge	1.0	23230	3(Data)	2	1	0	0.393
96	LTE Band 13	16QAM	Front Face	1.0	23230	3(Data)	1	25	13	0.19
97	LTE Band 13	16QAM	Front Face	1.0	23230	3(Data)	1	1	0	0.215
98	LTE Band 13	16QAM	Front Face	1.0	23230	3(Data)	1	1	49	0.197
99	LTE Band 13	16QAM	Back Face	1.0	23230	3(Data)	1	25	13	0.315
100	LTE Band 13	16QAM	Back Face	1.0	23230	3(Data)	1	1	0	0.356
101	**LTE Band 13**	**16QAM**	**Back Face**	**1.0**	**23230**	**3(Data)**	**1**	**1**	**49**	**0.483**
102	LTE Band 13	16QAM	Top Edge	1.0	23230	3(Data)	1	25	13	0.288
103	LTE Band 13	16QAM	Top Edge	1.0	23230	3(Data)	1	1	0	0.348
104	LTE Band 13	16QAM	Top Edge	1.0	23230	3(Data)	1	1	49	0.31
105	LTE Band 13	16QAM	Right Edge	1.0	23230	3(Data)	1	25	13	0.349
106	LTE Band 13	16QAM	Right Edge	1.0	23230	3(Data)	1	1	0	0.4
107	LTE Band 13	16QAM	Right Edge	1.0	23230	3(Data)	1	1	49	0.38
111	LTE Band 13	16QAM	Back Face	1.0	23230	3(Data)	2	1	49	0.137

Note:
The details of WLAN standalone SAR result can be referred to BVADT SAR report number SA110705C18-3 dated Aug. 11, 2011.

7.5 SIMULTANEOUS TRANSMISSION EVALUATION

<SPLSR calculation procedure>

1) Use DASY software to open SAR data file with zoom scan results.
2) Export data file to SEMCAD using 'Field Data Export' function.
3) Search for highest SAR based on the imported measured/interpolated data and identify the X, Y, and Z coordinates. Per the SAR system manufacture, DASY stores the individual coordinates of each measurement point in the measurement file where the, center coordinate (x=0, y=0) is always the Grid Reference Point as set in DASY for a phantom section.
4) Calculate the peak SAR separation distances using the Pythagoras' theorem where
$$\text{Peak SAR separation distance} = \sqrt{(X_1 - X_2)^2 + (Y_1 - Y_2)^2 + (Z_1 - Z_2)^2}$$
5) Calculate SPLSR = (SAR1 + SAR2) / Peak SAR separation distance.
6) The SPLSR calculation plots shown in test report are for reference only as the images were generated in a separate software program to add the antenna and arrow references. The distance information in the calculations below each plot is derived from the DASY SAR zoom scan data as specified in this procedure.

Table 7.1 Co-located Simultaneous Transmission Analysis for CDMA850 Voice + DO850 Data + WLAN

Position	Transmitter 1 CDMA 850 Voice	Transmitter 2 DO 850 Data	Transmitter 3 WLAN	All 3 SAR Summation	SPLSR T1&T2	SPLSR T1&T3	SPLSR T2&T3	Note
Head-Right Cheek	0.447	1.25	0.104	**1.801**	0.278	0.104	0.212	All SPLSR<0.3, Simul-TX SAR not required
Head-Right Tilted	0.219	0.669	0.049	0.937	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Cheek	0.518	0.868	0.314	**1.7**	0.283	0.287	0.179	All SPLSR<0.3, Simul-TX SAR not required
Head-Left Tilted	0.301	0.424	0.035	0.76	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Front Face	0.408	0.388	0.129	0.925	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Back Face	0.553	1.01	0.503	**2.066**	0.163	0.285	0.213	All SPLSR<0.3, Simul-TX SAR not required
Body-Bottom Side	0.056	0	0.075	0.131	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Top Side	0	0.031	0	0.031	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Left Side	0.196	1.12	0.596	**1.912**	0.269	0.283	0.291	All SPLSR<0.3, Simul-TX SAR not required
Body-Right Side	0.427	0	0	0.427	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0635, -0.274, -0.176), T2(0.0462, -0.332, -0.174)
Peak Location Spacing = 6.1 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.447 + 1.25) / 6.1 = 0.278

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0635, -0.274, -0.176), T3(0.103, -0.306, -0.16)
Peak Location Spacing = 5.3 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.447 + 0.104) / 5.3 = 0.104

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(0.0462, -0.332, -0.174), T3(0.103, -0.306, -0.16)
Peak Location Spacing = 6.4 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.25 + 0.104) / 6.4 = 0.212

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.063, 0.262, -0.175), T2(0.0169, 0.277, -0.171)
Peak Location Spacing = 4.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.518 + 0.868) / 4.9 = 0.283

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.063, 0.262, -0.175), T3(0.0658, 0.233, -0.172)
Peak Location Spacing = 2.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.518 + 0.314) / 2.9 = 0.287

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(0.0169, 0.277, -0.171), T3(0.0658, 0.233, -0.172)
Peak Location Spacing = 6.6 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.868 + 0.314) / 6.6 = 0.179

The calculation of SAR to peak location separation ratio for (Body-Back Face, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.013, -0.0453, -0.207), T2(-0.0538, -0.0419, -0.206)
Peak Location Spacing = 9.6 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.553 + 1.01) / 9.6 = 0.163

The calculation of SAR to peak location separation ratio for (Body-Back Face, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.013, 0.0453, -0.207), T3(-0.0455, 0.0282, -0.207)
Peak Location Spacing = 3.7 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.553 + 0.503) / 3.7 = 0.285

The calculation of SAR to peak location separation ratio for (Body-Back Face, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(-0.0538, -0.0419, -0.206), T3(-0.0455, 0.0282, -0.207)
Peak Location Spacing = 7.1 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.01 + 0.503) / 7.1 = 0.213

The calculation of SAR to peak location separation ratio for (Body-Left Edge, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.0365, 0.018, -0.206), T2(-0.0181, -0.0271, -0.207)
Peak Location Spacing = 4.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.196 + 1.12) / 4.9 = 0.269

The calculation of SAR to peak location separation ratio for (Body-Left Edge, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.0365, 0.018, -0.206), T3(-0.012, 0.0313, -0.207)
Peak Location Spacing = 2.8 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.196 + 0.596) / 2.8 = 0.283

The calculation of SAR to peak location separation ratio for (Body-Left Edge, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(-0.0181, -0.0271, -0.207), T3(-0.012, 0.0313, -0.207)
Peak Location Spacing = 5.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.12 + 0.596) / 5.9 = 0.291

Table 7.2 Co-located Simultaneous Transmission Analysis for CDMA850 Voice + DO1900 Data + WLAN

Position	Transmitter 1 CDMA 850 Voice	Transmitter 2 DO 1900 Data	Transmitter 3 WLAN	All 3 SAR Summation	SPLSR T1&T2	SPLSR T1&T3	SPLSR T2&T3	Note
Head-Right Cheek	0.447	0.605	0.104	1.156	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Right Tilted	0.219	0.322	0.049	0.59	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Cheek	0.518	0.358	0.314	1.19	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Tilted	0.301	0.296	0.035	0.632	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Front Face	0.408	0.179	0.129	0.716	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Back Face	0.553	0.27	0.503	1.326	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Bottom Side	0.056	0	0.075	0.131	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Top Side	0	0.079	0	0.079	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Left Side	0.196	0.547	0.596	1.339	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Right Side	0.427	0	0	0.427	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required

Table 7.3 Co-located Simultaneous Transmission Analysis for CDMA850 Voice + LTE700 Data + WLAN

Position	Transmitter 1 CDMA 850 Voice	Transmitter 2 LTE 700 Data	Transmitter 3 WLAN	All 3 SAR Summation	SPLSR T1&T2	SPLSR T1&T3	SPLSR T2&T3	Note
Head-Right Cheek	0.447	0.352	0.104	0.903	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Right Tilted	0.219	0.345	0.049	0.613	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Cheek	0.518	0.756	0.314	1.588	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Tilted	0.301	0.642	0.035	0.978	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Front Face	0.408	0.444	0.129	0.981	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Back Face	0.553	0.615	0.503	**1.671**	0.209	0.285	0.238	All SPLSR<0.3, Simul-TX SAR not required
Body-Bottom Side	0.056	0	0.075	0.131	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Top Side	0	0.455	0	0.455	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Left Side	0.196	0	0.596	0.792	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Right Side	0.427	0.644	0	1.071	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Body-Back Face, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.013, 0.0453, -0.207), T2(-0.0185, -0.0106, -0.207)
Peak Location Spacing = 5.6 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.553 + 0.615) / 5.6 = 0.209

The calculation of SAR to peak location separation ratio for (Body-Back Face, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.013, 0.0453, -0.207), T3(-0.0455, 0.0282, -0.207)
Peak Location Spacing = 3.7 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.553 + 0.503) / 3.7 = 0.285

The calculation of SAR to peak location separation ratio for (Body-Back Face, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(-0.0185, -0.0106, -0.207), T3(-0.0455, 0.0282, -0.207)
Peak Location Spacing = 4.7 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.615 + 0.503) / 4.7 = 0.238

Table 7.4 Co-located Simultaneous Transmission Analysis for CDMA1900 Voice + DO850 Data + WLAN

Position	Transmitter 1 CDMA 1900 Voice	Transmitter 2 DO 850 Data	Transmitter 3 WLAN	All 3 SAR Summation	SPLSR T1&T2	SPLSR T1&T3	SPLSR T2&T3	Note
Head-Right Cheek	1.07	1.25	0.104	**2.424**	0.286	0.175	0.212	All SPLSR<0.3, Simul-TX SAR not required
Head-Right Tilted	0.419	0.669	0.049	1.137	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Cheek	0.841	0.868	0.314	**2.023**	**0.322**	**0.608**	0.179	**T1+T2 & T1+T3 SPLSR>0.3, Simul-TX SAR required**
Head-Left Tilted	0.242	0.424	0.035	0.701	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Front Face	1.04	0.388	0.129	1.557	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Back Face	0.461	1.01	0.503	**1.974**	0.144	0.197	0.213	All SPLSR<0.3, Simul-TX SAR not required
Body-Bottom Side	0.593	0	0.075	0.668	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Top Side	0	0.031	0	0.031	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Left Side	0.242	1.12	0.596	**1.958**	0.184	**0.493**	0.291	**T1+T3 SPLSR>0.3, Simul-TX SAR required**
Body-Right Side	0.959	0	0	0.959	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0645, -0.253, -0.174), T2(0.0462, -0.332, -0.174)
Peak Location Spacing = 8.1 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.07 + 1.25) / 8.1 = 0.286

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0645, -0.253, -0.174), T3(0.103, -0.306, -0.16)
Peak Location Spacing = 6.7 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.07 + 0.104) / 6.7 = 0.175

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(0.0462, -0.332, -0.174), T3(0.103, -0.306, -0.16)
Peak Location Spacing = 6.4 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.25 + 0.104) / 6.4 = 0.212

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0631, 0.252, -0.175), T2(0.0169, 0.277, -0.171)
Peak Location Spacing = 5.3 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.841 + 0.868) / 5.3 = 0.322

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0631, 0.252, -0.175), T3(0.0658, 0.233, -0.172)
Peak Location Spacing = 1.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.841 + 0.314) / 1.9 = 0.608

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(0.0169, 0.277, -0.171), T3(0.0658, 0.233, -0.172)
Peak Location Spacing = 6.6 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.868 + 0.314) / 6.6 = 0.179

The calculation of SAR to peak location separation ratio for (Body-Back Face, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0013, 0.0437, -0.206), T2(-0.0538, -0.0419, -0.206)
Peak Location Spacing = 10.2 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.461 + 1.01) / 10.2 = 0.144

The calculation of SAR to peak location separation ratio for (Body-Back Face, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0013, 0.0437, -0.206), T3(-0.0455, 0.0282, -0.207)
Peak Location Spacing = 4.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.461 + 0.503) / 4.9 = 0.197

The calculation of SAR to peak location separation ratio for (Body-Back Face, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(-0.0538, -0.0419, -0.206), T3(-0.0455, 0.0282, -0.207)
Peak Location Spacing = 7.1 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.01 + 0.503) / 7.1 = 0.213

The calculation of SAR to peak location separation ratio for (Body-Left Edge, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.0195, 0.0465, -0.206), T2(-0.0181, -0.0271, -0.207)
Peak Location Spacing = 7.4 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.242 + 1.12) / 7.4 = 0.184

The calculation of SAR to peak location separation ratio for (Body-Left Edge, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.0195, 0.0465, -0.206), T3(-0.012, 0.0313, -0.207)
Peak Location Spacing = 1.7 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.242 + 0.596) / 1.7 = 0.493

The calculation of SAR to peak location separation ratio for (Body-Left Edge, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(-0.0181, -0.0271, -0.207), T3(-0.012, 0.0313, -0.207)
Peak Location Spacing = 5.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.12 + 0.596) / 5.9 = 0.291

Table 7.5 Co-located Simultaneous Transmission Analysis for CDMA1900 Voice + DO1900 Data + WLAN

Position	Transmitter 1 CDMA 1900 Voice	Transmitter 2 DO 1900 Data	Transmitter 3 WLAN	All 3 SAR Summation	SPLSR T1&T2	SPLSR T1&T3	SPLSR T2&T3	Note
Head-Right Cheek	1.07	0.605	0.104	**1.779**	0.209	0.175	0.098	All SPLSR<0.3, Simul-TX SAR not required
Head-Right Tilted	0.419	0.322	0.049	0.79	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Cheek	0.841	0.358	0.314	1.513	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Tilted	0.242	0.296	0.035	0.573	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Front Face	1.04	0.179	0.129	1.348	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Back Face	0.461	0.27	0.503	1.234	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Bottom Side	0.593	0	0.075	0.668	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Top Side	0	0.079	0	0.079	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Left Side	0.242	0.547	0.596	1.385	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Right Side	0.959	0	0	0.959	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0645, -0.253, -0.174), T2(0.0358, -0.328, -0.175)
Peak Location Spacing = 8.0 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.07 + 0.605) / 8.0 = 0.209

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0645, -0.253, -0.174), T3(0.103, -0.306, -0.16)
Peak Location Spacing = 6.7 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.07 + 0.104) / 6.7 = 0.175

The calculation of SAR to peak location separation ratio for (Head-Right Cheek, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(0.0358, -0.328, -0.175), T3(0.103, -0.306, -0.16)
Peak Location Spacing = 7.2 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.605 + 0.104) / 7.2 = 0.098

Table 7.6 Co-located Simultaneous Transmission Analysis for CDMA1900 Voice + LTE700 Data + WLAN

Position	Transmitter 1 CDMA 1900 Voice	Transmitter 2 LTE 700 Data	Transmitter 3 WLAN	All 3 SAR Summation	SPLSR T1&T2	SPLSR T1&T3	SPLSR T2&T3	Note
Head-Right Cheek	1.07	0.352	0.104	1.526	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Right Tilted	0.419	0.345	0.049	0.813	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Head-Left Cheek	0.841	0.756	0.314	**1.911**	0.186	**0.608**	0.102	**T1+T3 SPLSR>0.3, Simul-TX SAR required**
Head-Left Tilted	0.242	0.642	0.035	0.919	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Front Face	1.04	0.444	0.129	**1.613**	0.201	0.216	0.077	All SPLSR<0.3, Simul-TX SAR not required
Body-Back Face	0.461	0.615	0.503	1.579	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Bottom Side	0.593	0	0.075	0.668	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Top Side	0	0.455	0	0.455	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Left Side	0.242	0	0.596	0.838	N/A	N/A	N/A	SUM SAR<1.6, Simul-TX SAR not required
Body-Right Side	0.959	0.644	0	**1.603**	0.272	0	0	All SPLSR<0.3, Simul-TX SAR not required

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0631, 0.252, -0.175), T2(0.0268, 0.33, -0.175)
Peak Location Spacing = 8.6 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.841 + 0.756) / 8.6 = 0.186

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(0.0631, 0.252, -0.175), T3(0.0658, 0.233, -0.172)
Peak Location Spacing = 1.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.841 + 0.314) / 1.9 = 0.608

The calculation of SAR to peak location separation ratio for (Head-Left Cheek, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(0.0268, 0.33, -0.175), T3(0.0658, 0.233, -0.172)
Peak Location Spacing = 10.5 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.756 + 0.314) / 10.5 = 0.102

The calculation of SAR to peak location separation ratio for (Body-Front Face, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.0355, 0.05, -0.206), T2(-0.039, -0.0235, -0.207)
Peak Location Spacing = 7.4 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.444 + 1.04) / 7.4 = 0.201

The calculation of SAR to peak location separation ratio for (Body-Front Face, T1+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.0355, 0.05, -0.206), T3(0.014, 0.0276, -0.207)
Peak Location Spacing = 5.4 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.04 + 0.129) / 5.4 = 0.216

The calculation of SAR to peak location separation ratio for (Body-Front Face, T2+T3) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T2(-0.039, -0.0235, -0.207), T3(0.014, 0.0276, -0.207)
Peak Location Spacing = 7.4 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.444 + 0.129) / 7.4 = 0.077

The calculation of SAR to peak location separation ratio for (Body-Right Edge, T1+T2) is as below:
Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.0195, 0.0405, -0.206), T2(-0.0216, -0.0184, -0.207)
Peak Location Spacing = 5.9 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.959 + 0.644) / 5.9 = 0.272

Table 7.7 Volume Scan SAR Measurement Results

Plot No.	Band	Mode	Test Position	Ch.	Ant Status	Battery	Standalone SAR_{1g} (W/kg)	Volume SAR_{1g} (W/kg)	Multi Band SAR_{1g}(W/kg)
171	LTE Band 13	QPSK (RB 1, OS 0)	Left Cheek	23230	3(Data)	1	0.756	0.708	1.02
173	CDMA2000 BC1	RC3+SO55	Left Cheek	600	1(Voice)	1	0.841	0.901	
174	802.11b	-	Left Cheek	6	4	1	0.314	0.281	
172	CDMA2000 BC0	RTAP 153.6	Left Cheek	777	2(Data)	1	0.868	0.74	1.13
173	CDMA2000 BC1	RC3+SO55	Left Cheek	600	1(Voice)	1	0.841	0.901	
174	802.11b	-	Left Cheek	6	4	1	0.314	0.281	
179	**CDMA2000 BC0**	**RTAP 153.6**	**Left Edge**	**777**	**2(Data)**	**1**	**1.12**	**1.29**	**1.4**
180	**CDMA2000 BC1**	**RC3+SO32**	**Left Edge**	**600**	**1(Voice)**	**1**	**0.242**	**0.265**	
181	**802.11b**	**-**	**Left Edge**	**6**	**4**	**1**	**0.596**	**0.526**	

Notes:

1. The worst configuration on each position is used for the volume scan.

7.6 SAR LIMITS

HUMAN EXPOSURE	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	**(Occupational / controlled Exposure Environment)**
Spatial Average (whole body)	0.08	0.4
Spatial Peak (averaged over 1 g)	**1.6**	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

NOTE: This limits accord to 47 CFR 2.1093 – Safety Limit.

8. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5.phtml. If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.