SAR TEST REPORT

REPORT NO.: SA950915L21
MODEL NO.: TITA100
RECEIVED: Sep. 03, 2006
TESTED: Sep. 03 ~ 11, 2006
ISSUED: Oct. 04, 2006

APPLICANT: High Tech Computer Corp.

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0528

ACCREDITED
No.: 2177-01

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1. CERTIFICATION

PRODUCT: Pocket PC Phone
MODEL: TITA100
APPLICANT: High Tech Computer Corp.
TESTED: Sep. 03 ~ 11, 2006
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: FCC Part 2 (Section 2.1093), RSS-102
FCC OET Bulletin 65, Supplement C (01-01)

The above equipment have been tested by **Advance Data Technology Corporation**, 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 EMC characteristics under the conditions specified in this report.

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TECHNICAL ACCEPTANCE : Stanely Hsu , **DATE:** Oct. 04, 2006
Responsible for RF

APPROVED BY : Gary Chang / Supervisor , **DATE:** Oct. 04, 2006

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Pocket PC Phone	
MODEL NO.	TITA100	
FCC ID	NM8TITA100	
POWER SUPPLY	3.70Vdc from rechargeable lithium battery 5.00Vdc from power adapter 5.00Vdc from host equipment	
CLASSIFICATION	Portable device, production unit	
MODULATION TYPE	Mobile phone: QPSK, OQPSK, HPSK for CDMA2000, 1xEV-DO	
	WLAN: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM Bluetooth: GFSK for FHSS	
FREQUENCY RANGE	Mobile phone: Tx Frequency: 824.2MHz ~ 848.8MHz (CDMA850) 1850.2MHz ~ 1909.8MHz (CDMA1900) Rx Frequency: 869.2MHz ~ 893.8MHz (CDMA850) 1930.2MHz ~ 1989.8MHz (CDMA1900)	
	Wireless LAN & Bluetooth: 2400.0MHz ~ 2483.5MHz	
CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER	**TDSO SO32 RC3**	CDMA850 band: 0.2565Watts / 824.2MHz for channel 1013 0.2606Watts / 836.6MHz for channel 384 0.2698Watts / 848.8MHz for channel 777
	SO55 RC3	CDMA850 band: 0.2080Watts / 824.2MHz for channel 1013 0.2075Watts / 836.6MHz for channel 384 0.1928Watts / 848.8MHz for channel 777
	TDSO SO32 RC3	CDMA1900 band: 0.2377Watts / 1851.25MHz for channel 25 0.2421Watts / 1880.00MHz for channel 600 0.2466Watts / 1908.75MHz for channel 1175
	SO55 RC3	CDMA1900 band: 0.2244Watts / 1851.25MHz for channel 25 0.2291Watts / 1880.00MHz for channel 600 0.2286Watts / 1908.75MHz for channel 1175

CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER	WLAN-DSSS (802.11b): 79.433mW / 2412.0MHz for channel 1 80.353mW / 2437.0MHz for channel 6 79.616mW / 2462.0MHz for channel 11
	WLAN-OFDM (802.11g): 79.983mW / 2412.0MHz for channel 1 80.353mW / 2437.0MHz for channel 6 79.616mW / 2462.0MHz for channel 11
	Bluetooth: 0.628mW / 2402.0MHz for channel 0 0.964mW / 2441.0MHz for channel 39 1.064mW / 2480.0MHz for channel 78
MAX. AVERAGE SAR (1g)	Head: 0.869W/kg (CDMA850) 1.130W/kg (CDMA1900) 0.331W/kg (WLAN-802.11b) 0.161W/kg (WLAN-802.11g) 0.00372W/kg (Bluetooth)
	Body: 0.922W/kg (1xEDVO850) 0.815W/kg (CDMA850) 0.544W/kg (1xEDVO 1900) 0.422W/kg (CDMA1900) 0.034W/kg (WLAN- 802.11b) 0.025W/kg (WLAN- 802.11g) 0.00167W/kg (Bluetooth)
ANTENNA TYPE	Mobile phone: Monopole antenna with 0dBi gain Wireless LAN & Bluetooth: PIFA antenna with 0dBi gain
DATA CABLE	1.5m USB non-shielded cable without core 1.6m non-shielded cable without core for earphone
I/O PORTS	Refer to user’s manual
ASSOCIATED DEVICES	Earphone, Belt chip, Pouch, Cradle

NOTE:

1. The EUT is a CDMA850/CDMA1900 (1XEVDO / 1XRTT / IS-95A/B) Pocket PC Phone with wireless LAN, bluetooth, and GPS functions.
2. The EUT have two different appearances.
3. The EUT have lithium batteries listed as below:

BATTERY A:	
BRAND:	Dynapack International Technology Corporation
MODEL:	TRIN160
RATING:	3.7Vdc, 1500mAh

BATTERY B:	
BRAND:	SK mobile energy CO., LTD
MODEL:	TRIN160
RATING:	3.7Vdc, 1500mAh

NOTE: After pre-tested both batteries, found batter A is worse, therefore all the test results came out from this.

4. The EUT was operated with following power adapters:

ADAPTER 1:	
BRAND:	DELTA ELECTRONIC, INC.
MODEL:	ADP-5FH B
INPUT:	100-240Vac, 50-60Hz, 0.2A
OUTPUT:	5.0Vdc, 1A
POWER LINE:	DC 1.8m non-shielded cable without core

ADAPTER 2:	
BRAND:	PHIHONG
MODEL:	PSAA05A-050
INPUT:	100~240Vac, 50-60Hz, 200mA
OUTPUT:	5.0Vdc, 1A
POWER LINE:	DC 1.8m non-shielded cable without core

5. The EUT was operated with following car charger:

MODEL:	TITA150
OUTPUT:	5.0Vdc, 1A

6. The EUT operates in the 2.4GHz frequency spectrum and complies with 802.11b & 802.11g techniques.
7. Bluetooth Technology is used in this EUT.
8. Refer to following table for ESN no.:

ESN NO.
365D0035*******
365D0036*******
365D0037*******
365D0038*******
365D0039*******
36610011*******
36610012*******

9. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.
10. The EUT used the same antenna in Wireless LAN & Bluetooth function, but the two functions can not work at the same time.

2.2 SAR MEASUREMENT CONDITIONS FOR CDMA

The following procedures were followed according to FCC “SAR Measurement Procedures Devices”, June 2006.

- **Output Power Verification**

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices", May 2006.
Maximum output power is verified on the High, Middle and Low channels according to procedures defined in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in **“All Up”** condition.

1. If the mobile station(MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1 (Table 8-1) parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3, 4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
4. FCHs were configured at full rate for maximum SAR with “All Up” power control bits.

- **Head SAR Measurement**

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

- **Body SAR Measurements**

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only.
When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts. Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

- **Handsets with Ev-Do**

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at **153.6 kbps** using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev. 0 and Rev. A.

CDMA 2000 CONDUCTED POWER (SO2, SO55, TDSO SO32, SO3)												
CHAN.	FREQ. (MHz)	CDMA 2000	RAW VALUE (dBm)				CORR. FACTOR (dB)	PEAK OUTPUT POWER (dBm)				
		RC	SO2	SO55	TDSO SO32	SO3		SO2	SO55	TDSO SO32	SO3	
1013	824.12	RC1	20.58	22.61	-	22.70	0.6	21.18	23.21	-	23.30	
		RC3	22.44	22.58	23.49	22.75	0.6	23.04	23.18	24.09	23.35	
384	836.58	RC1	22.64	22.65	-	22.68	0.6	23.24	23.25	-	23.28	
		RC3	24.58	22.57	23.56	22.97	0.6	23.18	23.17	24.16	23.57	
777	848.76	RC1	22.32	22.41	-	22.66	0.6	22.92	23.01	-	23.26	
		RC3	22.28	22.25	23.71	22.69	0.6	22.88	22.85	**24.31**	23.29	

CDMA 2000 CONDUCTED POWER (SO2, SO55, TDSO SO32, SO3)												
CHAN.	FREQ. (MHz)	CDMA 2000	RAW VALUE (dBm)				CORR. FACTOR (dB)	PEAK OUTPUT POWER (dBm)				
		RC	SO2	SO55	TDSO SO32	SO3		SO2	SO55	TDSO SO32	SO3	
25	1851.25	RC1	22.48	22.52	-	22.51	0.90	23.38	23.42	-	23.41	
		RC3	22.74	22.61	22.86	22.68	0.90	23.64	23.51	23.76	23.58	
600	1880.00	RC1	22.61	22.58	-	22.43	0.90	23.51	23.48	-	23.33	
		RC3	22.69	22.70	22.94	22.72	0.90	23.59	23.60	23.84	23.62	
1175	1908.75	RC1	22.67	22.59	-	22.55	0.90	23.57	23.49	-	23.45	
		RC3	22.70	22.69	22.02	22.67	0.90	23.60	23.59	**23.92**	23.57	

2.3 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

IEEE 1528-2003

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

2.4 GENERAL INOFRMATION OF THE SAR SYSTEM

DASY4 (software 4.7 Build 44) 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 DASY4 software defined. The DASY4 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.

ET3DV6 ISOTROPIC E-FIELD PROBE (FREQUENCY BAND < 3GHz)

CONSTRUCTION	Symmetrical design with triangular core. Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., glycolether).
FREQUENCY	10 MHz to 3 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
DYNAMIC RANGE	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
OPTICAL SURFACE DETECTION	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
DIMENSIONS	Overall length: 330 mm (Tip Length: 16 mm) Tip diameter: 6.8 mm (Body diameter: 12 mm) Distance from probe tip to dipole centers: 2.7 mm
APPLICATION	General dosimetric measurements up to 3 GHz Fast automatic scanning in arbitrary phantoms (ET3DV6)

EX3DV3 ISOTROPIC E-FIELD PROBE (FREQUENCY BAND 5 ~ 6GHz)

DIMENSIONS	Overall length: 330 mm (Tip Length: 20 mm) Tip diameter: 2.5 mm (Body diameter: 12 mm) Distance from probe tip to dipole centers: 1.0 mm
APPLICATION	General dosimetric measurements range 5 ~ 6 GHz. Fast automatic scanning in arbitrary phantoms (EX3DV3)

NOTE:

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX D” for the Calibration Certification Report.
2. For frequencies above 800 MHz, calibration in a rectangular wave-guide is used, because wave-guide size is manageable.
3. For frequencies below 800 MHz, temperature transfer calibration is used because the wave-guide size becomes relatively large.

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	900, 1800, 1900, 2450 , 5200, 5800MHz
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 GSM900/DCS1800/PCS1900 GSM/GPRS/CDMA 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.

2.5 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY4 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 7 x 7 x 7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30 x 30 x 30mm contains about 30g of tissue. 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 (42875 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the 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.

3. 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.	CALIBRATED UNTIL
1	Universal Radio Communication Tester	R&S	CMU200	104958	Apr. 11, 2007

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).

4. DESCRIPTION OF TEST POSITION

4.1 DESCRIPTION OF TEST POSITION

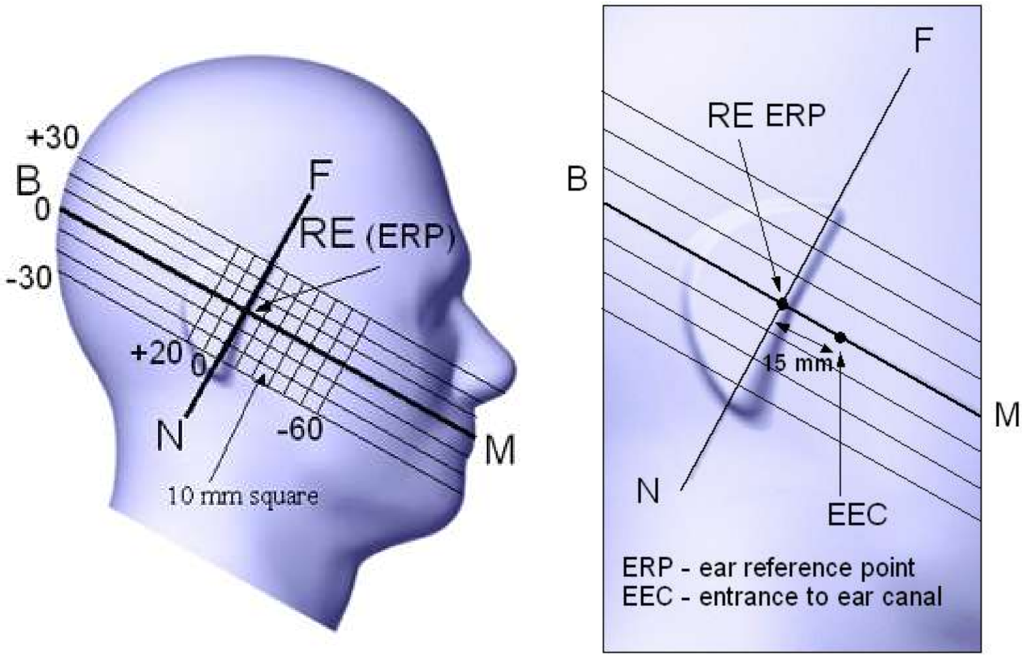


FIGURE 3.1

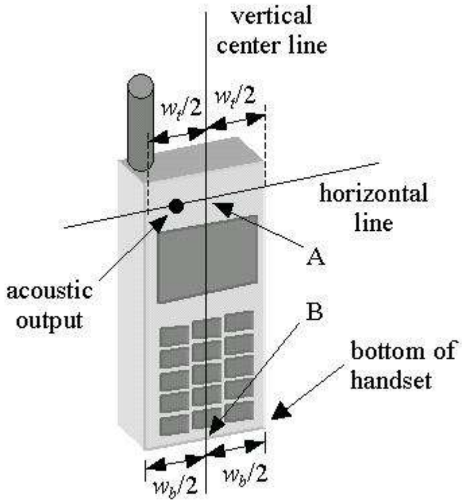


FIGURE 3.1a

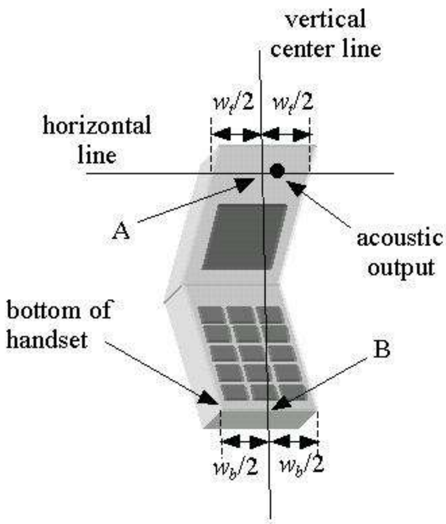
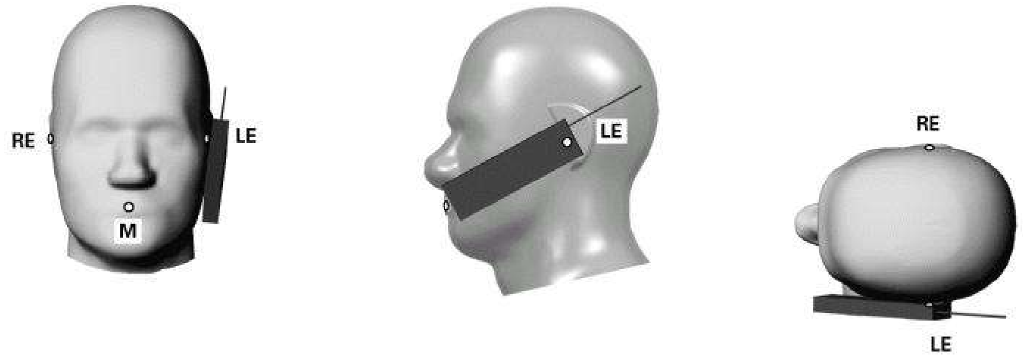


FIGURE 3.1b

4.2.1 TOUCH/CHEEK TEST POSITION

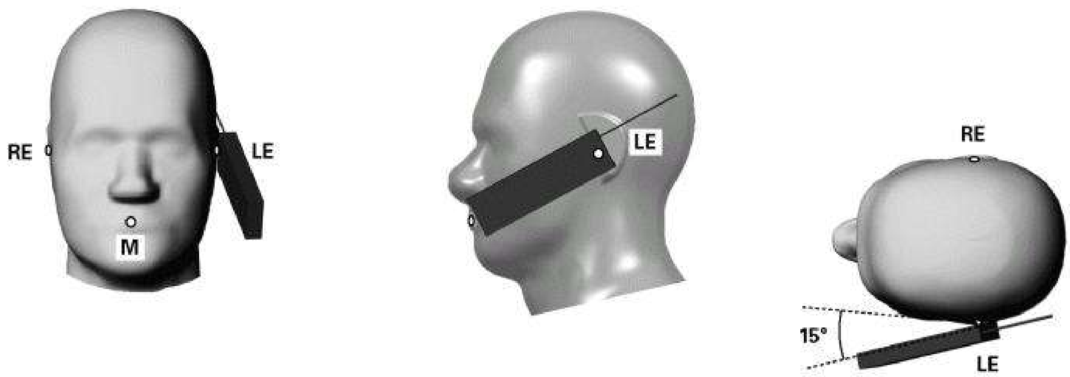
The head position in Figure 3.1, the ear reference points ERP are 15mm above entrance to ear canal along the B-M line. The line N-F (Neck-Front) is perpendicular to the B-M (Back Mouth) line. The handset device in Figure 3.1a and 3.1b,The vertical centerline pass through two points on the front side 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

4.2.2 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

4.2.3 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.

4.2 DESCRIPTION OF TEST MODE

Situation X and Y (listed as below) have been pre-tested firstly, and found battery 1 (situation X) is worse. After that compared both model no. (situation X & Z), X is still worse. Therefore the entire test came out with this one.

SITUATION	DESCRIPTION
X (as mode 7 middle channel)	TITA100 with battery 1
Y (as mode 8)	TITA100 with battery 2
Z (as mode 9)	TITA200 with battery 1

TEST MODE	COMMUNICATION MODE	MODULATION TYPE	ASSESSMENT POSTITION	TESTED CHANNEL	REMARK
1	CDMA 850	OQPSK	A / Cheek	L, M, H	-
2		OQPSK	A / Tilt	L, M, H	-
3		OQPSK	B / Cheek	L, M, H	-
4		OQPSK	B / Tilt	L, M, H	-
5		OQPSK	C : Body / Bottom	L, M, H	-
6		OQPSK	C : Body / Front	M	-
7	1xEVDO 850	HPSK	C : Body / Bottom	L, M, H	-
8		HPSK	C : Body / Bottom	M	TITA100 with battery 2
9		HPSK	C : Body / Bottom	M	TITA200 with battery 1
10		HPSK	C : Body / Front	M	-
11	CDMA 1900	OQPSK	A / Cheek	L, M, H	-
12		OQPSK	A / Tilt	L, M, H	-
13		OQPSK	B / Cheek	L, M, H	-
14		OQPSK	B / Tilt	L, M, H	-
15		OQPSK	C : Body / Bottom	L, M, H	-
16		OQPSK	C : Body / Front	H	-
17	1xEVDO 1900	HPSK	C : Body / Bottom	L, M, H	-
18		HPSK	C : Body / Front	H	-

TEST MODE	COMMUNICATION MODE	MODULATION TYPE	ASSESSMENT POSTITION	TESTED CHANNEL	REMARK
19	WLAN 802.11b	DBPSK	A / Cheek	L, M, H	-
20		DBPSK	A / Tilt	L, M, H	-
21		DBPSK	B / Cheek	L, M, H	-
22		DBPSK	B / Tilt	L, M, H	-
23		DBPSK	C : Body / Bottom	L, M, H	-
24		DBPSK	C : Body / Front	H	-
25	WLAN 802.11g	BPSK	A / Cheek	L, M, H	-
26		BPSK	A / Tilt	L, M, H	-
27		BPSK	B / Cheek	L, M, H	-
28		BPSK	B / Tilt	L, M, H	-
29		BPSK	C : Body / Bottom	L, M, H	-
30		BPSK	C : Body / Front	H	-
31	Bluetooth	GFSK	A / Cheek	L, M, H	-
32		GFSK	A / Tilt	L, M, H	-
33		GFSK	B / Cheek	L, M, H	-
34		GFSK	B / Tilt	L, M, H	-
35		GFSK	C : Body / Bottom	L, M, H	-
36		GFSK	C : Body / Front	H	-
37	CDMA 850 + 802.11b	NOTE 1	B / Cheek	NOTE 1	Co-located
38	1xEVDO 850 + 802.11b	NOTE 1	C : Body / Bottom	NOTE 1	Co-located
39	CDMA 1900 + 802.11b	NOTE 1	B / Tilt	NOTE 1	Co-located
40	1xEVDO 1900 + 802.11b	NOTE 1	C : Body / Bottom	NOTE 1	Co-located

TEST MODE	COMMUNICATION MODE	MODULATION TYPE	ASSESSMENT POSTITION	TESTED CHANNEL	REMARK
41	CDMA 850 + Bluetooth	NOTE 1	B / Cheek	NOTE 1	Co-located
42	1xEVDO 850 + Bluetooth	NOTE 1	C : Body / Bottom	NOTE 1	Co-located
43	CDMA 1900 + Bluetooth	NOTE 1	B / Tilt	NOTE 1	Co-located
44	1xEVDO 1900 + Bluetooth	NOTE 1	C : Body / Bottom	NOTE 1	Co-located

NOTE: 1. The combination is from the worst situation of each communication mode.
2. Assessment position A: Right head position, B: Left head position, C: Body position, please refer to appendix E for the photo.

4.3 SUMMARY OF TEST RESULTS

HEAD POSITION

PART OF ASSESSMENT	HEAD POSITION							
COMMUNICATION MODE	CDMA 850				CDMA 1900			
	MEASURED VALUE OF 1g SAR (W/kg)							
	RIGHT		LEFT		RIGHT		LEFT	
CHANNEL	CHEEK	TILT	CHEEK	TILT	CHEEK	TILT	CHEEK	TILT
LOW	0.667	0.572	0.708	0.595	0.765	0.825	0.602	0.759
MIDDLE	0.796	0.673	**0.869**	0.745	0.796	0.943	0.668	0.879
HIGH	0.679	0.582	0.714	0.602	0.834	**1.130**	0.740	1.040

NOTE: The worst value of each communication has been marked by boldface.

PART OF ASSESSMENT	HEAD POSITION							
COMMUNICATION MODE	802.11b				802.11g			
	MEASURED VALUE OF 1g SAR (W/kg)							
	RIGHT		LEFT		RIGHT		LEFT	
CHANNEL	CHEEK	TILT	CHEEK	TILT	CHEEK	TILT	CHEEK	TILT
LOW	0.246	0.051	0.281	0.051	0.137	0.041	0.128	0.048
MIDDLE	0.222	0.045	0.210	0.045	0.144	0.035	0.131	0.043
HIGH	0.258	0.061	**0.331**	0.055	**0.161**	0.042	0.151	0.049

NOTE: The worst value of each communication has been marked by boldface.

PART OF ASSESSMENT	HEAD POSITION			
COMMUNICATION MODE	BLUETOOTH			
	MEASURED VALUE OF 10g SAR (W/kg)			
	RIGHT		LEFT	
CHANNEL	CHEEK	TILT	CHEEK	TILT
LOW	0.00168	0.00117	0.00174	0.00113
MIDDLE	0.00151	0.00114	0.00171	0.00117
HIGH	0.00243	0.00125	**0.00372**	0.00164

NOTE: The worst value has been marked by boldface.

BODY POSITION

PART OF ASSESSMENT	BODY POSITION							
COMMUNICATION MODE	CDMA 850		1XEVDO 850		CDMA 1900		1XEVDO 1900	
	MEASURED VALUE OF 1g SAR (W/kg)							
CHANNEL	BOTTOM	FRONT	BOTTOM	FRONT	BOTTOM	FRONT	BOTTOM	FRONT
LOW	0.638	-	0.721	-	0.399	-	0.407	-
MIDDLE	**0.815**	0.518	**0.922**	0.674	0.399	-	0.484	-
HIGH	0.513	-	0.589	-	**0.422**	0.220	**0.544**	0.235

NOTE: The worst value of each communication has been marked by boldface.

PART OF ASSESSMENT	BODY POSITION					
COMMUNICATION MODE	802.11b		802.11g		BLUETOOTH	
	MEASURED VALUE OF 1g SAR (W/kg)					
CHANNEL	BOTTOM	FRONT	BOTTOM	FRONT	BOTTOM	FRONT
LOW	0.029	-	0.020	-	0.00145	-
MIDDLE	0.030	-	0.021	-	0.00147	-
HIGH	**0.034**	0.029	**0.025**	0.016	**0.00167**	0.00136

NOTE: The worst value of each communication has been marked by boldface.

TEST RESULTS OF MULTI-BANDS CO-LOCATED ASSESSMENT

The worst situation has been chosen from the above table, and make up following combinations for the test of co-location listed as below.

TEST MODE	DESCRIPTION	MEASURED VALUE OF 1g SAR (W/kg)
37	CDMA 850 middle channel + 802.11b high channel	0.869
38	1xEVDO 850 middle channel + 802.11b high channel	0.922
39	CDMA 1900 high channel + 802.11b high channel	1.130
40	1x EVDO 1900 high channel + 802.11b high channel	0.544
41	CDMA 850 middle channel + Bluetooth high channel	0.869
42	1xEVDO 850 middle channel + Bluetooth high channel	0.922
43	CDMA 1900 high channel + Bluetooth high channel	1.130
44	1x EVDO 1900 high channel + Bluetooth high channel	0.544

5. TEST RESULTS

5.1 TEST PROCEDURES

For CDMA2000, 1xEV-DO:

The EUT (Pocket PC Phone) 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 DASY4 SAR measurement system manufactured and calibrated by SPEAG. According to the IEEE 1528 / EN 50361, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

For WLAN & Bluetooth:

The EUT (Pocket PC Phone) use the software to control the EUT channel and transmission power. Then record the conducted power before the testing. Place the EUT to the specific test location. After the testing, must writing down the conducted power of the EUT into the report. The SAR value was calculated via the 3D spline interpolation algorithm that has been implemented in the software of DASY4 SAR measurement system manufactured and calibrated by SPEAG. According to the IEEE P1528 / EN 50361 standards, 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

The area scan with 15mm x 15mm grid was performed for the highest spatial SAR location. Consist of 11 x 13 points while the scan size is the 150mm x 180mm. The zoom scan with 30mm x 30mm x 30mm volume was performed for SAR value averaged over 1g and 10g spatial volumes.

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 4.0 mm and maintained at a constant distance of ±1.0 mm during a zoom scan to determine peak SAR locations. The distance is 4mm between the first measurement point and the bottom surface of the phantom. The secondary measurement point to the bottom surface of the phantom is with 9mm separation distance. The cube size is 7 x 7 x 7 points consist of 343 points and the grid space is 5mm.

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 4mm 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%.

5.2 MEASURED SAR RESULTS

CDMA 850 BAND RIGHT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.5°C, Liquid Temperature：21.6°C Humidity：57%RH		
TESTED BY	Sam Onn	DATE	Sep. 04, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1013	**824.2 (Low)**	**OQPSK**	0.2080	0.2057	-1.11	Standard Battery	1	0.667
384	**836.6 (Mid.)**	**OQPSK**	0.2075	0.2051	-1.16	Standard Battery	1	0.796
777	**848.8 (High)**	**OQPSK**	0.1928	0.1910	-0.93	Standard Battery	1	0.679
1013	**824.2 (Low)**	**OQPSK**	0.2080	0.2048	-1.54	Standard Battery	2	0.572
384	**836.6 (Mid.)**	**OQPSK**	0.2075	0.2049	-1.25	Standard Battery	2	0.673
777	**848.8 (High)**	**OQPSK**	0.1928	0.1908	-1.04	Standard Battery	2	0.582

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 850 BAND LEFT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.5°C, Liquid Temperature：21.6°C Humidity：57%RH		
TESTED BY	Sam Onn	DATE	Sep. 04, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1013	**824.2 (Low)**	**OQPSK**	0.2080	0.2038	-2.02	Standard Battery	3	0.708
384	**836.6 (Mid.)**	**OQPSK**	0.2075	0.2042	-1.59	Standard Battery	3	**0.869**
777	**848.8 (High)**	**OQPSK**	0.1928	0.1906	-1.14	Standard Battery	3	0.714
1013	**824.2 (Low)**	**OQPSK**	0.2080	0.2055	-1.20	Standard Battery	4	0.595
384	**836.6 (Mid.)**	**OQPSK**	0.2075	0.2037	-1.83	Standard Battery	4	0.745
777	**848.8 (High)**	**OQPSK**	0.1928	0.1903	-1.30	Standard Battery	4	0.602

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 850 BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.3°C, Liquid Temperature：21.2°C Humidity：55%RH		
TESTED BY	Sam Onn	DATE	Sep. 03, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1013	824.2 (Low)	OQPSK	0.2565	0.2524	-1.58	Standard Battery	5	0.638
384	836.6 (Mid.)	OQPSK	0.2606	0.2564	-1.63	Standard Battery	5	**0.815**
777	848.8 (High)	OQPSK	0.2698	0.2649	-1.83	Standard Battery	5	0.513
384	836.6 (Mid.)	OQPSK	0.2606	0.2578	-1.08	Standard Battery	6	0.518

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

1 x EVDO 850 BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.3°C, Liquid Temperature：21.2°C Humidity：55%RH		
TESTED BY	Sam Onn	DATE	Sep. 03, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1013	824.2 (Low)	HPSK	0.2187	0.2171	-0.73	Standard Battery	7	0.721
384	836.6 (Mid.)	HPSK	0.2265	0.2222	-1.92	Standard Battery	7	**0.922**
777	848.8 (High)	HPSK	0.2089	0.2066	-1.08	Standard Battery	7	0.589
384	836.6 (Mid.)	HPSK	0.2265	0.2240	-1.11	Standard Battery	8	0.912
384	836.6 (Mid.)	HPSK	0.2265	0.2237	-1.24	Standard Battery	9	0.893
384	836.6 (Mid.)	HPSK	0.2265	0.2236	-1.28	Standard Battery	10	0.674

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 1900 BAND RIGHT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.0°C, Liquid Temperature：21.1°C Humidity：58%RH		
TESTED BY	Sam Onn	DATE	Sep. 08, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
25	**1851.25 (Low)**	**OQPSK**	0.2244	0.2205	-1.74	Standard Battery	11	0.765
600	**1880.00 (Mid.)**	**OQPSK**	0.2291	0.2264	-1.18	Standard Battery	11	0.796
1175	**1908.75 (High)**	**OQPSK**	0.2286	0.2243	-1.88	Standard Battery	11	0.834
25	**1851.25 (Low)**	**OQPSK**	0.2244	0.2211	-1.47	Standard Battery	12	0.825
600	**1880.00 (Mid.)**	**OQPSK**	0.2291	0.2258	-1.44	Standard Battery	12	0.943
1175	**1908.75 (High)**	**OQPSK**	0.2286	0.2251	-1.53	Standard Battery	12	**1.130**

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 1900 BAND LEFT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.0°C, Liquid Temperature：21.1°C Humidity：58%RH		
TESTED BY	Sam Onn	DATE	Sep. 08, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
25	**1851.25 (Low)**	**OQPSK**	0.2244	0.2210	-1.52	Standard Battery	13	0.602
600	**1880.00 (Mid.)**	**OQPSK**	0.2291	0.2249	-1.83	Standard Battery	13	0.668
1175	**1908.75 (High)**	**OQPSK**	0.2286	0.2245	-1.79	Standard Battery	13	0.740
25	**1851.25 (Low)**	**OQPSK**	0.2244	0.2202	-1.87	Standard Battery	14	0.759
600	**1880.00 (Mid.)**	**OQPSK**	0.2291	0.2261	-1.31	Standard Battery	14	0.879
1175	**1908.75 (High)**	**OQPSK**	0.2286	0.2239	-2.06	Standard Battery	14	1.040

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 1900 BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.0°C, Liquid Temperature：21.1°C Humidity：62%RH		
TESTED BY	Sam Onn	DATE	Sep. 04, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
25	**1851.25 (Low)**	**OQPSK**	0.2377	0.2348	-1.23	Standard Battery	15	0.399
600	**1880.00 (Mid.)**	**OQPSK**	0.2421	0.2376	-1.86	Standard Battery	15	0.399
1175	**1908.75 (High)**	**OQPSK**	0.2466	0.2426	-1.62	Standard Battery	15	**0.422**
1175	**1908.75 (High)**	**OQPSK**	0.2466	0.2419	-1.89	Standard Battery	16	0.220

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

1 x EVDO 1900 BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.2°C, Liquid Temperature：21.1°C Humidity：62%RH		
TESTED BY	Sam Onn	DATE	Sep. 04, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (W)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
25	**1851.25 (Low)**	**HPSK**	0.2344	0.2312	-1.37	Standard Battery	17	0.407
600	**1880.00 (Mid.)**	**HPSK**	0.2355	0.2307	-2.04	Standard Battery	17	0.484
1175	**1908.75 (High)**	**HPSK**	0.2371	0.2347	-1.01	Standard Battery	17	**0.544**
1175	**1908.75 (High)**	**HPSK**	0.2371	0.2342	-1.22	Standard Battery	18	0.235

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

WLAN BAND (802.11b) RIGHT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.2°C, Liquid Temperature：21.3°C Humidity：59%RH		
TESTED BY	Sam Onn	DATE	Sep. 11, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1	**2412.00 (Low)**	**DBPSK**	79.433	78.400	-1.30	Standard Battery	19	0.246
6	**2437.00 (Mid.)**	**DBPSK**	80.353	79.027	-1.65	Standard Battery	19	0.222
11	**2462.00 (High)**	**DBPSK**	79.616	78.167	-1.82	Standard Battery	19	0.258
1	**2412.00 (Low)**	**DBPSK**	79.433	77.916	-1.91	Standard Battery	20	0.051
6	**2437.00 (Mid.)**	**DBPSK**	80.353	78.641	-2.13	Standard Battery	20	0.045
11	**2462.00 (High)**	**DBPSK**	79.616	77.419	-2.76	Standard Battery	20	0.061

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

WLAN BAND (802.11b) LEFT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.2°C, Liquid Temperature：21.3°C Humidity：59%RH		
TESTED BY	Sam Onn	DATE	Sep. 11, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1	**2412.00 (Low)**	**DBPSK**	79.433	78.472	-1.21	Standard Battery	21	0.281
6	**2437.00 (Mid.)**	**DBPSK**	80.353	78.891	-1.82	Standard Battery	21	0.210
11	**2462.00 (High)**	**DBPSK**	79.616	77.817	-2.26	Standard Battery	21	**0.331**
1	**2412.00 (Low)**	**DBPSK**	79.433	78.416	-1.28	Standard Battery	22	0.051
6	**2437.00 (Mid.)**	**DBPSK**	80.353	79.284	-1.33	Standard Battery	22	0.045
11	**2462.00 (High)**	**DBPSK**	79.616	78.517	-1.38	Standard Battery	22	0.055

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

WLAN BAND (802.11b) BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.1°C, Liquid Temperature：21.0°C Humidity：57%RH		
TESTED BY	Sam Onn	**DATE**	Sep. 10, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1	**2412.00 (Low)**	**DBPSK**	79.433	78.297	-1.43	Standard Battery	23	0.029
6	**2437.00 (Mid.)**	**DBPSK**	80.353	79.164	-1.48	Standard Battery	23	0.030
11	**2462.00 (High)**	**DBPSK**	79.616	78.398	-1.53	Standard Battery	23	**0.034**
11	**2462.00 (High)**	**DBPSK**	79.616	78.358	-1.58	Standard Battery	24	0.029

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

WLAN BAND (802.11g) RIGHT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.2°C, Liquid Temperature：21.3°C Humidity：59%RH		
TESTED BY	Sam Onn	DATE	Sep. 11, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1	**2412.00 (Low)**	**BPSK**	79.983	79.119	-1.08	Standard Battery	25	0.137
6	**2437.00 (Mid.)**	**BPSK**	80.353	79.333	-1.27	Standard Battery	25	0.144
11	**2462.00 (High)**	**BPSK**	79.616	78.087	-1.92	Standard Battery	25	**0.161**
1	**2412.00 (Low)**	**BPSK**	79.983	79.119	-1.08	Standard Battery	26	0.041
6	**2437.00 (Mid.)**	**BPSK**	80.353	79.461	-1.11	Standard Battery	26	0.035
11	**2462.00 (High)**	**BPSK**	79.616	78.629	-1.24	Standard Battery	26	0.042

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

WLAN BAND (802.11g) LEFT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.2°C, Liquid Temperature：21.3°C Humidity：59%RH		
TESTED BY	Sam Onn	DATE	Sep. 11, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1	2412.00 (Low)	BPSK	79.983	78.959	-1.28	Standard Battery	27	0.128
6	2437.00 (Mid.)	BPSK	80.353	79.252	-1.37	Standard Battery	27	0.131
11	2462.00 (High)	BPSK	79.616	78.438	-1.48	Standard Battery	27	0.151
1	2412.00 (Low)	BPSK	79.983	79.079	-1.13	Standard Battery	28	0.048
6	2437.00 (Mid.)	BPSK	80.353	79.614	-0.92	Standard Battery	28	0.043
11	2462.00 (High)	BPSK	79.616	78.533	-1.36	Standard Battery	28	0.049

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

WLAN BAND (802.11g) BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.1°C, Liquid Temperature：21.0°C Humidity：59%RH		
TESTED BY	Sam Onn	DATE	Sep. 10, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1	**2412.00 (Low)**	**BPSK**	79.983	79.063	-1.15	Standard Battery	29	0.020
6	**2437.00 (Mid.)**	**BPSK**	80.353	79.124	-1.53	Standard Battery	29	0.021
11	**2462.00 (High)**	**BPSK**	79.616	78.414	-1.51	Standard Battery	29	**0.025**
11	**2462.00 (High)**	**BPSK**	79.616	78.533	-1.36	Standard Battery	30	0.016

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

BLUETOOTH BAND RIGHT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：21.8°C, Liquid Temperature：20.9°C Humidity：62%RH		
TESTED BY	Sam Onn	DATE	Sep. 07, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
0	**2402.00 (Low)**	**GFSK**	0.628	0.615	-1.98	Standard Battery	31	0.00168
39	**2441.00 (Mid.)**	**GFSK**	0.964	0.945	-1.91	Standard Battery	31	0.00151
78	**2480.00 (High)**	**GFSK**	1.064	1.038	-2.36	Standard Battery	31	0.00243
0	**2402.00 (Low)**	**GFSK**	0.628	0.611	-2.66	Standard Battery	32	0.00117
39	**2441.00 (Mid.)**	**GFSK**	0.964	0.935	-2.97	Standard Battery	32	0.00114
78	**2480.00 (High)**	**GFSK**	1.064	1.041	-2.13	Standard Battery	32	0.00125

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

BLUETOOTH BAND LEFT HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：21.8°C, Liquid Temperature：20.9°C Humidity：62%RH		
TESTED BY	Sam Onn	DATE	Sep. 07, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
0	**2402.00 (Low)**	**GFSK**	0.628	0.620	-1.25	Standard Battery	33	0.00174
39	**2441.00 (Mid.)**	**GFSK**	0.964	0.952	-1.22	Standard Battery	33	0.00171
78	**2480.00 (High)**	**GFSK**	1.064	1.048	-1.46	Standard Battery	33	**0.00372**
0	**2402.00 (Low)**	**GFSK**	0.628	0.616	-1.82	Standard Battery	34	0.00113
39	**2441.00 (Mid.)**	**GFSK**	0.964	0.947	-1.73	Standard Battery	34	0.00117
78	**2480.00 (High)**	**GFSK**	1.064	1.049	-1.33	Standard Battery	34	0.00164

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

BLUETOOTH BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.1°C, Liquid Temperature：21.0°C Humidity：57%RH		
TESTED BY	Sam Onn	DATE	Sep. 10, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
0	**2402.00 (Low)**	**GFSK**	0.628	0.619	-1.34	Standard Battery	35	0.00145
39	**2441.00 (Mid.)**	**GFSK**	0.964	0.952	-1.25	Standard Battery	35	0.00147
78	**2480.00 (High)**	**GFSK**	1.064	1.050	-1.31	Standard Battery	35	**0.00167**
78	**2480.00 (High)**	**GFSK**	1.064	1.049	-1.36	Standard Battery	36	0.00136

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 850 + WLAN (802.11b) BAND LEFT HEAD (CHEEK) POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.5°C, Liquid Temperature：21.6°C Humidity：57%RH					
TESTED BY	Sam Onn		**DATE**	Sep. 04, 2006		

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
384	**836.6 (Mid.)**	**OQPSK**	0.2075W	0.2042W	-1.59	Standard Battery	37	0.869
11	**2462.00 (High)**	**DBPSK**	79.616mW	77.817mW	-2.26			

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

1xEVDO 850 + WLAN (802.11b) BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.3°C, Liquid Temperature：21.2°C Humidity：55%RH								
TESTED BY	Sam Onn				**DATE**		Sep. 03, 2006		
CHAN.	**FREQ. (MHz)**	**MODULATION TYPE**	**CONDUCTED POWER**		**POWER DRIFT (%)**	**DEVICE USE POWER**	**DEVICE TEST POSITION MODE**	**MEASURED 1g SAR (W/kg)**	
			BEGIN TEST	**AFTER TEST**					
384	**836.6 (Mid.)**	**OQPSK**	0.2265W	0.2222W	-1.92	Standard Battery	38	0.922	
11	**2462.00 (High)**	**DBPSK**	79.616mW	78.398mW	-1.53				

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 1900 + WLAN (802.11b) BAND RIGHT HEAD (TILT) POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.0°C, Liquid Temperature：21.1°C Humidity：58%RH		
TESTED BY	Sam Onn	**DATE**	Sep. 08, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1175	**1908.75 (High)**	**OQPSK**	0.2286W	0.2251W	-1.53	Standard Battery	39	1.130
11	**2462.00 (High)**	**DBPSK**	79.616mW	77.419mW	-2.76			

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

1xEVDO 1900 + WLAN (802.11b) BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.2°C, Liquid Temperature：21.1°C Humidity：62%RH							
TESTED BY	Sam Onn				DATE		Sep. 04, 2006	
CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1175	**1908.75 (High)**	**OQPSK**	0.2371W	0.2347W	-1.01	Standard Battery	40	0.544
11	**2462.00 (High)**	**DBPSK**	79.616mW	78.398mW	-1.53			

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 850 + BLUETOOTH BAND LEFT HEAD (CHEEK) POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.5°C, Liquid Temperature：21.6°C Humidity：57%RH		
TESTED BY	Sam Onn	DATE	Sep. 04, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
384	**836.6 (Mid.)**	**OQPSK**	0.2075W	0.2042W	-1.59	Standard Battery	41	0.869
78	**2480.00 (High)**	**GFSK**	1.064mW	1.048mW	-1.46			

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

1xEVDO 850 + BLUETOOTH BAND BODY POSITION

<table>
<tr><td>ENVIRONMENTAL CONDITION</td><td colspan="8">Air Temperature：22.3°C, Liquid Temperature：21.2°C
Humidity：55%RH</td></tr>
<tr><td>TESTED BY</td><td colspan="4">Sam Onn</td><td colspan="2">DATE</td><td colspan="2">Sep. 03, 2006</td></tr>
<tr><th rowspan="2">CHAN.</th><th rowspan="2">FREQ. (MHz)</th><th rowspan="2">MODULATION TYPE</th><th colspan="2">CONDUCTED POWER</th><th rowspan="2">POWER DRIFT (%)</th><th rowspan="2">DEVICE USE POWER</th><th rowspan="2">DEVICE TEST POSITION MODE</th><th rowspan="2">MEASURED 1g SAR (W/kg)</th></tr>
<tr><th>BEGIN TEST</th><th>AFTER TEST</th></tr>
<tr><td>384</td><td>836.6 (Mid.)</td><td>OQPSK</td><td>0.2265W</td><td>0.2222W</td><td>-1.92</td><td rowspan="2">Standard Battery</td><td rowspan="2">42</td><td rowspan="2">0.922</td></tr>
<tr><td>78</td><td>2480.00 (High)</td><td>GFSK</td><td>1.064mW</td><td>1.050mW</td><td>-1.31</td></tr>
</table>

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

CDMA 1900 + BLUETOOTH BAND RIGHT HEAD (TILT) POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.0°C, Liquid Temperature：21.1°C Humidity：58%RH		
TESTED BY	Sam Onn	**DATE**	Sep. 08, 2006

CHAN.	FREQ. (MHz)	MODULATION TYPE	CONDUCTED POWER		POWER DRIFT (%)	DEVICE USE POWER	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST				
1175	**1908.75 (High)**	**OQPSK**	0.2286W	0.2251W	-1.53	Standard Battery	43	1.130
78	**2480.00 (High)**	**GFSK**	1.064mW	1.041mW	-2.13			

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

1xEVDO 1900 + BLUETOOTH BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.2°C, Liquid Temperature：21.1°C Humidity：62%RH								
TESTED BY	Sam Onn				DATE		Sep. 04, 2006		
CHAN.	**FREQ. (MHz)**	**MODULATION TYPE**	**CONDUCTED POWER**		**POWER DRIFT (%)**	**DEVICE USE POWER**	**DEVICE TEST POSITION MODE**	**MEASURED 1g SAR (W/kg)**	
			BEGIN TEST	**AFTER TEST**					
1175	**1908.75 (High)**	**OQPSK**	0.2371W	0.2347W	-1.01	Standard Battery	44	0.544	
78	**2480.00 (High)**	**GFSK**	1.064mW	1.050mW	-1.31				

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

5.3 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:

1. This limits accord to 47 CFR 2.1093 – Safety Limit.
2. The EUT property been complied with the partial body exposure limit under the general population environment.

5.4 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 835MHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID 835MHz (HSL-835)	MUSCLE SIMULATING LIQUID 835MHz (MSL-835)
Water	40.28%	50.07%
Cellulose	02.41%	NA
Salt	01.38%	0.94%
Preventtol D-7	00.18%	0.09%
Sugar	57.97%	48.2%
Dielectric Parameters at 22℃	f = 835MHz ε= 41.5 ± 5% σ= 0.97 ± 5% S/m	f= 835MHz ε= 55.0 ± 5% σ= 1.05 ± 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

THE RECIPES FOR 2450MHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID 2450MHz (HSL-2450)	MUSCLE SIMULATING LIQUID 2450MHz (MSL-2450)
Water	45%	69.83%
DGMBE	55%	30.17%
Salt	NA	NA
Dielectric Parameters at 22℃	f= 2450MHz ε= 39.2 ± 5% σ= 1.80 ± 5% S/m	f= 2450MHz ε= 52.7 ± 5% σ= 1.95 ± 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 DASY4 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 CDMA850 BAND SIMULATING LIQUID

LIQUID TYPE		HSL-835		MSL-835	
SIMULATING LIQUID TEMP.		21.6		21.2	
TESTED DATE		Sep. 04, 2006		Sep. 03, 2006	
TESTED BY		Sam Onn		Sam Onn	
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**STANDARD VALUE**	**MEASUREMENT VALUE**
824.20	Permitivity (ε)	41.550	42.100	55.240	55.100
835.00		41.500	41.800	55.200	55.000
836.60		41.500	41.800	55.190	55.000
848.80		41.500	41.500	55.150	54.900
824.20	Conductivity (σ) S/m	0.899	0.870	0.969	0.940
835.00		0.900	0.890	0.970	0.950
836.60		0.901	0.890	0.972	0.950
848.80		0.914	0.900	0.987	0.960
Dielectric Parameters Required at 22℃		**f= 835MHz ε= 41.5 ± 5% σ= 0.97 ± 5% S/m**		**f= 835MHz ε= 55.0 ± 5% σ= 1.05 ± 5% S/m**	

FOR CDMA1900 BAND SIMULATING LIQUID

LIQUID TYPE		HSL-1900		MSL-1900	
SIMULATING LIQUID TEMP.		21.1		21.1	
TESTED DATE		Sep. 08, 2006		Sep. 04, 2006	
TESTED BY		Sam Onn		Sam Onn	
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**STANDARD VALUE**	**MEASUREMENT VALUE**
1851.25	Permitivity (ε)	40.000	39.600	53.300	52.900
1880.00		40.000	39.500	53.300	52.900
1900.00		40.000	39.400	53.300	53.000
1908.75		40.000	39.400	53.300	53.100
1851.25	Conductivity (σ) S/m	1.400	1.350	1.520	1.450
1880.00		1.400	1.390	1.520	1.510
1900.00		1.400	1.420	1.520	1.550
1908.75		1.400	1.430	1.520	1.560
Dielectric Parameters Required 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**	

FOR 2.4GHz BAND SIMULATING LIQUID

LIQUID TYPE		HSL-2450		MSL-2450	
SIMULATING LIQUID TEMP.		21.3		21.0	
TEST DATE		Sep. 11, 2006		Sep. 10, 2006	
TESTED BY		Sam Onn		Sam Onn	
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	STANDARD VALUE	MEASUREMENT VALUE
2412.0	Permitivity (ε)	39.267	40.000	52.750	52.300
2437.0		39.223	39.900	52.710	52.200
2450.0		39.200	39.900	52.700	52.100
2462.0		39.184	39.800	52.680	52.100
2412.0	Conductivity (σ) S/m	1.766	1.810	1.913	1.910
2437.0		1.788	1.840	1.937	1.950
2450.0		1.800	1.860	1.950	1.970
2462.0		1.813	1.870	1.967	1.980
Dielectric Parameters Required at 22℃		**f= 2450MHz ε= 39.2 ± 5% σ= 1.80 ± 5% S/m**		**f= 2450MHz ε= 52.7 ± 5% σ= 1.95 ± 5% S/m**	

FOR BLUETOOTH BAND SIMULATING LIQUID

LIQUID TYPE		HSL-2450		MSL-2450	
SIMULATING LIQUID TEMP.		20.9		21.0	
TEST DATE		Sep. 07, 2006		Sep. 10, 2006	
TESTED BY		Sam Onn		Sam Onn	
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**STANDARD VALUE**	**MEASUREMENT VALUE**
2402.0	Permitivity (ε)	39.280	40.500	52.760	52.300
2441.0		39.210	40.400	52.710	52.200
2450.0		39.200	40.300	52.700	52.100
2480.0		39.160	40.200	52.660	52.000
2402.0	Conductivity (σ) S/m	1.750	1.810	1.900	1.910
2441.0		1.790	1.850	1.940	1.960
2450.0		1.800	1.870	1.950	1.970
2480.0		1.830	1.900	1.990	2.010
Dielectric Parameters Required at 22℃		**f= 2450MHz ε= 39.2 ± 5% σ= 1.80 ± 5% S/m**		**f= 2450MHz ε= 52.7 ± 5% σ= 1.95 ± 5% S/m**	

5.5 TEST EQUIPMENT FOR TISSUE PROPERTY

ITEM	NAME	BAND	TYPE	SERIES NO.	CALIBRATED UNTIL
1	Network Analyzer	Agilent	E8358A	US41480538	Oct. 27, 2006
2	Dielectric Probe	Agilent	85070D	US01440176	NA

NOTE:

1. Before testing the measurement, all test equipment shall have 30 min warm up.
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.

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 EQUIPMENT

ITEM	NAME	BAND	TYPE	SERIES NO.	CALIBRATED UNTIL
1	SAM Phantom	S & P	QD000 P40 CA	PT-1150	NA
2	Signal Generator	Agilent	E8257C	MY43320668	Dec. 07, 2006
3	E-Field Probe	S & P	ET3DV6	1687	Sep. 14, 2006
5	DAE	S & P	DAE3 V1	579	Mar. 14, 2007
6	Robot Positioner	Staubli Unimation	NA	NA	NA
7	Validation Dipole	S & P	D835V2	4d021	May 22, 2007
		S & P	D1900V2	5d036	Apr. 27, 2007
		S & P	D2450V2	737	Apr. 26, 2007

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

6.2 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. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^{O}$.) However, varying breaking indices of different liquid compositions might also influence the distance. If the indicated difference varies from the actual setting, the probe parameter ”optical surface

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 DASY4 system is less than ±0.1mm.

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

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

6.3 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	**REQUIRED SAR (mW/g)**	**MEASURED SAR (mW/g)**	**DEVIATION (%)**	**SEPARATION DISTANCE**	**TESTED DATE**
HSL 835	2.31 (1g)	2.30	-0.43	15mm	Sep. 04, 2006
MSL 835	2.45 (1g)	2.41	-1.63	15mm	Sep. 03, 2006
HSL 1900	9.61 (1g)	9.59	-0.21	10mm	Sep. 08, 2006
MSL 1900	9.96 (1g)	9.65	-3.11	10mm	Sep. 04, 2006
HSL 2450 (Bluetooth)	13.30 (1g)	13.50	1.50	10mm	Sep. 07, 2006
MSL 2450	13.90 (1g)	13.80	-0.72	10mm	Sep. 10, 2006
HSL 2450 (WLAN)	13.30 (1g)	13.40	0.75	10mm	Sep. 11, 2006
TESTED BY	Sam Onn				

NOTE: Please sees Appendix for the photo of system validation test.

6.4 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	4.8	Normal	1	1	1	4.8	4.8	∞
Axial Isotropy	4.7	Rectangular	$\sqrt{3}$	1	1	2.7	2.7	∞
Hemispherical Isotropy	0	Rectangular	$\sqrt{3}$	1	1	0	0	∞
Boundary effect	1.0	Rectangular	$\sqrt{3}$	1	1	0.6	0.6	∞
Linearity	4.7	Rectangular	$\sqrt{3}$	1	1	2.7	2.7	∞
System Detection Limit	1.0	Rectangular	$\sqrt{3}$	1	1	0.6	0.6	∞
Readout Electronics	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time	0	Rectangular	$\sqrt{3}$	1	1	0	0	∞
Integration Time	0	Rectangular	$\sqrt{3}$	1	1	0	0	∞
RF Ambient Conditions	3.0	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
Probe Positioner	0.4	Rectangular	$\sqrt{3}$	1	1	0.2	0.2	∞
Probe positioning	2.9	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
Algorithms for Max. SAR Evaluation	1.0	Rectangular	$\sqrt{3}$	1	1	0.6	0.6	∞
Dipole								
Dipole Axis to Liquid Distance	2.0	Rectangular	$\sqrt{3}$	1	1	1.2	1.2	∞
Input power and SAR drift measurement	4.7	Rectangular	$\sqrt{3}$	1	1	2.7	2.7	∞
Phantom and Tissue Parameters								
Phantom Uncertainty	4.0	Rectangular	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5.0	Rectangular	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	2.5	Normal	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5.0	Rectangular	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	2.5	Normal	1	0.6	0.49	1.5	1.2	∞
Combined Standard Uncertainty						8.4	8.1	∞
Coverage Factor for 95%						kp=2		
Expanded Uncertainty (K=2)						16.8	16.2	

NOTE: About the system validation uncertainty assessment, please reference the section 7.

7. MEASUREMENT SAR PROCEDURE UNCERTAINTIES

The assessment of spatial peak SAR of the hand handheld devices is according to IEEE 1528. All testing situation shall be met below these requirements.

- The system is used by an experienced engineer who follows the manual and the guidelines taught during the training provided by SPEAG.
- The probe has been calibrated within the requested period and the stated uncertainty for the relevant frequency bands does not exceed 4.8% (k=1).
- The validation dipole has been calibrated within the requested period and the system performance check has been successful.
- The DAE unit has been calibrated within the within the requested period.
- The minimum distance between the probe sensor and inner phantom shell is selected to be between 4 and 5mm.
- The operational mode of the DUT is CW, CDMA, FDMA or TDMA (GSM, DCS, PCS, IS136 and PDC) and the measurement/integration time per point is >500 ms.
- The dielectric parameters of the liquid have been assessed using Agilent 85070D dielectric probe kit or a more accurate method.
- The dielectric parameters are within 5% of the target values.
- The DUT has been positioned as described in section 3.

7.1 PROBE CALIBRATION UNCERTAINTY

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 50361, IEC 62209, etc.) under ISO17025. The uncertainties are stated on the calibration certificate. For the most relevant frequency bands, these values do not exceed 4.8% (k=1). If evaluations of other bands are performed for which the uncertainty exceeds these values, the uncertainty tables given in the summary have to be revised accordingly.

7.2 ISOTROPY UNCERTAINTY

The axial isotropy tolerance accounts for probe rotation around its axis while the hemispherical isotropy error includes all probe orientations and field polarizations. These parameters are assessed by SPEAG during initial calibration. In 2001, SPEAG further tightened its quality controls and warrants that the maximal deviation from axial isotropy is ±0.20 dB, while the maximum deviation of hemispherical isotropy is ±0.40 dB, corresponding to ±4.7% and ±9.6%, respectively. A weighting factor of cp equal to 0.5 can be applied, since the axis of the probe deviates less than 30 degrees from the normal surface orientation.

7.3 BOUNDARY EFFECT UNCERTAINTY

The effect can be estimated according to the following error approximation formula

$$SAR_{tolerance}[\%] = SAR_{be}[\%] \times \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{e^{-\frac{d_{be}}{\delta/2}}}{\delta/2}$$

$$d_{be} + d_{step} < 10mm$$

The parameter d_{be} is the distance in mm between the surface and the closest measurement point used in the averaging process; d_{step} is the separation distance in mm between the first and second measurement points; δ is the minimum penetration depth in mm within the head tissue equivalent liquids (i.e., δ= 13.95 mm at 3GHz); SAR_{be} is the deviation between the measured SAR value at the distance d_{be} from the boundary and the wave-guide analytical value SAR_{ref}.DASY4 applies a boundary effect compensation algorithm according to IEEE 1528, which is possible since the axis of the probe never deviates more than 30 degrees from the normal surface orientation. SAR_{be}[%] is assessed during the calibration process and SPEAG warrants that the uncertainty at distances larger than 4mm is always less than 1%.In summary, the worst case boundary effect SAR tolerance[%] for scanning distances larger than 4mm is < ± 0.8%.

7.4 PROBE LINEARITY UNCERTAINTY

Field probe linearity uncertainty includes errors from the assessment and compensation of the diode compression effects for CW and pulsed signals with known duty cycles. This error is assessed using the procedure described in IEEE 1528. For SPEAG field probes, the measured difference between CW and pulsed signals, with pulse frequencies between 10 Hz and 1 kHz and duty cycles between 1 and 100, is < ±0.20 dB (< ±4.7%).

7.5 READOUT ELECTRONICS UNCERTAINTY

All uncertainties related to the probe readout electronics (DAE unit), including the gain and linearity of the instrumentation amplifier, its loading effect on the probe, and accuracy of the signal conversion algorithm, have been assessed accordingly to IEEE 1528.The combination (root-sum-square RSS method) of these components results in an overall maximum error of ±1.0%.

7.6 RESPONSE TIME UNCERTAINTY

The time response of the field probes is assessed by exposing the probe to a well-controlled electric field producing SAR larger than 2.0 W/kg at the tissue medium surface. The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/of switch of the power source. Analytically, it can be expressed as:

$$SAR_{tolerance}[\%] = 100 \times \left(\frac{T_m}{T_m + \tau e^{-T_m/\tau} - \tau} - 1\right)$$

where Tm is 500 ms, i.e., the time between measurement samples, and τ the time constant. The response time τ of SPEAG's probes is <5 ms. In the current implementation, DASY4 waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

7.7 INTEGRATION TIME UNCERTAINTY

If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization and can be assessed as follows

$$SAR_{tolerance}[\%] = 100 \times \sum_{allsub-frames} \frac{t_{frame}}{t_{integration}} \frac{slot_{idle}}{slot_{total}}$$

The tolerances for the different systems are given in Table 7.1, whereby the worst-case $SAR_{tolerance}$ is 2.6%.

System	$SAR_{tolerance}$ %
CW	0
CDMA*	0
WCDMA*	0
FDMA	0
IS-136	2.6
PDC	2.6
GSM/DCS/PCS	1.7
DECT	1.9
Worst-Case	2.6

TABLE 7.1

7.8 PROBE POSITIONER MECHANICAL TOLERANCE

The mechanical tolerance of the field probe positioner can introduce probe positioning uncertainties. The resulting SAR uncertainty is assessed by comparing the SAR obtained according to the specifications of the probe positioner with respect to the actual position defined by the geometric enter of the probe sensors. The tolerance is determined as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{\delta/2}$$

The specified repeatability of the RX robot family used in DASY4 systems is ±25 µm. The absolute accuracy for short distance movements is better than ±0.1mm, i.e., the $SAR_{tolerance}[\%]$ is better than 1.5% (rectangular).

7.9 PROBE POSITIONING

The probe positioning procedures affect the tolerance of the separation distance between the probe tip and the phantom surface as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{\delta/2}$$

where d_{ph} is the maximum deviation of the distance between the probe tip and the phantom surface. The optical surface detection has a precision of better than 0.2 mm, resulting in an $SAR_{tolerance}[\%]$ of <2.9% (rectangular distribution). Since the mechanical detection provides better accuracy, 2.9% is a worst-case figure for DASY4 system.

7.10 PHANTOM UNCERTAINTY

The SAR measurement uncertainty due to SPEAG phantom shell production tolerances has been evaluated using

$$SAR_{tolerance}[\%] \cong 100 \times \frac{2d}{a}, \qquad d << a$$

For a maximum deviation d of the inner and outer shell of the phantom from that specified in the CAD file of ±0.2 mm, and a 10mm spacing a between source and tissue liquid, the calculated phantom uncertainty is ±4.0%.

7.11 DASY4 UNCERTAINTY BUDGET

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C_i)		Standard Uncertainty (±%)		(v_i)
				(1g)	(10g)	(1g)	(10g)	
Measurement Equipment								
Probe Calibration	4.8	Normal	1	1	1	4.8	4.8	∞
Axial Isotropy	4.7	Rectangular	$\sqrt{3}$	1	1	1.9	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	$\sqrt{3}$	1	1	3.9	3.9	∞
Boundary effect	1.0	Rectangular	$\sqrt{3}$	1	1	0.6	0.6	∞
Linearity	4.7	Rectangular	$\sqrt{3}$	1	1	2.7	2.7	∞
System Detection Limit	1.0	Rectangular	$\sqrt{3}$	1	1	0.6	0.6	∞
Readout Electronics	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time	0.8	Normal	1	1	1	0.8	0.8	∞
Integration Time	2.6	Normal	1	1	1	2.6	2.6	∞
Noise	0.0	Normal	1	0	0	0	0	∞
Mechanical Constraints								
Scanning System	0.4	Rectangular	$\sqrt{3}$	1	1	0.2	0.2	∞
Phantom Shell	4.0	Rectangular	$\sqrt{3}$	1	1	2.3	2.3	∞
Probe Positioning	2.9	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
Device Positioning	2.9	Normal	1	1	1	2.9	2.9	875
Physical Parameters								
Liquid Conductivity (target)	5.0	Rectangular	$\sqrt{3}$	0.7	0.5	2	1.4	∞
Liquid Conductivity (measurement)	4.3	Rectangular	$\sqrt{3}$	0.7	0.5	1.7	1.2	∞
Liquid Permittivity (target)	5.0	Rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4	∞
Liquid Permittivity (measurement)	4.3	Rectangular	$\sqrt{3}$	0.6	0.5	1.5	1.2	∞
Power Drift	5	Rectangular	$\sqrt{3}$	1	1	2.9	2.9	∞
RF Ambient Conditions	3.0	Rectangular	$\sqrt{3}$	1	1	1.7	1.7	∞
Post-Processing								
Extrapolation and Integration	1	Rectangular	$\sqrt{3}$	1	1	0.6	0.6	∞
Combined Standard Uncertainty						**9.9**	**9.7**	
Coverage Factor for 95%						**kp=2**		
Expanded Uncertainty (K=2)						**19.9**	**19.3**	

TABLE 7.2

The table 7.2: Worst-Case uncertainty budget for DASY4 assessed according to IEEE 1528. The budget is valid for the frequency range 300MHz ~ 3GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

8. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, UL, A2LA
GERMANY	TUV Rheinland
JAPAN	VCCI
NORWAY	NEMKO
CANADA	INDUSTRY CANADA , CSA
R.O.C.	CNLA, BSMI, NCC
NETHERLANDS	Telefication
SINGAPORE	PSB , GOST-ASIA (MOU)
RUSSIA	CERTIS (MOU)

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.