

# FCC SAR Test Report

**Report No.** : SA120410C09

**Applicant** : Getac Technology Corporation.

**Address** : 5F., Building A, No. 209, Sec. 1, Nangang Rd., Nangang Dist, Taipei City 11568, Taiwan, R.O.C.

**Product** : Tablet PC

**FCC ID** : QYLE100AVL

**Brand** : Getac

**Model No.** : E100 AVL


**Standards** : FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1991 / IEEE 1528:2003  
FCC OET Bulletin 65 Supplement C (Edition 01-01)  
KDB 248227 D01 v01r02 / KDB 447498 D01 v04 / KDB 616217 D03 v01

**Date of Testing** : May 10, 2012 ~ May 12, 2012

**CERTIFICATION:** The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch - Taiwan HwaYa Lab**, 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.

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Prepared By :   
(Andrea Hsia / Specialist)

Approved By :   
Roy Wu / Manager



## Table of Contents

Release Control Record .....	3
1. Summary of Maximum SAR Value .....	4
2. Description of Equipment Under Test .....	5
3. SAR Measurement System .....	6
3.1 Definition of Specific Absorption Rate (SAR).....	6
3.2 SPEAG DASY System .....	6
3.2.1 Robot.....	7
3.2.2 Probes.....	8
3.2.3 Data Acquisition Electronics (DAE) .....	8
3.2.4 Phantoms .....	9
3.2.5 Device Holder.....	10
3.2.6 System Validation Dipoles.....	10
3.2.7 Tissue Simulating Liquids.....	11
3.3 SAR System Verification .....	12
3.4 SAR Measurement Procedure .....	13
3.4.1 Area & Zoom Scan Procedure .....	13
3.4.2 Volume Scan Procedure.....	13
3.4.3 Power Drift Monitoring.....	13
3.4.4 Spatial Peak SAR Evaluation .....	14
3.4.5 SAR Averaged Methods .....	14
4. SAR Measurement Evaluation .....	15
4.1 EUT Configuration and Setting.....	15
4.2 EUT Testing Position .....	15
4.3 Tissue Verification .....	16
4.4 System Verification.....	16
4.5 Conducted Power Results.....	17
4.6 SAR Testing Results.....	19
4.6.1 SAR Results for Body.....	19
5. Calibration of Test Equipment.....	20
6. Measurement Uncertainty .....	21
7. Information on the Testing Laboratories .....	23
Appendix A. SAR Plots of System Verification	
Appendix B. SAR Plots of SAR Measurement	
Appendix C. Calibration Certificate for Probe and Dipole	
Appendix D. Photographs of EUT and Setup	



## Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	May 21, 2012

## 1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
WLAN 2.4GHz	Body (0 cm Gap)	0.186
WLAN 5GHz	Body (0 cm Gap)	0.817
Bluetooth	Body (0 cm Gap)	N/A

**Note:**

1. The SAR limit (**1.6 W/kg**) for general population/uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991.
2. Since the Bluetooth maximum power is less than 60/f, SAR testing for Bluetooth is not required.

## 2. Description of Equipment Under Test

<b>EUT Type</b>	Tablet PC
<b>FCC ID</b>	QYLE100AVL
<b>Brand Name</b>	Getac
<b>Model Name</b>	E100 AVL
<b>Tx Frequency Bands (Unit: MHz)</b>	WLAN : 2400 ~ 2483.5, 5150 ~ 5350, 5470 ~ 5725, 5725 ~ 5850 Bluetooth : 2400 ~ 2483.5
<b>Uplink Modulations</b>	802.11b : DSSS 802.11a/g/n : OFDM Bluetooth : GFSK
<b>Maximum AVG Conducted Power (Unit: dBm)</b>	802.11b : 16.79 802.11g : 16.75 802.11n HT20 (2.4GHz) : 16.55 802.11n HT40 (2.4GHz) : 16.83 802.11a : 16.69 802.11n HT20 (5GHz) : 16.80 802.11n HT40 (5GHz) : 16.79
<b>Antenna Type</b>	PIFA Antenna
<b>EUT Stage</b>	Production Unit

**Note:**

- The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

**List of Accessory:**

<b>AC Adapter</b>	<b>Brand Name</b>	DELTA ELECTRONICS, INC.
	<b>Model Name</b>	ADP-90CD DB
	<b>Power Rating</b>	I/P:100-240Vac, 50-60Hz, 1.5A; O/P: 19Vdc, 4.74A
	<b>DC Power Cord Type</b>	1.7 meter shielded cable with one core
<b>Battery</b>	<b>Brand Name</b>	Getac
	<b>Model Name</b>	E100AVL Battery Pack
	<b>Power Rating</b>	14.4Vdc, 4200mAh
	<b>Type</b>	Li-ion

### 3. SAR Measurement System

#### 3.1 Definition of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density ( $\rho$ ). The equation description is as below:

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

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

SAR measurement can be related to the electrical field in the tissue by

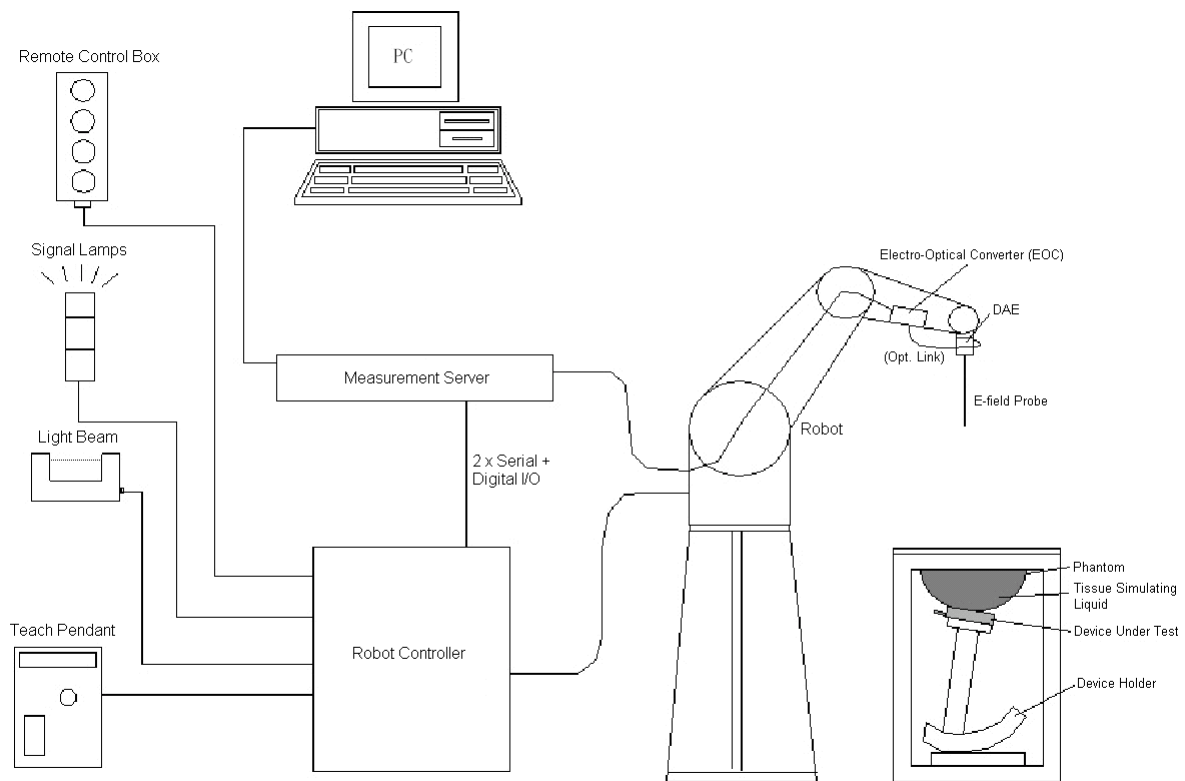
$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  is the mass density of the tissue and E is the RMS electrical field strength.

#### 3.2 SPEAG DASY System

DASY system 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 DASY4/5 software defined. The DASY 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 from the optical into digital electric signal of the DAE and transfers data to the PC.

## FCC SAR Test Report



**Fig-3.1 DASY System Setup**

### 3.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability  $\pm 0.035$  mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



**Fig-3.2 DASY4**





**Fig-3.3 DASY5**

## FCC SAR Test Report


### 3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

<b>Model</b>	EX3DV4	
<b>Construction</b>	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
<b>Frequency</b>	10 MHz to 6 GHz Linearity: $\pm 0.2$ dB	
<b>Directivity</b>	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)	
<b>Dynamic Range</b>	10 $\mu$ W/g to 100 mW/g Linearity: $\pm 0.2$ dB (noise: typically $< 1$ $\mu$ W/g)	
<b>Dimensions</b>	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

<b>Model</b>	ES3DV3	
<b>Construction</b>	Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
<b>Frequency</b>	10 MHz to 4 GHz Linearity: $\pm 0.2$ dB	
<b>Directivity</b>	$\pm 0.2$ dB in HSL (rotation around probe axis) $\pm 0.3$ dB in tissue material (rotation normal to probe axis)	
<b>Dynamic Range</b>	5 $\mu$ W/g to 100 mW/g Linearity: $\pm 0.2$ dB	
<b>Dimensions</b>	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	


### 3.2.3 Data Acquisition Electronics (DAE)


<b>Model</b>	DAE3, DAE4	
<b>Construction</b>	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
<b>Measurement Range</b>	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)	
<b>Input Offset Voltage</b>	$< 5$ $\mu$ V (with auto zero)	
<b>Input Bias Current</b>	$< 50$ fA	
<b>Dimensions</b>	60 x 60 x 68 mm	



## FCC SAR Test Report


### 3.2.4 Phantoms


<b>Model</b>	Twin SAM	
<b>Construction</b>	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. 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 teaching three points with the robot.	
<b>Material</b>	Vinylester, glass fiber reinforced (VE-GF)	
<b>Shell Thickness</b>	$2 \pm 0.2$ mm ( $6 \pm 0.2$ mm at ear point)	
<b>Dimensions</b>	Length: 1000 mm Width: 500 mm Height: adjustable feet	
<b>Filling Volume</b>	approx. 25 liters	

<b>Model</b>	ELI	
<b>Construction</b>	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
<b>Material</b>	Vinylester, glass fiber reinforced (VE-GF)	
<b>Shell Thickness</b>	$2.0 \pm 0.2$ mm (bottom plate)	
<b>Dimensions</b>	Major axis: 600 mm Minor axis: 400 mm	
<b>Filling Volume</b>	approx. 30 liters	


## FCC SAR Test Report

### 3.2.5 Device Holder

<b>Model</b>	Mounting Device	
<b>Construction</b>	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).	
<b>Material</b>	POM	

<b>Model</b>	Laptop Extensions Kit	
<b>Construction</b>	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.	
<b>Material</b>	POM, Acrylic glass, Foam	

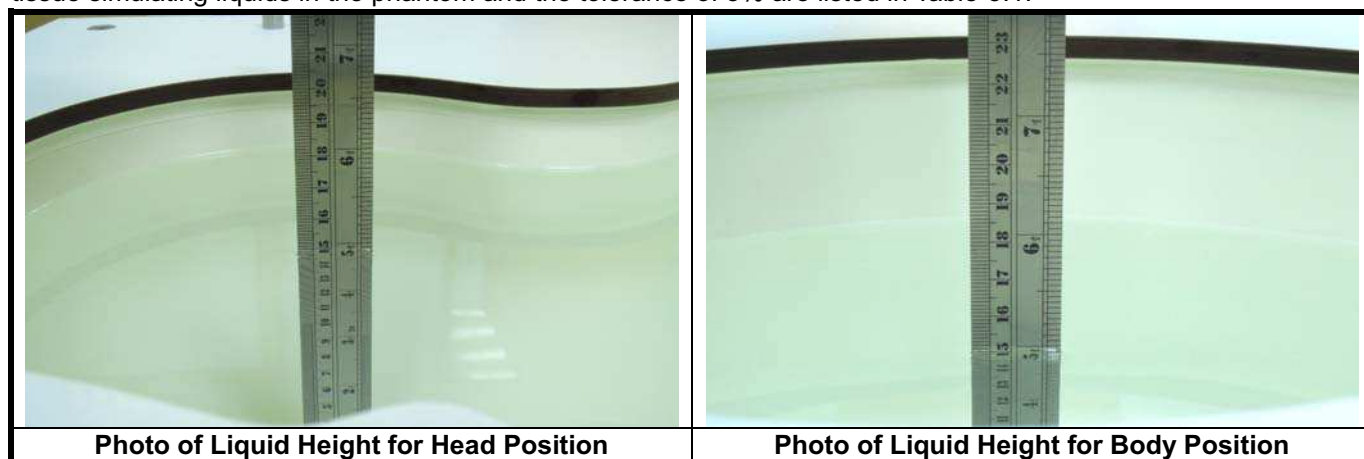
### 3.2.6 System Validation Dipoles

<b>Model</b>	D-Serial	
<b>Construction</b>	Symmetrical dipole with 1/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.	
<b>Frequency</b>	750 MHz to 5800 MHz	
<b>Return Loss</b>	> 20 dB	
<b>Power Capability</b>	> 100 W ( $f < 1\text{GHz}$ ), > 40 W ( $f > 1\text{GHz}$ )	

## FCC SAR Test Report

### 3.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in Table-3.1.



The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528 and FCC OET 65 Supplement C Appendix C. For the body tissue simulating liquids, the dielectric properties are defined in FCC OET 65 Supplement C Appendix C. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

**Table-3.1 Targets of Tissue Simulating Liquid**

Frequency (MHz)	Target Permittivity	Range of $\pm 5\%$	Target Conductivity	Range of $\pm 5\%$
<b>For Body</b>				
2450	52.7	50.1 ~ 55.3	1.95	1.85 ~ 2.05
5200	49.0	46.6 ~ 51.5	5.30	5.04 ~ 5.57
5500	48.6	46.2 ~ 51.0	5.65	5.37 ~ 5.93
5800	48.2	45.8 ~ 50.6	6.00	5.70 ~ 6.30

The following table gives the recipes for tissue simulating liquids.

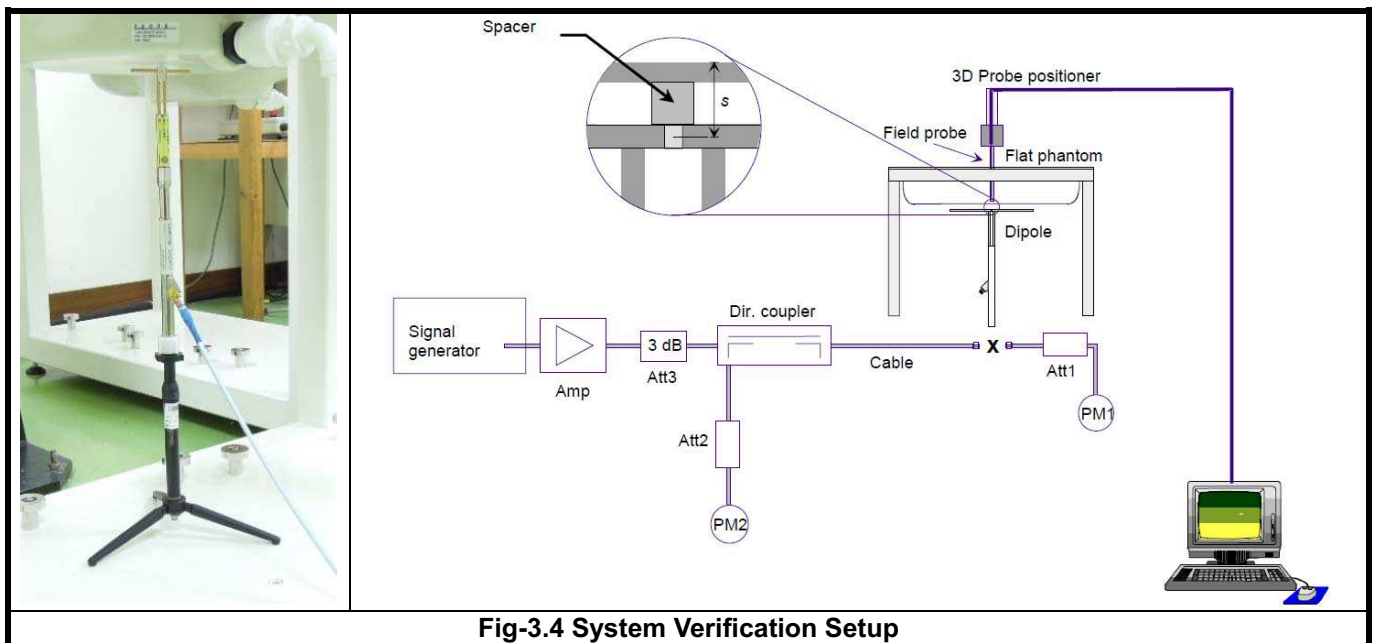
**Table-3.2 Recipes of Tissue Simulating Liquid**

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
B2450	-	31.4	-	0.1	-	-	68.5	-
B5G	-	-	-	-	-	10.7	78.6	10.7

## FCC SAR Test Report

### 3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.



The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

## FCC SAR Test Report

### 3.4 SAR Measurement Procedure

According to the SAR test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

The SAR measurement procedures for each of test conditions are as follows:

- (a) Make EUT to transmit maximum output power
- (b) Measure conducted output power through RF cable
- (c) Place the EUT in the specific position of phantom
- (d) Perform SAR testing steps on the DASY system
- (e) Record the SAR value

#### 3.4.1 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for below 3 GHz, and 7x7x9 points with step size 4, 4 and 2.5 mm for above 5 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

#### 3.4.2 Volume Scan Procedure

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

#### 3.4.3 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

## FCC SAR Test Report

### 3.4.4 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

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 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

### 3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. 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 5 mm.

## 4. SAR Measurement Evaluation

### 4.1 EUT Configuration and Setting

For WLAN SAR testing, the EUT has installed WLAN engineering testing software which can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle. The data rates for WLAN SAR testing were set in 1 Mbps for 802.11b, 6 Mbps for 802.11g/a, MCS0 for 802.11n 1Tx, and MCS8 for 802.11n 2Tx due to the highest RF output power.

### 4.2 EUT Testing Position

According to KDB 447498, SAR testing is required for the edges with a transmitting antenna within 5 cm from that surface or edge. Based on the antenna location shown on appendix D, the EUT was tested in some positions as **Rear Face**, **Secondary Landscape**, and **Secondary Portrait**. In these positions, the separation distance between EUT and phantom is 0 cm.

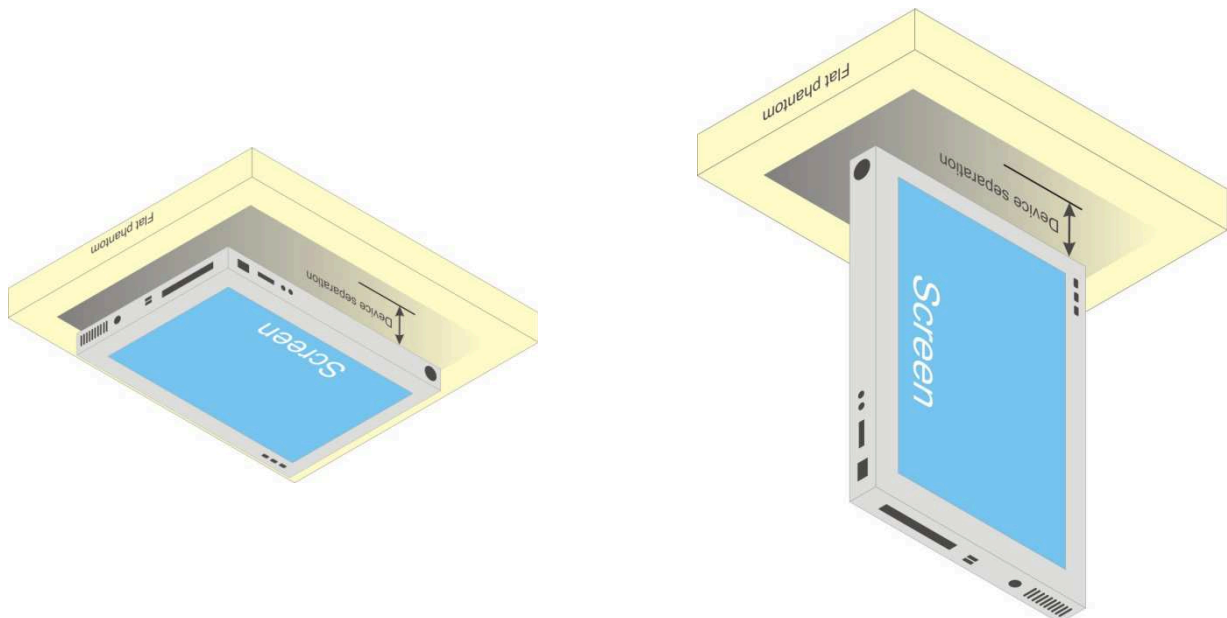


Fig-4.1 Illustration for Tablet Setup

## 4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Tissue Type	Frequency (MHz)	Liquid Temp. (°C)	Measured Conductivity ( $\sigma$ )	Measured Permittivity ( $\epsilon_r$ )	Target Conductivity ( $\sigma$ )	Target Permittivity ( $\epsilon_r$ )	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
B2450	2450	20.6	1.97	51.7	1.95	52.7	1.03	-1.90	May 10, 2012
B2450	2450	21.3	2.01	53.1	1.95	52.7	3.08	0.76	May 11, 2012
B5G	5200	20.4	5.21	51.0	5.30	49.0	-1.70	4.08	May 10, 2012
B5G	5200	21.4	5.17	50.9	5.30	49.0	-2.45	3.88	May 12, 2012
B5G	5500	20.4	5.72	50.6	5.65	48.6	1.24	4.12	May 10, 2012
B5G	5500	20.9	5.74	50.6	5.65	48.6	1.59	4.12	May 11, 2012
B5G	5500	21.4	5.67	50.5	5.65	48.6	0.35	3.91	May 12, 2012
B5G	5800	20.4	6.19	49.9	6.00	48.2	3.17	3.53	May 10, 2012
B5G	5800	20.9	6.22	49.9	6.00	48.2	3.67	3.53	May 11, 2012
B5G	5800	21.4	6.14	49.7	6.00	48.2	2.33	3.11	May 12, 2012

### Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within  $\pm 5\%$  of the target values. Liquid temperature during the SAR testing must be within  $\pm 2^\circ\text{C}$ .

## 4.4 System Verification

The measuring results for system check are shown as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
May 10, 2012	2450	50.00	13.40	53.60	7.20	737	3590	861
May 11, 2012	2450	50.00	12.80	51.20	2.40	737	3650	1277
May 10, 2012	5200	72.70	7.26	72.60	-0.14	1018	3590	861
May 12, 2012	5200	72.70	7.11	71.10	-2.20	1018	3650	1277
May 10, 2012	5500	78.30	7.51	75.10	-4.09	1018	3590	861
May 11, 2012	5500	78.30	7.67	76.70	-2.04	1018	3590	861
May 12, 2012	5500	78.30	8.12	81.20	3.70	1018	3650	1277
May 10, 2012	5800	73.40	7.35	73.50	0.14	1018	3590	861
May 11, 2012	5800	73.40	7.40	74.00	0.82	1018	3590	861
May 12, 2012	5800	73.40	6.93	69.30	-5.59	1018	3650	1277

### Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.



## 4.5 Conducted Power Results

The measuring conducted power (Unit: dBm) are shown as below.

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power (Ant A)	16.54	16.53	16.50	15.03	16.69	16.63
Average Power (Ant B)	16.79	16.74	16.63	15.22	16.75	16.73

Band	802.11n (HT20)			802.11n (HT40)		
Channel	1	6	11	3	6	9
Frequency (MHz)	2412	2437	2462	2422	2437	2452
Average Power (Ant A)	14.01	16.43	15.12	10.56	15.91	12.55
Average Power (Ant B)	14.12	16.53	15.21	10.78	16.13	12.62
Average Power (Ant A+B)	16.55	16.55	16.54	12.79	16.83	13.35

Band	802.11a							
Channel	36	40	44	48	52	56	60	64
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300	5320
Average Power (Ant A)	14.41	14.39	14.35	14.31	16.41	16.38	16.44	16.53
Average Power (Ant B)	14.56	14.45	14.52	14.35	16.57	14.48	16.49	16.61

Band	802.11a							
Channel	100	104	108	112	116	132	136	140
Frequency (MHz)	5500	5520	5540	5560	5580	5660	5680	5700
Average Power (Ant A)	16.01	16.11	16.24	16.42	16.48	16.58	16.51	16.45
Average Power (Ant B)	16.14	16.25	16.31	16.44	16.51	16.61	16.56	16.58

Band	802.11a							
Channel	149	153	157	161	165	-	-	-
Frequency (MHz)	5745	5765	5785	5805	5825	-	-	-
Average Power (Ant A)	16.59	16.57	16.62	16.51	16.42	-	-	-
Average Power (Ant B)	16.69	16.64	16.68	16.62	16.52	-	-	-

# FCC SAR Test Report

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Band	802.11n (HT20)							
Channel	36	40	44	48	52	56	60	64
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300	5320
Average Power (Ant A)	14.41	14.45	14.36	14.31	16.51	16.44	16.57	16.43
Average Power (Ant B)	14.47	14.51	14.46	14.43	16.59	14.56	16.63	16.52
Average Power (Ant A+B)	14.61	14.59	14.56	14.48	16.62	14.52	16.66	16.71

Band	802.11n (HT20)							
Channel	100	104	108	112	116	132	136	140
Frequency (MHz)	5500	5520	5540	5560	5580	5660	5680	5700
Average Power (Ant A)	15.24	16.32	16.25	16.40	16.53	16.32	16.28	15.11
Average Power (Ant B)	15.34	16.45	16.34	16.51	16.67	16.48	16.42	15.21
Average Power (Ant A+B)	16.80	16.75	16.71	16.64	16.58	16.49	16.58	16.74

Band	802.11n (HT20)							
Channel	149	153	157	161	165	-	-	-
Frequency (MHz)	5745	5765	5785	5805	5825	-	-	-
Average Power (Ant A)	16.42	16.53	16.65	16.59	16.53	-	-	-
Average Power (Ant B)	16.56	16.62	16.77	16.74	16.68	-	-	-
Average Power (Ant A+B)	16.73	16.73	16.73	16.66	16.66	-	-	-

Band	802.11n (HT40)							
Channel	38	46	54	62	102	134	151	159
Frequency (MHz)	5190	5230	5270	5310	5510	5670	5755	5795
Average Power (Ant A)	13.85	16.42	16.52	13.35	12.61	16.52	16.62	16.65
Average Power (Ant B)	14.06	16.58	16.61	13.44	12.78	16.64	16.74	16.79
Average Power (Ant A+B)	16.78	16.68	16.69	16.59	15.59	16.68	16.74	16.73

## 4.6 SAR Testing Results

### 4.6.1 SAR Results for Body

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Tx Ant Status	SAR-1g (W/kg)
1	802.11b	-	Rear Face	0	1	A	0.017
2	802.11b	-	Secondary Portrait	0	1	A	<b>0.186</b>
3	802.11b	-	Secondary Landscape	0	1	A	0.104
5	802.11b	-	Rear Face	0	1	B	0.017
8	802.11b	-	Secondary Landscape	0	1	B	0.133
9	802.11n	HT40	Rear Face	0	6	A+B	0.00412
10	802.11n	HT40	Secondary Portrait	0	6	A+B	0.066
11	802.11n	HT40	Secondary Landscape	0	6	A+B	0.052
12	802.11n	HT40	Rear Face	0	46	A	0.04
13	802.11n	HT40	Secondary Portrait	0	46	A	0.32
14	802.11n	HT40	Secondary Landscape	0	46	A	0.0079
15	802.11n	HT40	Rear Face	0	46	B	0.039
17	802.11n	HT40	Secondary Landscape	0	46	B	0.442
18	802.11n	HT40	Rear Face	0	38	A+B	0.029
19	802.11n	HT40	Secondary Portrait	0	38	A+B	0.185
20	802.11n	HT40	Secondary Landscape	0	38	A+B	0.317
21	802.11n	HT20	Rear Face	0	60	A	0.047
22	802.11n	HT20	Secondary Portrait	0	60	A	0.488
23	802.11n	HT20	Secondary Landscape	0	60	A	0.017
24	802.11n	HT20	Rear Face	0	60	B	0.035
26	802.11n	HT20	Secondary Landscape	0	60	B	0.701
27	802.11n	HT20	Rear Face	0	64	A+B	0.00327
28	802.11n	HT20	Secondary Portrait	0	64	A+B	0.528
29	802.11n	HT20	Secondary Landscape	0	64	A+B	0.214
30	802.11a	-	Rear Face	0	132	A	0.029
31	802.11a	-	Secondary Portrait	0	132	A	0.383
32	802.11a	-	Secondary Landscape	0	132	A	0.026
33	802.11n	HT20	Rear Face	0	116	B	0.06
35	802.11n	HT20	Secondary Landscape	0	116	B	0.584
36	802.11n	HT20	Rear Face	0	100	A+B	0.066
37	802.11n	HT20	Secondary Portrait	0	100	A+B	0.307
38	802.11n	HT20	Secondary Landscape	0	100	A+B	0.415
39	802.11n	HT20	Rear Face	0	157	A	N/A
40	802.11n	HT20	Secondary Portrait	0	157	A	0.415
41	802.11n	HT20	Secondary Landscape	0	157	A	0.01
42	802.11n	HT40	Rear Face	0	159	B	0.056
44	802.11n	HT40	Secondary Landscape	0	159	B	<b>0.817</b>
48	802.11n	HT40	Secondary Landscape	0	151	B	0.75
45	802.11n	HT40	Rear Face	0	151	A+B	0.042
46	802.11n	HT40	Secondary Portrait	0	151	A+B	0.175
47	802.11n	HT40	Secondary Landscape	0	151	A+B	0.409

#### Note:

1. SAR was performed on the maximum power mode for each Tx antenna configuration.
2. The "N/A" means there is no SAR value or the SAR is too low to be measured.

Test Engineer : Sam Onn, and Match Tsui

## 5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Kit	SPEAG	D2450V2	737	Jan. 24, 2012	Annual
System Validation Kit	SPEAG	D5GHzV2	1018	Jan. 18, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3590	Feb. 23, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	861	Aug. 29, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	1277	Jul. 29, 2011	Annual
ELI Phantom	SPEAG	QDOVA001B	TP-1039	N/A	N/A
ENA Series Network Analyzer	Agilent	E5071C	MY46107999	Mar. 24, 2012	Annual
Signal Generator	Agilent	E8257C	MY43320668	Dec. 20, 2011	Annual
Power Meter	Anritsu	ML2487A	6K00001571	May 25, 2011	Annual
Power Sensor	Anritsu	MA2491A	030954	May 25, 2011	Annual
Dielectric Probe Kit	Agilent	85070D	N/A	N/A	N/A
Thermometer	YFE	YF-160A	110600361	Feb. 21, 2012	Annual

## 6. Measurement Uncertainty

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
<b>Measurement System</b>						
Probe Calibration	6.0	Normal	1	1	± 6.0 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	1.0	Rectangular	√3	1	± 0.6 %	∞
Linearity	4.7	Rectangular	√3	1	± 2.7 %	∞
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	0.6	Normal	1	1	± 0.6 %	∞
Response Time	0.0	Rectangular	√3	1	± 0.0 %	∞
Integration Time	1.7	Rectangular	√3	1	± 1.0 %	∞
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %	∞
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	0.5	Rectangular	√3	1	± 0.3 %	∞
Probe Positioning	2.9	Rectangular	√3	1	± 1.7 %	∞
Max. SAR Eval.	2.3	Rectangular	√3	1	± 1.3 %	∞
<b>Test Sample Related</b>						
Device Positioning	3.9	Normal	1	1	± 3.9 %	31
Device Holder	2.7	Normal	1	1	± 2.7 %	19
Power Drift	5.0	Rectangular	√3	1	± 2.9 %	∞
<b>Phantom and Setup</b>						
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid Conductivity (Meas.)	5.0	Normal	1	0.64	± 3.2 %	29
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	29
<b>Combined Standard Uncertainty</b>					± 11.7 %	
<b>Expanded Uncertainty (K=2)</b>					<b>± 23.4 %</b>	

Uncertainty budget for frequency range 300 MHz to 3 GHz

# FCC SAR Test Report

A D T

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
<b>Measurement System</b>						
Probe Calibration	6.55	Normal	1	1	± 6.55 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	2.0	Rectangular	√3	1	± 1.2 %	∞
Linearity	4.7	Rectangular	√3	1	± 2.7 %	∞
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	0.3	Normal	1	1	± 0.3 %	∞
Response Time	0.8	Rectangular	√3	1	± 0.5 %	∞
Integration Time	2.6	Rectangular	√3	1	± 1.5 %	∞
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %	∞
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	0.8	Rectangular	√3	1	± 0.5 %	∞
Probe Positioning	9.9	Rectangular	√3	1	± 5.7 %	∞
Max. SAR Eval.	4.0	Rectangular	√3	1	± 2.3 %	∞
<b>Test Sample Related</b>						
Device Positioning	3.9	Normal	1	1	± 3.9 %	31
Device Holder	2.7	Normal	1	1	± 2.7 %	19
Power Drift	5.0	Rectangular	√3	1	± 2.9 %	∞
<b>Phantom and Setup</b>						
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid Conductivity (Meas.)	5.0	Normal	1	0.64	± 3.2 %	30
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	30
<b>Combined Standard Uncertainty</b>					± 13.4 %	
<b>Expanded Uncertainty (K=2)</b>					± 26.8 %	

Uncertainty budget for frequency range 3 GHz to 6 GHz

## **7. 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 and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site. If you have any comments, please feel free to contact us at the following:

**Taiwan HwaYa EMC/RF/Safety/Telecom Lab:**

Add: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

Tel: 886-3-318-3232

Fax: 886-3-327-0892

**Taiwan LinKo EMC/RF Lab:**

Add: No. 47, 14th Ling, Chia Pau Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C.

Tel: 886-2-2605-2180

Fax: 886-2-2605-1924

**Taiwan HsinChu EMC/RF Lab:**

Add: No. 81-1, Lu Liao Keng, 9<sup>th</sup> Ling, Wu Lung Vil., Chiung Lin Township, Hsinchu County 307, Taiwan, R.O.C.

Tel: 886-3-593-5343

Fax: 886-3-593-5342

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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

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## Appendix A. SAR Plots of System Verification

The plots for system verification are shown as follows.



## **Appendix B. SAR Plots of SAR Measurement**

The plots for SAR measurement are shown as follows.



## **Appendix C. Calibration Certificate for Probe and Dipole**

The SPEAG calibration certificates are shown as follows.



## **Appendix D. Photographs of EUT and Setup**