SAR Test Report

Report No.: AGC00866140901FH01

FCC ID	:	NZ3-WSWN622HN1
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Wireless N USB Adapter 150Mbps Hi-Gain
BRAND NAME	:	ULTRA
MODEL NAME	:	WS-WN622HN1, U12-43871
CLIENT	:	Winstars Technology Limited
DATE OF ISSUE	:	Oct. 20,2014
STANDARD(S)	:	IEEE Std. 1528:2003 47CFR § 2.1093 IEEE/ANSI C95.1
REPORT VERSION	:	V1.0

Attestation of Global Compliance(Shenzhen) Co., Ltd.

Report Revise Record

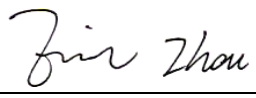
Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Oct. 20,2014	Valid	Original Report

The test plans were performed in accordance with IEEE Std. 1528:2003; 47CFR § 2.1093; IEEE/ANSI C95.1 and the following specific FCC Test Procedures:

- KDB 447498 D01 General RF Exposure Guidance v05r01
- KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01
- KDB 248227 D01 SAR meas for 802 11 a b g v01r02
- KDB 447498 D02 SAR Procedures for Dongle Xmtr v02

Test Report Certification

Applicant Name	Winstars Technology Limited
Applicant Address	Block 4, TaiSong Industrial Park, DaLang Street, LongHua Town, Bao'an District, Shenzhen, China
Manufacturer Name	Winstars Technology Limited
Manufacturer Address	Block 4, TaiSong Industrial Park, DaLang Street, LongHua Town, Bao'an District, Shenzhen, China
Product Designation	Wireless N USB Adapter 150Mbps Hi-Gain
Brand Name	ULTRA
Model Name	WS-WN622HN1, U12-43871
Different Description	All the same, except for the model name. The test model is WS-WN622HN1.
EUT Voltage	DC5V power from the notebook
Applicable Standard	IEEE Std. 1528:2003 47CFR § 2.1093 IEEE/ANSI C95.1
Test Date	Oct. 17,2014
Performed Location	Attestation of Global Compliance(Shenzhen) Co., Ltd. 2 F, Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang Street, Bao'an District, Shenzhen, China
Report Template	AGCRT-US-2.5G/SAR (2014-04-01)

Tested By 

Eric Zhou Oct. 20,2014

Checked By 

Angela Li Oct. 20,2014

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1. SUMMARY OF MAXIMUM SAR VALUE

The maximum results of Specific Absorption Rate (SAR) found during testing for EUT are as follows:

Highest Report standalone SAR Summary

Exposure Position	Test Mode	Highest Tested 1g-SAR(W/Kg)	Highest Reported Maximum SAR(W/Kg)
Body	802.11b	**0.603**	**0.725**

This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/Kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1, and had been tested in accordance with measurement methods and procedures specified in IEEE 1528-2003 and the relevant KDB files like KDB 447498 D01 , KDB 9447498 D02 ,KDB 865664 D02….etc.

2. GENERAL INFORMATION

2.1. EUT Description

General Information	
Product Designation	Wireless N USB Adapter 150Mbps Hi-Gain
Test Model	WS-WN622HN1
Hardware Version	WS-WN622HNN1-B1
Software Version	RT3x7xQA
Device Category	Portable
RF Exposure Environment	Uncontrolled
Antenna Type	External
WIFI	
WIFI Specification	☐802.11a ☒802.11b ☒802.11g ☒802.11n(20) ☒802.11n(40)
Operation Frequency	2412~2462MHz
Avg. Burst Power	11b: 18.29dBm,11g:16.75dBm,11n(20):16.41dBm,11n(40):16.64dBm
Antenna Specification	Dipole Antenna with 5dBi gain (Max)

Product	Type	
	☒ Production unit	☐ Identical Prototype

2.2. Test Procedure

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	EUT Communicate with 8960, and test them respectively at U.S. bands

2.3. Test Environment

Ambient conditions in the laboratory:

Items	Required	Actual
Temperature (°C)	18-25	21± 2
Humidity (%RH)	30-70	55±2

3. SAR MEASUREMENT SYSTEM

3.1. Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in 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 occupational/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 (dv) of given mass density (ρ). The equation description is as below:

$$\mathrm{SAR} = \frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\mathrm{d}W}{\mathrm{d}m}\right) = \frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\mathrm{d}W}{\rho \mathrm{d}V}\right)$$

SAR is expressed in units of Watts per kilogram (W/Kg)
SAR can be obtained using either of the following equations:

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

$$\mathrm{SAR} = c_{\mathrm{h}} \left.\frac{\mathrm{d}T}{\mathrm{d}t}\right|_{t=0}$$

Where

SAR	is the specific absorption rate in watts per kilogram;
E	is the r.m.s. value of the electric field strength in the tissue in volts per meter;
σ	is the conductivity of the tissue in siemens per metre;
ρ	is the density of the tissue in kilograms per cubic metre;
c_h	is the heat capacity of the tissue in joules per kilogram and Kelvin;
$\frac{\mathrm{dT}}{\mathrm{dt}} \mid \mathrm{t} = 0$	is the initial time derivative of temperature in the tissue in kelvins per second

3.2. SAR Measurement Procedure

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

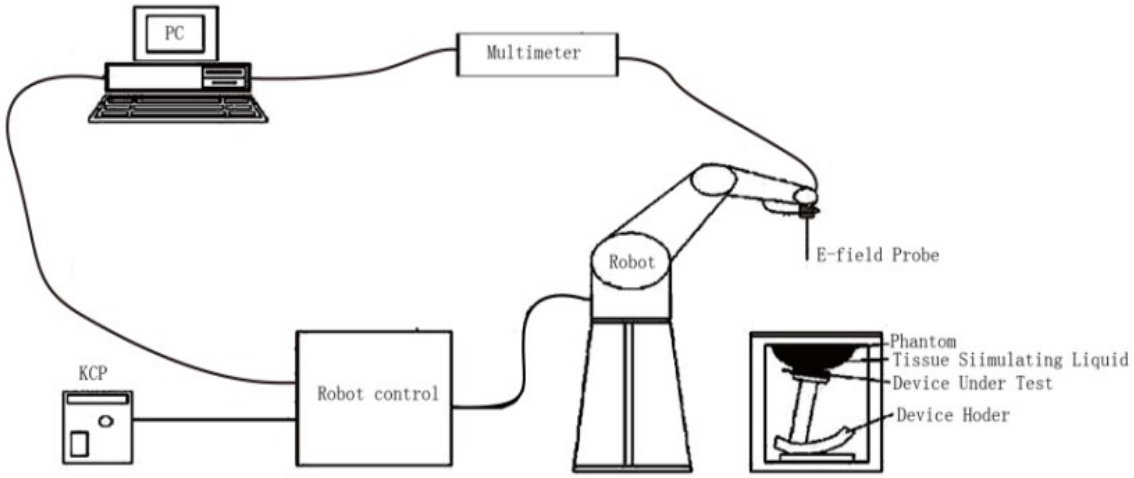
Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at $1mm^2$) which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at $1mm^3$).

When multiple peak SAR location were found during the same configuration or test mode, Zoom scan shall performed on each peak SAR location, only the peak point with maximum SAR value will be reported for the configuration or test mode.

3.3. COMOSAR System Description



The COMOSAR system for performing compliance tests consists of the following items:

- The PC. It controls most of the bench devices and stores measurement data. A computer running WinXP and the Opensar software.
- The E-Field probe. The probe is a 3-axis system made of 3 distinct dipoles. Each dipole returns a voltage in function of the ambient electric field.
- The Keithley multimeter measures each probe dipole voltages.
- The SAM phantom simulates a human head. The measurement of the electric field is made inside the phantom.
- The liquids simulate the dielectric properties of the human head tissues.
- The network emulator controls the mobile phone under test.
- The validation dipoles are used to measure a reference SAR. They are used to periodically check the bench to make sure that there is no drift of the system characteristics over time.
- The phantom, the device holder and other accessories according to the targeted measurement.

3.3.1. Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEEE 1528, OET 65, IEC 62209-1, IEC 62209-2, EN 50360, EN 50383 and others.

3.3.2. Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm² step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments. When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

3.3.3. Zoom Scan (Cube Scan Averaging)

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm. The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 7x7x7 (5mmx5mmx5mm) providing a volume of 30mm in the X & Y axis, and 30mm in the Z axis.

3.3.4. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Post processor, COMOSAR allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}}\cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

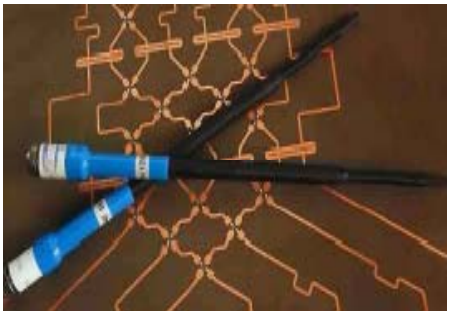
$$f_2(x,y,z) = Ae^{-\frac{z}{a}}\frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

3.4. COMOSAR E-Field Probe

The SAR measurement is conducted with the dissymmetric probe manufactured by SATIMO. The probe is specially designed and calibrated for use in liquid with high permittivity. The dissymmetric probe has special calibration in liquid at different frequency. SATIMO conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN62209-1, IEC 62209, etc.) under ISO17025. The calibration data are in Appendix D.

3.5. Isotropic E-Field Probe Specification

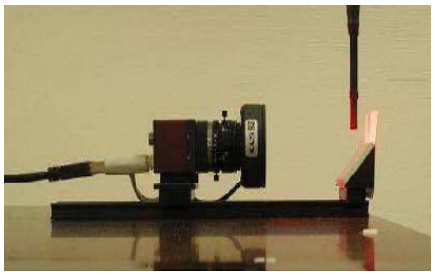
Model	EP159	
Manufacture	SATIMO	
Frequency	0.3GHz-3GHz Linearity:±0.09dB(300MHz-3GHz)	
Dynamic Range	0.01W/Kg-100W/Kg Linearity:±0.09dB	
Dimensions	Overall length:330mm Length of individual dipoles:4.5mm Maximum external diameter:8mm Probe Tip external diameter:5mm Distance between dipoles/ probe extremity:2.7mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 3 GHz with precision of better 30%.	

3.6. Robot

The COMOSAR system uses the KUKA robot from SATIMO SA (France).For the 6-axis controller COMOSAR system, the KUKA robot controller version from SATIMO is used. The XL robot series have many features that are important for our application: □ High precision (repeatability 0.02 mm) □ High reliability (industrial design) □ Jerk-free straight movements □ Low ELF interference (the closed metallic construction shields against motor control fields) □ 6-axis controller	

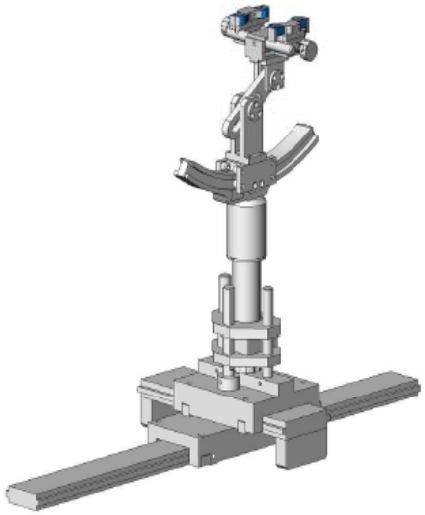
3.7. Video Positioning System

The video positioning system is used in OpenSAR to check the probe. Which is composed of a camera, LED, mirror and mechanical parts. The camera is piloted by the main computer with firewire link.
During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.



3.8. Device Holder

The COMOSAR device holder 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 center for both scales is the ear reference point (EPR).
Thus the device needs no repositioning when changing
the angles.
The COMOSAR device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =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.



3.9. SAM Twin Phantom

The Elliptic Phantom is a fiberglass shell flat phantom with 2mm+/- 0.2 mm shell thickness. It has only one measurement area for Flat phantom	

4. TISSUE SIMULATING LIQUID

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 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 4.2

4.1. The composition of the tissue simulating liquid

Ingredient	2450MHz
(% Weight)	Body
Water	73.2
Salt	0.04
Sugar	0.00
HEC	0.00
Preventol	0.00
DGBE	26.7
TWEEN	48.34

4.2. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using COMOSAR Dielectric Probe Kit and R&S Network Analyzer ZVL6 .

Tissue Stimulant Measurement for 2450 MHz					
Fr. (MHz)	Ch.	Dielectric Parameters (±5%) body		Tissue Temp [°C]	Test time
		εr 52.7 50.065-55.335	δ[s/m] 1.95 1.8525-2.0475		
2450	Low	52.40	1.92	21	Oct. 17,2014
2450	Mid	52.16	1.94	21	Oct. 17,2014
2450	High	52.71	1.96	21	Oct. 17,2014

4.3. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Target Frequency (MHz)	head		body	
	εr	σ (S/m)	εr	σ (S/m)
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	1.01	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	**39.2**	**1.80**	**52.7**	**1.95**
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

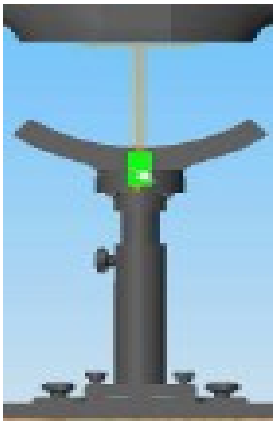
(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

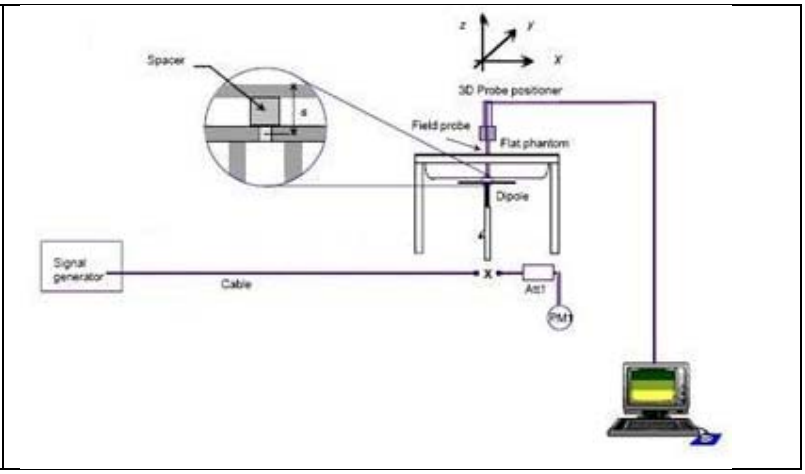
5. SAR MEASUREMENT PROCEDURE

5.1. SAR System Validation Procedures

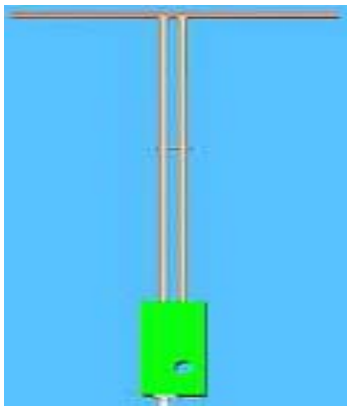
Each SATIMO system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the SATIMO software, enable the user to conduct the system performance check and system validation. System kit includes a dipole, and dipole device holder.

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





5.2. SAR System Validation
5.2.1. Validation Dipoles



The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical
and electrical specifications in line with the
requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical Specifications for the dipoles.

Frequency	L (mm)	h (mm)	d (mm)
2450MHz	51.5	30.4	3.6

5.2.2. Validation Result

System Performance Check at 2450MHz for Body								
Validation Kit: SN 46/11DIP 2G450-189								
Frequency [MHz]	Target Value(W/Kg)		Reference Result (± 10%)		Tested Value(W/Kg)		Tissue Temp. [°C]	Test time
	1g	10g	1g	10g	1g	10g		
2450	54.19	24.96	48.771-59.609	22.464-27.456	50.19	23.04		Oct. 17,2014

6. EUT TEST POSITION

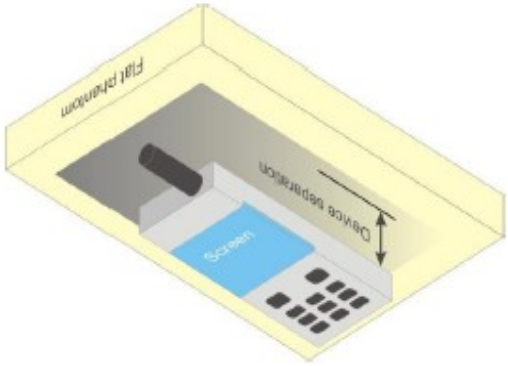
This EUT was tested in **Horizontal-Up with antenna 90°, Horizontal Up with antenna 0°, Horizontal-Down with antenna 0°, Vertical-Back with antenna 0°, Vertical-Front with antenna 0°.**

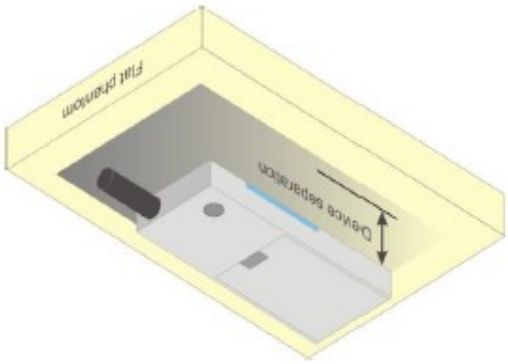
6.1. Body Worn Position

(1) To position the EUT parallel to the phantom surface.

(2) To adjust the EUT parallel to the flat phantom.

(3) To adjust the distance between the EUT surface and the flat phantom to **5mm.**





7. SAR EXPOSURE LIMITS

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled Environment” which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure

Limits for General Population/Uncontrolled Exposure (W/kg)

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for brain or body)	1.60 W/kg

8. TEST EQUIPMENT LIST

Equipment description	Manufacturer/Model	Identification No.	Current calibration date	Next calibration date
SAR Probe	SATIMO	SN 22/12 EP159	01/12/2014	01/11/2015
TISSUE Probe	SATIMO	SN 45/11 OCPG45	11/14/2013	11/13/2015
Phantom	SATIMO	SN_4511_SAM90	Validated. No cal required.	Validated. No cal required.
Liquid	SATIMO	-	Validated. No cal required.	Validated. No cal required.
Comm Tester	R&S - CMU200	069Y7-158-13-712	02/17/2014	02/16/2015
Comm Tester	Agilent-8960	GB46310822	02/17/2014	02/16/2015
Multimeter	Keithley 2000	1188656	02/17/2014	02/16/2015
Dipole	SATIMO SID2450	SN46/11 DIP 2G450-189	11/14/2013	11/13/2015
Signal Generator	Agilent-E4438C	MY44260051	02/23/2014	02/22/2015
Power Sensor	NRP-Z23	US38261498	02/17/2014	02/16/2015
SPECTRUM ANALYZER	Agilent- E4440A	MY44303916	10/22/2013	10/21/2014
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/17/2014	02/16/2015

Note: Per KDB 865664 Dipole SAR Validation Verification, AGC Lab has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:
1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement;
4. Impedance is within 5Ω of calibrated measurement.

9. MEASUREMENT UNCERTAINTY

SATIMO Uncertainty Measurement uncertainty for 300 MHz to 3GHz averaged over 1 gram / 10 gram.									
Error Description	Sec	Sec	Tol (±%)	Prob. Dist.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g) (±%)	Std. Unc. (10g)(±%)	(Vi) Veff
Measurement System									
Probe Calibration	E.2.1	6	N	1	1	1	6	6	∞
Axial Isotropy	E.2.2	3	R	$\sqrt{3}$	$(1-C_p)^{1/2}$	$(1-C_p)^{1/2}$	1.22474	1.22474	∞
Hemispherical Isotropy	E.2.2	5	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.04124	2.04124	∞
Boundary Effects	E.2.3	1	R	$\sqrt{3}$	1	1	0.57735	0.57735	∞
Linearity	E.2.4	5	R	$\sqrt{3}$	1	1	2.88675	2.88675	∞
System Detection Limits	E.2.5	1	R	$\sqrt{3}$	1	1	0.57735	0.57735	∞
Readout Electronics	E.2.6	0.5	N	1	1	1	0.5	0.5	∞
Response Time	E.2.7	0.2	R	$\sqrt{3}$	1	1	0.11547	0.11547	∞
Integration Time	E.2.8	2	R	$\sqrt{3}$	1	1	1.1547	1.1547	∞
RF Ambient Noise	E.6.1	3	R	$\sqrt{3}$	1	1	1.73205	1.73205	∞
Probe Positioner Mechanical Tolerance	E.6.2	2	R	$\sqrt{3}$	1	1	1.1547	1.1547	∞
Probe Positioning with Respect to Phantom Shell	E.6.3	1	R	$\sqrt{3}$	1	1	0.57735	0.57735	∞
Extrapolation,interpolation and Integration Algorithms for Max. SAR Evaluation	E.5.2	1.5	R	$\sqrt{3}$	1	1	0.86603	0.86603	∞
Dipole									
Device Positioning	8,E.4.2	1	N	$\sqrt{3}$	1	1	0.57735	0.57735	N-1
Power Drift	8.6.6.2	2	R	$\sqrt{3}$	1	1	1.1547	1.1547	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4	R	$\sqrt{3}$	1	1	2.3094	2.3094	∞
Liquid Conductivity (target)	E.3.2	5	R	$\sqrt{3}$	0.64	0.43	1.84752	1.2413	∞
Liquid Conductivity (meas.)	E.3.3	2.5	N	1	0.64	0.43	1.6	1.075	∞
Liquid Permittivity (target)	E.3.2	3	R	$\sqrt{3}$	0.6	0.49	1.03923	0.8487	∞
Liquid Permittivity (meas.)	E.3.3	2.5	N	1	0.6	0.49	1.5	1.225	M
Combined Standard Uncertainty			RSS				8.09272	7.9296	

10. CONDUCTED POWER MEASUREMENT

WIFI

Mode	Data Rate (Mbps)	Channel	Frequency(MHz)	Avg. Burst Power(dBm)
802.11b	1	01	2412	**18.29**
		06	2437	18.2
		11	2462	17.98
802.11g	6	01	2412	16.68
		06	2437	16.75
		11	2462	16.25
802.11n(20)	6.5	01	2412	16.22
		06	2437	16.41
		11	2462	16.32
802.11n(40)	13.5	03	2422	16.59
		06	2437	16.64
		09	2452	16.29

11. TEST RESULTS

11.1. SAR Test Results Summary

11.1.1. Test position and configuration

Body SAR was performed with the device 5mm from the phantom

11.1.2. Operation Mode and configuration

- According to the procedures found in FCC KDB Publication 447498 D02, body SAR was performed with the device to phantom separation distance of 5mm.Test the dongle in the following configurations. Test the Horizontal up, Horizontal Down, Vertical Back and Vertical Front positions of the dongle with the antenna in straight mode (no bend or angle). Then additionally test the Horizontal Up position with the dipole antenna at 90 degrees, perpendicular to the phantom (antenna pointing down and away from the phantom) and SAR testing conditions for this dongle will be satisfied. Please check the SAR test photos.
- According to KDB 447498 D01 v05r01 ,for each exposure position, if the highest 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.
- Maximum Scaling SAR in order to calculate the Maximum SAR values to test under the standard Peak Power, Calculation method is as follows:
  Maximum Scaling SAR =tested SAR (Max.) ×[maximum turn-up power (mw)/ maximum measurement output power(mw)]

11.1.3. Test Result

SAR MEASUREMENT									
Ambient Temperature (°C) : 21 ± 2				Relative Humidity (%): 55					
Liquid Temperature (°C) : 21 ± 2				Depth of Liquid (cm):>15					
Product: USB Wireless-N Adapter									
Test Mode:802.11b									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
Horizontal Down with antenna 0°	DTS	6	2437	0.12	0.124	19.00	18.2	0.149	1.6
Horizontal Up with antenna 0°	DTS	6	2437	-0.36	**0.603**	19.00	18.2	**0.725**	1.6
Horizontal Up with antenna 90°	DTS	6	2437	0.56	0.270	19.00	18.2	0.325	1.6
Vertical back with antenna 0	DTS	6	2437	-0.74	0.078	19.00	18.2	0.094	1.6
Vertical front with antenna 0	DTS	6	2437	-0.33	0.035	19.00	18.2	0.042	1.6

Note:
·According to KDB248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.
·The test separation is 5mm of all above table; above test model see the Photographs
·When the 1-g SAR is ≤ 0.8W/kg, testing for low and high channel is optional.
·All of above “DTS” means data transmitters.

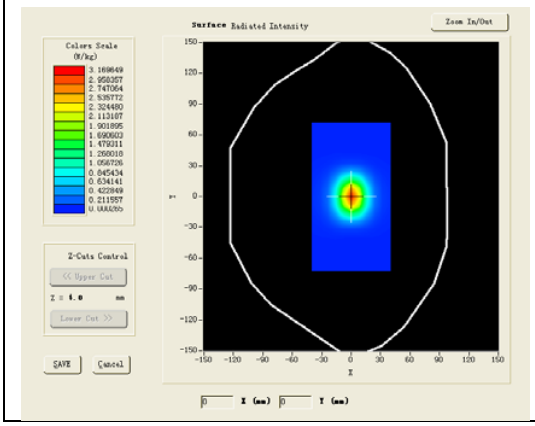
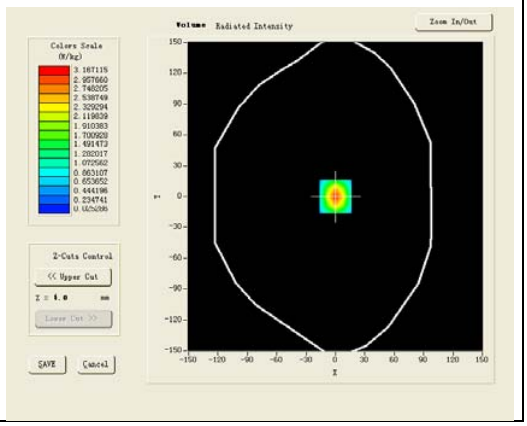
APPENDIX A. SAR SYSTEM VALIDATION DATA

Test Laboratory: AGC Lab **Date: Oct. 17,2014**
System Check Body 2450 MHz
DUT: Dipole 2450 MHz Type: SID 2450
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Duty Cycle: 1:1; Conv.F=4.31
Frequency: 2450 MHz; Medium parameters used: f = 2450 MHz; σ=1.94 mho/m; εr =52.16; ρ= 1000 kg/m^3 ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃): 21, Liquid temperature (℃): 21

SATIMO Configuration:

- Probe: SSE5; Calibrated: 01/12/2014; Serial No.:SN 22/12 EP159
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

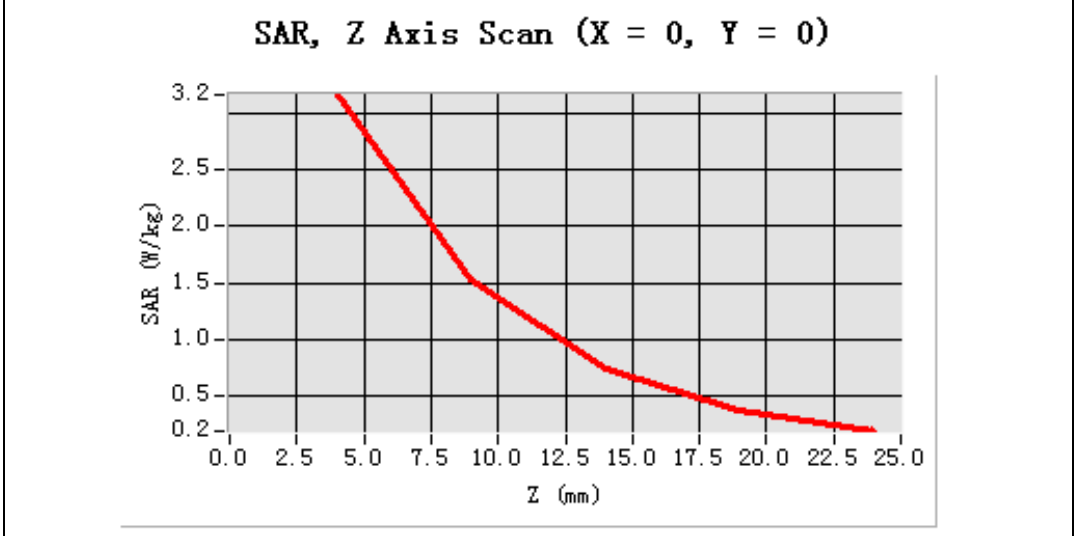
Configuration/System Check 2450 MHz Body /Area Scan: Measurement grid: dx=8mm,dy=8mm
Configuration/System Check 2450 MHz Body /Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm

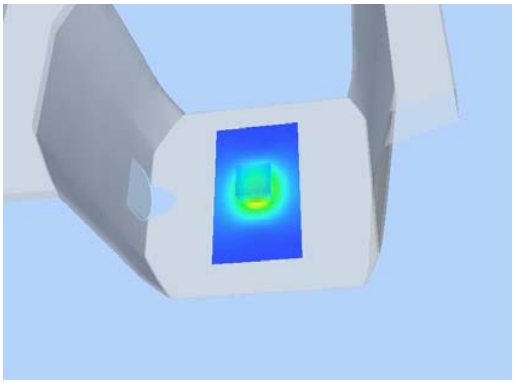
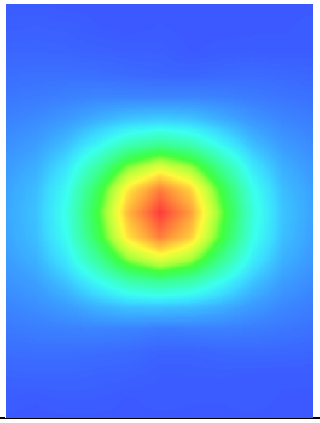
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	1.439875
SAR 1g (W/Kg)	3.137032

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	3.1671	1.5316	0.7301	0.3691



3D screen shot	Hot spot position
	

APPENDIX B. SAR MEASUREMENT DATA

Test Laboratory: AGC Lab **Date: Oct. 17,2014**

802.11b Horizontal Down with antenna 0° (DTS)

DUT: Wireless N USB Adapter 150Mbps Hi-Gain ; Type: WS-WN622HN1

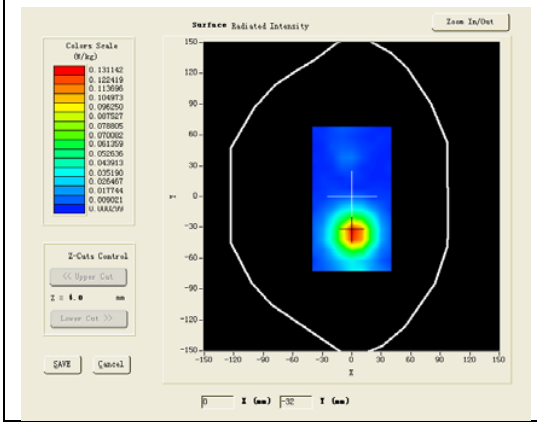
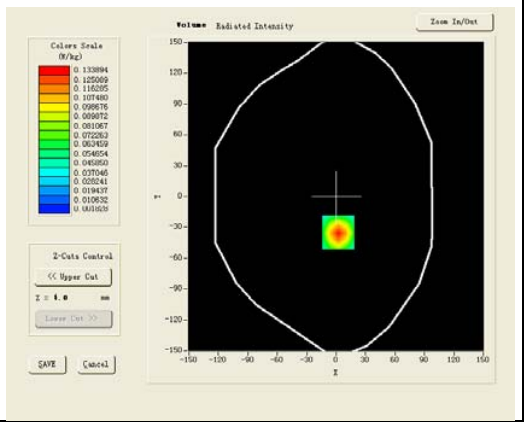
Communication System: Wi-Fi; Communication System Band: 802.11b; Duty Cycle: 1:1; Conv.F=4.31;
Frequency: 2437 MHz; Medium parameters used: f = 2450 MHz; σ=1.94 mho/m; εr =52.16; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):21, Liquid temperature (℃):21

SATIMO Configuration:

- Probe: SSE5; Calibrated: 01/12/2014; Serial No.:SN 22/12 EP159
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/802.11b Horizontal Down with antenna 0° /Area Scan (6x8x1): Measurement grid: dx=8mm, dy=8mm
Configuration/802.11b Horizontal Down with antenna 0°/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,
dy=8mm, dz=5mm;

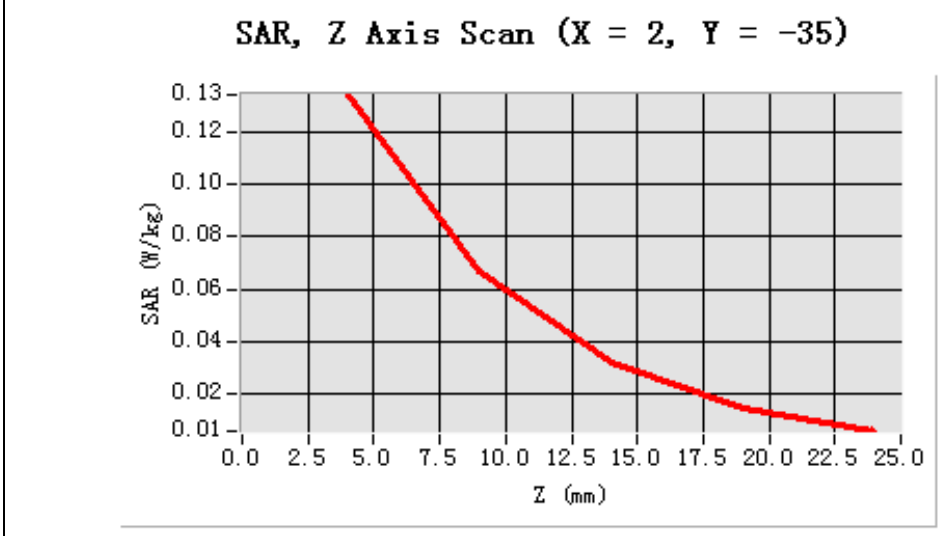
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Horizontal
Band	2450MHz
Channels	Mid
Signal	Crest factor: 1.0

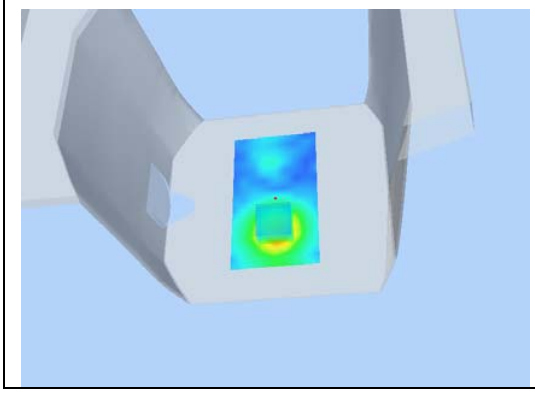
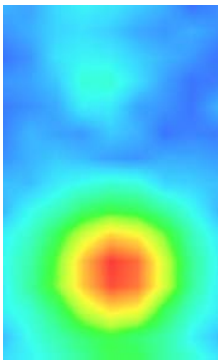
SURFACE SAR	VOLUME SAR
	

Maximum location: X=2.00, Y=-35.00

SAR 10g (W/Kg)	0.060443
SAR 1g (W/Kg)	0.124442

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.1339	0.0669	0.0319	0.0149



3D screen shot	Hot spot position
	

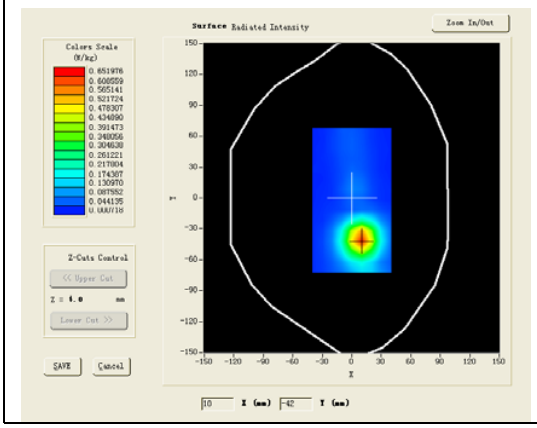
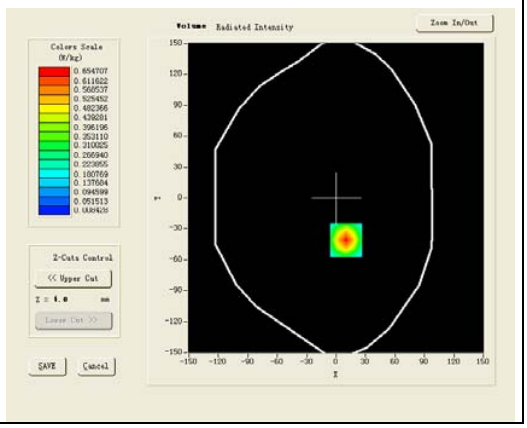
Test Laboratory: AGC Lab **Date: Oct. 17,2014**
802.11b Horizontal Up with antenna 0 (DTS)
DUT: Wireless N USB Adapter 150Mbps Hi-Gain; Type: WS-WN622HN1

Communication System: Wi-Fi; Communication System Band: 802.11b; Duty Cycle: 1:1; Conv.F=4.31;
Frequency: 2437 MHz; Medium parameters used: f = 2450 MHz; σ=1.94 mho/m; εr =52.16; ρ= 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃):21, Liquid temperature (℃):21

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.:SN 22/12 EP159
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/802.11b Horizontal Up with antenna 0° /Area Scan (6x8x1): Measurement grid: dx=8mm, dy=8mm
Configuration/802.11b Horizontal Up with antenna 0° /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,
dy=8mm, dz=5mm;

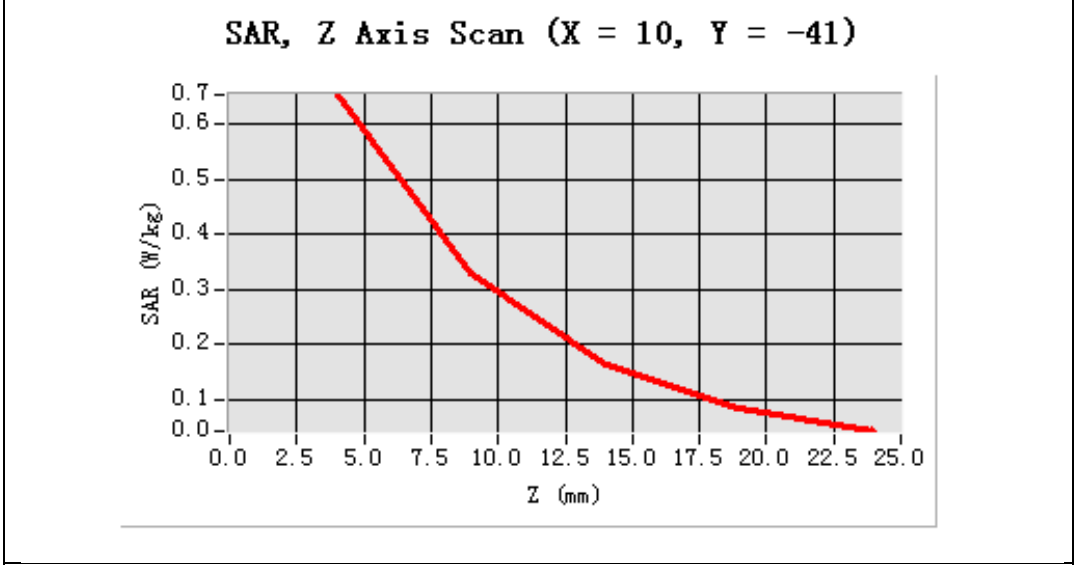
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Horizontal
Band	2450MHz
Channels	Middle
Signal	Crest factor: 1.0

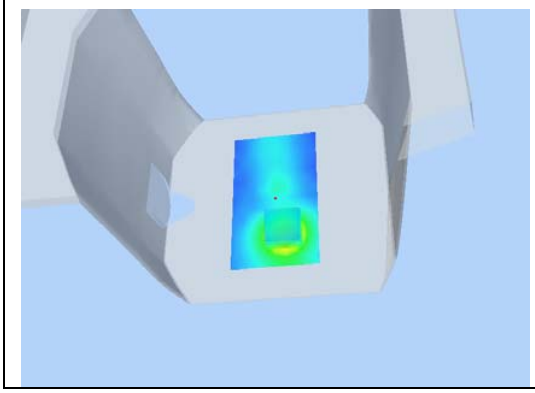
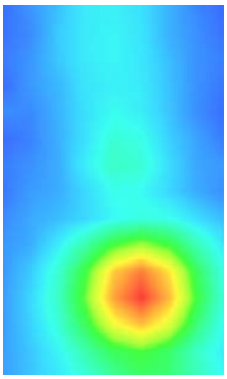
SURFACE SAR	VOLUME SAR
	

Maximum location: X=10.00, Y=-41.00

SAR 10g (W/Kg)	0.291815
SAR 1g (W/Kg)	0.603360

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.6547	0.3301	0.1639	0.0847



3D screen shot	Hot spot position
	

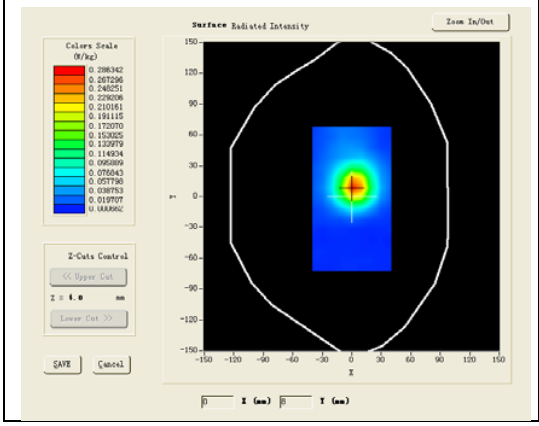
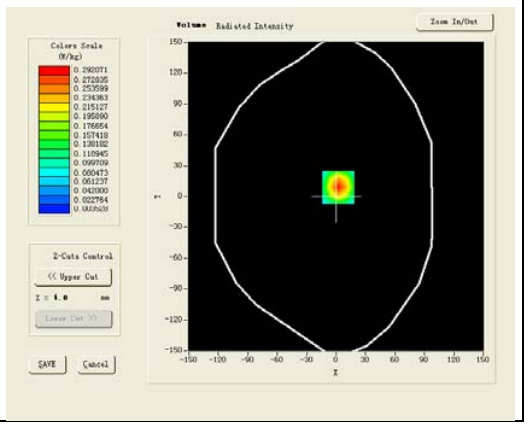
Test Laboratory: AGC Lab **Date: Oct. 17,2014**
802.11b Horizontal Up with antenna 90°(DTS)
DUT: Wireless N USB Adapter 150Mbps Hi-Gain ; Type: WS-WN622HN1

Communication System: Wi-Fi; Communication System Band: 802.11b; Duty Cycle: 1:1; Conv.F=4.31;
Frequency: 2437 MHz; Medium parameters used: f = 2450 MHz; σ=1.94 mho/m; εr =52.16; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.:SN 22/12 EP159
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/802.11b Horizontal Up with antenna 90° /Area Scan (6x8x1): Measurement grid: dx=8mm, dy=8mm
Configuration/802.11b Horizontal Up with antenna 90° /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

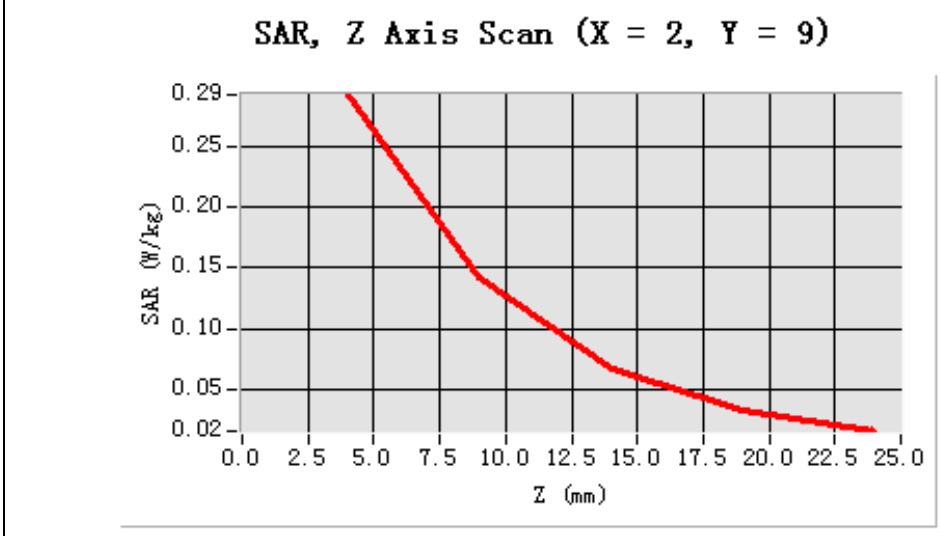
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Horizontal
Band	2450MHz
Channels	Middle
Signal	Crest factor: 1.0

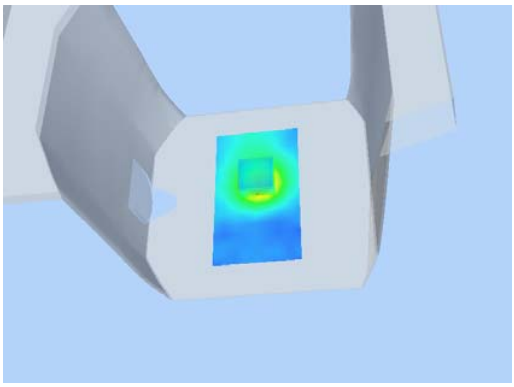
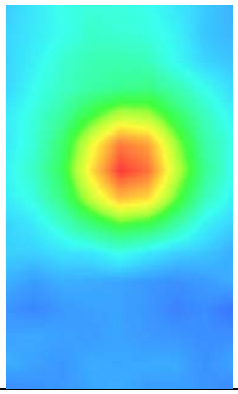
SURFACE SAR	VOLUME SAR
	

Maximum location: X=2.00, Y=9.00

SAR 10g (W/Kg)	0.129453
SAR 1g (W/Kg)	0.269838

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.2921	0.1426	0.0682	0.0340



3D screen shot	Hot spot position
	

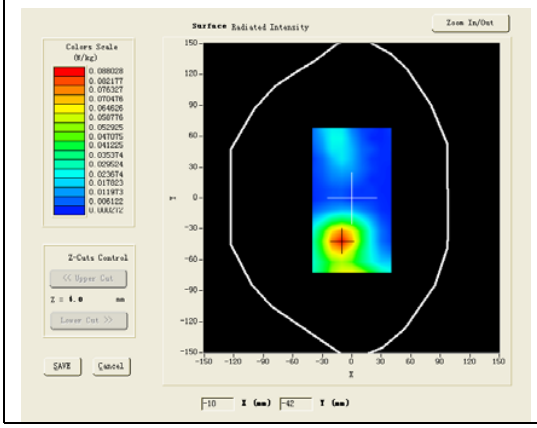
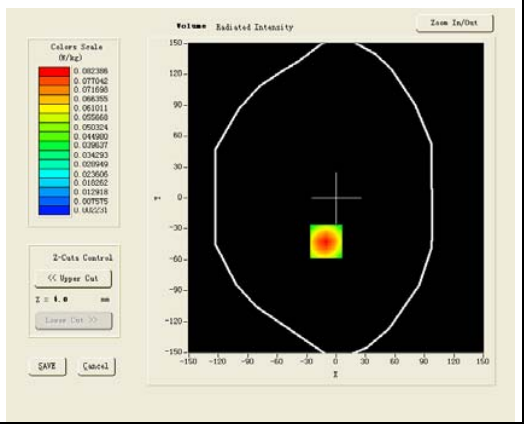
Test Laboratory: AGC Lab **Date: Oct. 17,2014**
802.11b Mid- Vertical back with antenna 0°(DTS)
DUT: Wireless N USB Adapter 150Mbps Hi-Gain ; Type: WS-WN622HN1

Communication System: Wi-Fi; Communication System Band: 802.11b; Duty Cycle: 1:1; Conv.F=4.31;
Frequency: 2437 MHz; Medium parameters used: f = 2450 MHz; σ=1.94 mho/m; εr =52.16; ρ= 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.:SN 22/12 EP159
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/802.11b Mid- Vertical back with antenna 0°/Area Scan (6x8x1): Measurement grid: dx=8mm, dy=8mm
Configuration/802.11b Mid- Vertical back with antenna 0°/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,
dy=8mm, dz=5mm;

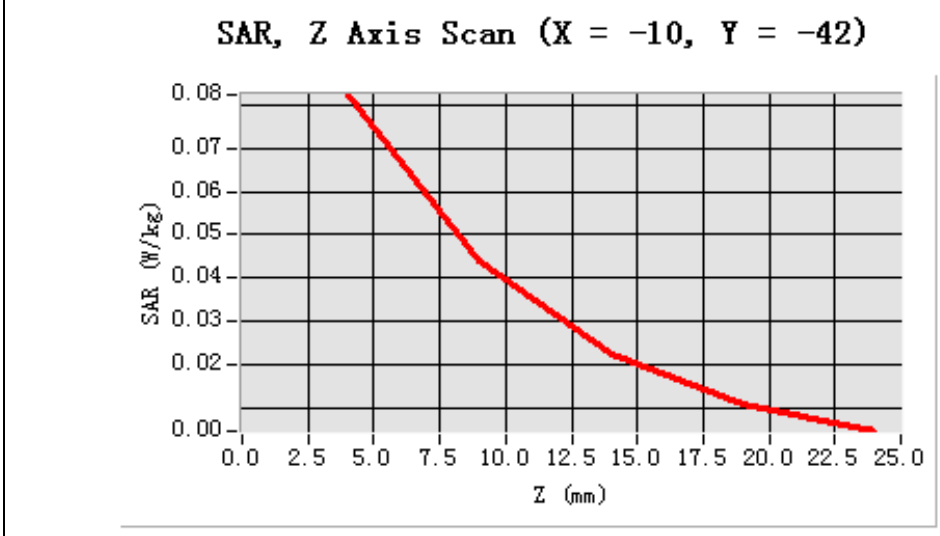
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Vertical
Band	2450MHz
Channels	Middle
Signal	Crest factor: 1.0

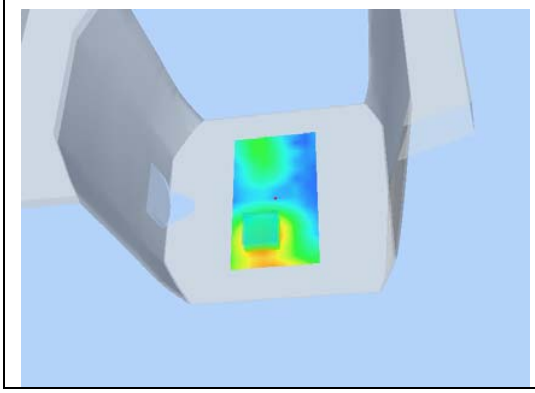
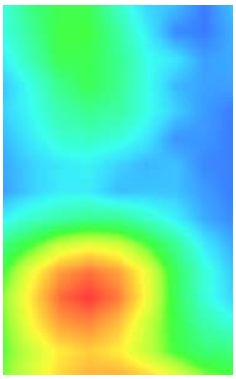
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-10.00, Y=-42.00

SAR 10g (W/Kg)	0.041435
SAR 1g (W/Kg)	0.077756

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.0824	0.0439	0.0224	0.0110



3D screen shot	Hot spot position
	

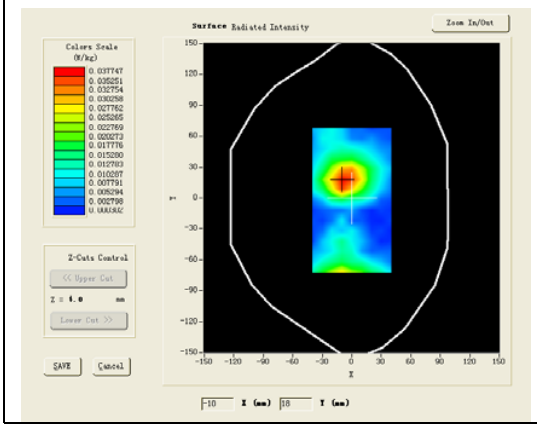
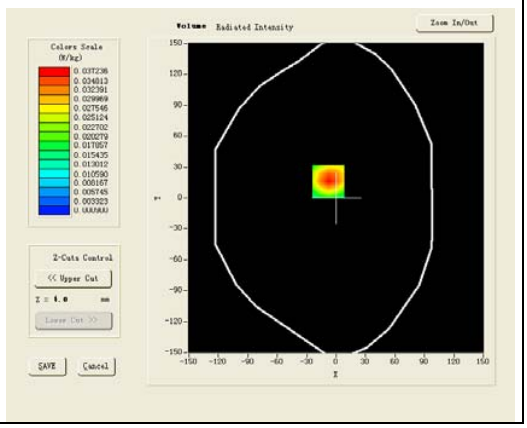
Test Laboratory: AGC Lab **Date: Oct. 17,2014**
802.11b Mid- Vertical front with antenna 0°(DTS)
DUT: Wireless N USB Adapter 150Mbps Hi-Gain ; Type: WS-WN622HN1

Communication System: Wi-Fi; Communication System Band: 802.11b; Duty Cycle: 1:1; Conv.F=4.31;
Frequency: 2437 MHz; Medium parameters used: f = 2450 MHz; σ=1.94 mho/m; εr =52.16; ρ= 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.:SN 22/12 EP159
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/802.11b Mid- Vertical front with antenna 0°/Area Scan (6x8x1): Measurement grid: dx=8mm, dy=8mm
Configuration/802.11b Mid- Vertical front with antenna 0°/ Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,
dy=8mm, dz=5mm;

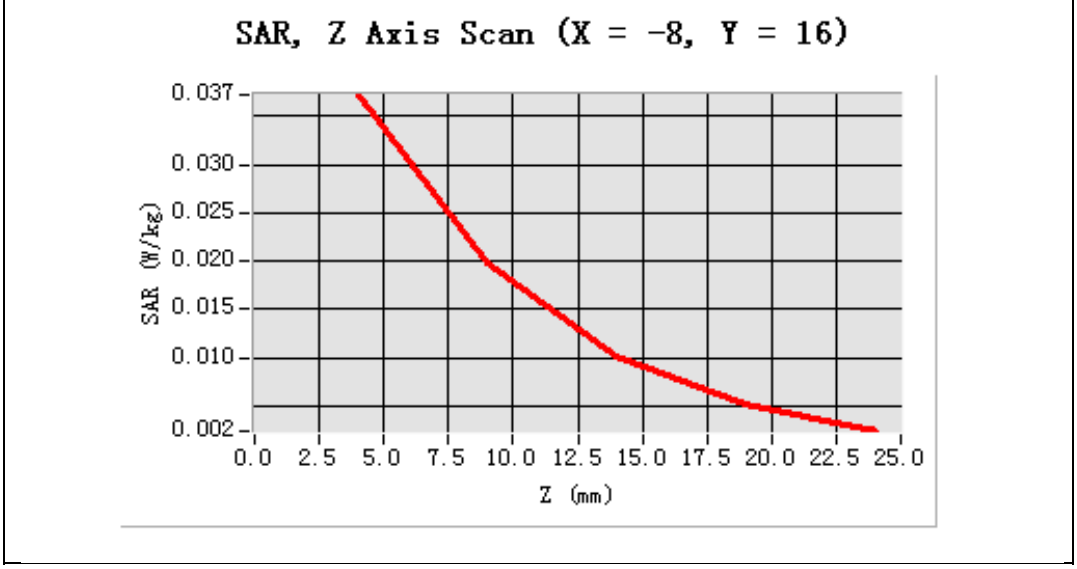
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Vertical
Band	2450MHz
Channels	Middle
Signal	Crest factor: 1.0

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-8.00, Y=16.00

SAR 10g (W/Kg)	0.018682
SAR 1g (W/Kg)	0.035184

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.0372	0.0198	0.0102	0.0052



3D screen shot	Hot spot position