FCC SAR TEST REPORT

Report No.: STS2201219H02

Issued for

Winmate Inc.

9F, No.111-6 , Shing-De Rd., San-Chung Dist., New Taipei City 24158, Taiwan, R.O.C

Product Name:	Rugged Laptop
Brand Name:	Winmate
Model Name:	L140TG
Series Model:	L140XXXXXXXXXXX("XXXXXXXXXXX"= A~Z,a~z,0~9,"-" Blank or Slash)
FCC ID:	PX9L140TG
Test Standard:	ANSI/IEEE Std. C95.1
	FCC 47 CFR Part 2 (2.1093)
	IEEE 1528: 2013
Max. Report SAR (1g):	Body: 0.094 W/kg

ShenZhen STS Test Services Co.,Ltd.
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Test Report Certification

Applicant's name	:	Winmate Inc.
Address	:	9F, No.111-6 , Shing-De Rd., San-Chung Dist., New Taipei City 24158, Taiwan, R.O.C
Manufacturer's Name	:	Winmate Inc.
Address	:	9F, No.111-6 , Shing-De Rd., San-Chung Dist., New Taipei City 24158, Taiwan, R.O.C

Product description

Product name	:	Rugged Laptop
Brand name	:	Winmate
Model name	:	L140TG
Series Model	:	L140XXXXXXXXXXX ("XXXXXXXXXXX"= A~Z,a~z,0~9,"-" Blank or Slash)
Standards	:	ANSI/IEEE Std. C95.1-1992 FCC 47 CFR Part 2 (2.1093) IEEE 1528: 2013

The device was tested by Shenzhen STS Test Services Co., Ltd. in accordance with the measurement methods and procedures specified in KDB 865664 The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of Test	:	
Date (s) of performance of tests	:	02 Mar. 2022
Date of Issue	:	07 Mar. 2022
Test Result	:	**Pass**

Testing Engineer : Shi fan. long

(Shifan. Long)

Technical Manager : Sean She

(Sean she)

Authorized Signatory : Bovey Yang

(Bovey Yang)

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Revision History

Rev.	Issue Date	Report No.	Effect Page	Contents
00	07 Mar. 2022	STS2201219H02	ALL	Initial Issue

1. General Information

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

1.1 EUT Description

Product Name	Rugged Laptop		
Brand Name	Winmate		
Model Name	L140TG		
Series Model	L140XXXXXXXXXXX (“XXXXXXXXXXX”= A~Z,a~z,0~9,"-" Blank or Slash)		
Model Difference	The circuit principle is the same and does not affect electromagnetic compatibility and safety-related structures or key components, and the model difference is only for marketing purposes		
Battery	Rated Voltage: DC 10.8V Charge Limit Voltage:12.6V Capacity: 2400mAh		
Device Category	Portable		
Product stage	Production unit		
RF Exposure Environment	General Population / Uncontrolled		
Hardware Version	L133TG		
Software Version	N/A		
Frequency Range	802.11b/g/n 20: 2412~2462 MHz 802.11n(40MHz): 2422~2452MHz Bluetooth: 2402 to 2480 MHz		
Max. Reported SAR(1g): (Limit:1.6W/kg)	Band	Mode	Body (W/kg)
	DTS	2.4G WLAN ANT A	0.084
	DTS	2.4G WLAN ANT B	0.011
	DTS	2.4G WLAN ANT A+B	0.094
	DSS	BT	0.034
FCC Equipment Class	Digital Transmission System (DTS) Part 15 Spread Spectrum Transmitter (DSS)		
Operating Mode:	WLAN: 802.11 b/g/n20/n40 Bluetooth: GFSK +π/4DQPSK+8DPSK		
Antenna Specification:	WLAN/BT: PIFA Antenna		
Hotspot Mode	Not Support		
DTM Mode	Not Support		

Note:
1. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power.
2. Bluetooth and WLAN can’t simultaneous transmission at the same time.

1.2 Test Environment

Ambient conditions in the SAR laboratory:

Items	Required
Temperature (℃)	18-25
Humidity (%RH)	30-70

1.3 Test Factory

ShenZhen STS Test Services Co.,Ltd.

A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration No.: 625569

IC Registration No.: 12108A

A2LA Certificate No.: 4338.01

2. Test Standards and Limits

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	ANSI/IEEE Std. C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	IEEE Std. 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
4	FCC KDB 447498 D01 v06	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
5	FCC KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
6	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
7	FCC KDB 648474 D04 v01r03	SAR Evaluation Considerations for Wireless Handsets
8	FCC KDB 248227 D01 Wi-Fi SAR v02r02	SAR Considerations for 802.11 Devices
9	FCC 616217 D04 SAR for laptop and tablets v01r02	SAR Evaluation Considerations For Laptop, Notebook, Netbook And Tablet Computers

(A). Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

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

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

NOTE: Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

Population/Uncontrolled Environments:
Are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Occupational/Controlled Environments:
Are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

NOTE

GENERAL POPULATION/UNCONTROLLED EXPOSURE

PARTIAL BODY LIMIT

1.6 W/kg

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 (ρ). The equation description is as below:

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

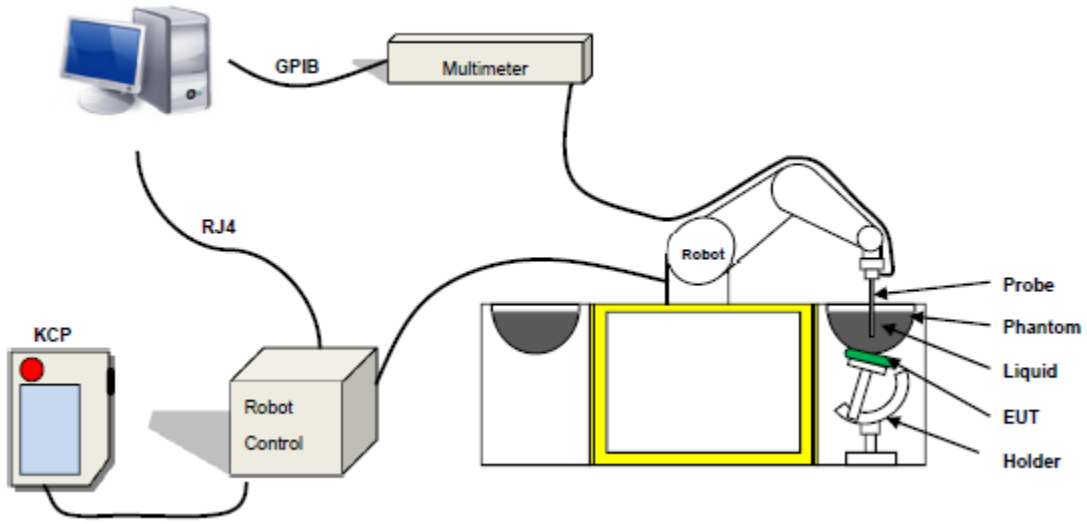
SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue,
ρ is the mass density of the tissue and E is the RMS electrical field strength.

3.2 SAR System

MVG SAR System Diagram:



COMOSAR is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The COMOSAR system consists of the following items:

- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The following figure shows the system.

The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The Open SAR software computes the results to give a SAR value in a 1g or 10g mass.

3.2.1 Probe

For the measurements the Specific Dosimetric E-Field Probe SN 07/21 EPGO352 with following specifications is used

- Probe Length: 330 mm
- Length of Individual Dipoles: 2 mm
- Maximum external diameter: 8 mm
- Probe Tip External Diameter: 2.5 mm
- Distance between dipole/probe extremity: 1 mm
- Dynamic range: 0.01-100 W/kg
- Probe linearity: 3%
- Axial Isotropy: < 0.10 dB
- Spherical Isotropy: < 0.10 dB
- Calibration range: 150 MHz to 6 GHz for head & body simulating liquid.
- Angle between probe axis (evaluation axis) and surface normal line: less than 30°

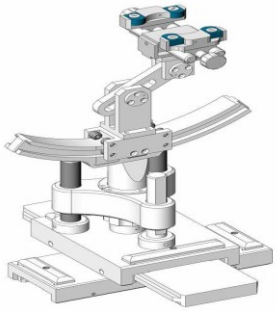
Figure 1-MVG COMOSAR Dosimetric E field Dipole

3.2.2 Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right EUT usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.

Figure-SN 21/21 ELLI48

3.2.3 Device Holder



The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

4. Tissue Simulating Liquids

4.1 Simulating Liquids Parameter Check

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.

Head Tissue

Frequency (MHz)	cellulose	DGBE	HEC	NaCl	Preventol	Sugar	X100	Water	Conductivity	Permittivity
	%	%	%	%	%	%	%	%	σ	εr
750	0.2	/	/	1.4	0.2	57.0	/	41.1	0.89	41.9
835	0.2	/	/	1.4	0.2	57.9	/	40.3	0.90	41.5
900	0.2	/	/	1.4	0.2	57.9	/	40.3	0.97	41.5
1800	/	44.5	/	0.3	/	/	30.45	55.2	1.4	40.0
1900	/	44.5	/	0.3	/	/	30.45	55.2	1.4	40.0
2000	/	44.5	/	0.3	/	/	/	55.2	1.4	40.0
2450	/	44.9	/	0.1	/	/	/	55.0	1.80	39.2
2600	/	45.0	/	0.1	/	/	/	54.9	1.96	39.0

Body Tissue

Frequency (MHz)	cellulose	DGBE	HEC	NaCl	Preventol	Sugar	X100	Water	Conductivity	Permittivity
	%	%	%	%	%	%	%	%	σ	εr
750	0.2	/	/	0.9	0.1	47.2	/	51.7	0.96	55.5
835	0.2	/	/	0.9	0.1	48.2	/	50.8	0.97	55.2
900	0.2	/	/	0.9	0.1	48.2	/	50.8	1.05	55.0
1800	/	29.4	/	0.4	/	/	30.45	70.2	1.52	53.3
1900	/	29.4	/	0.4	/	/	30.45	70.2	1.52	53.3
2000	/	29.4	/	0.4	/	/	/	70.2	1.52	53.3
2450	/	31.3	/	0.1	/	/	/	68.6	1.95	52.7
2600	/	31.7	/	0.1	/	/	/	68.2	2.16	52.3

Tissue dielectric parameters for head and body phantoms				
Frequency	εr		σ S/m	
	Head	Body	Head	Body
300	45.3	58.2	0.87	0.92
450	43.5	56.7	0.87	0.94
900	41.5	55.0	0.97	1.05
1450	40.5	54.0	1.20	1.30
1800	40.0	53.3	1.40	1.52
2450	39.2	52.7	1.80	1.95
3000	38.5	52.0	2.40	2.73
5800	35.3	48.2	5.27	6.00

LIQUID MEASUREMENT RESULTS

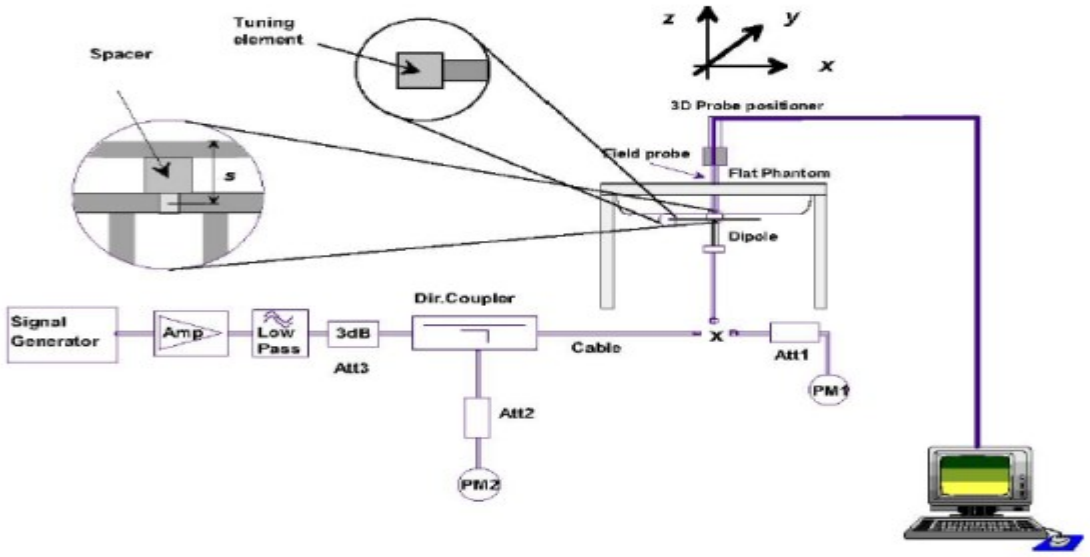
Date	Ambient		Simulating Liquid		Parameters	Target	Measured	Deviation %	Limited %
	Temp. [°C]	Humidity %	Frequency	Temp. [°C]					
2022/3/2	22.1	56.0	2412 MHz	21.7	Permittivity	39.26	40.33	2.73	±5
					Conductivity	1.77	1.74	-1.69	±5
2022/3/2	22.4	50.0	2437 MHz	22.2	Permittivity	39.2	39.58	0.92	±5
					Conductivity	1.8	1.77	-1.12	±5
2022/3/2	21.4	42.0	2450 MHz	21.0	Permittivity	39.2	39.93	1.86	±5
					Conductivity	1.8	1.79	-0.56	±5
2022/3/2	23.9	41.0	2462 MHz	23.6	Permittivity	39.18	39.23	0.13	±5
					Conductivity	1.81	1.84	1.66	±5
2022/3/2	22.5	58.0	2480 MHz	22.2	Permittivity	39.16	38.96	2.48	±5
					Conductivity	1.83	1.85	-3.00	±5

5. SAR System Validation

5.1 Validation System

Each MVG system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the MVG 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 Validation Result

Comparing to the original SAR value provided by MVG, the validation data should be within its specification of 10 %.

Date	Freq.	Power	Tested Value	Normalized SAR	Target SAR	Tolerance	Limit
	(MHz)	(mW)	(W/Kg)	(W/kg)	1g(W/kg)	(%)	(%)
2022-03-02	2450	100	5.179	51.79	52.40	-1.14	10

Note:

1. The tolerance limit of System validation ±10%.
2. The dipole input power (forward power) was 100 mW.
3. The results are normalized to 1 W input power.

6. SAR Evaluation Procedures

The procedure for assessing the average SAR value consists of the following steps:
The following steps are used for each test position

- Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface
- Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
- Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

➢ Area Scan& Zoom Scan

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 is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01 quoted below.
When the 1-g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

7. EUT Antenna Location Sketch

It is a Rugged Laptop, support BT/WLAN mode.

Top side

Left side

Right side

Bottom side

ANT	Transmitting antenna located(mm)					
	Left	Right	Front	Back	Top	Bottom
WLAN ANT-A/ BT	88	220	≤5	28	≤5	455
WLAN ANT-B	183	143	≤5	28	115	297

Note 1: The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report.

7.1 SAR test exclusion consider table

The WLAN SAR evaluation of Maximum power (dBm) summing tolerance.

Exposure Position	Wireless Interface	2.4G WLAN 802.11b ANT-A	2.4G WLAN 802.11b ANT-B	2.4G WLAN 802.11N20 ANT-A	2.4G WLAN 802.11N20 ANT-B	BT
	Calculated Frequency	2437	2462	2437	2437	2480
	Maximum Turn-up power (dBm)	10	10.5	12	12	9.5
	Maximum rated power(mW)	10.00	11.22	15.85	15.85	9.31
Back Side	Separation distance (mm)	28	28	28	28	28
	exclusion threshold(mW)	53.81	53.53	53.81	53.81	53.34
	Testing required?	NO	NO	NO	NO	NO
Front Side	Separation distance (mm)	≤5	≤5	≤5	≤5	≤5
	exclusion threshold(mW)	9.61	9.56	9.61	9.61	9.53
	Testing required?	YES	YES	YES	YES	YES
Left Edge	Separation distance (mm)	88	183	88	183	88
	exclusion threshold(mW)	476.09	1425.60	476.09	1426.09	475.25
	Testing required?	NO	NO	NO	NO	NO
Right Edge	Separation distance (mm)	220	143	220	143	220
	exclusion threshold(mW)	1796.09	1025.60	1796.09	1026.09	1795.25
	Testing required?	NO	NO	NO	NO	NO
Top Edge	Separation distance (mm)	≤5	115	≤5	115	≤5
	exclusion threshold(mW)	9.61	745.60	9.61	746.09	9.53
	Testing required?	YES	NO	YES	NO	NO
Bottom Edge	Separation distance (mm)	455	297	455	297	455
	exclusion threshold(mW)	4146.09	2565.60	4146.09	2566.09	4145.25
	Testing required?	NO	NO	NO	NO	NO

Note：

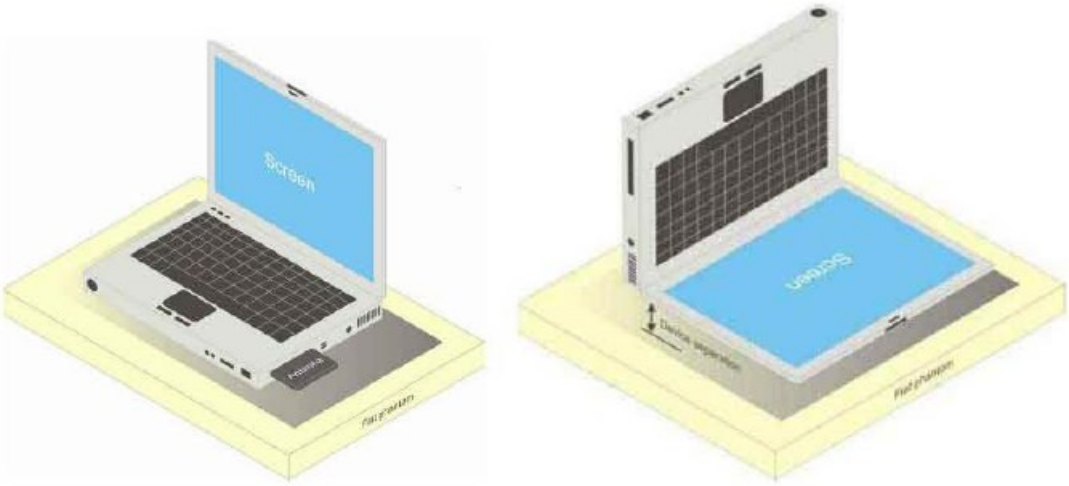
1. maximum power is the source-based time-average power and represents the maximum RF output power among production units.
2. per KDB 447498 D01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. per KDB 447498 D01, standalone SAR test exclusion threshold is applied; if the distance of the antenna to the user is <25mm,25mm is user to determine SAR exclusion threshold
4. per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distance ≤50mm are determined by:
   [(max.power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]*[√f(GHz）)≤3.0 for 1-g SAR and≤7.5 for10-g extremity SAR ,f(GHz) is the RF channel transmit frequency in GHz. Power and distance are rounded to the nearest mW and mm before calculation. The result is rounded to one decimal place for comparison
   For <50mm distance, we just calculate mW of the exclusion threshold value(3.0)to do compare
5. per KDB 447498 D01, at 100 MHz to 6GHz and for test separation distances >50mm, the SAR test exclusion threshold is determined according to the following
   a)[threshold at 50mm in step 1]+(test separation distance -50mm)*(f (MHz)/150)]mW, at 100 MHz to 1500 MHz
   b) [threshold at 50mm in step1]+(test separation distance -50mm) *10]mW at＞1500MHz and≤ 6GHz
6. Per KDB 248227 D01, choose the highest output power channel to test SAR and determine further SAR exclusion 8.for each frequency band ,testing at higher data rates and higher order modulations is not required when the maximum average output power for each of each of these configurations is less than 1/4db higher than those measured at the lower data rate than 11b mode ,thus the SAR can be excluded.
7. Per KDB 616217 D04, SAR evaluation for the front surface of tablet display screens are generally not necessary.

8. EUT Test Position

The EUT was tested on the back and top.

8.1 Body-supported Position Conditions:

The required minimum test separation distance for incorporating transmitters and antennas into laptop , notebook and netbook computer displays is determined with the display screen opened at an angle of 90° to the keyboard compartment. If a computer has other operating configurations that require a di fferent or more conservative display to keyboard angle for normal use, a KDB inquiry should be submi tted to determine the test requirements. When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditio ns are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the Keyboard and display screen of laptop computers are generally not required.



9. Uncertainty

9.1 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in IEEE 1528: 2013.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Uncertainty Component	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	vi
Measurement System								
Probe calibration	5.86	N	1	1	1	5.86	5.86	∞
Axial Isotropy	0.16	R	$\sqrt{3}$	√0.5	√0.5	0.07	0.07	∞
Hemispherical Isotropy	1.06	R	$\sqrt{3}$	√0.5	√0.5	0.43	0.43	∞
Boundary effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	1.27	R	$\sqrt{3}$	1	1	0.73	0.73	∞
System detection limits	1.23	R	$\sqrt{3}$	1	1	0.71	0.71	∞
Modulation response	3.6	R	$\sqrt{3}$	1	1	3.60	3.60	∞
Readout Electronics	0.28	N	1	1	1	0.28	0.28	∞
Response Time	0.19	R	$\sqrt{3}$	1	1	0.11	0.11	∞
Integration Time	1.47	R	$\sqrt{3}$	1	1	0.85	0.85	∞
RF ambient conditions-Noise	3.5	R	$\sqrt{3}$	1	1	2.02	2.02	∞
RF ambient conditions-reflections	3.2	R	$\sqrt{3}$	1	1	1.85	1.85	∞
Probe positioner mechanical tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to phantom shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Post-processing	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Test sample Related								
Test sample positioning	3.1	N	1	1	1	3.10	3.10	∞
Device holder uncertainty	3.8	N	1	1	1	3.80	3.80	∞
SAR drift measurement	4.8	R	$\sqrt{3}$	1	1	2.77	2.77	∞
SAR scaling	2	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Phantom and tissue parameters								
Phantom uncertainty (shape and thickness uncertainty)	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	2	N	1	1	0.84	2.00	1.68	∞
Liquid conductivity (temperature uncertainty)	2.5	R	$\sqrt{3}$	0.78	0.71	1.95	1.78	∞
Liquid conductivity (measured)	4	N	1	0.78	0.71	0.92	1.04	M
Liquid permittivity (temperature uncertainty)	2.5	R	$\sqrt{3}$	0.23	0.26	1.95	1.78	∞
Liquid permittivity (measured)	5	N	1	0.23	0.26	1.15	1.30	M
Combined Standard Uncertainty		RSS				10.60	10.51	
Expanded Uncertainty (95% Confidence interval)		K=2				21.21	21.03	

10. Conducted Power Measurement

10.1 Test Result

2.4G WLAN

Modulation	Frequency (MHz)	Ant_A Final Average Output Power (dBm)	Ant_B Final Average Output Power (dBm)	Ant_A+B Final Average Output Power (dBm)
802.11b	2412	9.67	10.07	N/A
	2437	9.74	10.17	N/A
	2462	9.71	10.2	N/A
802.11g	2412	9.1	9.45	N/A
	2437	9.14	9.59	N/A
	2462	9.16	9.51	N/A
802.11n(HT20)	2412	8.72	8.99	11.87
	2437	8.7	9.1	11.92
	2462	8.69	8.99	11.85
802.11n(HT40)	2422	8.65	8.88	11.78
	2437	8.66	8.83	11.76
	2452	8.59	8.87	11.74

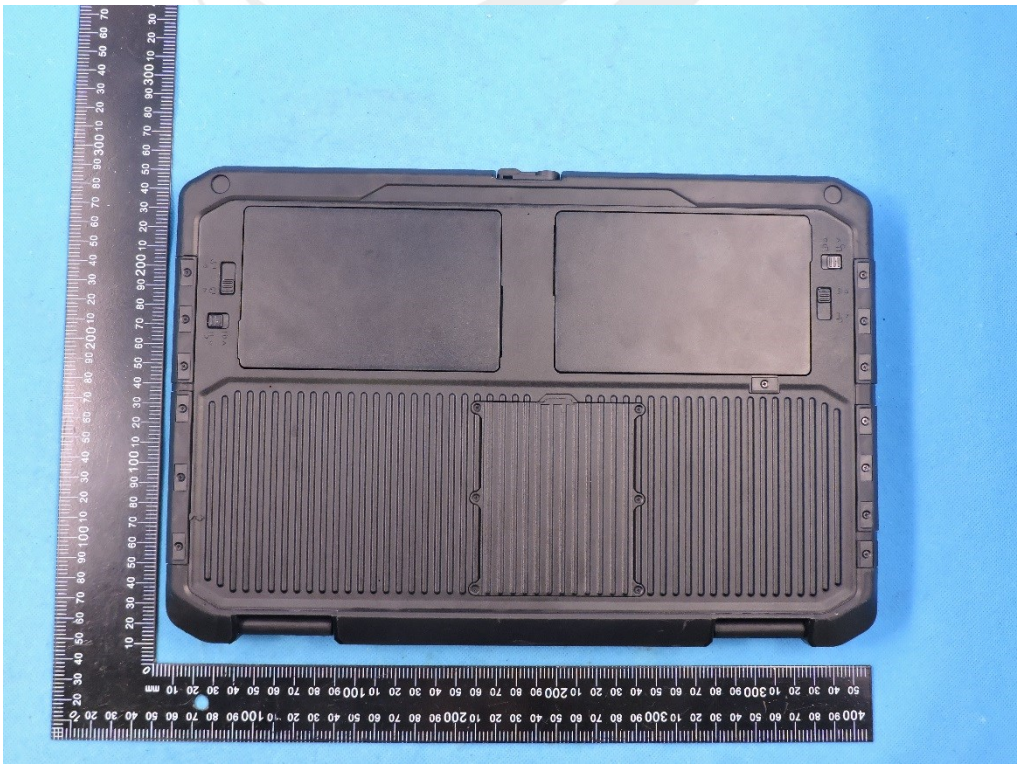
BT				
Mode	Channel Number	Frequency (MHz)	Average Power (dBm)	Output Power (mW)
GFSK(1Mbps)	0	2402	7.59	5.74
	39	2441	9.28	8.47
	78	2480	9.31	8.53
π/4-QPSK(2Mbps)	0	2402	5.12	3.25
	39	2441	6.01	3.99
	78	2480	6.25	4.22
8DPSK(3Mbps)	0	2402	5.83	3.83
	39	2441	6.03	4.01
	78	2480	5.42	3.48

11. EUT and Test Setup Photo

11.1 EUT Photo

Front side

Back side

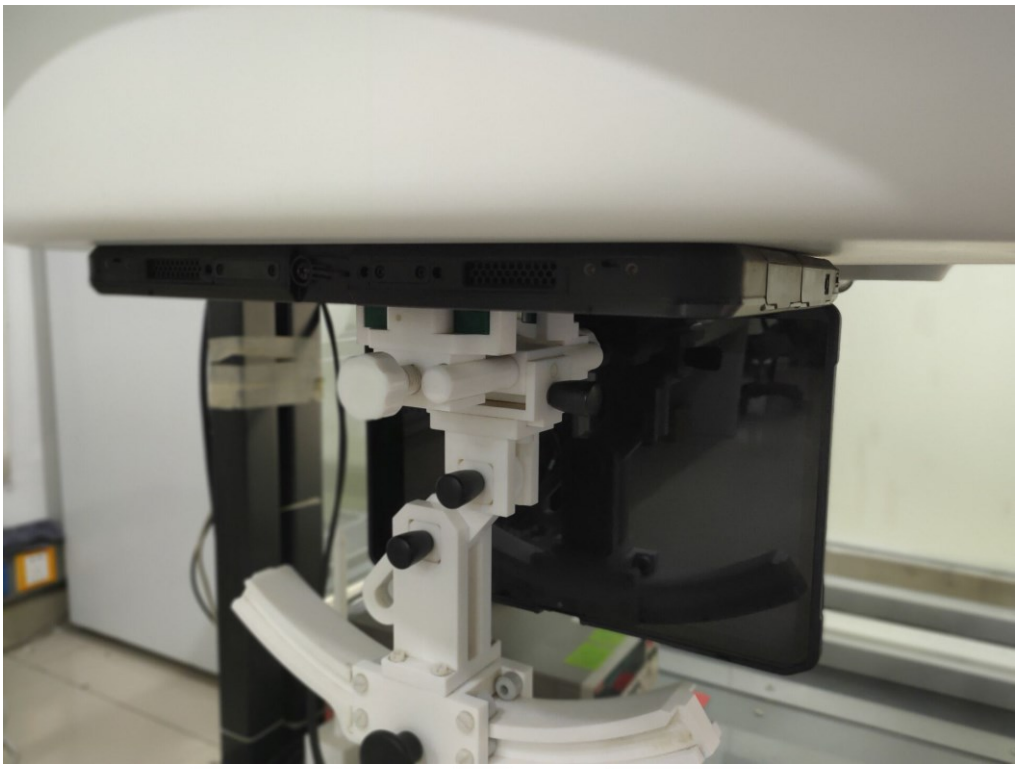


Left side

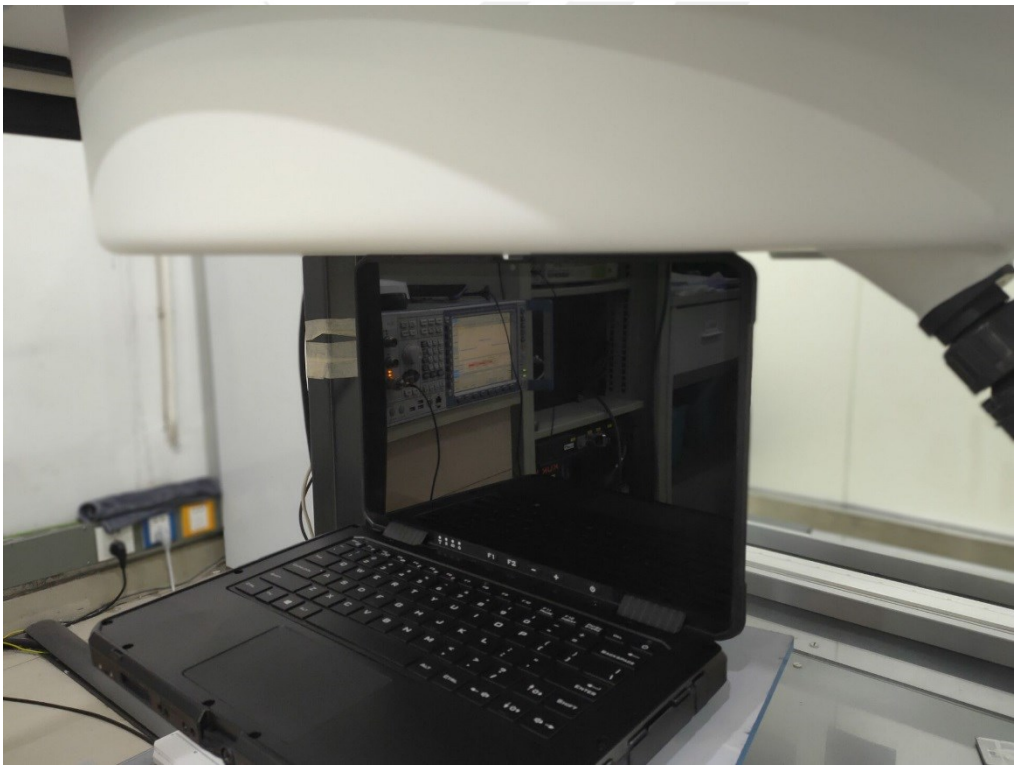
Right side

11.2 Setup Photo

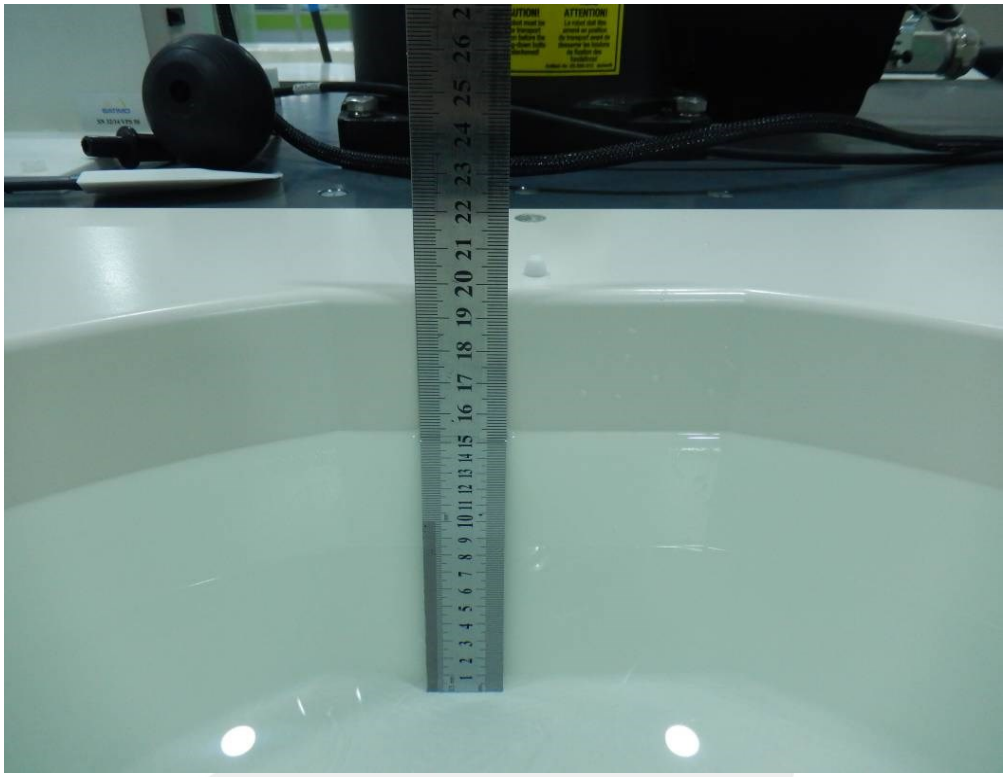
Body Back side(separation distance is 0mm)



Body Top side(separation distance is 0mm)



Liquid depth (15 cm)



12. SAR Result Summary

12.1 Body SAR

Band	Model	Test Position	Frequency (MHz)	SAR (1g) (W/kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Scaled SAR (W/Kg)	Meas.No.
2.4G WLAN ANT-A	802.11b	Front Side	2412	0.070	3.68	10.00	9.67	0.076	/
		Front Side	2437	0.079	-0.32	10.00	9.74	**0.084**	**1**
		Front Side	2462	0.075	-1.14	10.00	9.71	0.080	/
		Top Side	2437	0.060	1.52	10.00	9.74	0.064	/
2.4G WLAN ANT-B	802.11b	Front Side	2462	0.010	-0.19	10.50	10.20	**0.011**	**2**
2.4G WLAN ANT-A	802.11N20	Front Side	2437	0.083	1.31	12.00	11.92	**0.085**	**3**
		Top Edge	2437	0.066	-1.00	12.00	11.92	0.067	/
2.4G WLAN ANT-B	802.11N20	Front Side	2437	0.009	1.66	12.00	11.92	**0.009**	**4**
BT	GFSK	Front Side	2480	0.033	1.25	9.50	9.31	**0.034**	**5**

Band	ANT	Max SAR (W/Kg)	2.4G WLAN N20 ANT A+B
2.4G WLAN N20 ANT A+B	ANT-A	0.085	0.094
	ANT-B	0.009	

Note:

1. The test separation of all above table is 0mm.
2. Per KDB 447498 D01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. Scaled SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor

13. Equipment List

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
2450MHzDipole	MVG	SID2450	SN 30/14 DIP2G450-335	2020.07.14	2023.07.13
E-Field Probe	MVG	SSE2	SN 07/21 EPGO352	2022.02.28	2023.03.01
Dielectric Probe Kit	MVG	SCLMP	SN 32/14 OCPG67	2021.11.23	2022.11.22
Antenna	MVG	ANTA3	SN 07/13 ZNTA52	N/A	N/A
Phantom1	MVG	SAM	SN 21/21 ELLI48	N/A	N/A
Phone holder	MVG	N/A	SN 32/14 MSH97	N/A	N/A
Laptop holder	MVG	N/A	SN 32/14 LSH29	N/A	N/A
Attenuator	Agilent	99899	DC-18GHz	N/A	N/A
Directional coupler	Narda	4226-20	3305	N/A	N/A
Network Analyzer	Agilent	8753ES	US38432810	2021.09.29	2022.09.28
Multi Meter	Keithley	Multi Meter 2000	4050073	2021.10.08	2022.10.07
Signal Generator	Agilent	N5182A	MY50140530	2021.09.30	2022.09.29
Wireless Communication Test Set	Agilent	8960-E5515C	MY48360751	2021.09.30	2022.09.29
Wireless Communication Test Set	R&S	CMW500	117239	2021.09.30	2022.09.29
Power Amplifier	DESAY	ZHL-42W	9638	2021.10.09	2022.10.08
Power Meter	R&S	NRP	100510	2021.09.29	2022.09.28
Power Sensor	R&S	NRP-Z11	101919	2021.09.29	2022.09.28
Temperature hygrometer	SuWei	SW-108	N/A	2021.10.09	2022.10.08
Thermograph	Elitech	RC-4	S/N EF7176501537	2021.10.09	2022.10.08

Note:
Per KDB 865664 D01, Dipole SAR Validation Verification, STS 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 Return-loss in within 20% of calibrated measurement

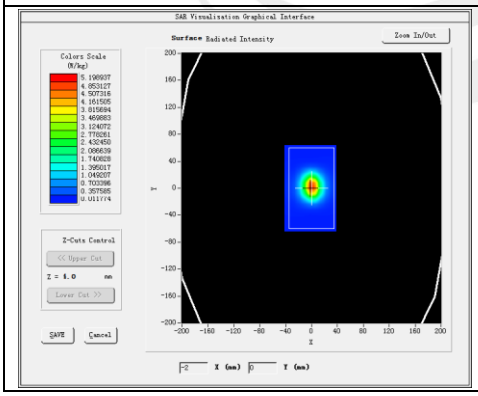
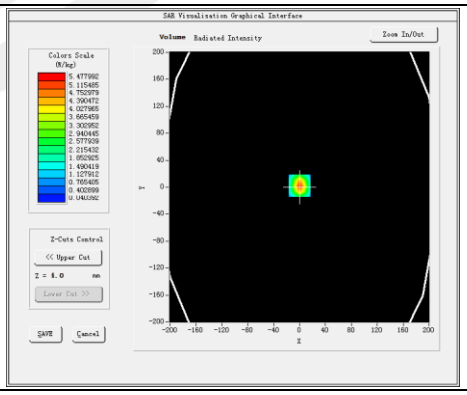
Appendix A. System Validation Plots

System Performance Check Data (2450MHz)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm, dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2022-03-02

Experimental conditions.

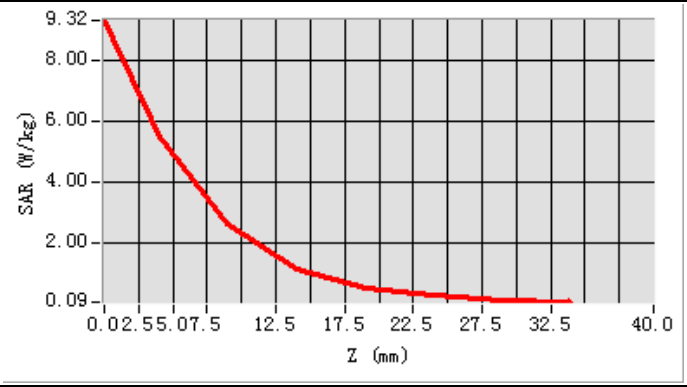
Device Position	Validation plane
Band	2450 MHz
Channels	-
Signal	CW
Frequency (MHz)	2450
Relative permittivity	39.93
Conductivity (S/m)	1.79
Probe	SN 07/21 EPGO352
ConvF	1.97
Crest factor:	1:1

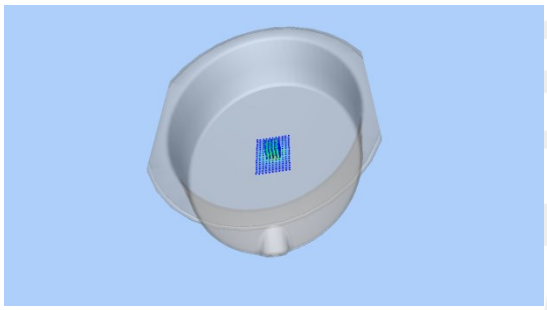
SURFACE SAR	VOLUME SAR
	

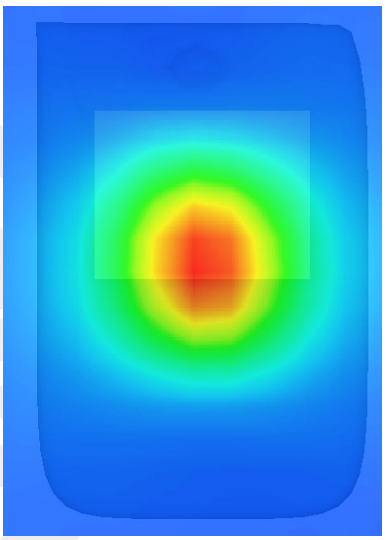
Maximum location: X=3.00, Y=1.00

SAR 10g (W/Kg)	2.411700
SAR 1g (W/Kg)	5.178711

Z Axis Scan


9.32
8.00
6.00
4.00
2.00
0.09
SAR (W/kg)
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)





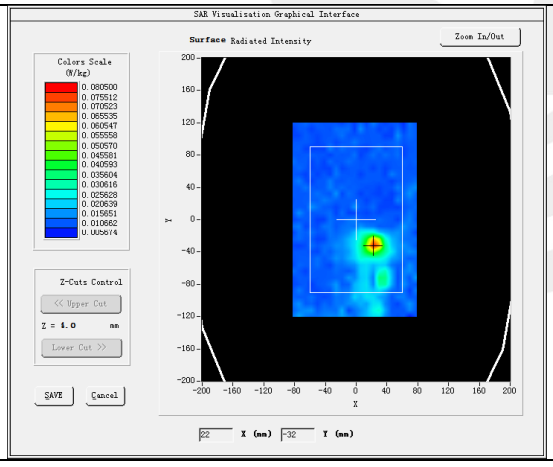
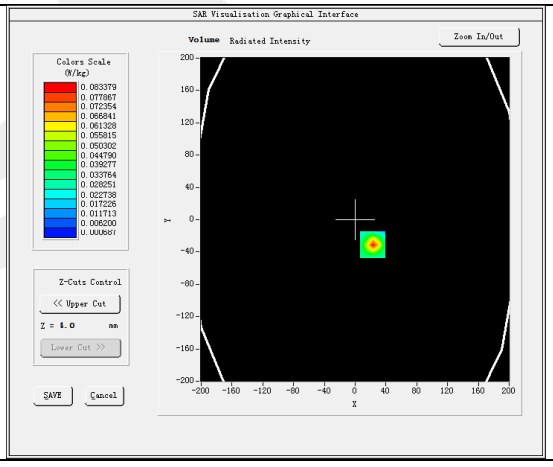
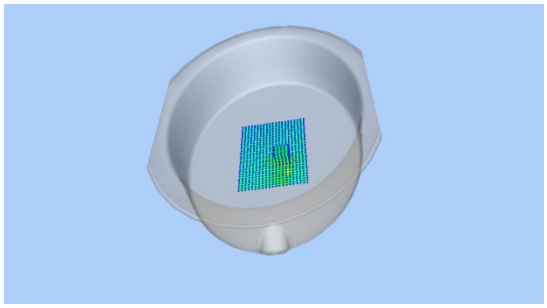
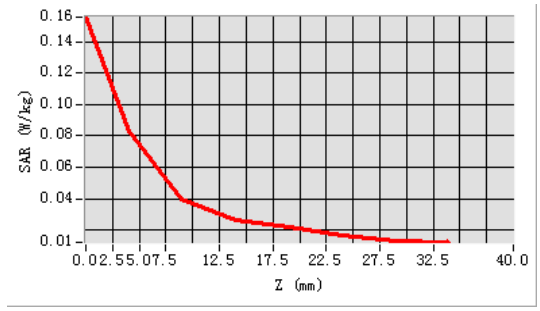
Appendix B. SAR Test Plots

Plot 1: DUT: Rugged Laptop; EUT Model: L140TG

Test Date	2022-03-02
Probe	SN 07/21 EPGO352
Area Scan	dx=8mm, dy=8mm, h= 5.00 mm
Zoom Scan	5x5x7, dx=8mm, dy=8mm, dz=5mm, Complete/ndx=8mm, dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Front Side
Band	2.4G WLAN
Channels	Mid
ANT	ANT A
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2437

Maximum location: X=23.00, Y=-31.00
SAR Peak: 0.15 W/kg

SAR 10g (W/Kg)	0.037956
SAR 1g (W/Kg)	0.078821

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

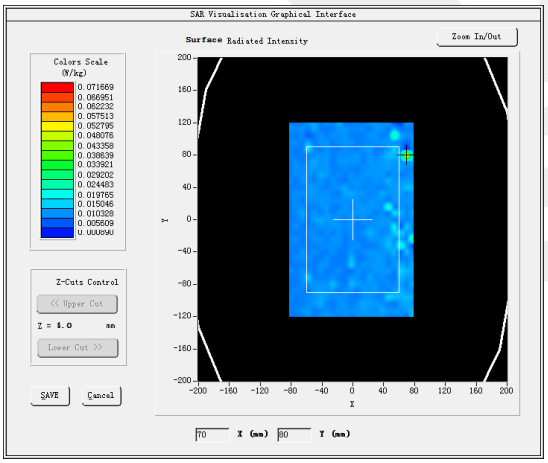
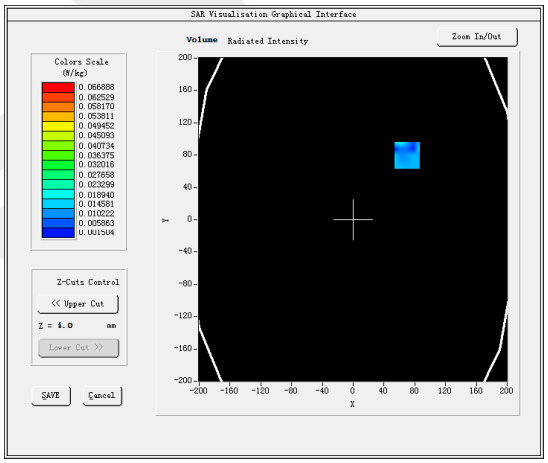
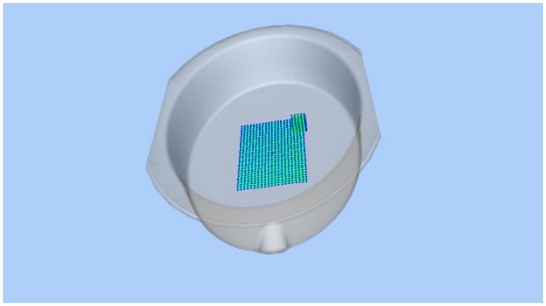
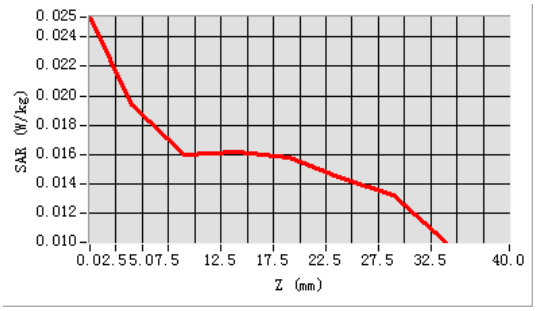
Plot 2: DUT: Rugged Laptop; EUT Model: L140TG

Test Date	2022-03-02
Probe	SN 07/21 EPGO352
Area Scan	dx=8mm, dy=8mm, h= 5.00 mm
Zoom Scan	5x5x7, dx=8mm, dy=8mm, dz=5mm, Complete/ndx=8mm, dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Front Side
Band	2.4G WLAN
ANT	ANT B
Channels	High
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2462

Maximum location: X=70.00, Y=80.00

SAR Peak: 0.03 W/kg

SAR 10g (W/Kg)	0.011295
SAR 1g (W/Kg)	0.010250

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

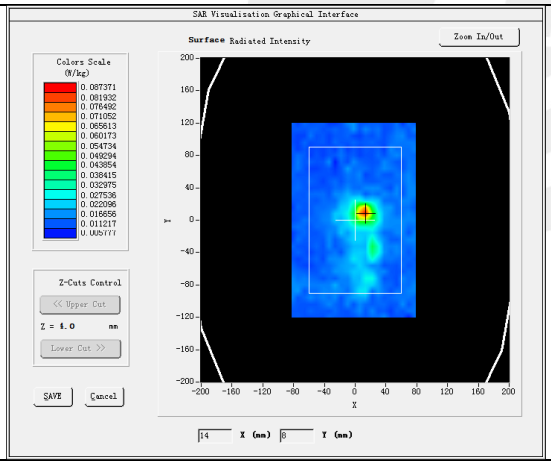
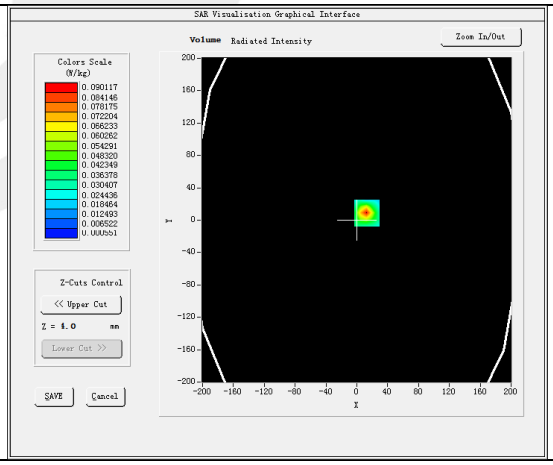
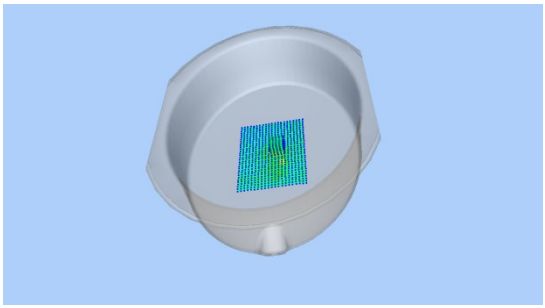
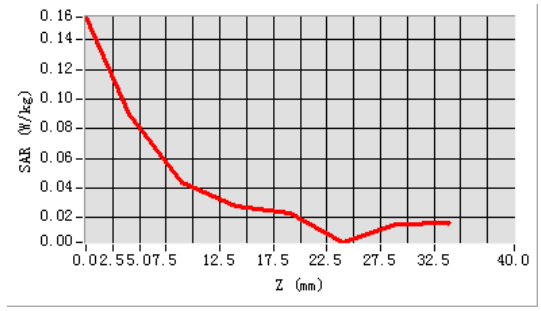
Plot 3: DUT: Rugged Laptop; EUT Model: L140TG

Test Date	2022-03-02
Probe	SN 07/21 EPGO352
ConvF	1.84
Area Scan	dx=8mm, dy=8mm, h= 5.00 mm
Zoom Scan	5x5x7, dx=8mm, dy=8mm, dz=5mm, Complete/ndx=8mm, dy=8mm, h= 5.00mm
Phantom	Validation plane
Device Position	Front Side
Band	2.4G WLAN 802.11N20
ANT	ANT A
Channels	Mid
Signal	IEEE802.N20 (Crest factor: 1.0)
Frequency (MHz)	2437

Maximum location: X=13.00, Y=9.00

SAR Peak: 0.15 W/kg

SAR 10g (W/Kg)	0.041067
SAR 1g (W/Kg)	0.083355

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

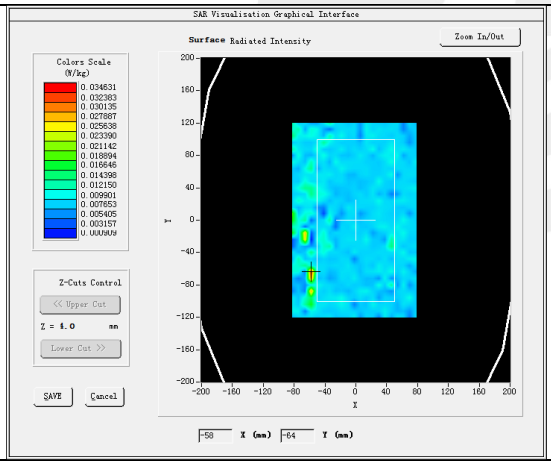
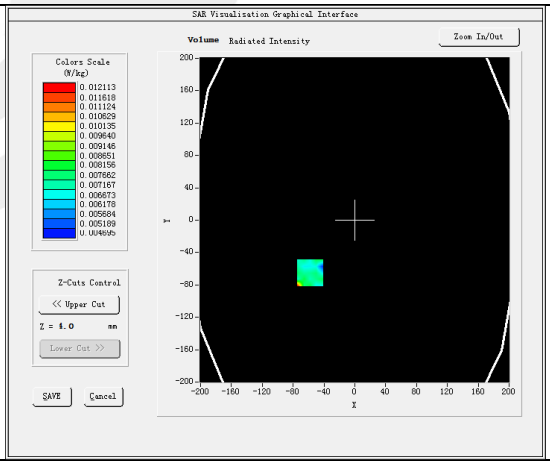
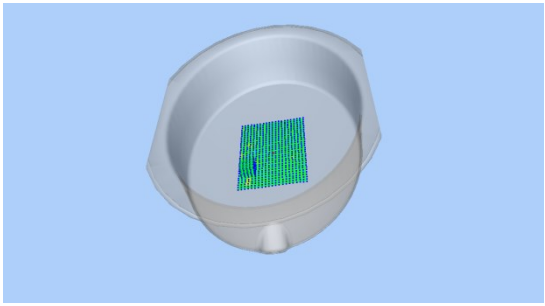
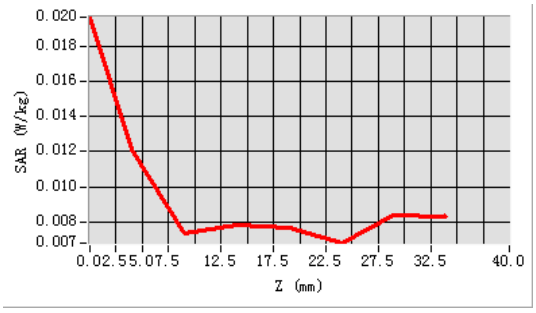
Plot 4: DUT: Rugged Laptop; EUT Model: L140TG

Test Date	2022-03-02
Probe	SN 07/21 EPGO352
ConvF	1.60
Area Scan	dx=8mm, dy=8mm, h= 5.00 mm
Zoom Scan	5x5x7, dx=8mm, dy=8mm, dz=5mm, Complete/ndx=8mm, dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Front Side
Band	2.4G WLAN 802.11N20
ANT	ANT B
Channels	Mid
Signal	IEEE802.N20 (Crest factor: 1.0)
Frequency (MHz)	2437

Maximum location: X=-58.00, Y=-65.00

SAR Peak: 0.02 W/kg

SAR 10g (W/Kg)	0.007398
SAR 1g (W/Kg)	0.008569

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

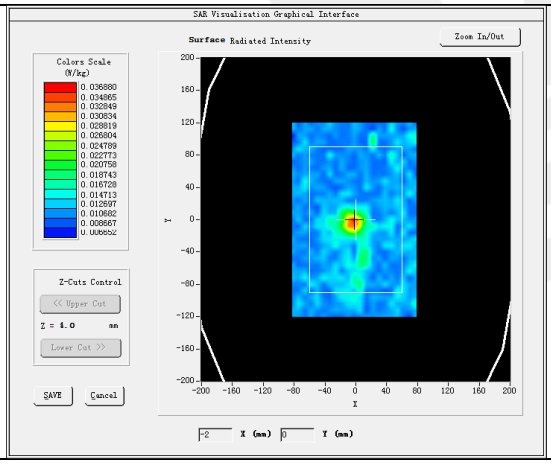
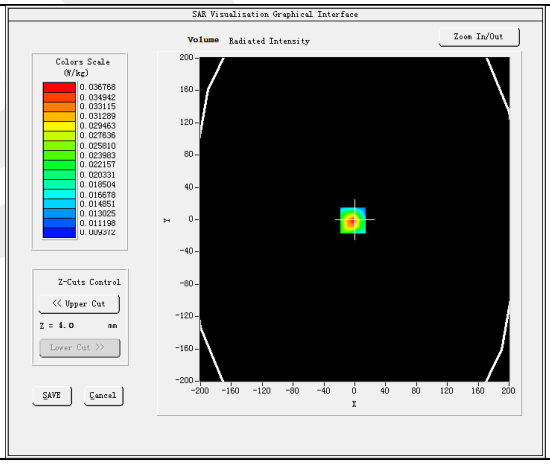
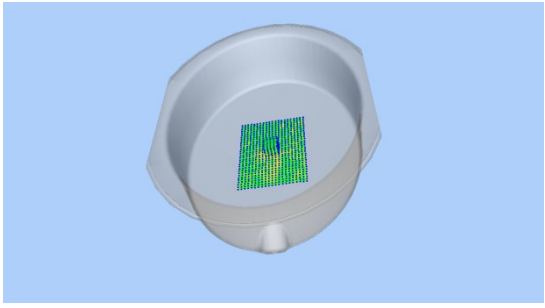
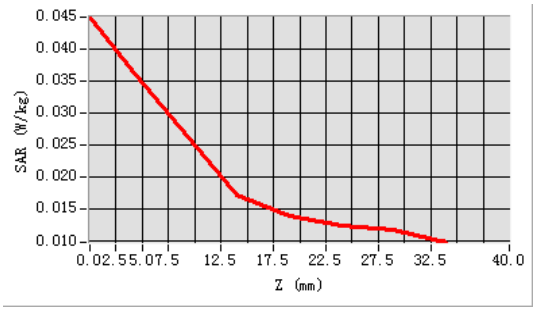
Plot 5: DUT: Rugged Laptop; EUT Model: L140TG

Test Date	2022-03-02
Probe	SN 07/21 EPGO352
ConvF	1.60
Area Scan	dx=8mm, dy=8mm, h= 5.00 mm
Zoom Scan	5x5x7, dx=8mm, dy=8mm, dz=5mm, Complete/ndx=8mm, dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Front Side
Band	BT
Channels	High
Signal	GFSK (Crest factor: 1.0)
Frequency (MHz)	2480

Maximum location: X=-2.00, Y=-1.00

SAR Peak: 0.05 W/kg

SAR 10g (W/Kg)	0.022010
SAR 1g (W/Kg)	0.032897

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Appendix C. Probe Calibration and Dipole Calibration Report

Refer the appendix Calibration Report.

※※※※※END OF THE REPORT※※※※※