FCC SAR TEST REPORT

Report No.: STS1808184H01

Issued for

Shadow Creator Information Technology Co., Ltd.

3 Floor, Building 12, 399 lane, Chuan Qiao Road, Pudong New Area, Shanghai, China

Product Name:	Virtual Reality HDM
Brand Name:	Shadow Creator
Model Name:	Shadow V01
Series Model:	N/A
FCC ID:	2AQYUSHADOWV01
Test Standard:	ANSI/IEEE Std. C95.1
	FCC 47 CFR Part 2 (2.1093)
	IEEE 1528: 2013
Max. Report SAR (1g):	Head: 0.396 W/kg
Max. Report SAR (10g):	Extremity: 0.132 W/kg

Shenzhen STS Test Services Co., Ltd.
1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong,China
TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail:sts@stsapp.com

Test Report Certification

Applicant's name ..... :	Shadow Creator Information Technology Co., Ltd.
Address ..... :	3 Floor, Building 12, 399 lane, Chuan Qiao Road, Pudong New Area, Shanghai, China
Manufacture's Name ..... :	Shadow Creator Information Technology Co., Ltd.
Address ..... :	3 Floor, Building 12, 399 lane, Chuan Qiao Road, Pudong New Area, Shanghai, China

Product description

Product name ..... :	Virtual Reality HDM
Brand name ..... :	Shadow Creator
Model name ..... :	Shadow V01
Series Model ..... :	N/A
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 ..... :	30 Aug. 2018&23 Oct. 2018
Date of Issue ..... :	24 Oct. 2018
Test Result ..... :	**Pass**

Testing Engineer **:** Aaron Bu

(Aaron Bu)

Technical Manager **:**

(John Zou)

Authorized Signatory **:**

(Vita Li)

Table of Contents

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	Virtual Reality HDM		
Brand Name	Shadow Creator		
Model Name.	Shadow V01		
Series Model	N/A		
FCC ID	2AQYUSHADOWV01		
Model Difference	N/A		
Adapter	Input: AC 100-240V, 450mA, 50-60 Hz Output: DC 5.2V, 2000mA		
Battery	Rated Voltage: 3.6V; Charge Limit: 4.2V; Capacity: 3400mAh		
Device Category	Portable		
Product stage	Production unit		
RF Exposure Environment	General Population / Uncontrolled		
Hardware Version	V01-MB-V1.0		
Software Version	SW_V01_YC_A_V1.7.1_180813		
Frequency Range	WLAN 802.11b/g/n(HT20):2412~2462MHz WLAN 802.11a/n/ac(HT20/40/80): 5725~5875 MHz; Bluetooth:2402~ 2480MHz		
Max. Reported SAR:	Mode	Head SAR(1g) (W/kg)	Extremity SAR(10g) (W/kg)
	2.4G WLAN ANT A	0.133	0.054
	2.4G WLAN ANT B	0.116	0.045
	2.4G WLAN (MIMO)	0.214	0.105
	5.8G WLAN ANT A	0.116	0.049
	5.8G WLAN ANT B	0.192	0.067
	5.8G WLAN (MIMO)	0.396	0.132
	Bluetooth Note	0.084	0.034
Limit		1.6	4.0
Operating Mode:	WLAN: 802.11 b/g/n(HT20) /a/ac20/ac40/ac80 Bluetooth: V5.0 + EDR (GFSK, π/4DQPSK, 8DPSK) ; BLE: GFSK		
Antenna Specification:	BT,WLAN: PIFA Antenna		
Hotspot Mode:	Not Support		
DTM Mode:	Not Support		

Note:
1. Bluetooth SAR was estimated
2. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power

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.
Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
CNAS Registration No.: L7649
FCC 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	Virtual Reality HDM 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 616217 D04	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers
7	FCC KDB 248227 D01 Wi-Fi SAR v02r02	SAR Considerations for 802.11 Devices

(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/ Wrists LIMIT

1.6 W/kg/4.0 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:

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

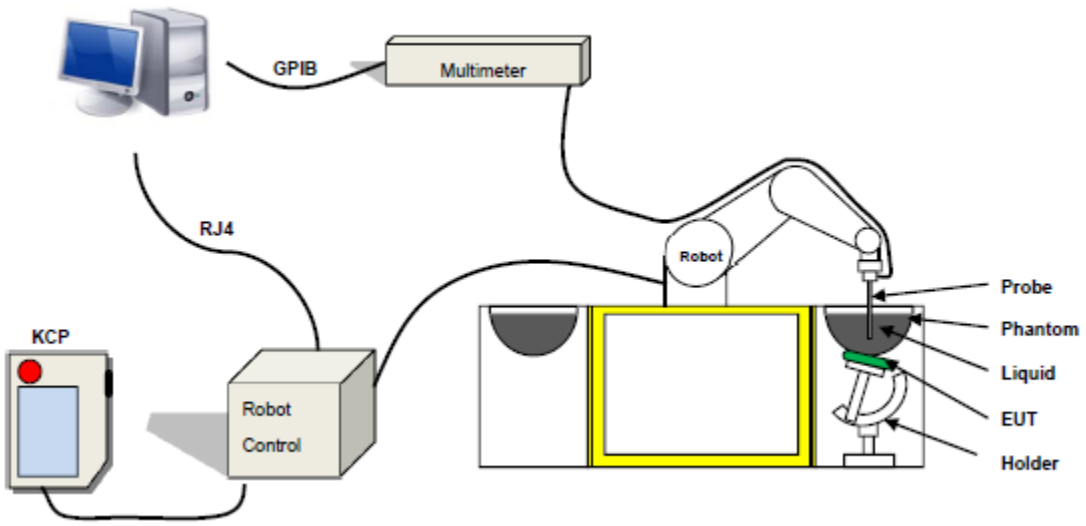
SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

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

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

SATIMO 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 OpenSAR 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 45/15 EPGO281 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter: 2.5 mm
- Length of Individual Dipoles: 2 mm
- Maximum external diameter: 8 mm
- Distance between dipole/probe extremity: 8 mm (repeatability better than +/- 1mm)
- Probe linearity: 0±2.60%(0.11dB)
- Axial Isotropy: < 0.25 dB
- Spherical Isotropy: < 0.25 dB
- Calibration range: 450 MHz to 6 GHz for head & body simulating liquid.
- Angle between probe axis (evaluation axis) and surface normal line: less than 30°

Figure-MVG COMOSAR Dosimetric E field Dipole

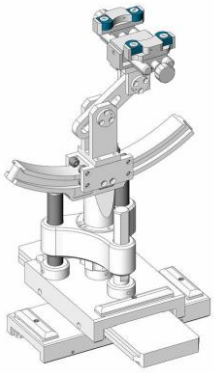
3.2.2 Phantom

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 phone 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 32/14 SAM115

Figure-SN 32/14 SAM116

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.

Frequency (MHz)	Bactericide	DGBE	HEC	NaCl	Sucrose	1,2-Propanediol	X100	Water	Conductivity	Permittivity
	%	%	%	%	%	%	%	%	σ	εr
750	/	/	/	0.79	/	64.81	/	34.40	0.97	41.8
835	/	/	/	0.79	/	64.81	/	34.40	0.97	41.8
900	/	/	/	0.79	/	64.81	/	34.40	0.97	41.8
1800	/	13.84	/	0.35	/	/	30.45	55.36	1.38	41.0
1900	/	13.84	/	0.35	/	/	30.45	55.36	1.38	41.0
2000	/	7.99	/	0.16	/	/	19.97	71.88	1.55	41.1
2450	/	7.99	/	0.16	/	/	19.97	71.88	1.88	40.3
2600	/	7.99	/	0.16	/	/	19.97	71.88	1.88	40.3

Tissue dielectric parameters for head and body phantoms				
Frequency	ε_r		σ S/m	
	Head	Body	Head	Body
300	45.3	58.2	0.87	0.92
450	43.5	58.7	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 condition		Head Simulating Liquid		Parameters	Target	Measured	Deviation [%]	Limited [%]
	Temp. [°C]	Humidity [%]	Frequency	Temp. [°C]					
2018-10-23	22.9	53	2450 MHz	22.6	Permittivity:	39.2	40.12	2.34	±5
					Conductivity:	1.8	1.82	1.12	±5
2018-10-23	22.8	51	5800 MHz	22.5	Permittivity:	35.3	35.70	1.13	±5
					Conductivity:	5.27	5.25	-0.38	±5

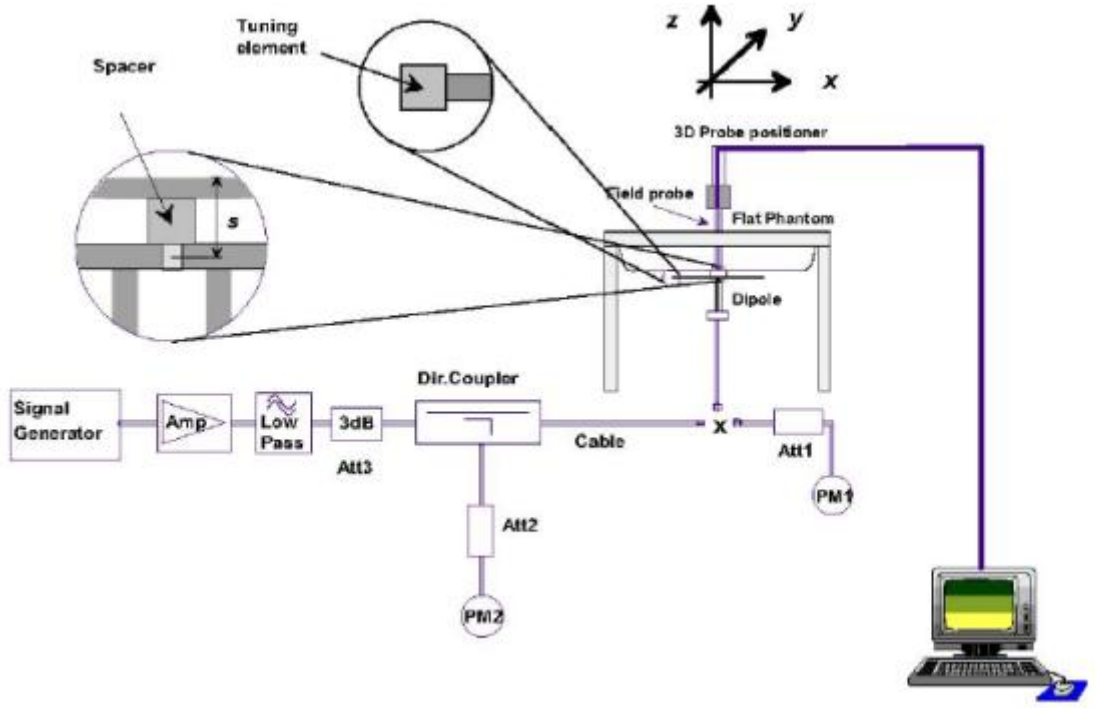
Date	Ambient condition		Body Simulating Liquid		Parameters	Target	Measured	Deviation [%]	Limited [%]
	Temp. [°C]	Humidity [%]	Frequency	Temp. [°C]					
2018-08-30	2.32	54	2450 MHz	22.9	Permittivity:	52.70	52.65	-0.10	± 5
					Conductivity	1.95	1.96	0.36	± 5
2018-10-30	23.0	51	5800 MHz	22.7	Permittivity:	48.2	47.75	-0.93	± 5
					Conductivity:	6.00	5.85	-2.50	± 5

5. SAR System Validation

5.1 Validation System

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 Validation Result

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

Freq.(MHz)	Power(mW)	Tested Value (W/Kg)	Normalized SAR (W/kg)	Target(W/Kg)	Tolerance(%)	Date
2450 Head	100	5.416	54.16	52.4	3.36	2018-10-23
2450 Body	100	2.472	24.72	24.1	2.60	2018-08-30
5800 Head	100	17.25	172.5	181.2	-4.80	2018-10-23
5800 Body	100	5.869	58.69	61.50	-4.56	2018-10-30

Note: The tolerance limit of System validation ±10%.

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.

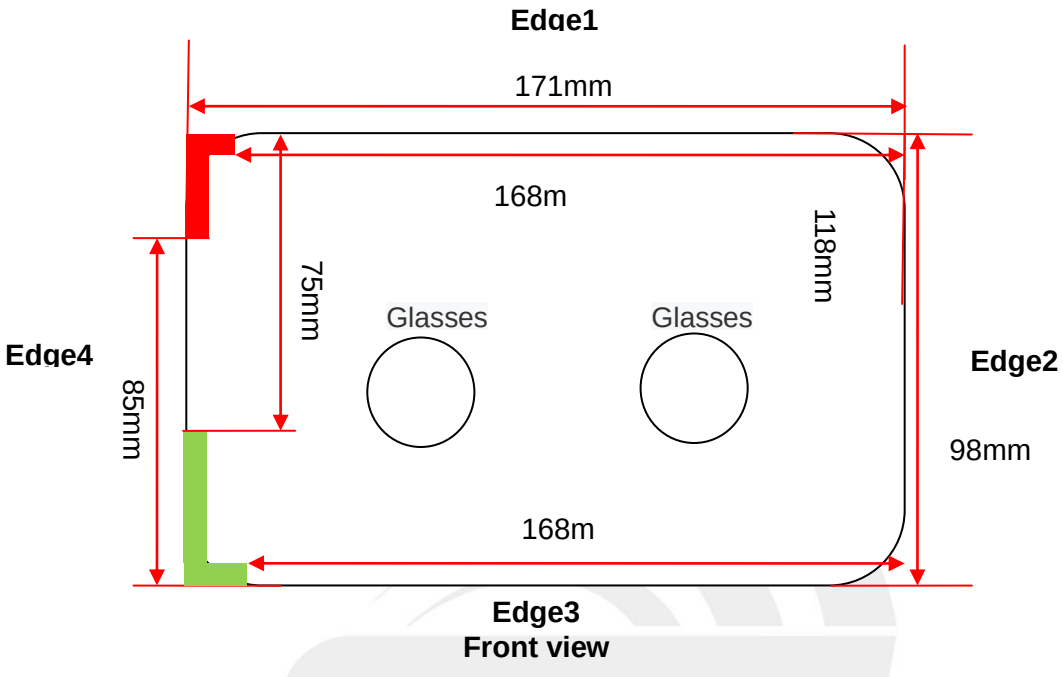
Area Scan& Zoom Scan:

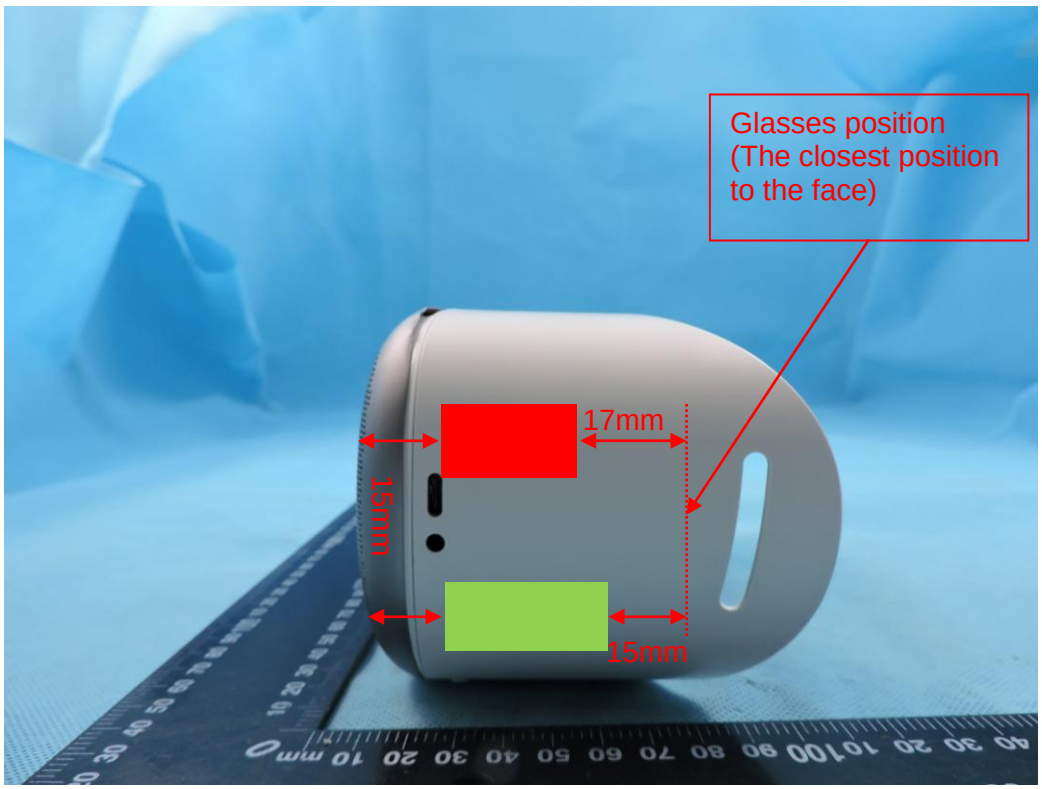
First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan 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 D01v01r01 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 Virtual Reality HDM, support WLAN/BT mode.





WLAN/BT Antenna A

WLAN Antenna B

7.1 SAR test exclusion consider table

According with FCC KDB 447498 D01, appendix A, <SAR test exclusion thresholds for 100MHz ~6GHz and≤50mm＞table, this device SAR test configurations consider as following:

Band	Test position configurations					
	Bottom Face	Front Face	Edge1	Edge2	Edge3	Edge4
WLAN/BT Antenna A	15mm	30mm	75mm	168mm	＜5mm	＜5mm
WLAN Antenna B	15mm	32mm	＜5mm	168mm	85mm	＜5mm

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 <5mm, 5mm 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 447498 D02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/ HSUPA/DC-HSDPA output power is<0.25db higher than RMC 12.2Kbps,or reported SAR with RMC 12.2kbps setting is ≤1.2W/Kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.
7. Per KDB 248227 D01, choose the highest output power channel to test SAR and determine futher 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.

The WIFI SAR evaluation of Maximum power (dBm) summing tolerance (antenna A/BT)

Exposure Position	Wireless Interface	2.4G WIFI	5.8G WIFI	BT
	Calculated Frequency	2412	5785	2480
	Maxim um power (dBm)	19.67	12.69	2.66
	Maximum rated power(mW)	92.68	18.58	1.85
Bottom Face	Separation distance (mm)	15	15	15
	exclusion threshold	3	3	3
	Testing required?	YES	YES	NO
Front Face	Separation distance (mm)	15	15	15
	exclusion threshold	3	3	3
	Testing required?	YES	NO	NO
Edge1	Separation distance (mm)	75	75	75
	exclusion threshold	346	312	346
	Testing required?	NO	NO	NO
Edge2	Separation distance (mm)	168	168	168
	exclusion threshold	1267	1233	1267
	Testing required?	NO	NO	NO
Edge3	Separation distance (mm)	5	5	5
	exclusion threshold	3	3	3
	Testing required?	YES	YES	NO
Edge4	Separation distance (mm)	5	5	5
	exclusion threshold	3	3	3
	Testing required?	YES	YES	NO

The WIFI SAR evaluation of Maximum power (dBm) summing tolerance (antenna B)

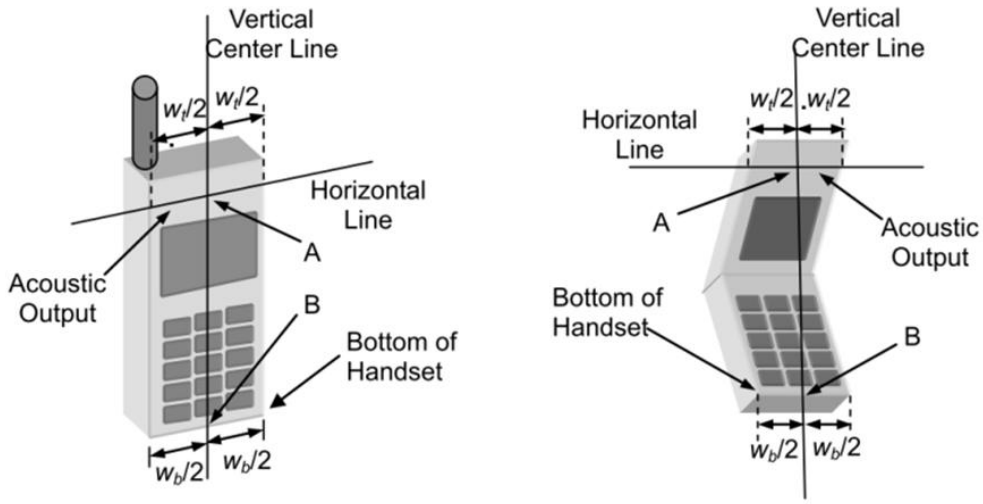
Exposure Position	Wireless Interface	2.4G WIFI	5.8G WIFI
	Calculated Frequency	2412	5745
	Maxim um power (dBm)	18.82	16.23
	Maximum rated power(mW)	76.21	41.98
Bottom Face	Separation distance (mm)	15	15
	exclusion threshold	3	3
	Testing required?	YES	YES
Front Face	Separation distance (mm)	5	5
	exclusion threshold	17	17
	Testing required?	YES	NO
Edge1	Separation distance (mm)	5	5
	exclusion threshold	3	3
	Testing required?	YES	YES
Edge2	Separation distance (mm)	168	168
	exclusion threshold	1267	1233
	Testing required?	NO	NO
Edge3	Separation distance (mm)	85	85
	exclusion threshold	446	412
	Testing required?	NO	NO
Edge4	Separation distance (mm)	5	5
	exclusion threshold	3	3
	Testing required?	YES	YES

8. EUT Test Position

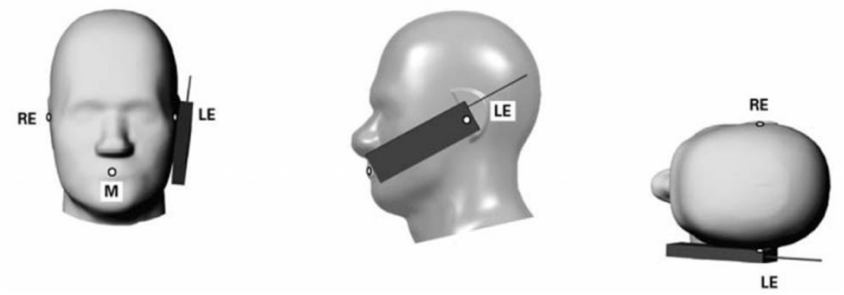
This EUT was tested in Right Cheek, Right Titled, Left Cheek, Left Titled, Front Face and Rear Face.

8.1 Define Two Imaginary Lines On The Handset

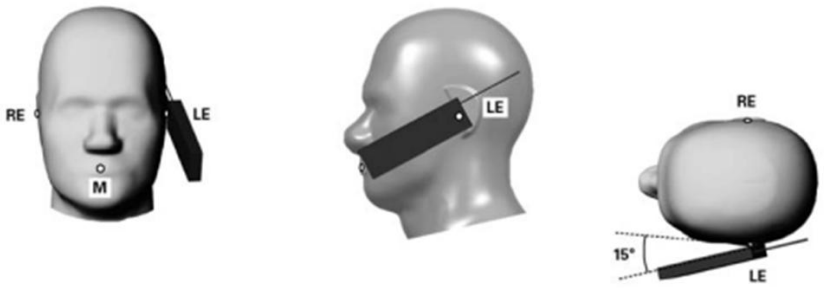
(1)The vertical centerline passes through two points on the front side of the handset the midpoint of the width wt of the handset at the level of the acoustic output, and the midpoint of the width wb of the handset.
(2)The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
(3)The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.



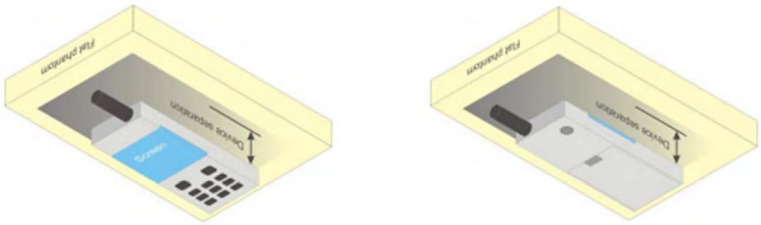
Cheek Position
1)To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
2)To move the device towards the phantom with the ear piece aligned with the the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost



Title Position
(1)To position the device in the “cheek” position described above.
(2) While maintaining the device in the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until with the ear is lost.

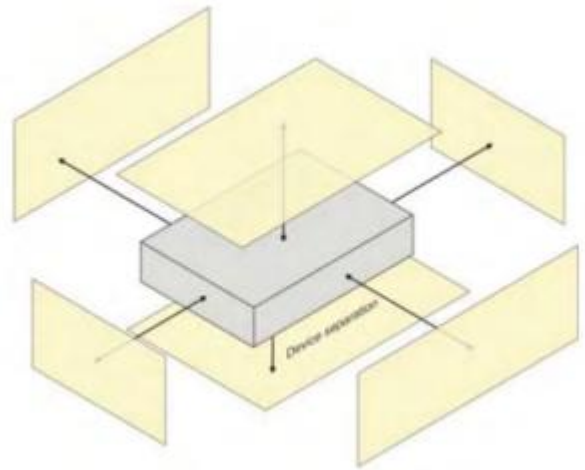


Body-worn Position Conditions:
Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. When the same wireless transmission configuration is used for testing body-worn accessory and hotspot mode SAR, respectively, in voice and data mode, SAR results for the most conservative *test separation distance* configuration may be used to support both SAR conditions. When the *reported* SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest *reported* SAR configuration for that wireless mode and frequency band should be repeated for the body-worn accessory with a headset attached to the handset.



8.2 Hotspot mode exposure position condition

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing function, the relevant hand and body exposure condition are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 10 mm is required between the phantom and all surface and edges with a transmitting antenna located within 25 mm form that surface or edge. When form factor of a handset is smaller than 9cm x 5cm, a test separation distance of 5mm (instead of 10mm)is required for testing hotspot mode. When the separate distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration(surface).



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.

NO	Source	Tol(%)	Prob. Dist.	Div. k	ci (1g)	ci (10g)	1gUi	10gUi	Veff
Measurement System									
1	Probe calibration	5.8	N	1	1	1	5.8	5.8	∞
2	Axial isotropy	3.5	R	√3	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.43	1.43	∞
3	Hemispherical isotropy	5.9	R	√3	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
4	Boundary effect	1.0	R	√3	1	1	0.58	0.58	∞
5	Linearity	4.7	R	√3	1	1	2.71	2.71	∞
6	System Detection limits	1.0	R	√3	1	1	0.58	0.58	∞
7	Readout electronics	0.5	N	1	1	1	0.50	0.50	∞
8	Response time	0	R	√3	1	1	0	0	∞
9	Integration time	1.4	R	√3	1	1	0.81	0.81	∞
10	Ambient noise	3.0	R	√3	1	1	1.73	1.73	∞
11	Ambient reflections	3.0	R	√3	1	1	1.73	1.73	∞
12	Probe positioner mech. restrictions	1.4	R	√3	1	1	0.81	0.81	∞
13	Probe positioning with respect to phantom shell	1.4	R	√3	1	1	0.81	0.81	∞
14	Max.SAR evaluation	1.0	R	√3	1	1	0.6	0.6	∞
Test sample related									
15	Device positioning	2.6	N	1	1	1	2.6	2.6	11

16	Device holder	3	N	1	1	1	3.0	3.0	7
17	Drift of output power	5.0	R	√3	1	1	2.89	2.89	∞
Phantom and set-up									
18	Phantom uncertainty	4.0	R	√3	1	1	2.31	2.31	∞
19	Liquid conductivity (target)	2.5	N	1	0.78	0.71	1.95	1.78	5
20	Liquid conductivity (meas)	4	N	1	0.23	0.26	0.92	1.04	5
21	Liquid Permittivity (target)	2.5	N	1	0.78	0.71	1.95	1.78	∞
22	Liquid Permittivity (meas)	5.0	N	1	0.23	0.26	1.15	1.30	∞
Combined standard			RSS	$U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$			10.63%	10.54%	
Expanded uncertainty (P=95%)		$U = k\, U_C$,k=2					21.26%	21.08%	

9.2 System validation Uncertainty

NO	Source	Tol(%)	Prob. Dist.	Div. k	ci (1g)	ci (10g)	1gUi	10gUi	Veff
Measurement System									
1	Probe calibration	5.8	N	1	1	1	5.8	5.8	∞
2	Axial isotropy	3.5	R	√3	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.43	1.43	∞
3	Hemispherical isotropy	5.9	R	√3	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
4	Boundary effect	1.0	R	√3	1	1	0.58	0.58	∞
5	Linearity	4.7	R	√3	1	1	2.71	2.71	∞
6	System Detection limits	1.0	R	√3	1	1	0.58	0.58	∞
7	Modulation response	0	N	1	1	1	0	0	∞
8	Readout electronics	0.5	N	1	1	1	0.50	0.50	∞
9	Response time	0	R	√3	1	1	0	0	∞
10	Integration time	1.4	R	√3	1	1	0.81	0.81	∞
11	Ambient noise	3.0	R	√3	1	1	1.73	1.73	∞
12	Ambient reflections	3.0	R	√3	1	1	1.73	1.73	∞
13	Probe positioner mech. restrictions	1.4	R	√3	1	1	0.81	0.81	∞
14	Probe positioning with respect to phantom shell	1.4	R	√3	1	1	0.81	0.81	∞
15	Max.SAR evaluation	1.0	R	√3	1	1	0.6	0.6	∞
Dipole									
16	Deviation of experimental source from	4	N	1	1	1	4.00	4.00	∞

17	Input power and SAR drit measurement	5	R	√3	1	1	2.89	2.89	∞
18	Dipole Axis to liquid Distance	2	R	√3	1	1			∞
Phantom and set-up									
19	Phantom uncertainty	4.0	R	√3	1	1	2.31	2.31	∞
20	Uncertainty in SAR correction for deviation(in	2.0	N	1	1	0.84	2	1.68	∞
21	Liquid conductivity (target)	2	N	1	1	0.84	2.00	1.68	∞
22	Liquid conductivity (temperature uncertainty)	2.5	N	1	0.78	0.71	1.95	1.78	5
23	Liquid conductivity (meas)	4	N	1	0.23	0.26	0.92	1.04	5
24	Liquid Permittivity (target)	2.5	N	1	0.78	0.71	1.95	1.78	∞
25	Liquid Permittivity (temperature uncertainty)	2.5	N	1	0.78	0.71	1.95	1.78	5
26	Liquid Permittivity (meas)	5.0	N	1	0.23	0.26	1.15	1.30	∞
Combined standard			RSS	$U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$			10.15%	10.05%	
Expanded uncertainty (P=95%)		$U = k\, U_C$,k=2					20.29%	20.10%	

10. Conducted Power Measurement

WLAN (2.4Gband)

Mode	Channel Number	Frequency (MHz)	Average Power (dBm)		
			Antenna A	Antenna B	Antenna A+B
802.11b	1	2412	19.67	18.82	N/A
	6	2437	19.50	18.60	N/A
	11	2462	19.07	17.65	N/A
802.11g	1	2412	19.12	18.24	N/A
	6	2437	19.05	18.16	N/A
	11	2462	18.56	17.63	N/A
802.11n(HT 20)	1	2412	17.82	16.77	20.34
	6	2437	17.42	16.43	19.96
	11	2462	17.17	16.18	19.71

WLAN (5.8band)

Mode	Channel Number	Frequency (MHz)	Average EIRP Power (dBm)		
			Antenna A	Antenna B	Antenna A+B
802.11a	149	5745	12.25	16.23	N/A
	157	5785	12.69	15.91	N/A
	165	5825	11.92	15.20	N/A
802.11 n-HT20	149	5745	12.58	15.44	17.252
	157	5785	11.78	15.78	17.235
	165	5825	11.74	15.51	17.032
802.11 n-HT40	151	5755	11.01	14.61	16.183
	159	5795	11.17	15.30	16.719
802.11ac(HT20)	149	5745	11.65	16.00	17.359
	157	5785	11.99	15.28	16.950
	165	5825	12.11	15.07	16.848
802.11ac(HT40)	151	5755	11.67	14.84	16.548
	159	5795	10.85	14.16	15.823
802.11ac(HT80)	155	5775	10.10	14.65	15.956

Bluetooth

Mode	Channel Number	Frequency (MHz)	Average Power (dBm)
GFSK(1Mbps)	0	2402	1.23
	39	2441	1.45
	78	2480	2.66
π/4-DQPSK(2Mbps)	0	2402	-1.23
	39	2441	0.15
	78	2480	1.22
8DPSK(3Mbps)	0	2402	-1.43
	39	2441	0.05
	78	2480	1.18

BLE

Mode	Channel Number	Frequency (MHz)	Average Power (dBm)
GFSK(1Mbps)	0	2402	-1.47
	19	2440	-0.53
	39	2480	-0.41
GFSK(2Mbps)	0	2402	-3.26
	19	2440	-1.06
	39	2480	-1.33

10.1 Tune-up Power

Mode	WLAN(AVG)		
	Antenna A	Antenna B	Antenna A+B
IEEE 802.11b	19±1dBm	18±1dBm	N/A
IEEE 802.11g	19±1dBm	18±1dBm	N/A
IEEE 802.11n(HT 20)	17±1dBm	16±1dBm	20±1dBm

	Mode	WLAN(AVG)		
		Antenna A	Antenna B	Antenna A+B
5800 MHz	802.11a	12±1dBm	16±1dBm	N/A
	802.11 n-HT20	12±1dBm	15±1dBm	17±1dBm
	802.11 n-HT40	11±1dBm	15±1dBm	16±1dBm
	802.11ac(HT20)	12±1dBm	16±1dBm	17±1dBm
	802.11ac(HT40)	11±1dBm	14±1dBm	16±1dBm
	802.11ac(HT80)	10±1dBm	14±1dBm	15±1dBm

Mode	BT(AVG)	
GFSK	2±1dBm	
π/4-DQPSK	Low	-1±1dBm
	Middle	0±1dBm
	High	1±1dBm
8DPSK	Low	-1±1dBm
	Middle	0±1dBm
	High	1±1dBm

Mode	BLE(AVG)	
GFSK(1Mbps)	-1±1dBm	
GFSK(2Mbps)	Low	-3±1dBm
	Middle	-1±1dBm
	High	-1±1dBm

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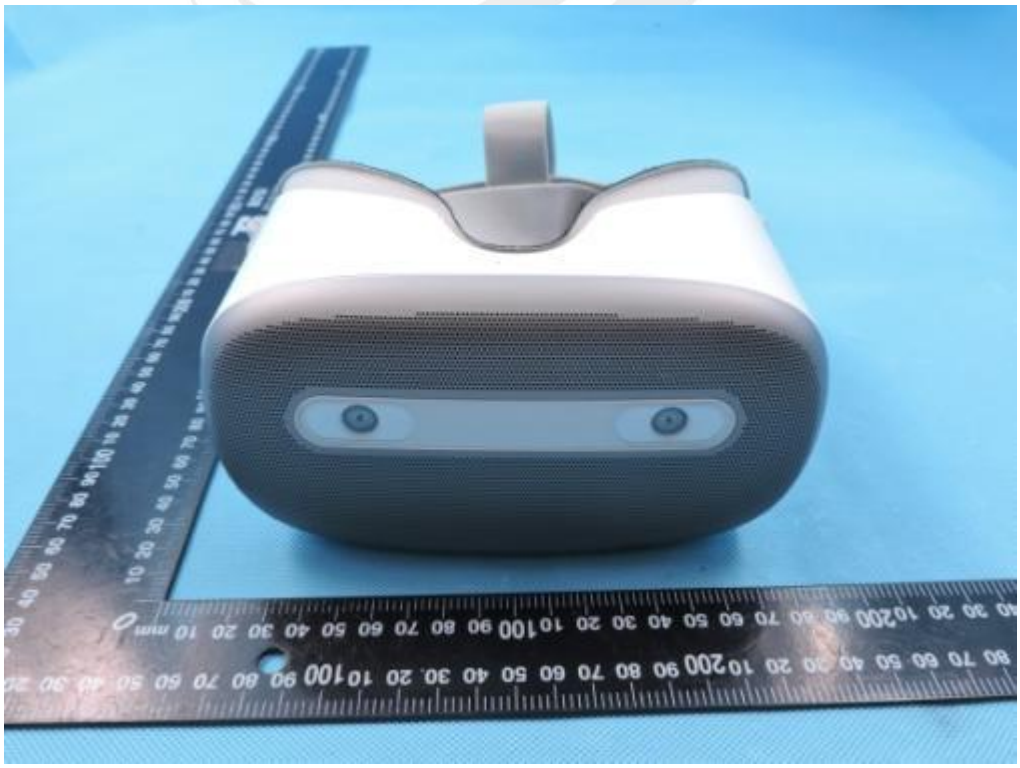
11. EUT And Test Setup Photo

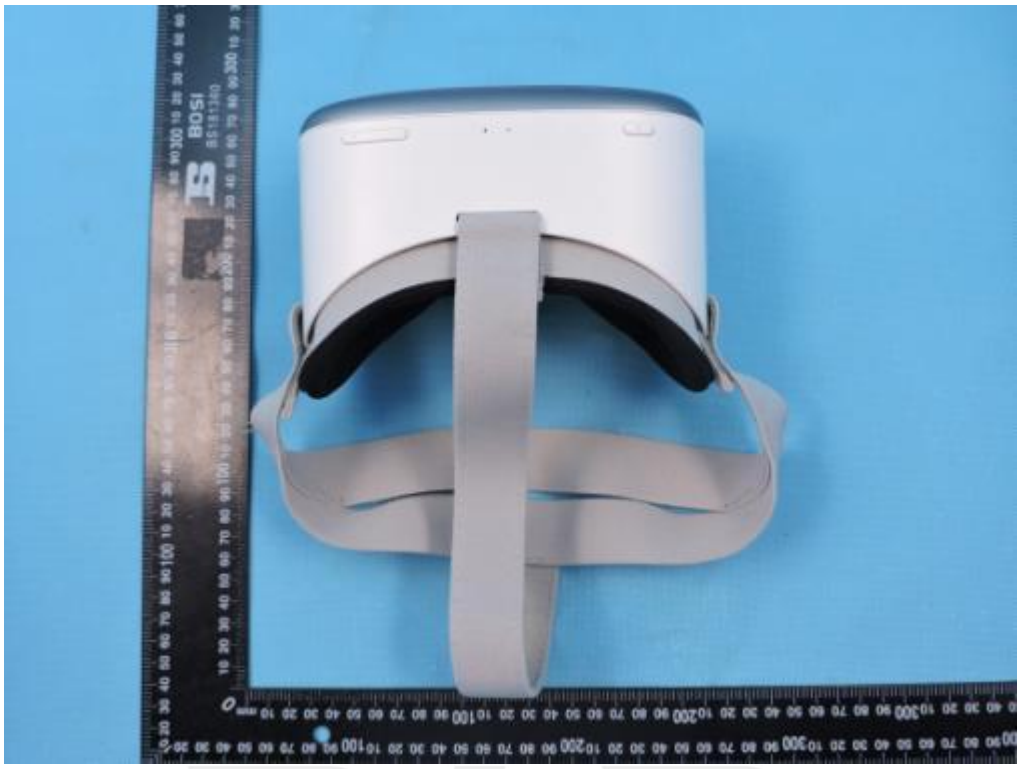
11.1 EUT Photo

Front side

Back side



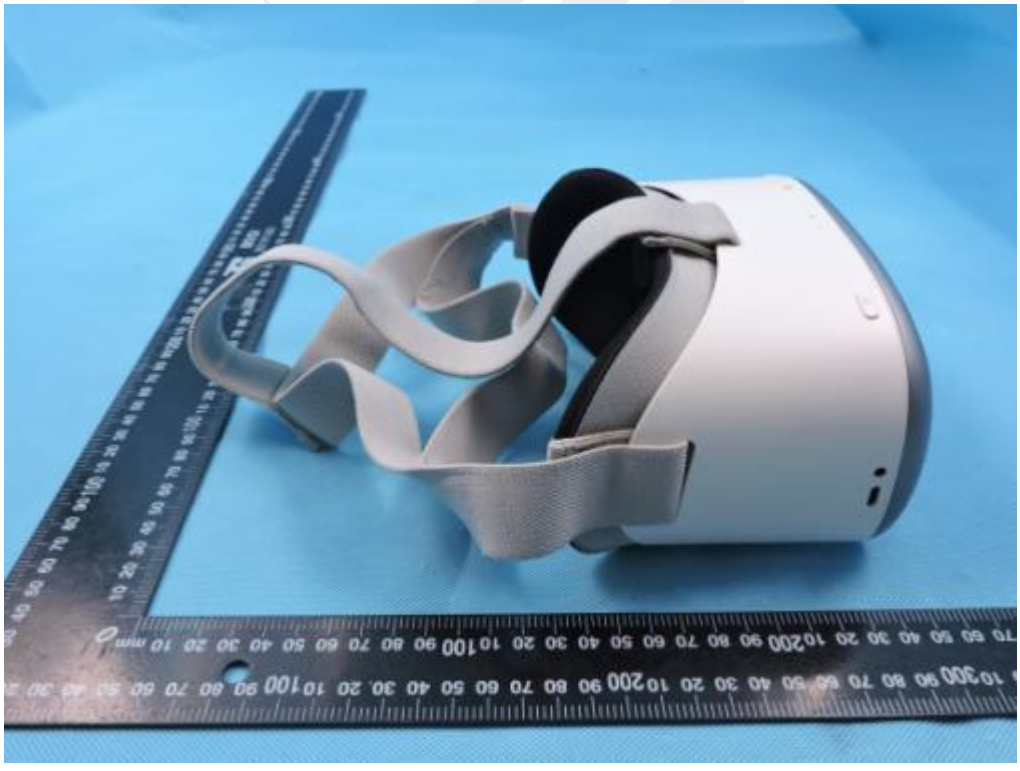
Edge1



Edge2

Edge3

Edge4



11.2 Setup Photo

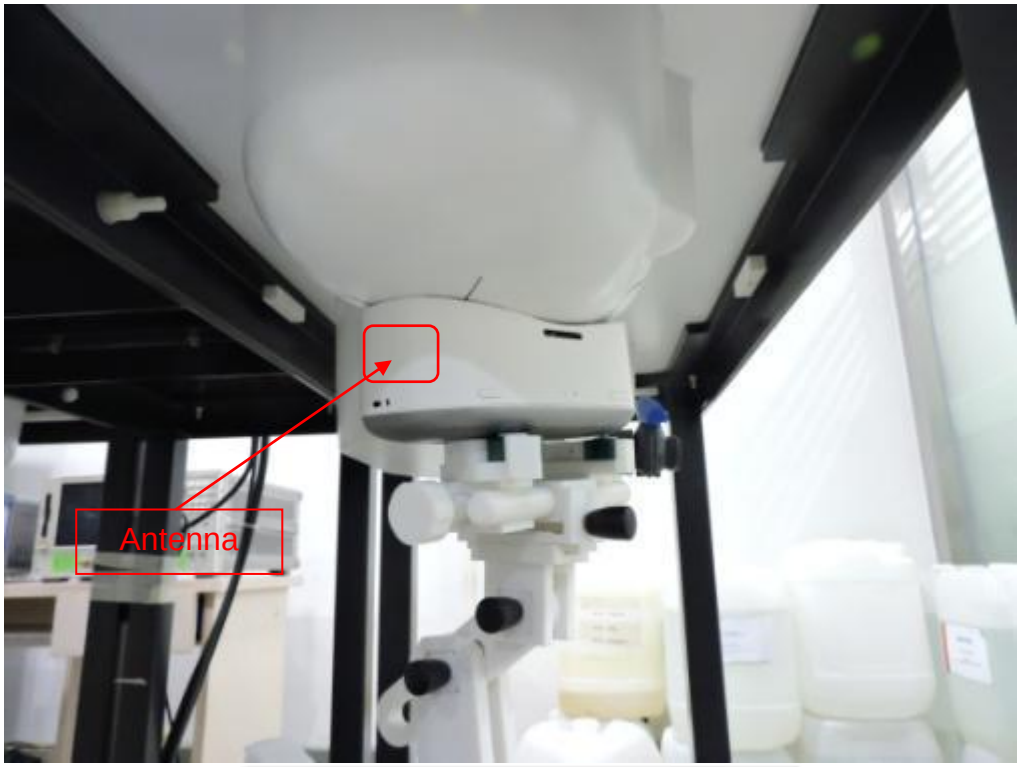
Eextremity SAR-Bottom (separation distance is 0mm)

Extremity SAR-Edge1(separation distance is 0mm)

Extremity SAR-Edge3(separation distance is 0mm)

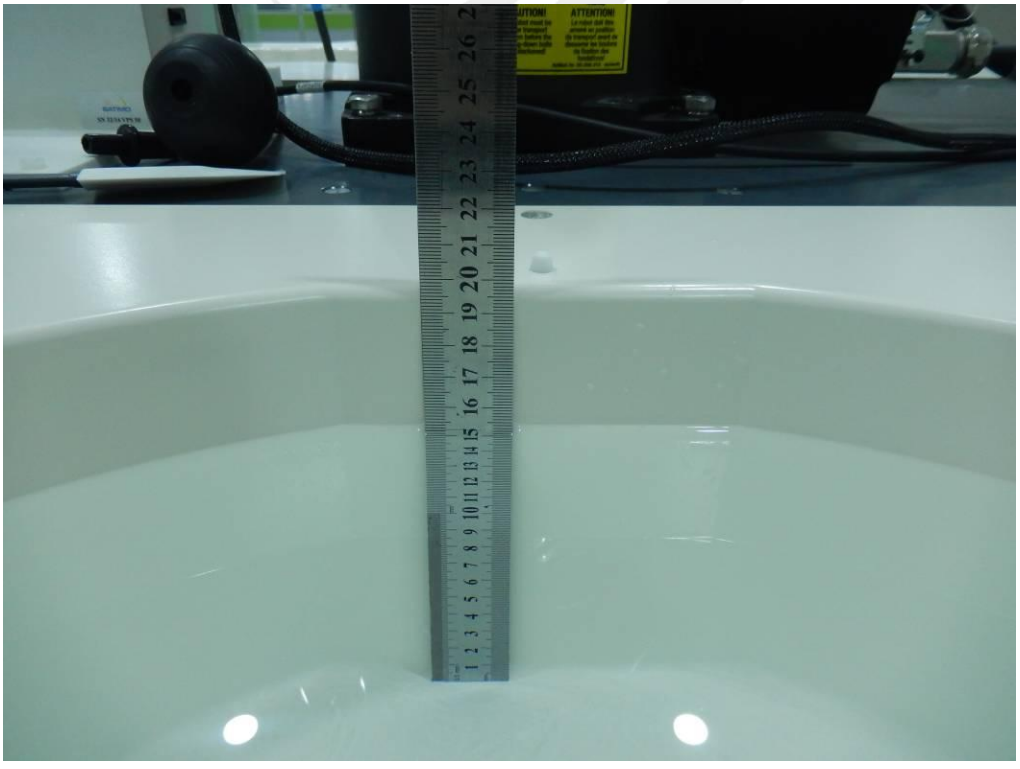
Extremity SAR-Edge4(separation distance is 0mm)

Head(separation distance is 0mm)



Note: Due to the curve radian, it is impractical to make the inner surface directly touch a flat phantom, thus a curved region of SAM phantom was used to keep the inner surface touching the phantom in testing, fully complying with the intended use condition.

Liquid depth (15 cm)



12. SAR Result Summary

12.1 Head SAR

802.11b（Antenna A）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11b	Head	1	0.123	-0.84	20	19.67	100%	**0.133**	1

802.11b（Antenna B）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11b	Head	1	0.111	-0.62	19	18.82	100%	**0.116**	2

802.11n（Antenna A）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11n	Head	1	0.100	-1.25	18	17.82	100%	**0.104**	3

802.11n（Antenna B）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11n	Head	1	0.104	1.36	17	16.77	100%	**0.110**	4

802.11a（Antenna A）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11a	Head	157	0.108	-1.39	13	12.69	100%	**0.116**	5

802.11a（Antenna B）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11a	Head	149	0.161	0.98	17	16.23	100%	**0. 192**	6

802.11ac（Antenna A）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11ac	Head	149	0.134	2.11	13	11.65	100%	**0.183**	7

802.11ac（Antenna B）

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11ac	Head	149	0.169	-1.69	17	16.00	100%	**0.213**	8

12.2 Extremity SAR

802.11b（Antenna A）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11b	Bottom	1	0.037	-1.15	20	19.67	100%	0.040	-
WLAN 2.4G	802.11b	Edge3	1	0.041	-3.77	20	19.67	100%	0.044	-
WLAN 2.4G	802.11b	Edge4	1	0.050	2.63	20	19.67	100%	**0.054**	9

802.11b（Antenna B）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11b	Bottom	1	0.025	0.12	19	18.82	100%	0.026	-
WLAN 2.4G	802.11b	Edge1	1	0.037	-1.25	19	18.82	100%	0.039	-
WLAN 2.4G	802.11b	Edge4	1	0.043	-0.35	19	18.82	100%	**0.045**	10

802.11n（Antenna A）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11n	Bottom	1	0.037	0.29	18	17.82	100%	0.039	-
WLAN 2.4G	802.11n	Edge3	1	0.042	2.67	18	17.82	100%	0.044	-
WLAN 2.4G	802.11n	Edge4	1	0.051	1.39	18	17.82	100%	**0.053**	11

802.11n（Antenna B）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 2.4G	802.11n	Bottom	1	0.038	3.56	17	16.77	100%	0.040	-
WLAN 2.4G	802.11n	Edge1	1	0.042	2.36	17	16.77	100%	0.044	-
WLAN 2.4G	802.11n	Edge4	1	0.049	1.37	17	16.77	100%	**0.052**	12

802.11a（Antenna A）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11a	Bottom	157	0.030	-1.40	13	12.69	100%	0.032	-
WLAN 5.8G	802.11a	Edge3	157	0.039	0.46	13	12.69	100%	0.042	-
WLAN 5.8G	802.11a	Edge4	157	0.046	-1.85	13	12.69	100%	**0.049**	13

802.11a（Antenna B）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11a	Bottom	149	0.041	3.80	17	16.23	100%	0.049	-
WLAN 5.8G	802.11a	Edge1	149	0.047	-0.17	17	16.23	100%	0.056	-
WLAN 5.8G	802.11a	Edge4	149	0.056	1.09	17	16.23	100%	**0.067**	14

802.11ac（Antenna A）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11ac	Bottom	149	0.032	-0.92	13	11.65	100%	0.044	-
WLAN 5.8G	802.11ac	Edge3	149	0.037	0.08	13	11.65	100%	0.050	-
WLAN 5.8G	802.11ac	Edge4	149	0.046	-2.95	13	11.65	100%	**0.063**	15

802.11ac（Antenna B）

Band	Mode	Test Position	Ch.	Result 10g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.8G	802.11ac	Bottom	149	0.039	-2.83	17	16.00	100%	0.049	-
WLAN 5.8G	802.11ac	Edge1	149	0.044	2.50	17	16.00	100%	0.055	-
WLAN 5.8G	802.11ac	Edge4	149	0.055	-0.19	17	16.00	100%	**0.069**	16

Note:

1. The test separation of all above table is 0mm.
2. Per KDB 447498 D01v05r01, 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. For WWAN: Scaled SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
3. When the user enables the personal Wireless router functions for the handsets, actual operations include simultaneous transmission of both the Wi-Fi transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. The “Portable Hotspot” feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

Simultaneous Multi-band Transmission Evaluation:

1. Bluetooth and WLAN can't simultaneous transmission at the same time.
2. 2.4G WLAN and 5.8G WLAN can't simultaneous transmission at the same time.
2. For simultaneous transmission at head and body exposure position, 2 transmitters simultaneous transmission was the worst state.
3. Based upon KDB 447498 D01, BT SAR is excluded as below table.
4. If the test separation distance is <5mm, 5mm is used for excluded SAR calculation.
5. For minimum test separation distance≦50mm,Bluetooth standalone SAR is excluded according to [(max. power of channel, including tune-up tolerance, mW)/ (min. test separation distance, mm) ·[√f (GHz) /x] ≦3.0 for 1-g SAR and ≦7.5 for 10-g extremity SAR
6. The reported SAR summation is calculated based on the same configuration and test position.
7. KDB 447498 / 4.3.2 (2) when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
   a) (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f (GHz) /x] W/kg for test separation distances≤ 50 mm;
   Where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
   b) 0.4W/Kg for 1-g SAR and 1.0W/Kg for 10-g SAR, when the separation distance is >50mm.

Estimated SAR		Maximum Power		Antenna to user(mm)	Frequency(GHz)	Stand alone SAR [W/kg]
		dBm	mW			
BT	Head	3	1.995	5	2.480	0.084
	Extremity			5	2.480	0.034

MIMO

Band	Mode	Position	Scaled SAR (W/Kg)		A+B
WLAN 2.4G (MIMO)	802.11n	Head	Antenna A	0.104	**0.214**
			Antenna B	0.110	
		Extremity	Antenna A	0.053	**0.105**
			Antenna B	0.052	
WLAN 5.8G (MIMO)	802.11ac	Head	Antenna A	0.183	**0.396**
			Antenna B	0.213	
		Extremity	Antenna A	0.063	**0.132**
			Antenna B	0.069	

13. Equipment List

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
2450MHzDipole	SATIMO	SID2450	SN 30/14 DIP2G450-335	2017.08.15	2020.08.14
Waveguide	SATIMO	SWG5500	SN 13/14 WGA32	2017.08.15	2020.08.14
E-Field Probe	MVG	SSE2	SN 45/15 EPGO281	2018.04.10	2019.04.09
Dielectric Probe Kit	SATIMO	SCLMP	SN 32/14 OCPG67	2017.12.03	2018.12.02
Antenna	SATIMO	ANTA3	SN 07/13 ZNTA52	N/A	N/A
Phantom1	SATIMO	SAM	SN 32/14 SAM115	2014.09.01	N/A
Phantom2	SATIMO	SAM	SN 32/14 SAM116	2014.09.01	N/A
Phone holder	SATIMO	N/A	SN 32/14 MSH97	2014.09.01	N/A
Laptop holder	SATIMO	N/A	SN 32/14 LSH29	2014.09.01	N/A
Network Analyzer	Agilent	8753ES	US38432810	2018.03.08	2019.03.07
Multi Meter	Keithley	Multi Meter 2000	4050073	2017.10.15	2018.10.14
Signal Generator	Agilent	N5182A	MY50140530	2017.10.15	2018.10.14
Wireless Communication Test Set	Agilent	8960-E5515C	MY48360751	2017.10.15	2018.10.14
Power Amplifier	DESAY	ZHL-42W	9638	2017.10.15	2018.10.14
Power Meter	R&S	NRP	100510	2017.10.15	2018.10.14
Power Meter	Agilent	E4418B	GB43312526	2017.10.15	2018.10.14
Power Sensor	R&S	NRP-Z11	101919	2017.10.15	2018.10.14
Power Sensor	Agilent	E9301A	MY41497725	2017.10.15	2018.10.14
9dB Attenuator	Agilent	99899	DC-18GHz	2018.05.09	2019.05.08
11dB Attenuator	Agilent	8494B	DC-18GHz	2018.05.09	2019.05.08
110dB Attenuator	Agilent	8494B	DC-18GHz	2018.05.09	2019.05.08
Dual Directional Coupler	Agilent	SHWPDI-1080S	N/A	2017.10.15	2018.10.14
hygrothermograph	MiEO	HH660	N/A	2017.10.18	2018.10.17
Thermograph	Elitech	RC-4	S/N EF7176501537	2017.11.10	2018.11.09

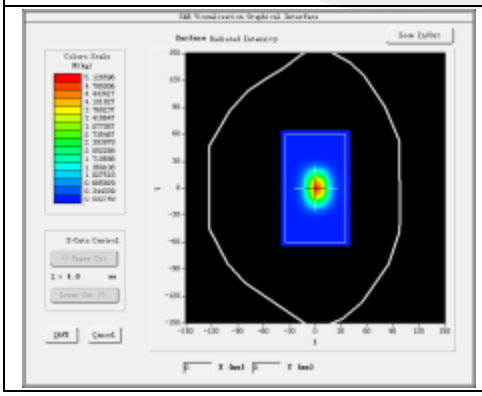
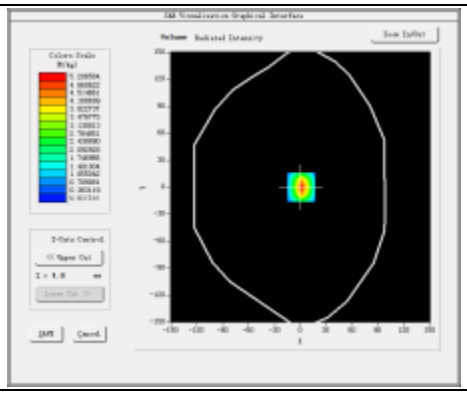
Appendix A. System Validation Plots

System Performance Check Data (2450MHz Head)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-10-23
Measurement duration: 13 minutes 51seconds

Experimental conditions.

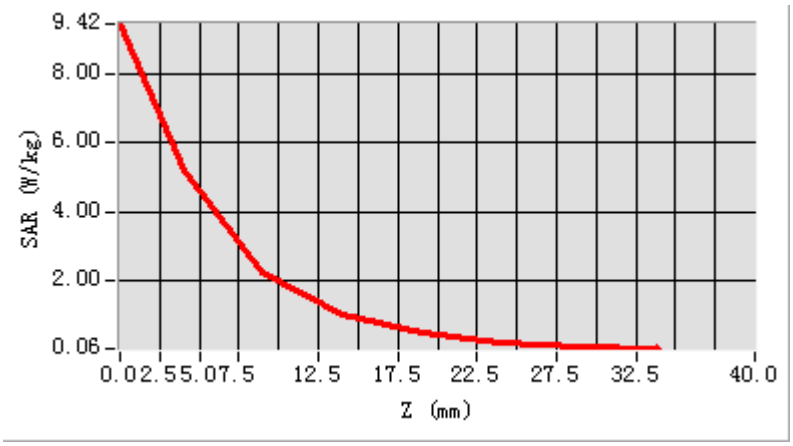
Device Position	Validation plane
Band	2450 MHz
Channels	-
Signal	CW
Frequency (MHz)	2450
Relative permittivity	39.20
Conductivity (S/m)	1.80
Power drift (%)	-0.38
Probe	SN 45/15 EPGO281
ConvF	2.21
Crest factor:	1:1

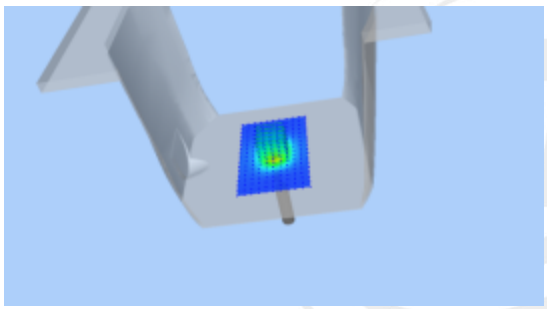
SURFACE SAR	VOLUME SAR
	

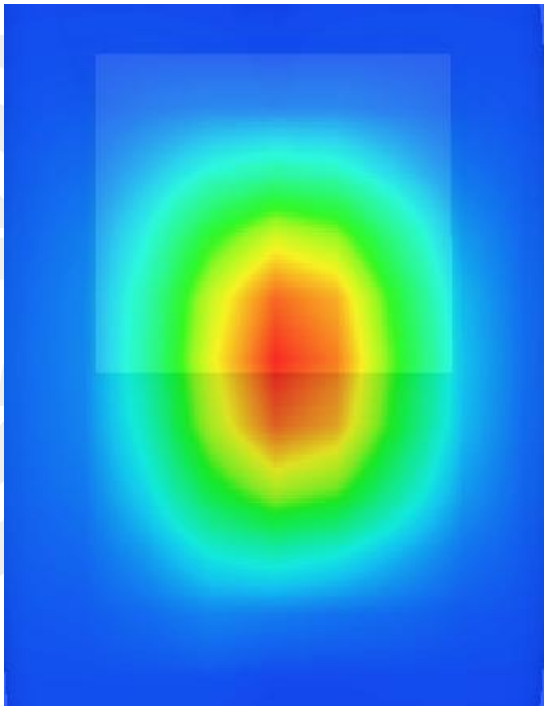
Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	2.412104
SAR 1g (W/Kg)	5.415907

Z Axis Scan


9.42
8.00
6.00
4.00
2.00
0.06
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)



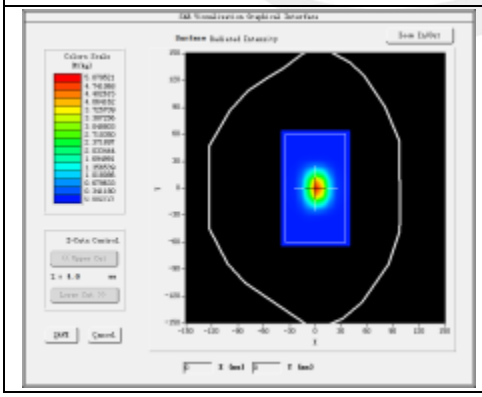
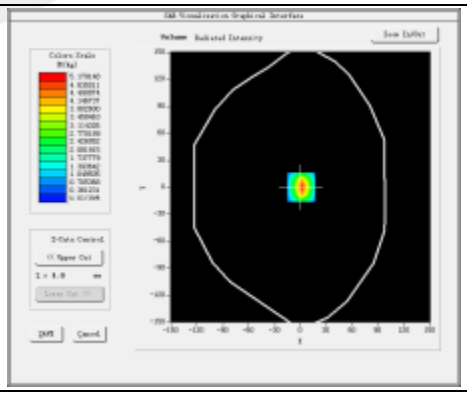


System Performance Check Data (2450MHz Body)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-08-30
Measurement duration: 14 minutes 23 seconds

Experimental conditions.

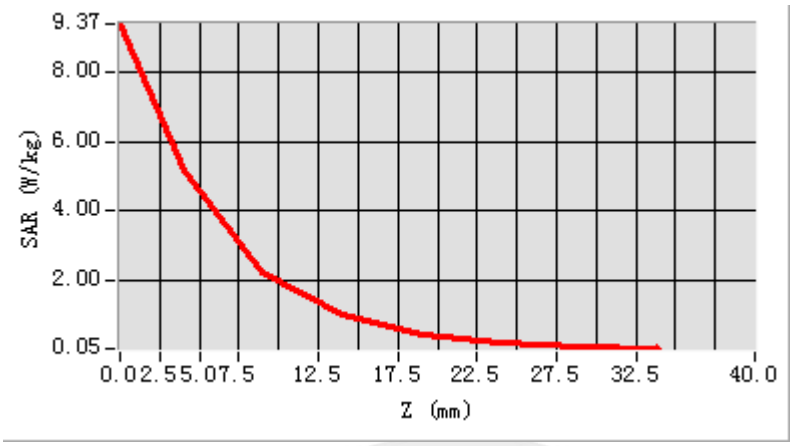
Device Position	Validation plane
Band	2450 MHz
Channels	-
Signal	CW
Frequency (MHz)	2450
Relative permittivity	52.65
Conductivity (S/m)	1.96
Power drift (%)	-0.07
Probe	SN 45/15 EPGO281
ConvF	2.28
Crest factor:	1:1

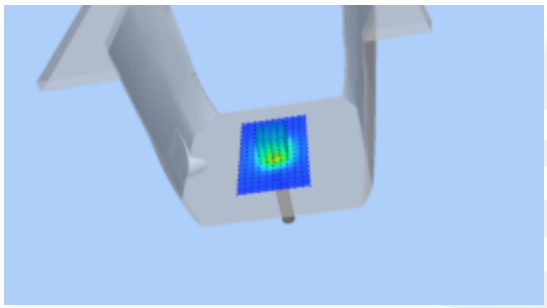
SURFACE SAR	VOLUME SAR
	

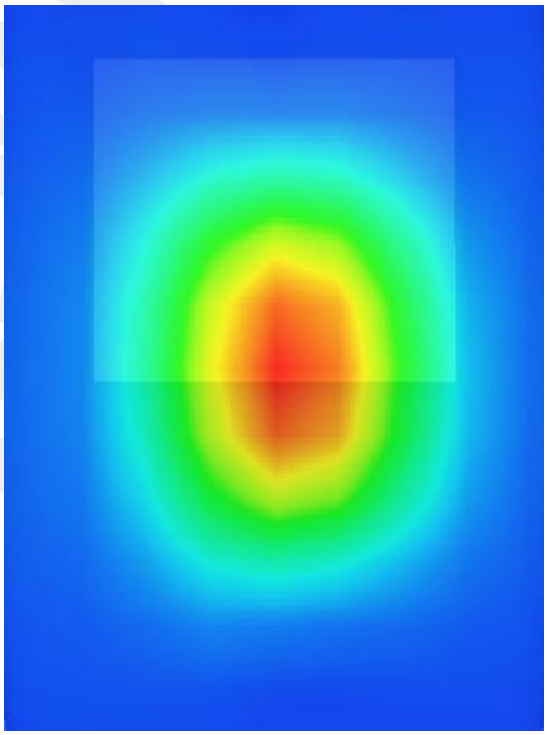
Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	2.472014
SAR 1g (W/Kg)	5.274820

Z Axis Scan


9.37
8.00
6.00
4.00
2.00
0.05
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)



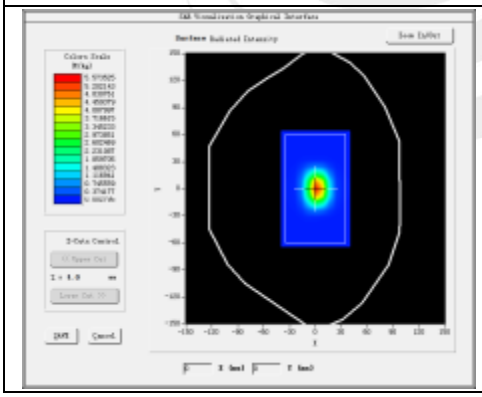
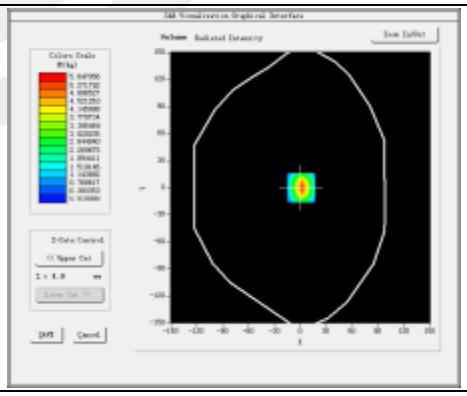


System Performance Check Data(5800MHz Head)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=4mm, dy=4mm, dz=2mm
Date of measurement: 2018-10-23

Experimental conditions.

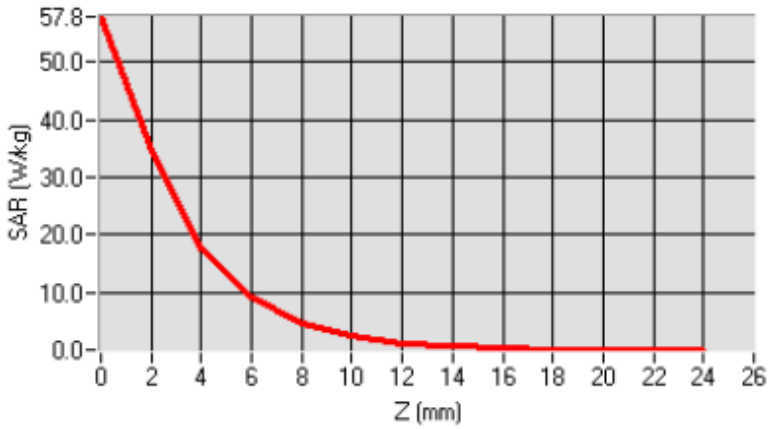
Device Position	Validation plane
Band	5800 MHz
Channels	-
Signal	CW
Frequency (MHz)	5800
Relative permittivity	35.56
Conductivity (S/m)	5.25
Power drift (%)	2.74
Probe	SN 45/15 EPGO281
ConvF	2.53
Crest factor:	1:1

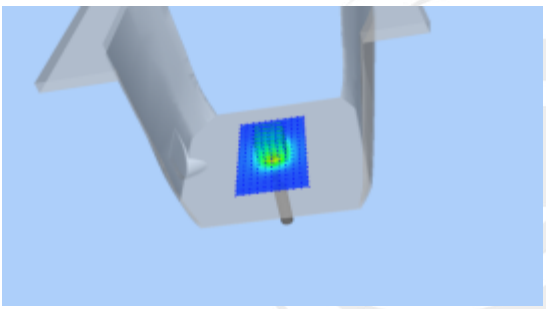
SURFACE SAR	VOLUME SAR
	

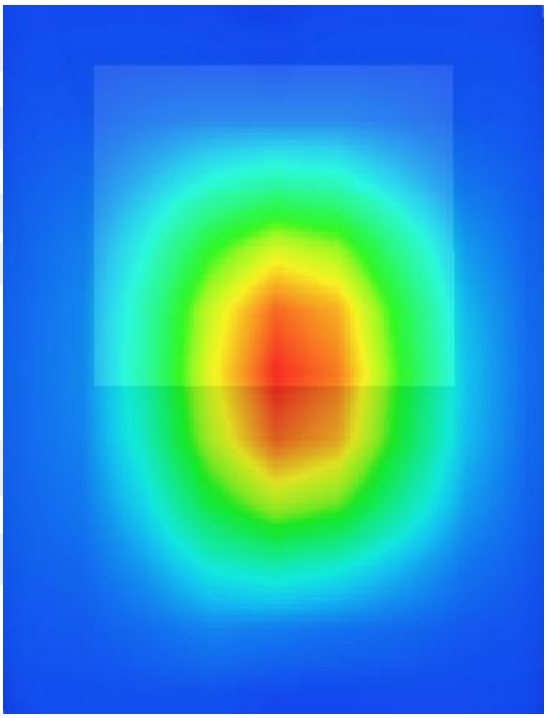
Maximum location: X=7.00, Y=2.00

SAR 10g (W/Kg)	5.875153
SAR 1g (W/Kg)	17.254701

Z Axis Scan


57.8
50.0
40.0
30.0
20.0
10.0
0.0
SAR (W/kg)
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Z (mm)



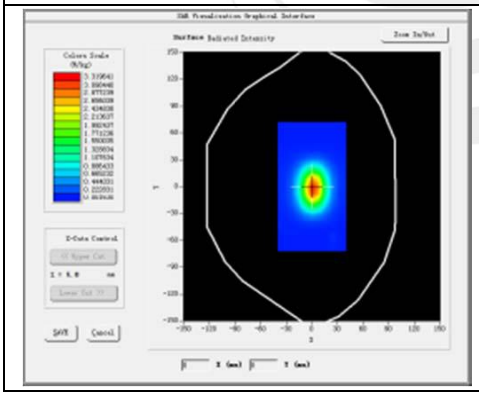
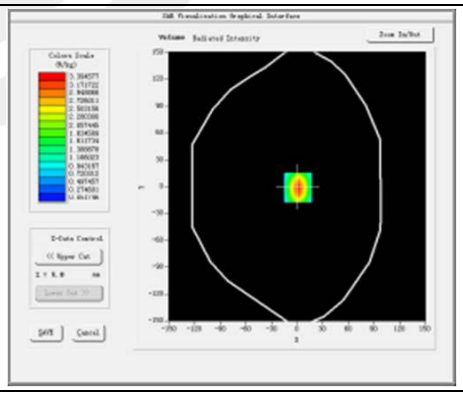


System Performance Check Data(5800MHz Body)

Type: Dipole measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=4mm, dy=4mm, dz=2mm
Date of measurement: 2018-10-30

Experimental conditions.

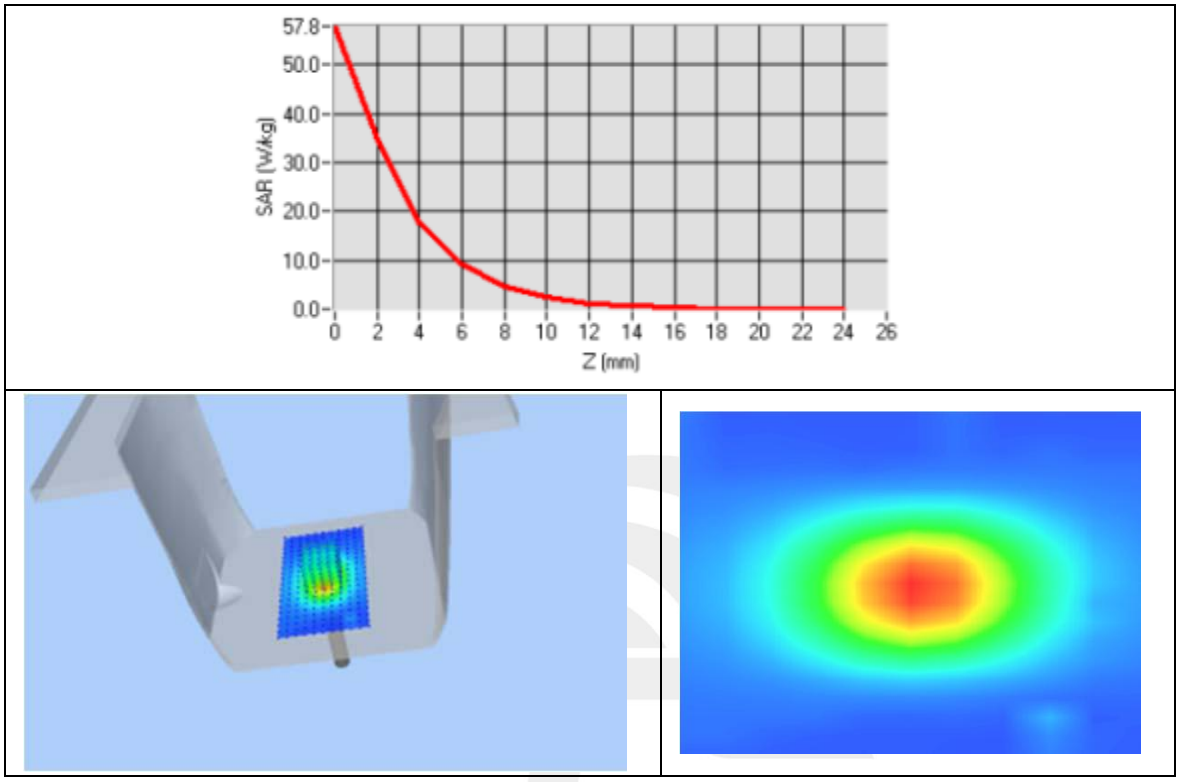
Device Position	Validation plane
Band	5800 MHz
Channels	-
Signal	CW
Frequency (MHz)	5800
Relative permittivity	47.75
Conductivity (S/m)	5.85
Power drift (%)	-1.00
Probe	SN 45/15 EPGO281
ConvF	2.60
Crest factor:	1:1

SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=2.00

SAR 10g (W/Kg)	5.869201
SAR 1g (W/Kg)	17.840147

Z Axis Scan


57.8
50.0
40.0
30.0
20.0
10.0
0.0
SAR (W/kg)
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Z (mm)

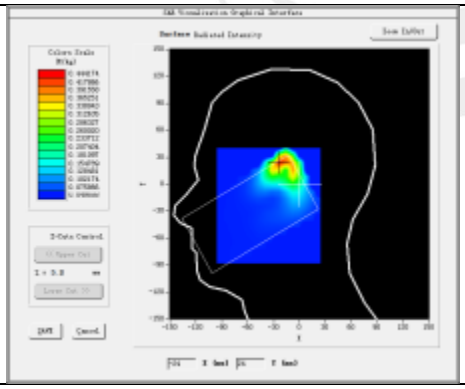
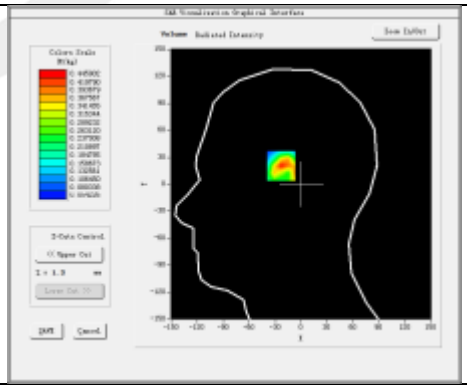
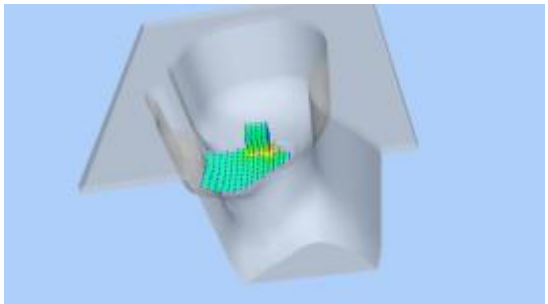
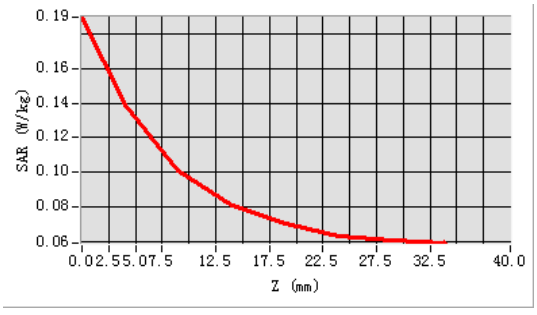
Appendix B. SAR Test Plots

Plot 1: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	A
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	39.2
Conductivity (S/m)	1.80
Variation (%)	-0.84

Maximum location: X=-23.00, Y=24.00
SAR Peak: 0.19 W/kg

SAR 10g (W/Kg)	0.051810
SAR 1g (W/Kg)	0.123046

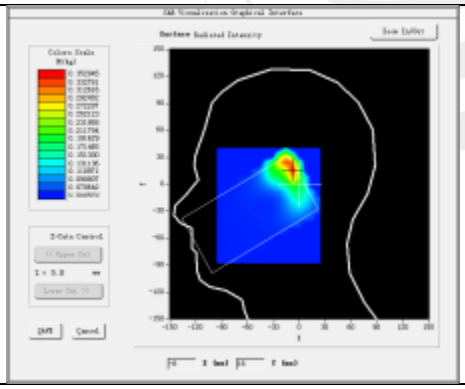
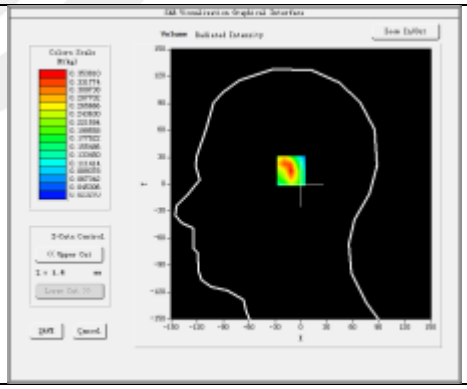
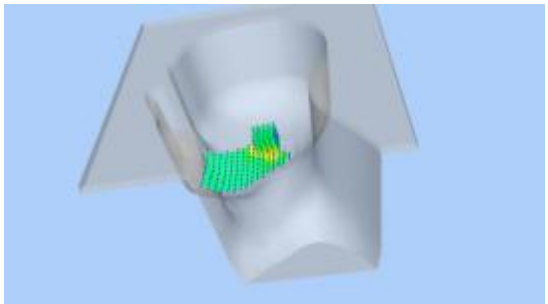
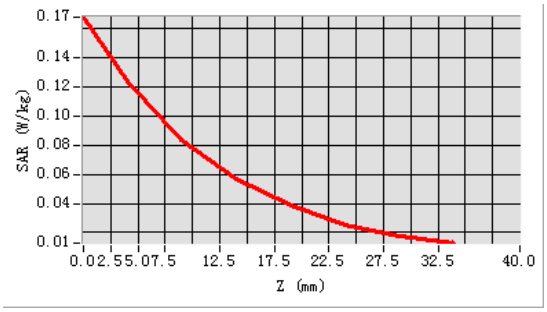
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 2: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	B
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	39.2
Conductivity (S/m)	1.80
Variation (%)	-0.62

Maximum location: X=-8.00, Y=16.00
SAR Peak: 0.17 W/kg

SAR 10g (W/Kg)	0.046143
SAR 1g (W/Kg)	0.110823

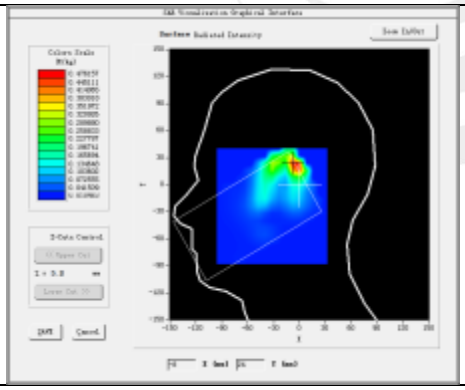
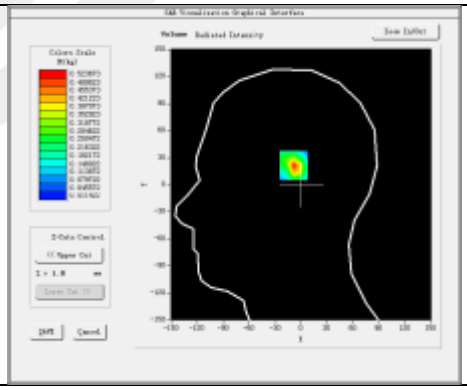
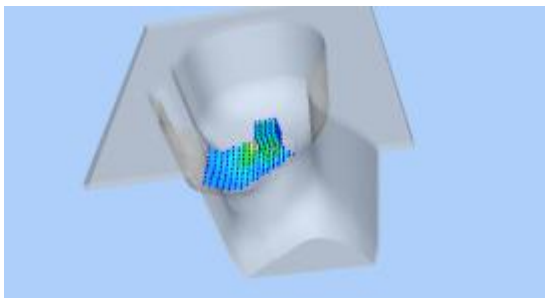
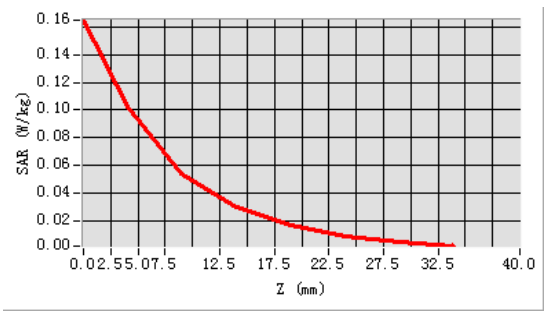
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 3: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	A
Band	IEEE 802.11n ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	39.2
Conductivity (S/m)	1.80
Variation (%)	-1.25

Maximum location: X=5.00, Y=23.00
SAR Peak: 0.16 W/kg

SAR 10g (W/Kg)	0.052660
SAR 1g (W/Kg)	0.100484

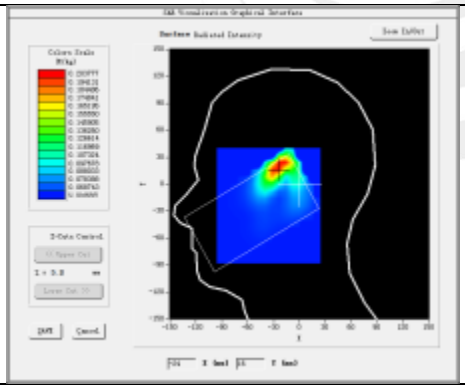
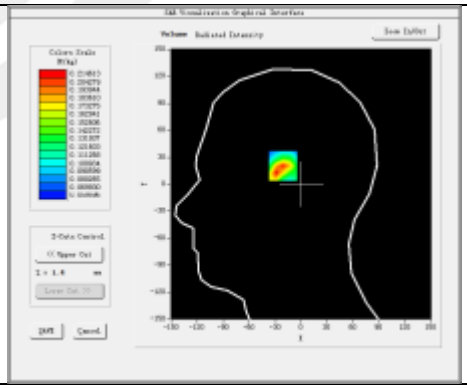
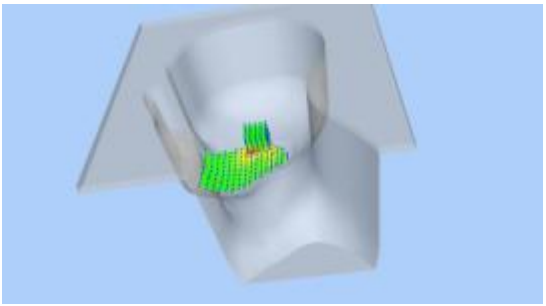
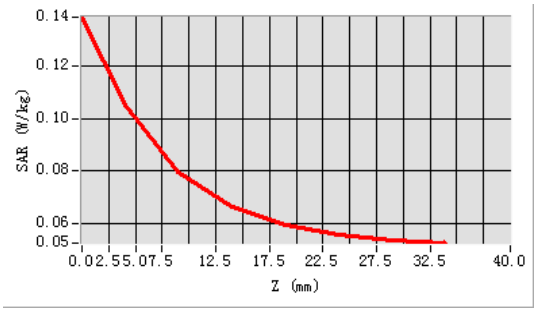
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 4: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	B
Band	IEEE 802.11n ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	39.2
Conductivity (S/m)	1.80
Variation (%)	1.36

Maximum location: X=-20.00, Y=24.00
SAR Peak: 0.14 W/kg

SAR 10g (W/Kg)	0.060995
SAR 1g (W/Kg)	0.103929

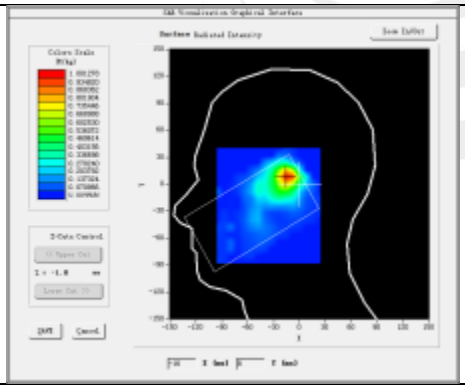
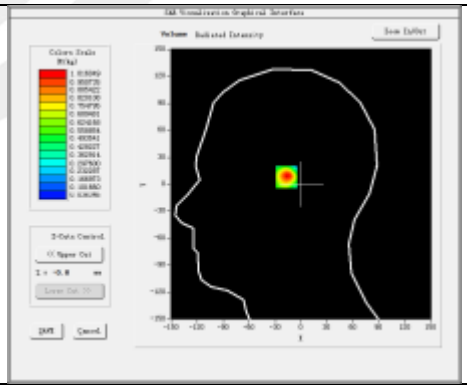
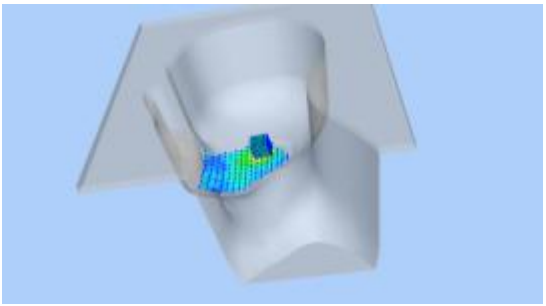
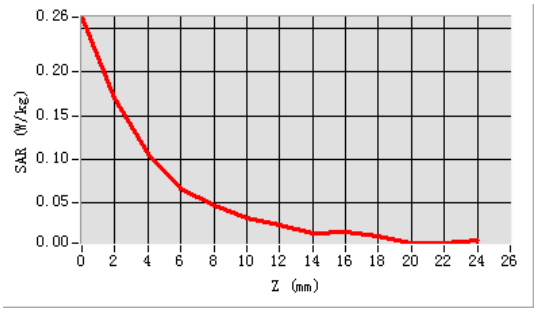
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 5: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	A
Band	IEEE 802.11a ISM
Channels	Middle
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5785
Relative permittivity (real part)	35.3
Conductivity (S/m)	5.27
Variation (%)	-1.39

Maximum location: X=-14.00, Y=8.00
SAR Peak: 0.27 W/kg

SAR 10g (W/Kg)	0.062158
SAR 1g (W/Kg)	0.108492

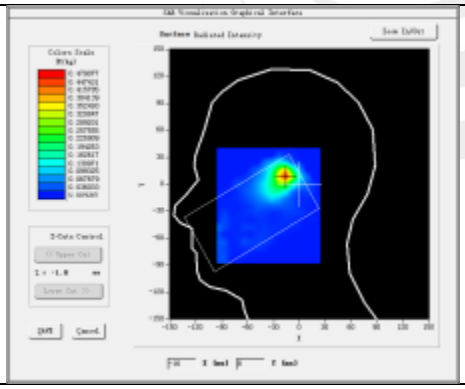
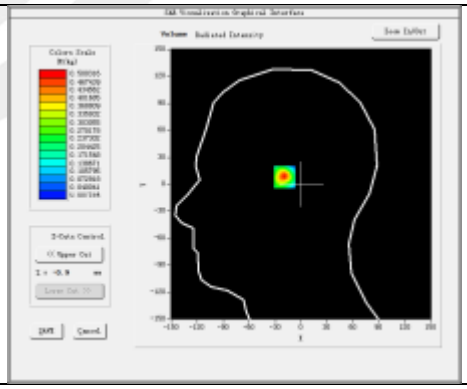
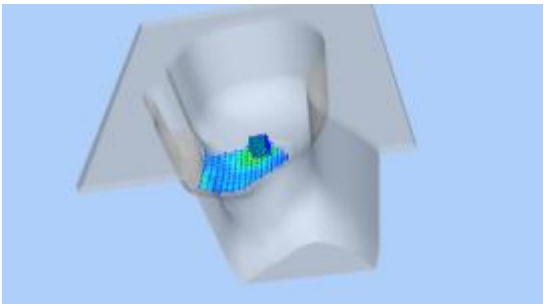
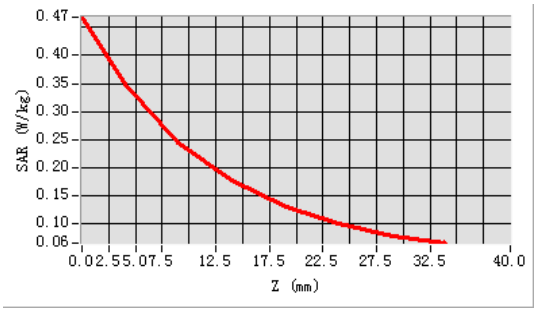
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 6: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	B
Band	IEEE 802.11a ISM
Channels	Low
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5745
Relative permittivity (real part)	35.3
Conductivity (S/m)	5.27
Variation (%)	0.98

Maximum location: X=-15.00, Y=9.00
SAR Peak: 0.47 W/kg

SAR 10g (W/Kg)	0.097425
SAR 1g (W/Kg)	0.161258

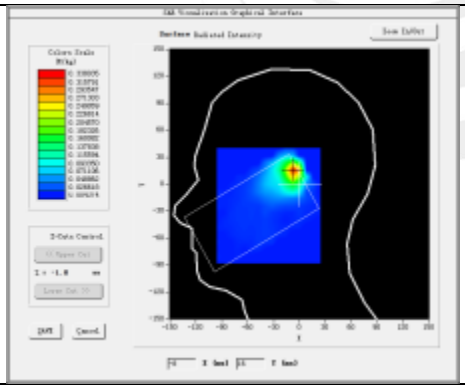
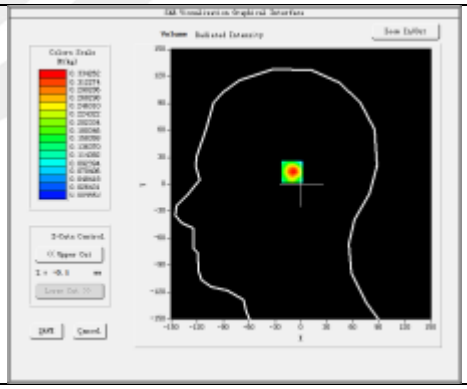
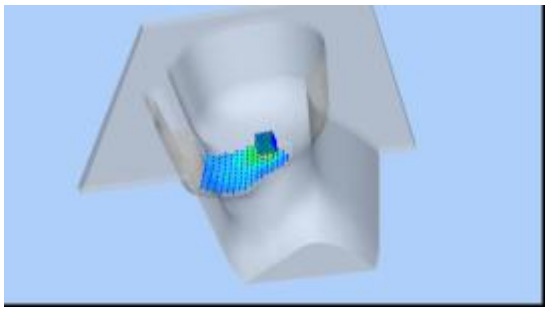
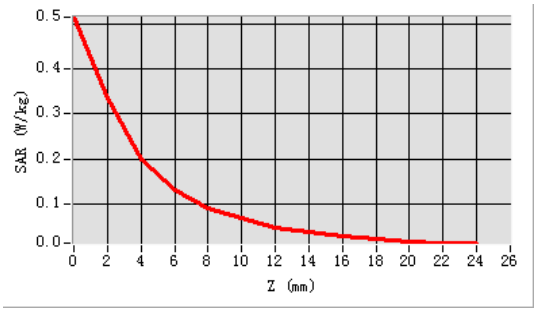
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 7: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	A
Band	IEEE 802.11ac ISM
Channels	Low
Signal	IEEE802.ac (Crest factor: 1.0)
Frequency (MHz)	5745
Relative permittivity (real part)	35.3
Conductivity (S/m)	5.27
Variation (%)	2.11

Maximum location: X=-7.00, Y=15.00
SAR Peak: 0.57 W/kg

SAR 10g (W/Kg)	0.068524
SAR 1g (W/Kg)	0.134286

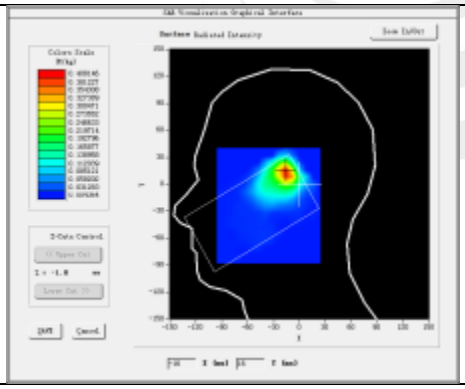
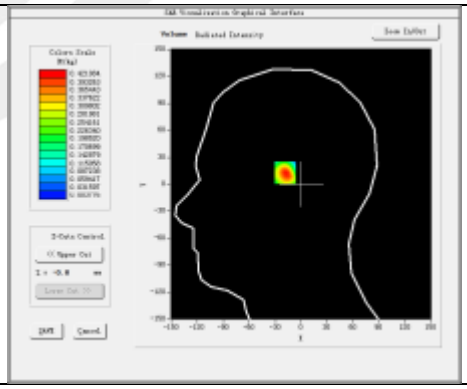
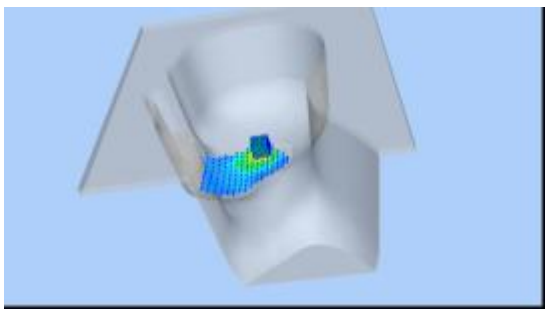
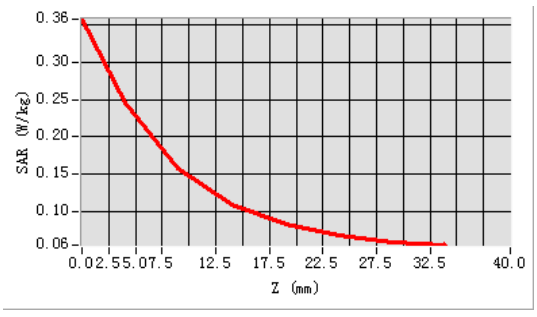
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 8: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-23
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Head
Antenna	B
Band	IEEE 802.11ac ISM
Channels	Low
Signal	IEEE802.ac (Crest factor: 1.0)
Frequency (MHz)	5745
Relative permittivity (real part)	35.3
Conductivity (S/m)	5.27
Variation (%)	1.69

Maximum location: X=-16.00, Y=14.00
SAR Peak: 0.36 W/kg

SAR 10g (W/Kg)	0.074582
SAR 1g (W/Kg)	0.168529

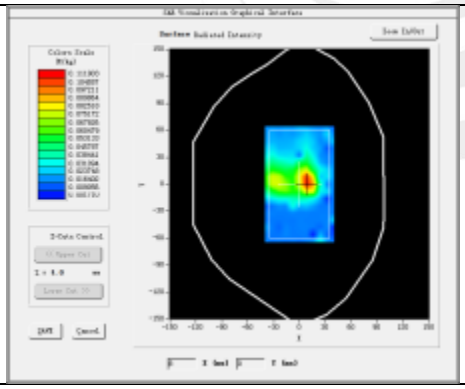
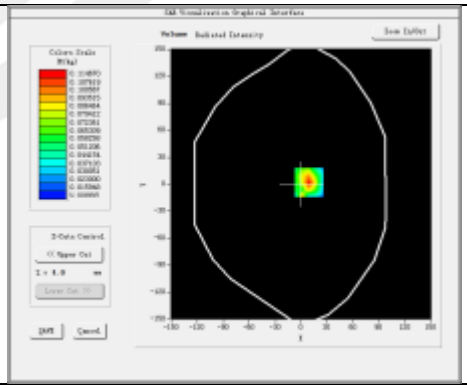
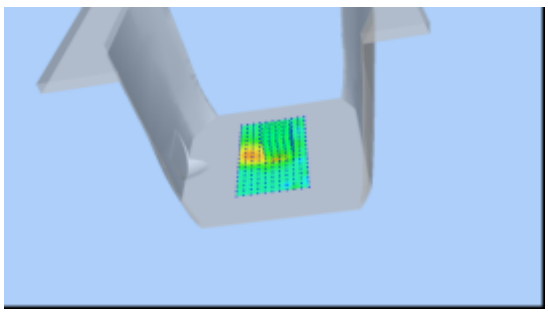
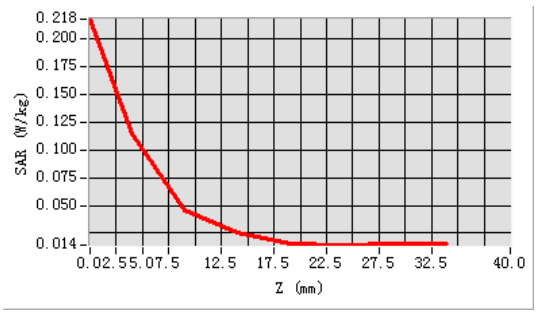
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 9: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-08-30
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	A
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	52.70
Conductivity (S/m)	1.95
Variation (%)	2.63

Maximum location: X=9.00, Y=2.00
SAR Peak: 0.22 W/kg

SAR 10g (W/Kg)	0.049524
SAR 1g (W/Kg)	0.107896

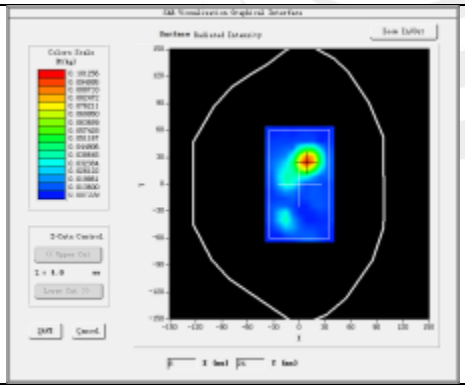
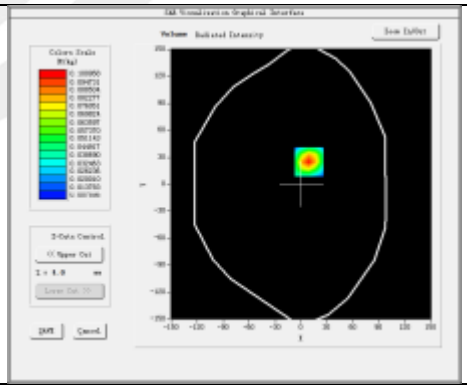
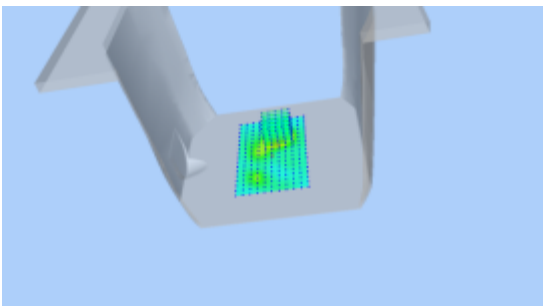
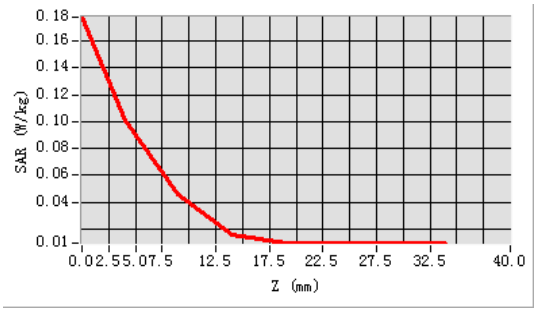
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 10: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-08-30
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	B
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	52.70
Conductivity (S/m)	1.95
Variation (%)	-0.35

Maximum location: X=9.00, Y=25.00
SAR Peak: 0.18 W/kg

SAR 10g (W/Kg)	0.042828
SAR 1g (W/Kg)	0.095079

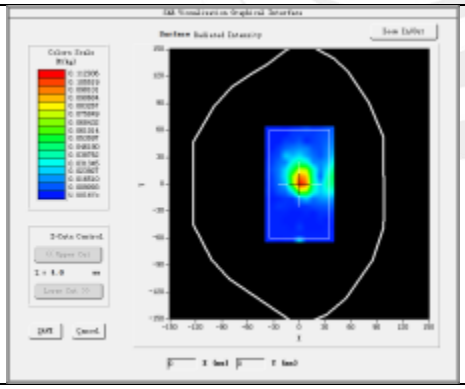
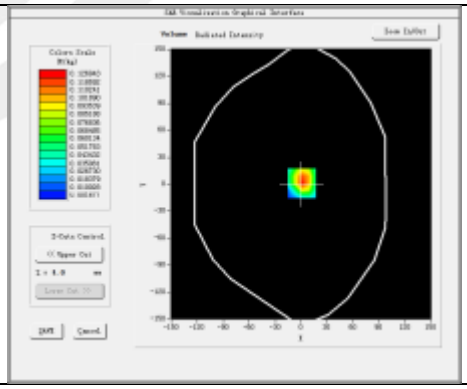
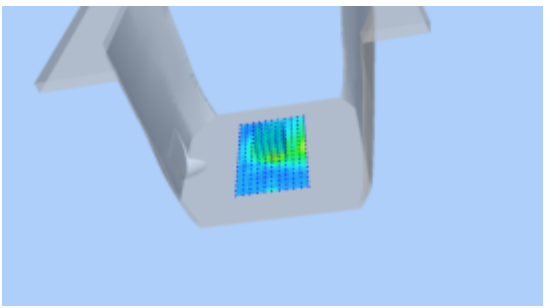
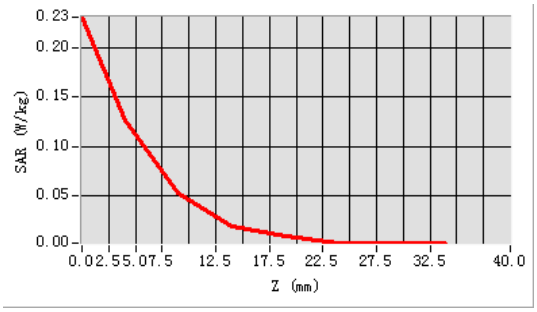
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 11: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-08-30
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	A
Band	IEEE 802.11n ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	52.70
Conductivity (S/m)	1.95
Variation (%)	1.39

Maximum location: X=1.00, Y=1.00
SAR Peak: 0.25 W/kg

SAR 10g (W/Kg)	0.051155
SAR 1g (W/Kg)	0.123020

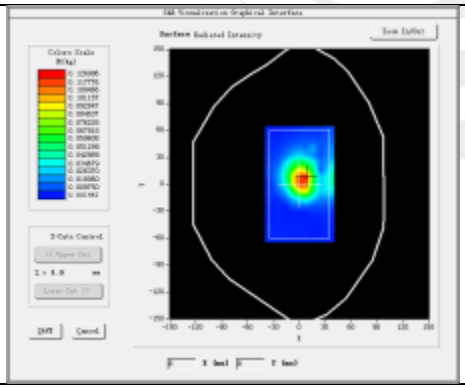
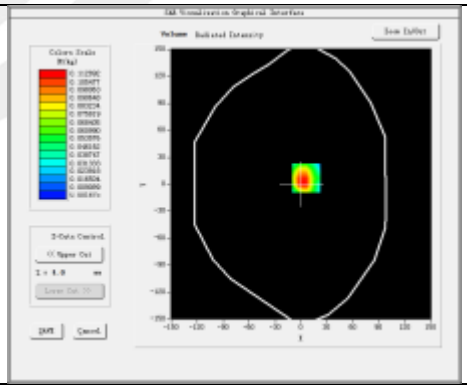
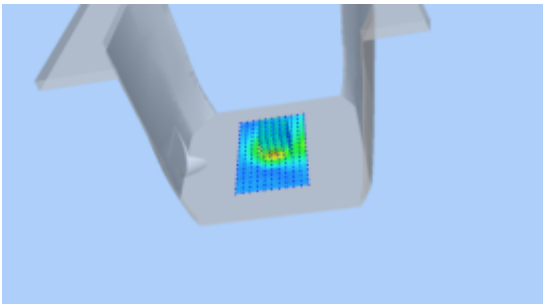
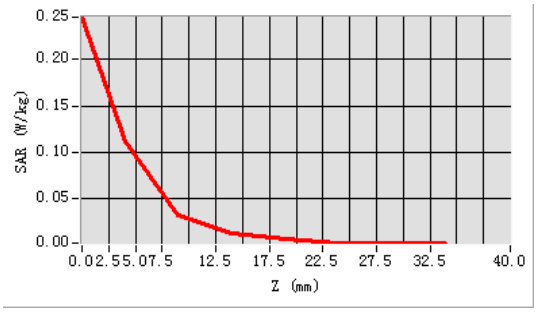
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 12: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-08-30
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	B
Band	IEEE 802.11n ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	52.70
Conductivity (S/m)	1.95
Variation (%)	1.37

Maximum location: X=6.00, Y=7.00
SAR Peak: 0.24 W/kg

SAR 10g (W/Kg)	0.048692
SAR 1g (W/Kg)	0.117611

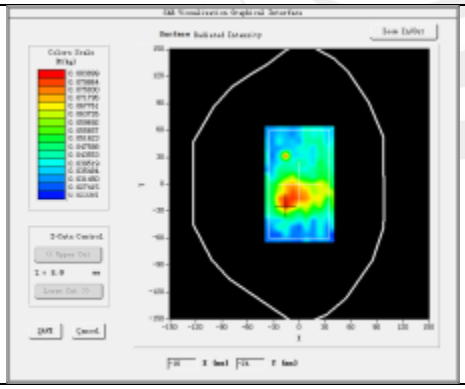
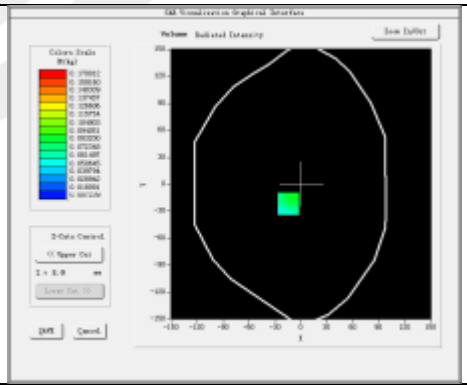
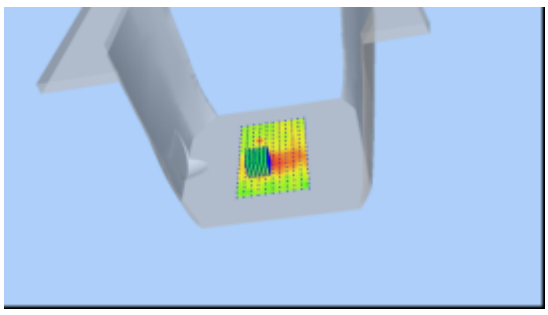
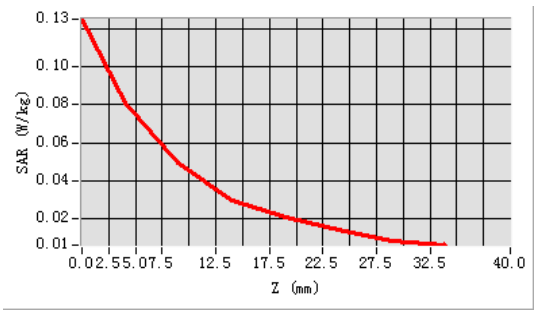
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 13: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-30
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	A
Band	IEEE 802.11a ISM
Channels	Middle
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5785
Relative permittivity (real part)	48.2
Conductivity (S/m)	6.00
Variation (%)	-1.85

Maximum location: X=-15.00, Y=-22.00
SAR Peak: 0.13 W/kg

SAR 10g (W/Kg)	0.046215
SAR 1g (W/Kg)	0.066645

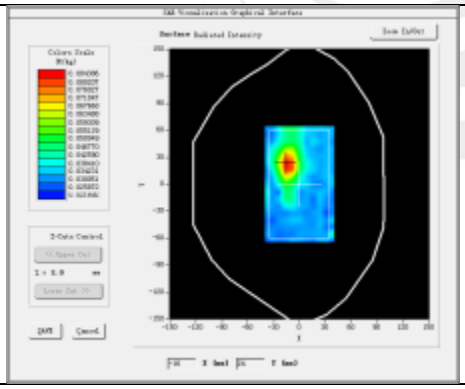
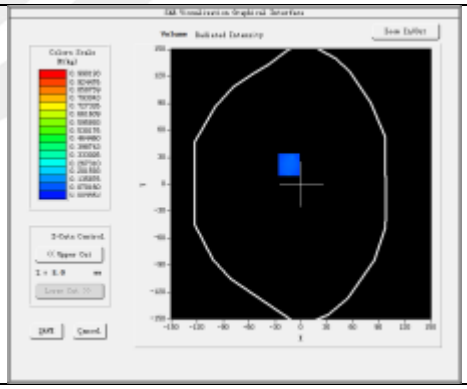
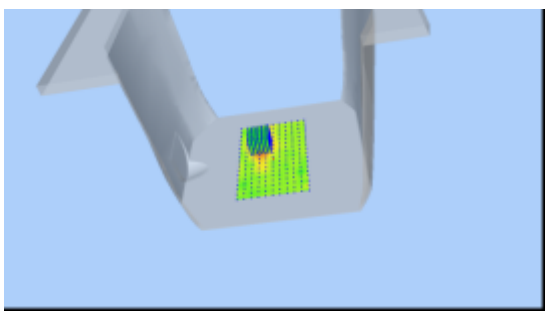
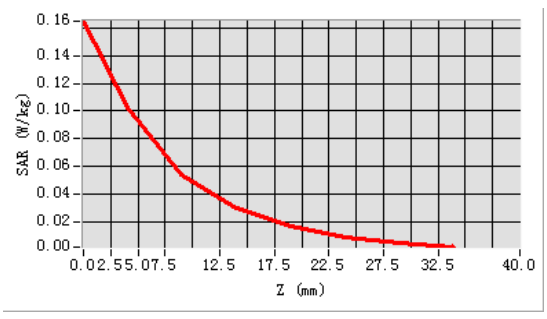
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 14: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-30
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	B
Band	IEEE 802.11a ISM
Channels	Low
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5745
Relative permittivity (real part)	48.2
Conductivity (S/m)	6.00
Variation (%)	1.09

Maximum location: X=-14.00, Y=22.00
SAR Peak: 0.16 W/kg

SAR 10g (W/Kg)	0.056116
SAR 1g (W/Kg)	0.095042

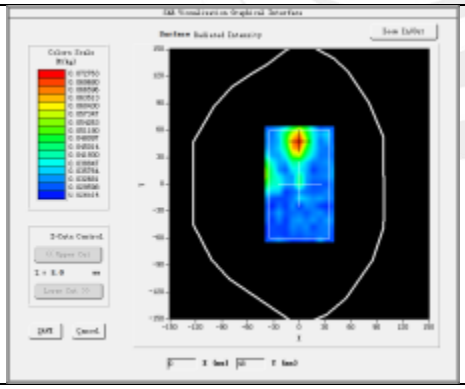
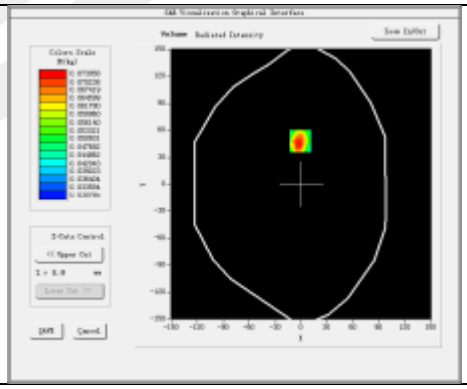
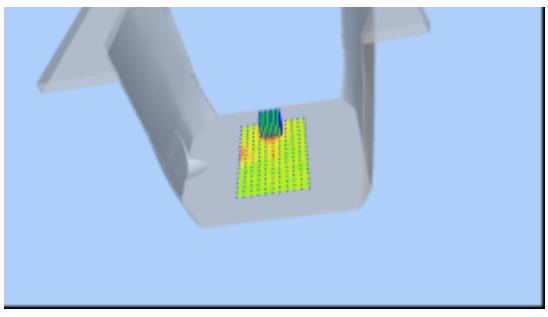
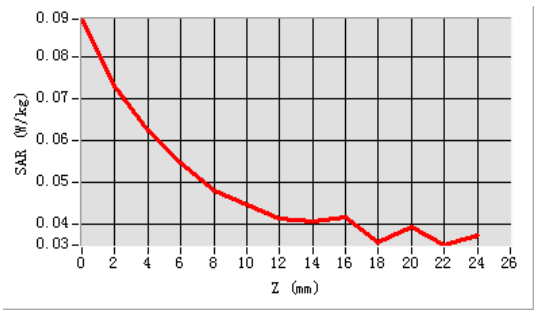
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 15: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-30
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	A
Band	IEEE 802.11ac ISM
Channels	Low
Signal	IEEE802.ac (Crest factor: 1.0)
Frequency (MHz)	5745
Relative permittivity (real part)	48.2
Conductivity (S/m)	6.00
Variation (%)	-2.95

Maximum location: X=-1.00, Y=48.00
SAR Peak: 0.09 W/kg

SAR 10g (W/Kg)	0.045952
SAR 1g (W/Kg)	0.060067

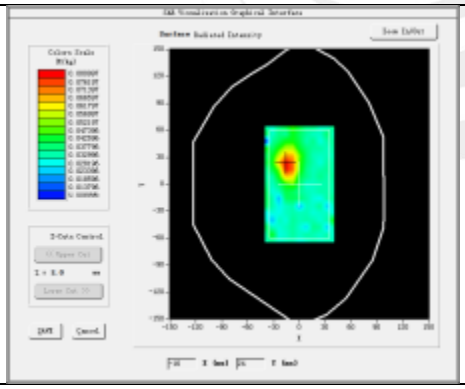
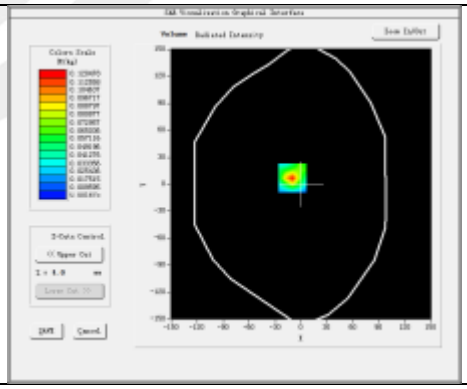
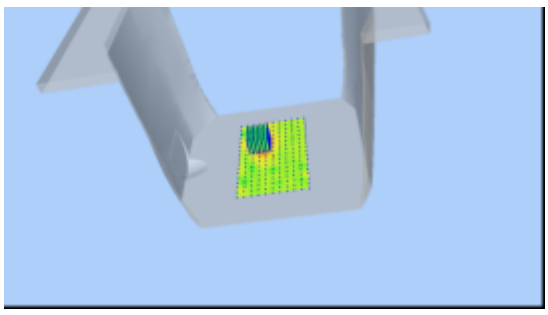
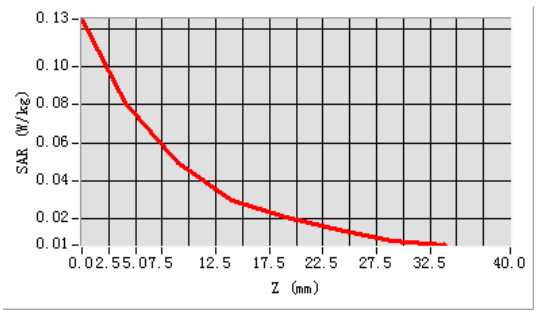
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 16: DUT: Virtual Reality HDM; EUT Model: Shadow V01

Test Date	2018-10-30
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Edge4- Extremity SAR
Antenna	B
Band	IEEE 802.11ac ISM
Channels	Low
Signal	IEEE802.ac (Crest factor: 1.0)
Frequency (MHz)	5745
Relative permittivity (real part)	48.2
Conductivity (S/m)	6.00
Variation (%)	-0.19

Maximum location: X=-15.00, Y=20.00
SAR Peak: 0.13 W/kg

SAR 10g (W/Kg)	0.054572
SAR 1g (W/Kg)	0.074587

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

Appendix C. Probe Calibration And Dipole Calibration Report

Refer the appendix Calibration Report.

※※※※※END OF THE REPORT※※※※※