FCC SAR TEST REPORT

Report No: STS1711165H01

Issued for

Blocks wearables Inc.

1800 Century Park East, 10th Floor, Los Angles,California, United States, 90067

Product Name:	Modular Smartwatch
Brand Name:	Blocks
Model Name:	BLKS002
Series Model:	KW88
FCC ID:	2AHBVBLKS002
Test Standard:	ANSI/IEEE Std. C95.1
	IEEE 1528: 2013
Max. Report SAR (1g):	Front to mouth:0.301 W/kg
Max. Report SAR (10g):	Wrist:0.424 W/kg

Test Report Certification

Applicant's name ....: Blocks wearables Inc.

Address .... : 1800 Century Park East, 10th Floor, Los Angles,California, United States, 90067

Manufacture's Name ....: Shenzhen KingWear Intelligent Technology Co., Ltd

Address ....: The 21st floor, building C, Block No.9, Baoneng Hi-Tech Industrial Park, Qingxiang Road, Qinghu, Longhua district, Shenzhen, China
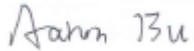
Product description

Product name ....: Modular Smartwatch

Brand name ....: Blocks

Model name ....: BLKS002

Series Model..........................: KW88

Standards .... : ANSI/IEEE Std. C95.1-1992
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 ....: 23 Nov. 2017

Date of Issue ....: 27 Nov. 2017

Test Result..: **Pass**

Testing Engineer   **:**

(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	Modular Smartwatch
Brand Name	Blocks
Model Name	BLKS002
Series Model	KW88
FCC ID	2AHBVBLKS002
Model Difference	All are the same except the model number
Battery	Rated Voltage: 3.8V; Charge Limit: 5V; Capacity: 350mAh
Device Category	Portable
Product stage	Production unit
Exposure Environment	General Population / Uncontrolled
Hardware Version	V1.02
Software Version	sombrero-dvt4-factory-rom
Frequency Range	WLAN 802.11b/g/n(HT20/40):2412~2462MHz Bluetooth:2402~ 2480MHz

Max. Reported SAR	Mode	Front to mouth-1g (W/kg)	Wrist-10g (W/kg)
	WLAN	0.301	0.424
	Bluetooth[Note]	0.033	0.027
Limit		1.6	4.0

Operating Mode	WLAN: 802.11 b/g/n(HT20/40); Bluetooth: V3.0 + EDR (GFSK, π/4DQPSK, 8DPSK) ; BLE
Antenna Specification	BT,WLAN: PIFA Antenna

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	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

(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).

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:
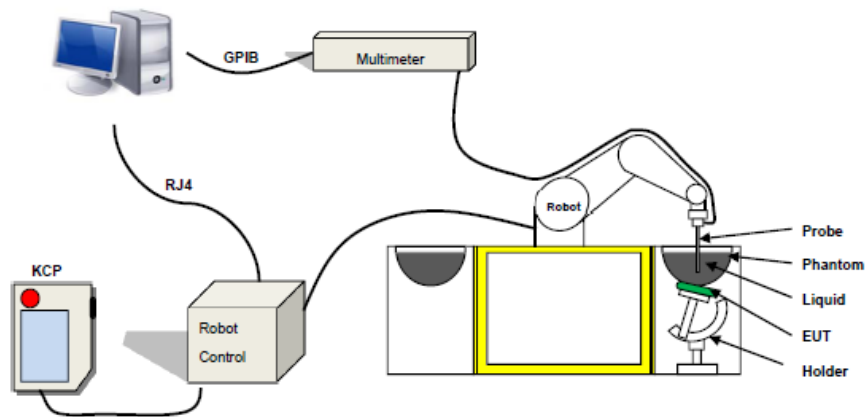
Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the following items:
- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone 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 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 14/16 EP309 with following specifications is used
- Dynamic range: 0.01-100 W/kg
- Tip Diameter: 5 mm
- Length of Individual Dipoles: 4.5 mm
- Maximum external diameter: 8 mm
- Distance between dipole/probe extremity: 8 mm (repeatability better than +/- 2.7mm)
- Probe linearity: 0±2.27%(±0.10dB)

- Axial Isotropy: < 0.10 dB

- Spherical Isotropy: < 0.10 dB
- Calibration range: 400 MHz to 3 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 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.

SN 32/14 SAM115

SN 32/14 SAM116

3.2.3 Device Holder
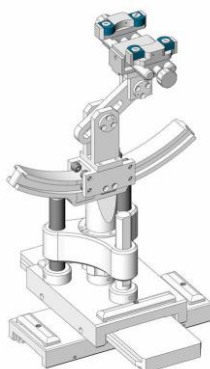
The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for 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]					
2017-11-23	22.8	57	2450 MHz	22.4	Permittivity:	39.20	39.78	1.48	± 5
					Conductivity:	1.80	1.81	0.56	± 5

Date	Ambient condition		Body Simulating Liquid		Parameters	Target	Measured	Deviation [%]	Limited [%]
	Temp. [°C]	Humidity [%]	Frequency	Temp. [°C]					
2017-11-23	22.8	57	2450 MHz	22.4	Permittivity:	52.70	52.47	-0.44	± 5
					Conductivity	1.95	1.97	1.03	± 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 %.

Freq.(MHz)	Power(mW)	Tested Value (W/Kg)	Normalized SAR$_{-1g}$ (W/kg)	Target(W/Kg)	Tolerance(%)	Date
2450 Head	100	5.228	52.28	54.70	-4.43	2017-11-23

Freq.(MHz)	Power(mW)	Tested Value (W/Kg)	Normalized SAR$_{-10g}$ (W/kg)	Target(W/Kg)	Tolerance(%)	Date
2450 Body	100	2.318	23.18	24.11	-3.86	2017-11-23

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

5.3 SAR system Validation

SAR probe and tissue dielectric parameters are as shown bellow.

Test Data	Probe S/N	Tested Freq (MHz)	Tissue Type	Cond.	Perm	CW validation			Mod. validation		
						Sensitivity	Probe Linearity	Probe Isotropy	Mod. Type	Duty Factor	Peak to average power ratio
2017.11.23	SN 14/16 EP309	2450	head	1.81	39.78	PASS	PASS	PASS	OFDM	PASS	PASS
2017-11-23	SN 14/16 EP309	2450	head	1.81	39.78	PASS	PASS	PASS	DSSS	PASS	PASS
2017-11-23	SN 14/16 EP309	2450	head	1.81	39.78	PASS	PASS	PASS	GFSK	PASS	PASS
2017-11-23	SN 14/16 EP309	2450	body	1.97	52.47	PASS	PASS	PASS	OFDM	PASS	PASS
2017-11-23	SN 14/16 EP309	2450	body	1.97	52.47	PASS	PASS	PASS	DSSS	PASS	PASS
2017-11-23	SN 14/16 EP309	2450	body	1.97	52.47	PASS	PASS	PASS	GFSK	PASS	PASS

6. SAR Evaluation Procedures

The procedure for assessing the average SAR value consists of the following steps:

- 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 Test Position

This EUT was tested in Front Face and Rear Face.
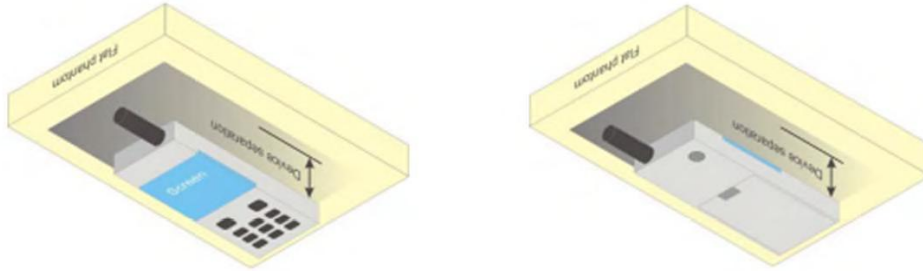
7.1 Hotspot mode exposure position condition

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 25mm 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).
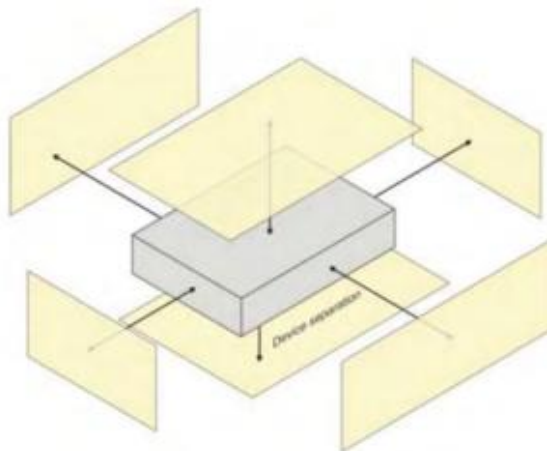
8. Uncertainty

8.1 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	$\sqrt{3}$	$(1-cp)1/2$	$(1-cp)1/2$	1.43	1.43	∞
3	Hemispherical isotropy	5.9	R	$\sqrt{3}$	$\sqrt{Cp}$	$\sqrt{Cp}$	2.41	2.41	∞
4	Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
5	Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
6	System Detection limits	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
7	Readout electronics	0.5	N	1	1	1	0.50	0.50	∞
8	Response time	0	R	$\sqrt{3}$	1	1	0	0	∞
9	Integration time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
10	Ambient noise	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
11	Ambient reflections	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
12	Probe positioner mech. restrictions	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
13	Probe positioning with respect to phantom shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
14	Max.SAR evaluation	1.0	R	$\sqrt{3}$	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	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and set-up									
18	Phantom uncertainty	4.0	R	$\sqrt{3}$	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%	

8.2 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-cp)1/2	(1-cp)1/2	1.43	1.43	∞
3	Hemispherical isotropy	5.9	R	√3	√Cp	√Cp	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 drift mea.	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	$U_C = \sqrt{\sum_{i}^{n} C_i{}^2 U_i{}^2}$			10.15%	10.05%	
Expanded uncertainty (P=95%)			$U = k\,U_{C},\ k=2$				20.29%	20.10%	

9. Conducted Power Measurement

9.1 Test Result

WLAN

Mode	Channel Number	Frequency (MHz)	Average Power (dBm)
802.11b	1	2412	17.65
	6	2437	17.17
	11	2462	16.99
802.11g	1	2412	13.66
	6	2437	14.74
	11	2462	13.45
802.11n(HT 20)	1	2412	12.58
	6	2437	13.43
	11	2462	11.87
802.11n(HT 40)	1	2412	12.34
	6	2437	12.01
	11	2462	11.53

Bluetooth

Mode	Channel Number	Frequency (MHz)	Average Power (dBm)
GFSK(1Mbps)	0	2402	1.21
	39	2441	1.38
	78	2480	0.92
π/4-DQPSK(2Mbps)	0	2402	0.14
	39	2441	0.08
	78	2480	-0.43
8DPSK(3Mbps)	0	2402	0.06
	39	2441	-0.07
	78	2480	-0.35

BLE

Mode	Channel Number	Frequency (MHz)	Average Power (dBm)
GFSK(1Mbps)	0	2402	-4.38
	19	2440	-4.46
	39	2480	-5.04

9.2 Tune-up Power

Mode	WLAN(AVG)
IEEE 802.11b	17±1dBm
IEEE 802.11g	14±1dBm
IEEE 802.11n(HT 20)	12.5±1dBm
IEEE 802.11n(HT 40)	12±1dBm

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

Mode	BLE(AVG)
GFSK	-5±1dBm

9.3 SAR Test Exclusions Applied

Per FCC KDB 447498D01, the 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz
at test separation distances ≤ 50 mm 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 for 10-g extremity SAR, where:

• 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

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

$$\frac{Max\ Power\ of\ Channel\ (mW)}{Test\ Separation\ Dist\ (mm)} * \sqrt{Frequency(GHz)} \leq 3.0$$

Based on the maximum conducted power of **Bluetooth Front to mouth** (rounded to the nearest mW) and the antenna to user separation distance,

Bluetooth Front to mouth SAR was not required; [(1.585/10)* √2.480] = **0.25** < 3.0.

Based on the maximum conducted power of **Bluetooth Wrist** (rounded to the nearest mW) and the antenna to user separation distance,

Bluetooth Wrist SAR was not required; [(1.585/5)* √2.480] = **0.50** < 7.5.

Based on the maximum conducted power of **2.4 GHz WLAN Front to mouth** (rounded to the nearest mW) and the antenna to user separation distance,

2.4 GHz WLAN Front to mouth SAR was required; [(63.096/10)* √2.462] = **9.90** > 3.0.

Based on the maximum conducted power of **2.4 GHz WLAN Wrist** (rounded to the nearest mW) and the antenna to user separation distance,

2.4 GHz WLAN Wrist SAR was required; [(63.096/5)* √2.462] = **19.98** >7.5.
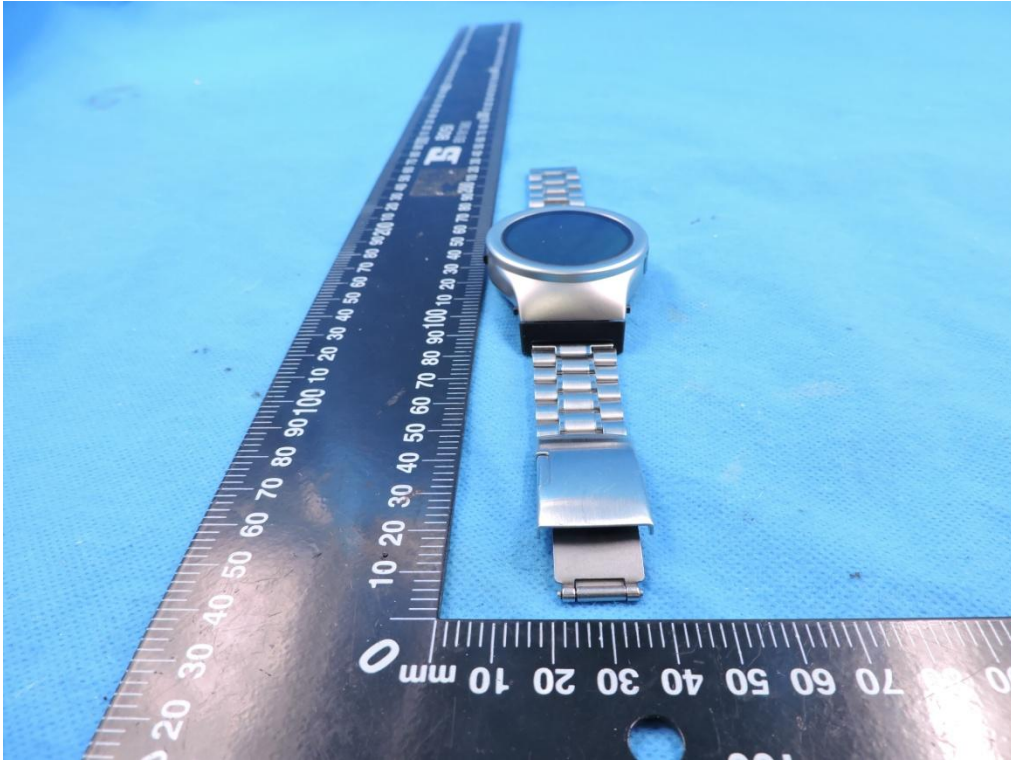
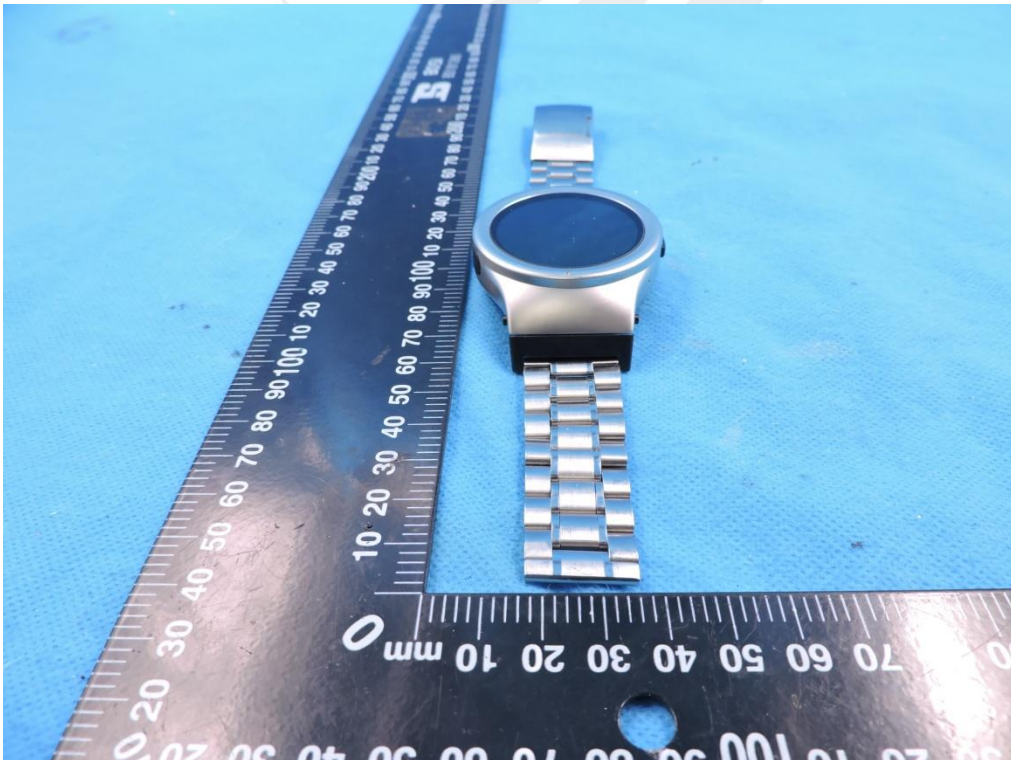# 10. EUT And Test Setup Photo
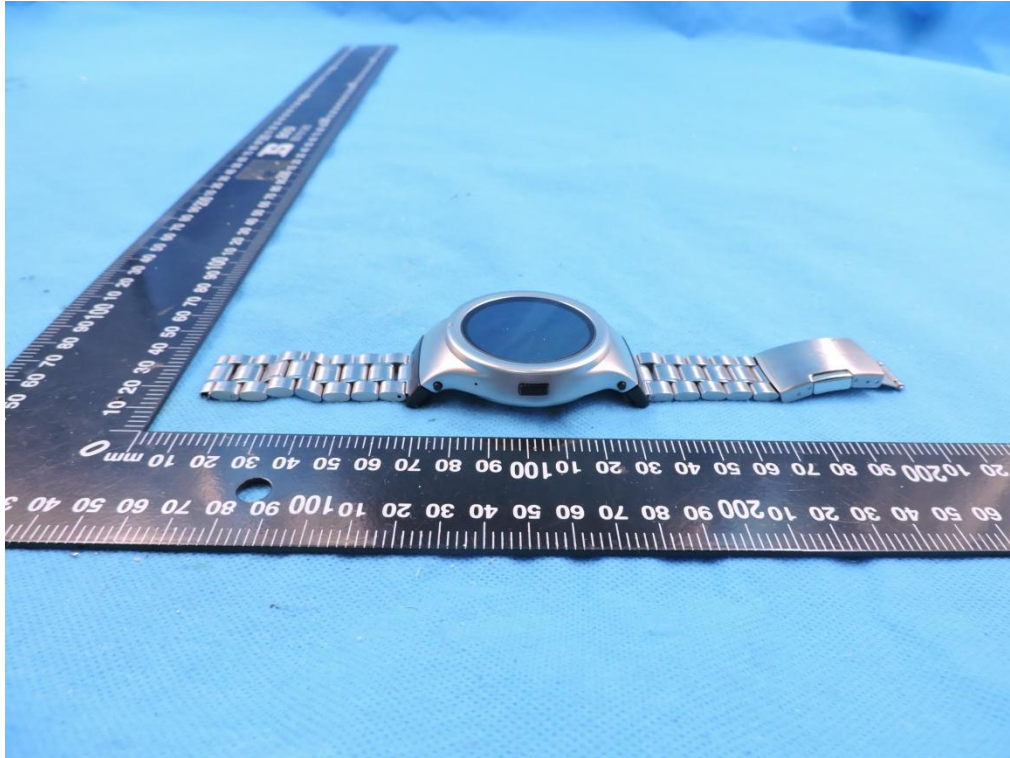
10.1 EUT Photo

Front side
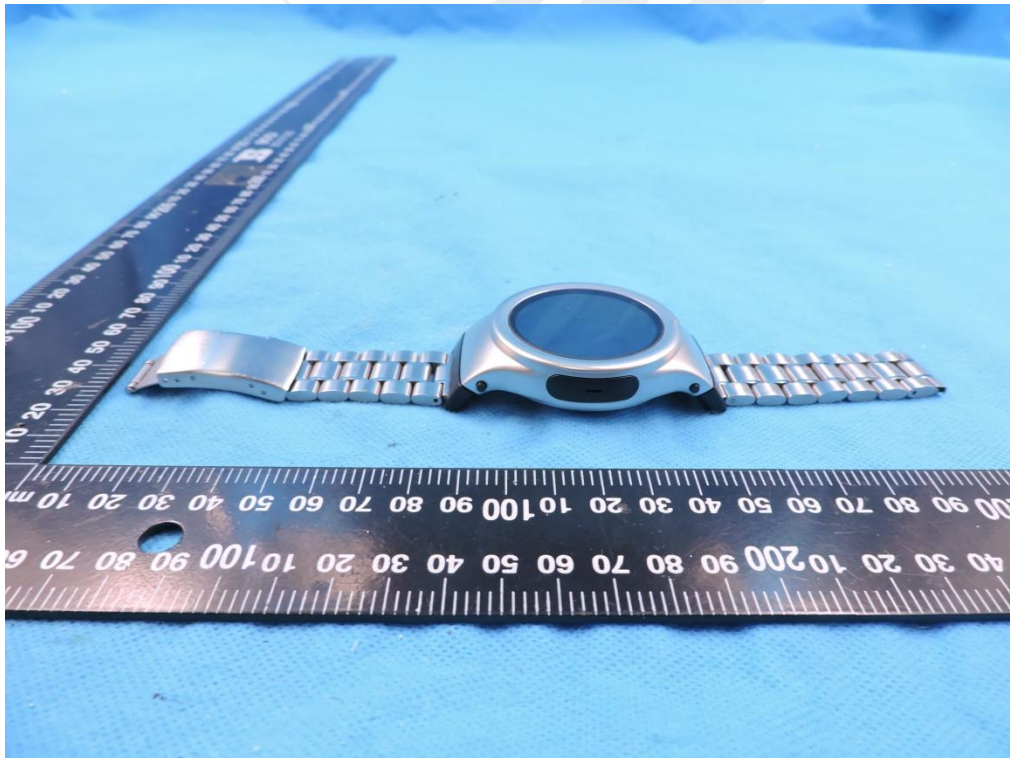

Back side

Top side

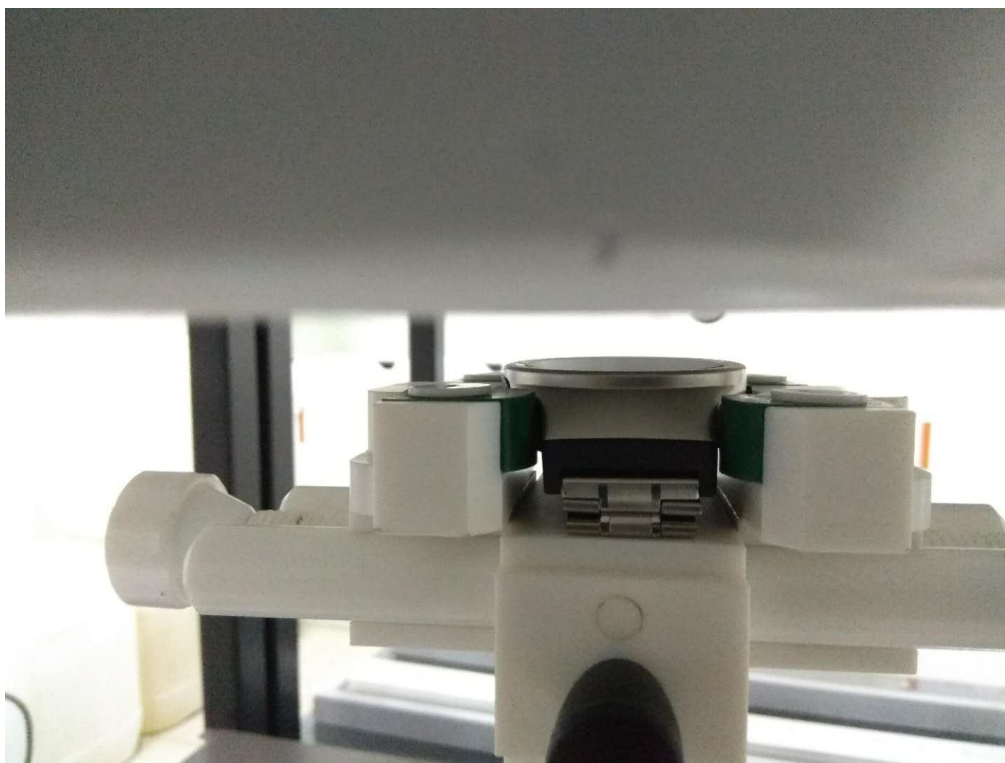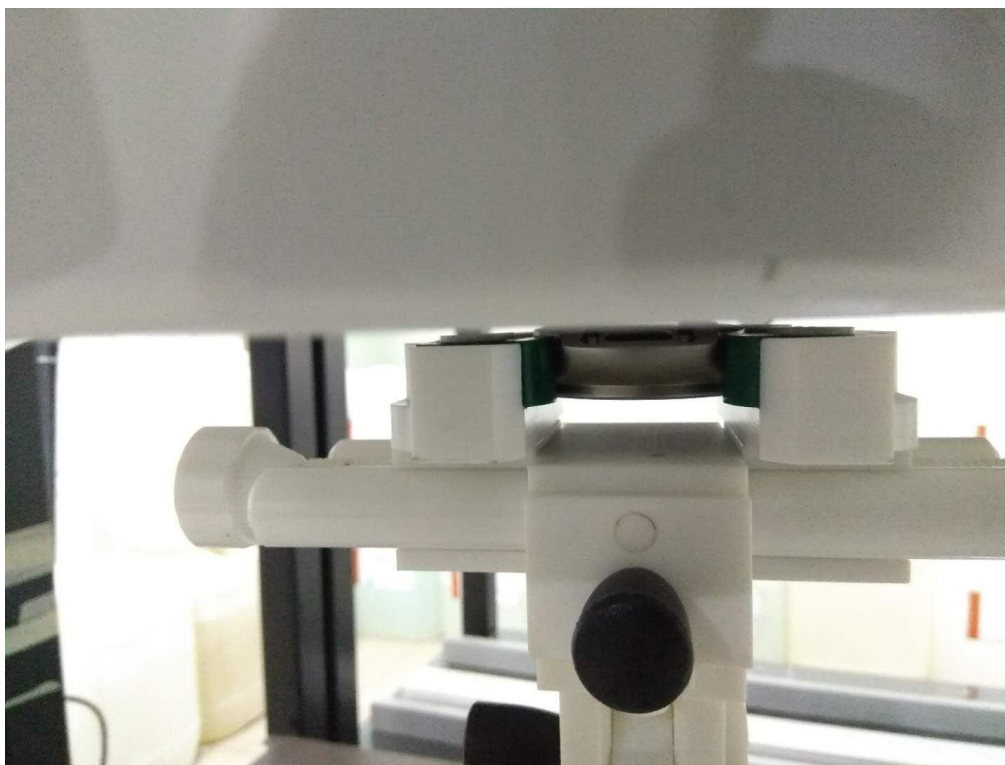Bottom side

Left side

Right side
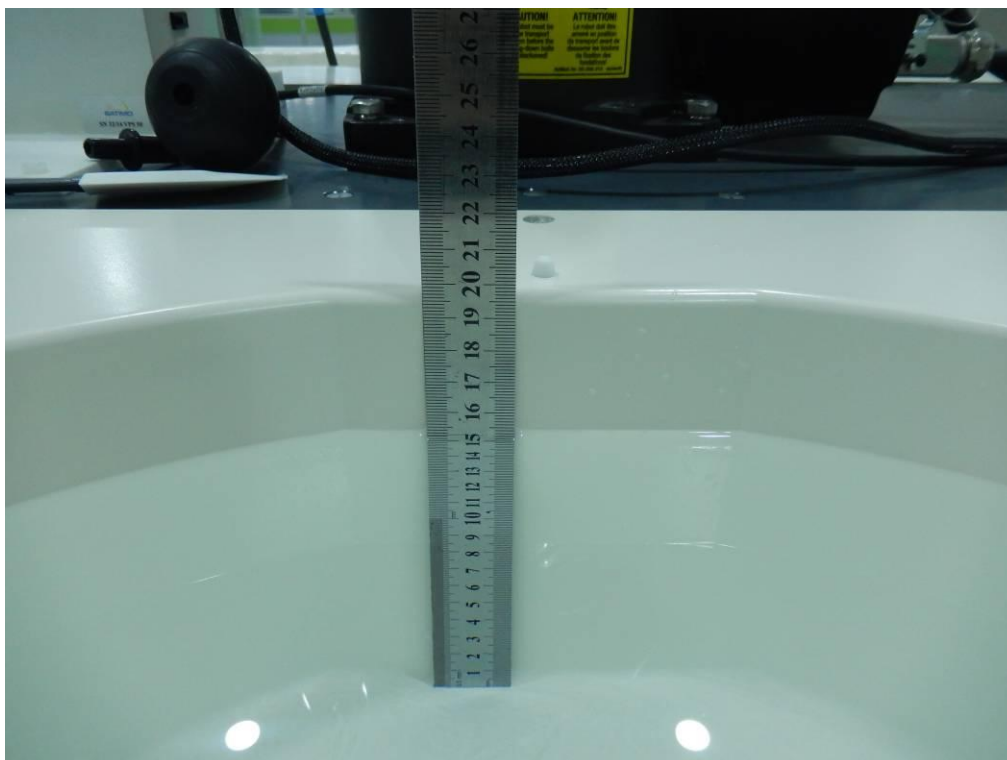
10.2 Setup Photo

Front to mouth (separation distance is 10mm)

Wrist (separation distance is 0mm)

Liquid depth (15 cm)

11. SAR Result Summary

11.1 Front to mouth SAR

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	802.11b	Front to mouth	1	0.278	0.48	18	17.65	100	0.301	1

Note:
1. The test separation of all above table is 10mm.
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. Per KDB 248227- When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg. (The highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power was **0.154** W/Kg for Front to mouth)
4. 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.

11.2 Wrist SAR

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	802.11b	Wrist	1	0.391	1.03	18	17.65	100	0.424	2

Note:
5. The test separation of all above table is 0mm.
6. 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
7. Per KDB 248227- When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg. (The highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power was **0.217** W/Kg for Wrist)
8. 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:

Estimated SAR		Maximum Power		Antenna to user(mm)	Frequency(GHz)	Stand alone SAR [W/kg]
		dBm	mW			
BT	Front to Mouth(1g)	2	1.585	10	2.480	0.033
	Wrist（10g）			5	2.480	0.027

NOTE:
   1. Bluetooth and WLAN can't simultaneous transmission at the same time.

12. Equipment List

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
2450MHzDipole	MVG	SID2450	SN 30/14 DIP2G450-335	2017.08.15	2020.08.14
E-Field Probe	MVG	SSE5	SN 14/16 EP309	2016.12.05	2017.12.04
Dielectric Probe Kit	MVG	SCLMP	SN 32/14 OCPG67	2016.12.05	2017.12.04
Antenna	MVG	ANTA3	SN 07/13 ZNTA52	Blocks	Blocks
Phantom1	MVG	SAM	SN 32/14 SAM115	2014.09.01	Blocks
Phantom2	MVG	SAM	SN 32/14 SAM116	2014.09.01	Blocks
Phone holder	MVG	Blocks	SN 32/14 MSH97	2014.09.01	Blocks
Laptop holder	MVG	Blocks	SN 32/14 LSH29	2014.09.01	Blocks
Network Analyzer	Agilent	8753ES	US38432810	2017.03.16	2018.03.15
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	2017.05.10	2018.05.09
11dB Attenuator	Agilent	8494B	DC-18GHz	2017.05.10	2018.05.09
110dB Attenuator	Agilent	8494B	DC-18GHz	2017.05.10	2018.05.09
Dual Directional Coupler	Agilent	SHWPDI-1080S	Blocks	2017.05.09	2018.05.08
Temperature & Humitidy	MiEO	HH660	Blocks	2017.10.15	2018.10.14

Appendix A. System Validation Plots

System Performance Check Data (2450MHz Head)

Type: Phone measurement (Complete)

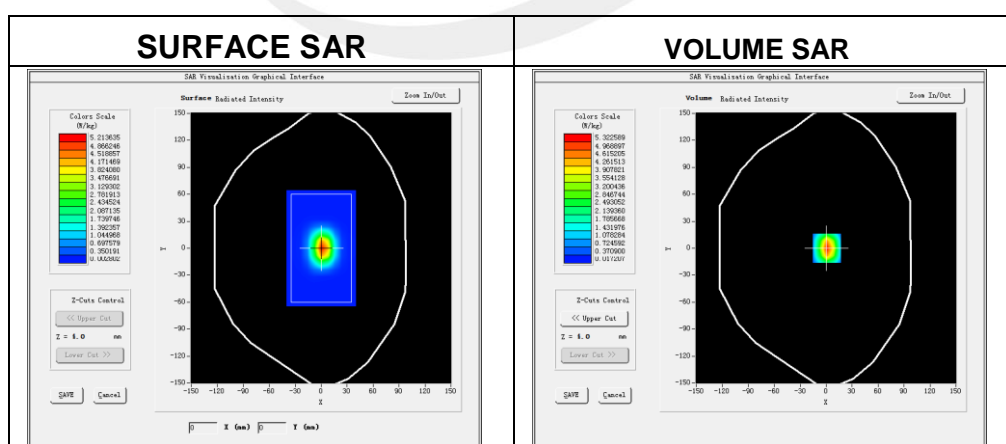Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 2017-11-23

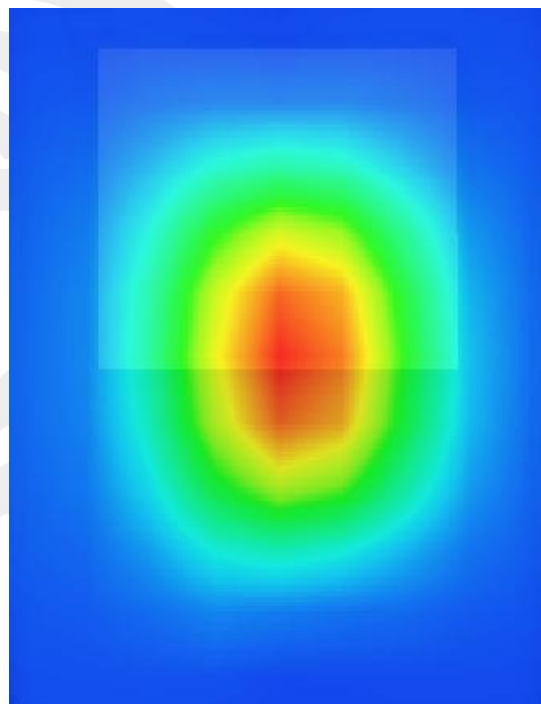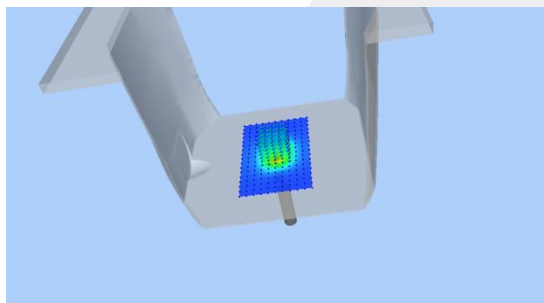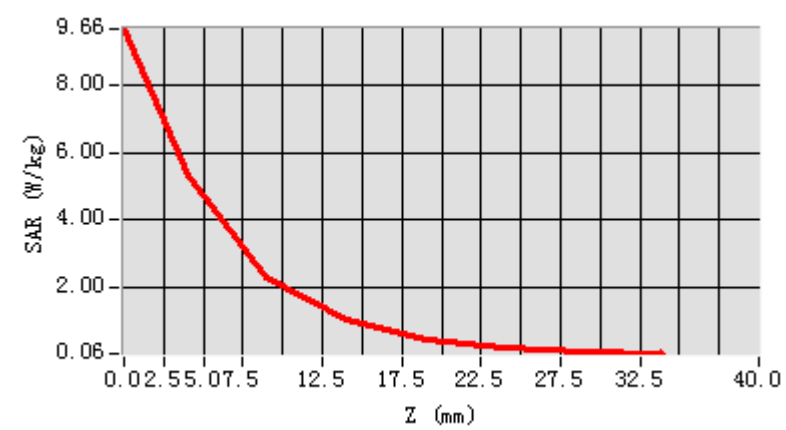Measurement duration: 13 minutes 51seconds

Experimental conditions.

Device Position	Validation plane
Band	2450 MHz
Channels	-
Signal	CW
Frequency (MHz)	2450
Relative permittivity	39.78
Conductivity (S/m)	1.81
Power drift (%)	-0.39
Probe	SN 14/16 EP309
ConvF	5.09
Crest factor:	1:1

SURFACE SAR	VOLUME SAR

Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	2.317792
SAR 1g (W/Kg)	5.228344

Z Axis Scan

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: 2017-11-23

Measurement duration: 14 minutes 23 seconds

Experimental conditions.
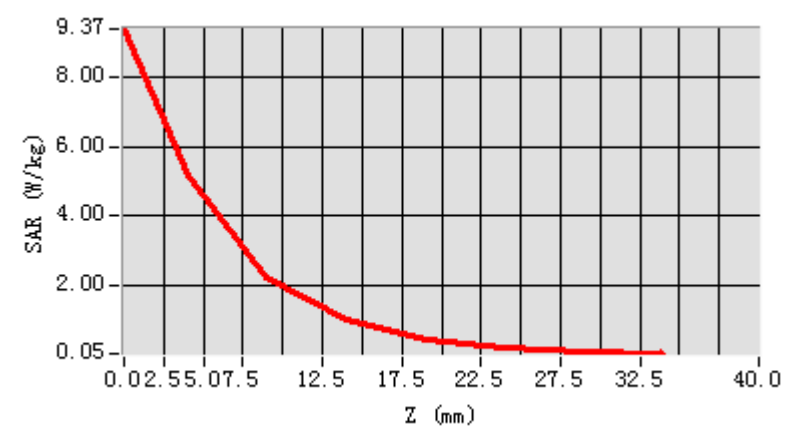
Device Position	Validation plane
Band	2450 MHz
Channels	-
Signal	CW
Frequency (MHz)	2450
Relative permittivity	52.47
Conductivity (S/m)	1.97
Power drift (%)	-0.07
Probe	SN 14/16 EP309
ConvF	5.24
Crest factor:	1:1

SURFACE SAR	VOLUME SAR
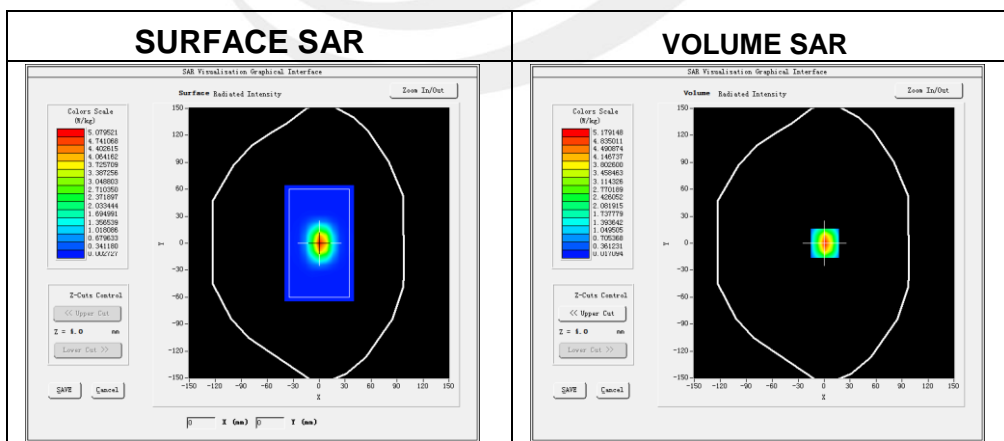
Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	2.360609
SAR 1g (W/Kg)	5.365373

Z Axis Scan
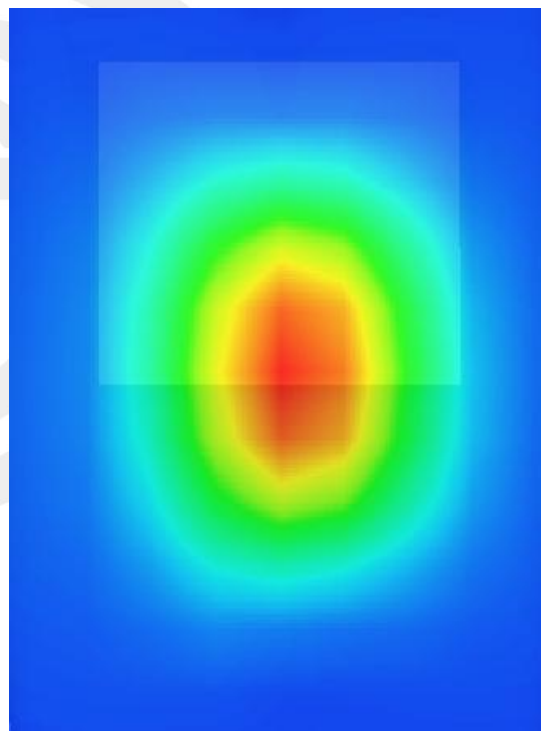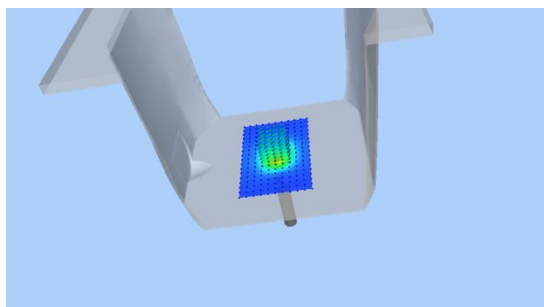
Appendix B. SAR Test Plots

Plot 1: DUT: Modular Smartwatch; EUT Model: BLKS002

Test Date	2017-11-23
Ambient Temperature(°C)	22.80
Liquid Temperature(°C)	22.40
Probe	SN 14/16 EP309
ConvF	5.67
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	Front to mouth
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	39.78
Conductivity (S/m)	1.81
Variation (%)	0.48

Maximum location: X=-23.00, Y=7.00
SAR Peak: 0.57 W/kg

SAR 10g (W/Kg)	0.098061
SAR 1g (W/Kg)	0.278296

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

Shenzhen STS Test Services Co., Ltd.

Plot 2: DUT: Modular Smartwatch; EUT Model: BLKS002

Test Date	2017-11-23
Ambient Temperature(°C)	22.80
Liquid Temperature(°C)	22.40
Probe	SN 14/16 EP309
ConvF	5.67
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	Wrist
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2412
Relative permittivity (real part)	52.47
Conductivity (S/m)	1.97
Variation (%)	1.03

Maximum location: X=12.00, Y=1.00
SAR Peak: 0.72 W/kg

SAR 10g (W/Kg)	0.180083
SAR 1g (W/Kg)	0.391475

SURFACE SAR	VOLUME SAR
3D screen shot	**Z Axis Scan**
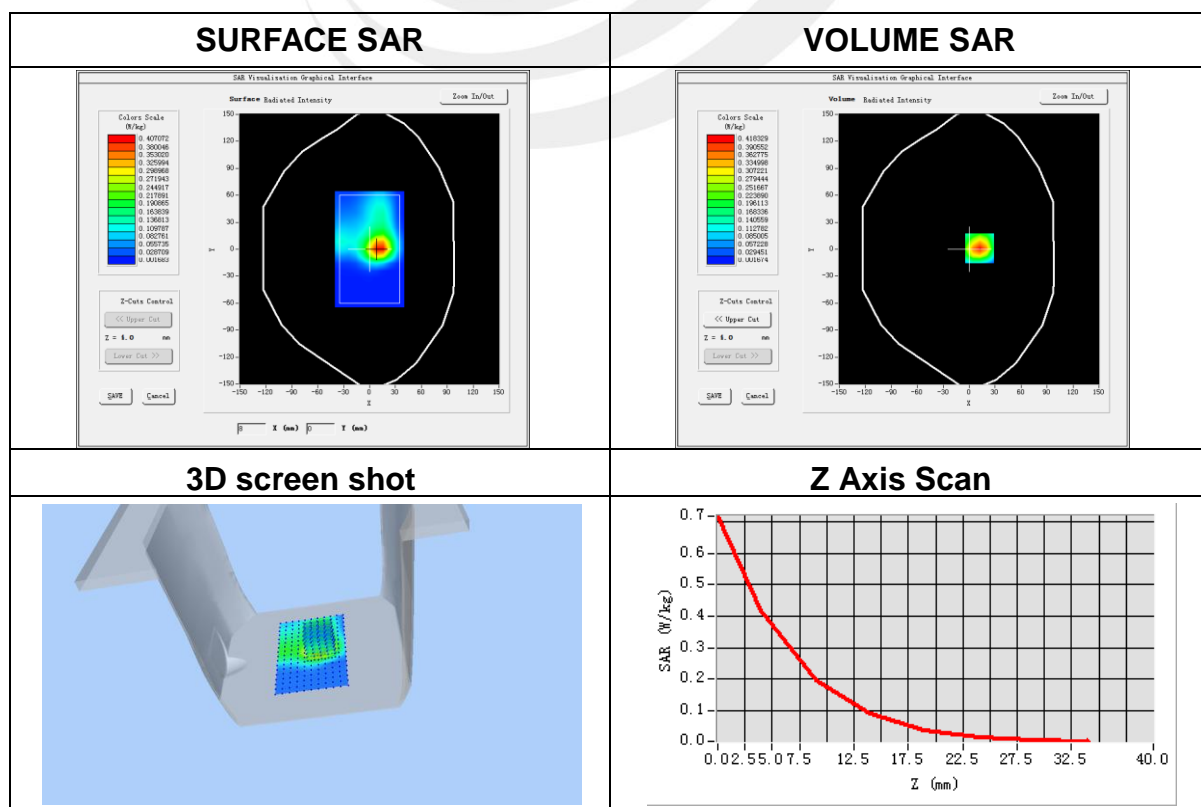
Appendix C. Probe Calibration And Dipole Calibration Report

Refer the appendix Calibration Report.

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※※※※※END OF THE REPORT※※※※※

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