

# SAR Test Report

## For

**Applicant Name:****Shenzhen Videotimes Technology Co., Ltd.****Address:**

Room 2106, Building 11, Tianan Yungu Phase II (Plot of Land 02-08), Gangtou Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China

**EUT Name:**

2.4GHz Digital Wireless Video Baby Monitor

**Brand Name:**

N/A

**Model Number:**

HB6550

**Series Model Number:**

Refer to section 2

## Issued By

**Company Name:****BTF Testing Lab (Shenzhen) Co., Ltd.****Address:**

F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

**Report Number:**

BTF230605R00301

47 CFR Part 2.1093 IEEE1528-2013 IEEE C95.1-2019

**Test Standards:**

KDB 447498 D01 KDB 447498 D04 KDB 865664 D01

KDB 865664 D02 KDB 248227 D01 KDB 648474 D04

KDB 941225 D07 KDB 690783 D01

**FCC ID:**

2AF2R-52RX

**Test Conclusion:**

Pass

**Test Date:**

2023-06-12

**Date of Issue:**

2023-06-12

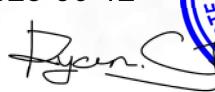
**Prepared By:**

Monica Zhou

Monica Zhou / Project Engineer

**Date:**

2023-06-12

**Approved By:**

Ryan.CJ / EMC Manager

**Date:**

2023-06-12

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Revision History		
Version	Issue Date	Revisions Content
R_V0	2023-06-12	Original
<b>Note:</b>	<i>Once the revision has been made, then previous versions reports are invalid.</i>	

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## 1. Introduction

### 1.1 Identification of Testing Laboratory

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130

### 1.2 Identification of the Responsible Testing Location

Test Location:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Description:	All measurement facilities used to collect the measurement data are located at F101,201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
FCC Registration Number	518915
Designation Number	CN1330

### 1.3 Laboratory Condition

Ambient Temperature:	21°C to 25°C
Ambient Relative Humidity:	48% to 59%
Ambient Pressure:	100 kPa to 102 kPa

### 1.4 Announcement

- (1) The test report reference to the report template version v0.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
- (5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

## 2. Product Information

### 2.1 Application Information

Company Name:	Shenzhen Videotimes Technology Co., Ltd.
Address:	Room 2106, Building 11, Tianan Yungu Phase II (Plot of Land 02-08), Gangtou Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China

### 2.2 Manufacturer Information

Company Name:	Shenzhen Videotimes Technology Co., Ltd.
Address:	Room 2106, Building 11, Tianan Yungu Phase II (Plot of Land 02-08), Gangtou Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China

### 2.3 Factory Information

Company Name:	Shenzhen Videotimes Technology Co., Ltd.
Address:	Room 2106, Building 11, Tianan Yungu Phase II (Plot of Land 02-08), Gangtou Community, Bantian Street, Longgang District, Shenzhen, Guangdong, China

### 2.4 General Description of Equipment under Test (EUT)

EUT Name	2.4GHz Digital Wireless Video Baby Monitor
Under Test Model Name	HB6550
Series Model Name	HB6550-2, HB6250, HB6250-2, HB6350, HB6350-2, VT502, VT502-2, JA2216, JA2216-2, FK5163, FK5163-2, BL9052, BL9052-2, CF6851, CF6851-2
Description of Model name differentiation	Only the model name is different, others are the same.
Sample No.	BTFSN230518E003-1/1

### 2.5 Technical Information

Network and Wireless connectivity	2.4G FHSS
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	2.4G FHSS	
Frequency Range	2.4G FHSS	2412MHz ~ 2469MHz
Antenna Type	2.4G FHSS: Dipole Antenna	
Hotspot Function	Not Support	
Power Reduction	Not Support	

Exposure Category	General Population/Uncontrolled exposure	
EUT Stage	Portable Device	
Product	Type <input type="checkbox"/> Production unit <input checked="" type="checkbox"/> Identical prototype	

### 3. Summary of Test Results

#### 3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1093	Radiofrequency radiation exposure evaluation: portable devices
2	IEEE1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate in the Human Head from Wireless Communications Devices: Measurement Techniques
3	IEEE C95.1-2019	IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
4	KDB 447498 D01	General RF Exposure Guidance v06
5	KDB 447498 D04	Interim General RF Exposure Guidance v01
6	KDB 865664 D01	SAR measurement 100MHz to 6GHz v01r04
7	KDB 865664 D02	RF Exposure Reporting v01r02
8	KDB 248227 D01	802.11 Wi-Fi SAR v02r02
9	KDB 648474 D04	Handset SAR v01r03
10	KDB 941225 D07	UMPC Mini Tablet v01r02
11	KDB 690783 D01	SAR Listings on Grant v01r03

#### 3.2 Device Category and SAR Limit

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

Body Position	SAR Value (W/Kg)	
	General Population/ Uncontrolled Exposure	Occupational/ Controlled Exposure
Whole-Body SAR (averaged over the entire body)	0.08	0.4
Partial-Body SAR (averaged over any 1 gram of tissue)	1.60	8.0
SAR for hands, wrists, feet and ankles (averaged over any 10 grams of tissue)	4.0	20.0

NOTE:

**General Population/Uncontrolled Exposure:** Locations where there is the exposure of individuals who have no knowledge or control of their exposure. General population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

**Occupational/Controlled Exposure:** Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure. In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

### 3.3 Test Result Summary

The maximum results of Specific Absorption Rate (SAR) found during test as bellow:

< Highest Reported standalone SAR Summary>

Frequency Band		Antenna Status	Maximum Reported SAR (W/kg) 1 g	
			UMPC SAR (Separation 0 mm)	
2.4G FHSS	2412.0MHz	Folded	0.226	
		Unfolded	0.359	
Limits (W/kg)			1.6	
Test Verdict			Pass	

This device is in compliance with Specific Absorption Rate(SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC47 CFR part 2(2.1093) and ANSI/IEEE C95.1-2019, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.

## 3.4 Test Uncertainty

### 3.4.1 Measurement uncertainty evaluation for SAR test

#### Measurement uncertainty evaluation for SAR test (300MHz to 6GHz)

Uncertainty Component	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+- %)	10 g Ui (+- %)	Vi eff
<b>Measurement System</b>								
Probe calibration	5.8	N	1	1	1	5.80	5.80	$\infty$
Axial Isotropy	3.5	R	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	1.43	1.43	$\infty$
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	$\sqrt{0.5}$	$\sqrt{0.5}$	2.41	2.41	$\infty$
Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	$\infty$
System detection limits	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Modulation response	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
Readout Electronics	0.5	N	1	1	1	0.50	0.50	$\infty$
Response Time	0	R	$\sqrt{3}$	1	1	0.00	0.00	$\infty$
Integration Time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
RF ambient Conditions - Noise	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
RF ambient Conditions - Reflections	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
Probe positioner Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Probe positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	$\infty$
<b>Test sample Related</b>								
Test sample positioning	2.6	N	1	1	1	2.60	2.60	11
Device Holder Uncertainty	3.0	N	1	1	1	3.00	3.00	7
Output power Variation - SAR drift measurement	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	$\infty$
SAR scaling	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	$\infty$
<b>Phantom and Tissue Parameters</b>								
Phantom Shell Uncertainty - Shape, Thickness and Permittivity	4	R	$\sqrt{3}$	1	1	2.31	2.31	$\infty$
Uncertainty in SAR correction for deviation in permittivity and conductivity	2.0	N	1	1	0.84	2.00	1.68	$\infty$
Liquid conductivity measurement	4.0	N	1	0.78	0.71	3.12	2.84	5
Liquid permittivity measurement	5.0	N	1	0.23	0.26	1.15	1.30	5
Liquid Conductivity - Temperature Uncertainty	2.5	R	$\sqrt{3}$	0.78	0.71	1.13	1.02	$\infty$
Liquid permittivity - Temperature Uncertainty	2.5	R	$\sqrt{3}$	0.23	0.26	0.33	0.38	$\infty$
Combined Standard Uncertainty		RSS				10.47	10.34	
Expanded Uncertainty (95% Confidence interval)		k				20.95	20.69	

\* This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3.4.2 Measurement uncertainty evaluation for system check

Uncertainty Component	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10 g)	1g Ui (+- %)	10 g Ui (+- %)	Vi eff
<b>Measurement System</b>								
Probe calibration	5.8	N	1	1	1	5.80	5.80	$\infty$
Axial Isotropy	3.5	R	$\sqrt{3}$	1	1	2.02	2.02	$\infty$
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	0	0	0.00	0.00	$\infty$
Boundary effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	$\infty$
System detection limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Modulation response	0	N	$\sqrt{3}$	0	0	0.00	0.00	$\infty$
Readout Electronics	0.5	N	1	1	1	0.50	0.50	$\infty$
Response Time	0	R	$\sqrt{3}$	0	0	0.00	0.00	$\infty$
Integration Time	1.4	R	$\sqrt{3}$	0	0	0.00	0.00	$\infty$
RF ambient Conditions - Noise	3	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
RF ambient Conditions - Reflections	3	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
Probe positioner Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Probe positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	$\infty$
<b>Dipole</b>								
Deviation of experimental source from numerical source	5	N	1	1	1	5.00	5.00	$\infty$
Input Power and SAR driftmeasurement	0.5	R	$\sqrt{3}$	1	1	0.29	0.29	$\infty$
Dipole Axis to Liquid Dist.	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	$\infty$
<b>Phantom and Tissue Parameters</b>								
Phantom Shell Uncertainty - Shape,Thickness and Permittivity	4	R	$\sqrt{3}$	1	1	2.31	2.31	$\infty$
Uncertainty in SAR correction for deviation in permittivity and conductivity	2.0	N	1	1	0.84	2.00	1.68	$\infty$
Liquid conductivity measurement	4	N	1	0.78	0.71	3.12	2.84	5
Liquid permittivity measurement	5.0	N	1	0.23	0.26	1.15	1.30	5
Liquid Conductivity - Temperature Uncertainty	2.5	R	$\sqrt{3}$	0.78	0.71	1.13	1.02	$\infty$
Liquid permittivity - Temperature Uncertainty	2.5	R	$\sqrt{3}$	0.23	0.26	0.33	0.38	$\infty$
Combined Standard Uncertainty		RSS				10.16	10.03	
Expanded Uncertainty (95% Confidence interval)		k				20.32	20.06	

## 4. Measurement System

### 4.1 Specific Absorption Rate (SAR) Definition

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

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

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

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

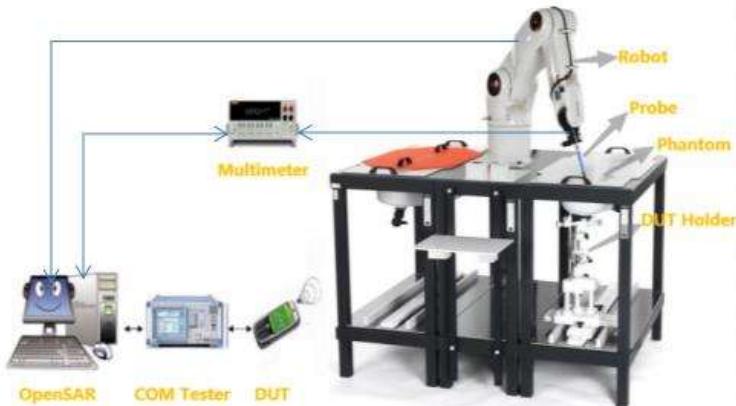
$$\mathbf{SAR} = \frac{\sigma E^2}{\rho}$$

Where:  $\sigma$  is the conductivity of the tissue,

$\rho$  is the mass density of the tissue and  $E$  is the RMS electrical field strength.

### 4.2 MVG SAR System

#### 4.2.1 SAR system diagram



#### 4.2.2 Robot



A standard high precision 6-axis robot (Denso) with teaches pendant with Scanning System

- It must be able to scan all the volume of the phantom to evaluate the tridimensional distribution of SAR.
- Must be able to set the probe orthogonal of the surface of the phantom ( $\pm 30^\circ$ ).
- Detects stresses on the probe and stop itself if necessary to keep the integrity of the probe.

#### 4.2.3 E-Field Probe

For the measurements, the Specific Dosimetric SSE2 E-Field Probe with following specifications is used:

- Dynamic range: 0.01-100 W/kg
- Tip diameter: 2mm for SSE2
- Distance between probe tip and sensor centre: 1mm for SSE2
- Distance between sensor centre and the inner phantom surface: 2mm for  $f \geq 4\text{GHz}$ .
- Probe linearity: <0.25dB.
- Axial Isotropy: <0.25dB.
- Spherical Isotropy: <0.50dB.
- Calibration range: 150 to 6000 MHz for head & body simulating liquid
- Angle between probe axis (evaluation axis) and surface normal line: less than 20°.



#### 4.2.4 Phantoms

##### SAM Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The probe scanning of the E-Field is done in the 2 halves of the normalized head. The normalized shape of the phantom corresponds to the dimensions of 90% of an adult head size. It enables the dosimetric evaluation of left and right-hand phone usage and includes an additional flat phantom part for the simplified body performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.


**SAM Phantom**

The thickness of the phantom amounts to  $2 \text{ mm} \pm 0.2 \text{ mm}$ . The materials for the phantom do not affect the radiation of the device under test (DUT) :  $\epsilon' < 5$ . The head is filled with tissue simulating liquid. The hand do not have to be modeled.

**TWIN SAM phantom**

	Mechanical	Electrical
Overall thickness	$2 \pm 0.2 \text{ mm}$ (except ear area)	Relative permittivity
Dimensions	1000 mm(L) x 500 mm(W) x 200 mm(H)	Loss tangent
Maximum volume		0.02
Material	27 L	
	Fiberglass based	

**ELLIPTICAL Phantom**

The phantom is for Body performance check filled with tissue-equivalent liquid to a depth of at least 150 mm, whose shell material is resistant to damage or reaction with tissue-equivalent liquid chemicals.

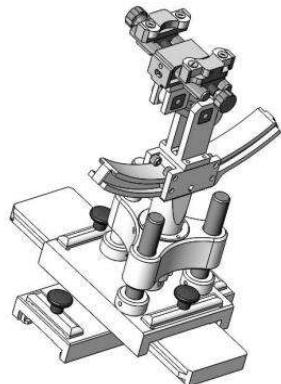

**ELLI Phantom**

The shape of the phantom is an ellipse with length  $600\text{mm} \pm 5\text{mm}$  and width  $400\text{mm} \pm 5\text{mm}$ . The phantom shell is made of low-loss and low-permittivity material, having loss tangent  $\tan\delta \leq 0.05$  and relative permittivity:  $\epsilon' \leq 5$  for  $f \leq 3 \text{ GHz}$   $3 \leq \epsilon' \leq 5$  for  $f > 3 \text{ GHz}$  The thickness of the bottom-wall of the flat phantom is 2.0 mm with a tolerance of  $\pm 0.2 \text{ mm}$ .

**Technical & mechanical characteristics**

Shell thickness	$2 \text{ mm} \pm 0.2 \text{ mm}$
Filling volume	25 L
Dimensions	600 mm x 400 mm x 200mm
Permittivity	4.4
Loss tangent	0.017

#### 4.2.5 Device Holder



System Material	Permittivity	Loss tangent
Delrin	3.7	0.005

(The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1°.)

System Material	Permittivity	Loss tangent
PMMA	2.9	0.028

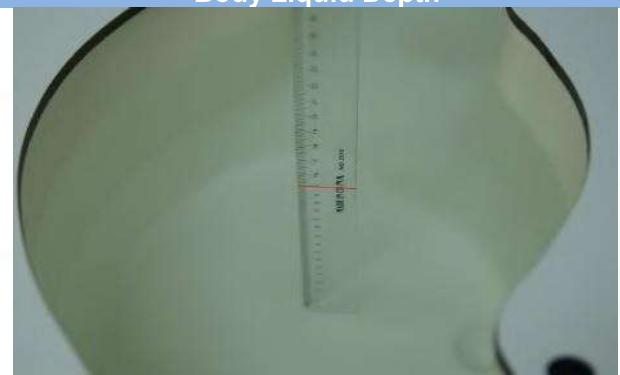
#### 4.2.6 Simulating Liquid

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

Head Liquid Depth



Body Liquid Depth



The following table gives the recipes for tissue simulating liquid and the theoretical Conductivity/Permittivity.

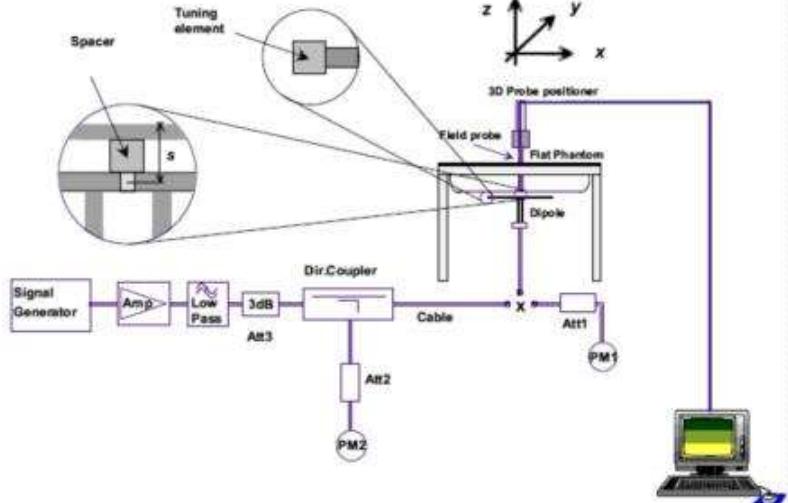
Head (Reference IEEE1528)								
Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity $\sigma$ (S/m)	Permittivity $\epsilon$
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.4	40.0
2450	55.0	0	0	0.1	0	44.9	1.80	39.2
2600	54.9	0	0	0.1	0	45.0	1.96	39.0
Frequency (MHz)	Water (%)	Hexyl Carbitol (%)			Triton X-100 (%)		Conductivity $\sigma$ (S/m)	Permittivity $\epsilon$
5200	62.52	17.24			17.24		4.66	36.0
5800	62.52	17.24			17.24		5.27	35.3
Body (From instrument manufacturer)								
Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity $\sigma$ (S/m)	Permittivity $\epsilon$
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0.1	0	31.3	1.95	52.7
2600	68.2	0	0	0.1	0	31.7	2.16	52.5
Frequency(MHz)	Water	DGBE (%)			Salt (%)		Conductivity $\sigma$ (S/m)	Permittivity $\epsilon$
5200	78.60	21.40			/		5.30	49.00
5800	78.50	21.40			0.1		6.00	48.20

## 5. System Verification

### 5.1 Purpose of System Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. The setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

## 5.2 System Check Setup

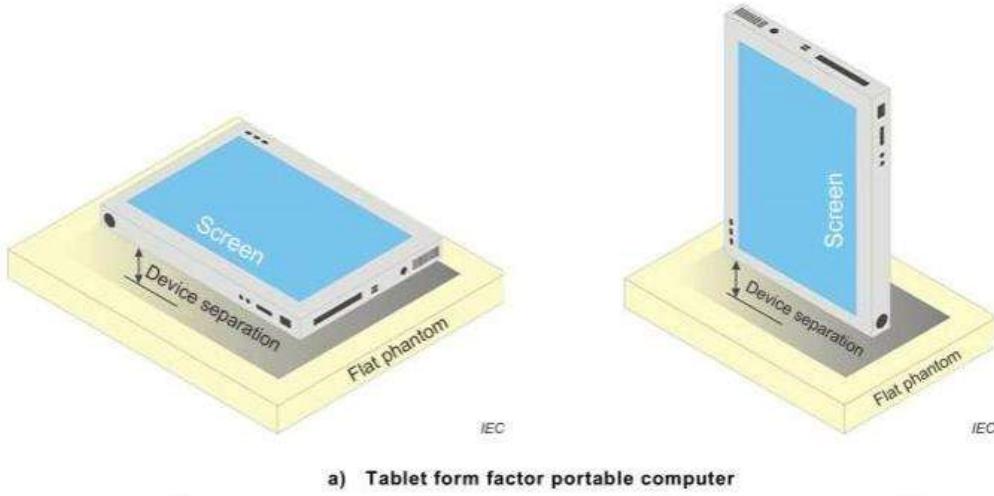


## 6. TEST POSITION CONFIGURATIONS

According to KDB 941225 D07 UMPC Mini Tablet v01r02, small hand-held tablets and devices of similar form factors are tested for SAR compliance in use configurations described in the following subsections.

### 6.1 UMPC test position

The test procedures are applicable to devices with a display and overall diagonal dimension  $\leq 20$  cm (~7.9"). These devices are typically operated like a mini-tablet and are usually designed with certain UMPC features and operating characteristics; therefore, the term "UMPC Mini-Tablet" is used to identify the SAR test requirements for this category of devices. A composite test separation distance of 5 mm is applied to test UMPC mini-tablet transmitters and to maintain RF exposure conservativeness for the interactive operations associated with this type of devices. UMPC mini-tablet devices must be tested for 1-g SAR on all surfaces and side edges with a transmitting antenna located at  $\leq 25$  mm from that surface or edge, at 5 mm separation from a flat phantom, for the data modes, wireless technologies and frequency bands supported by the device to determine SAR compliance. When 1-g SAR is tested at 5 mm, 10-g SAR is not required.



a) Tablet form factor portable computer

## 6.2 Product Specific 10g Exposure Consideration

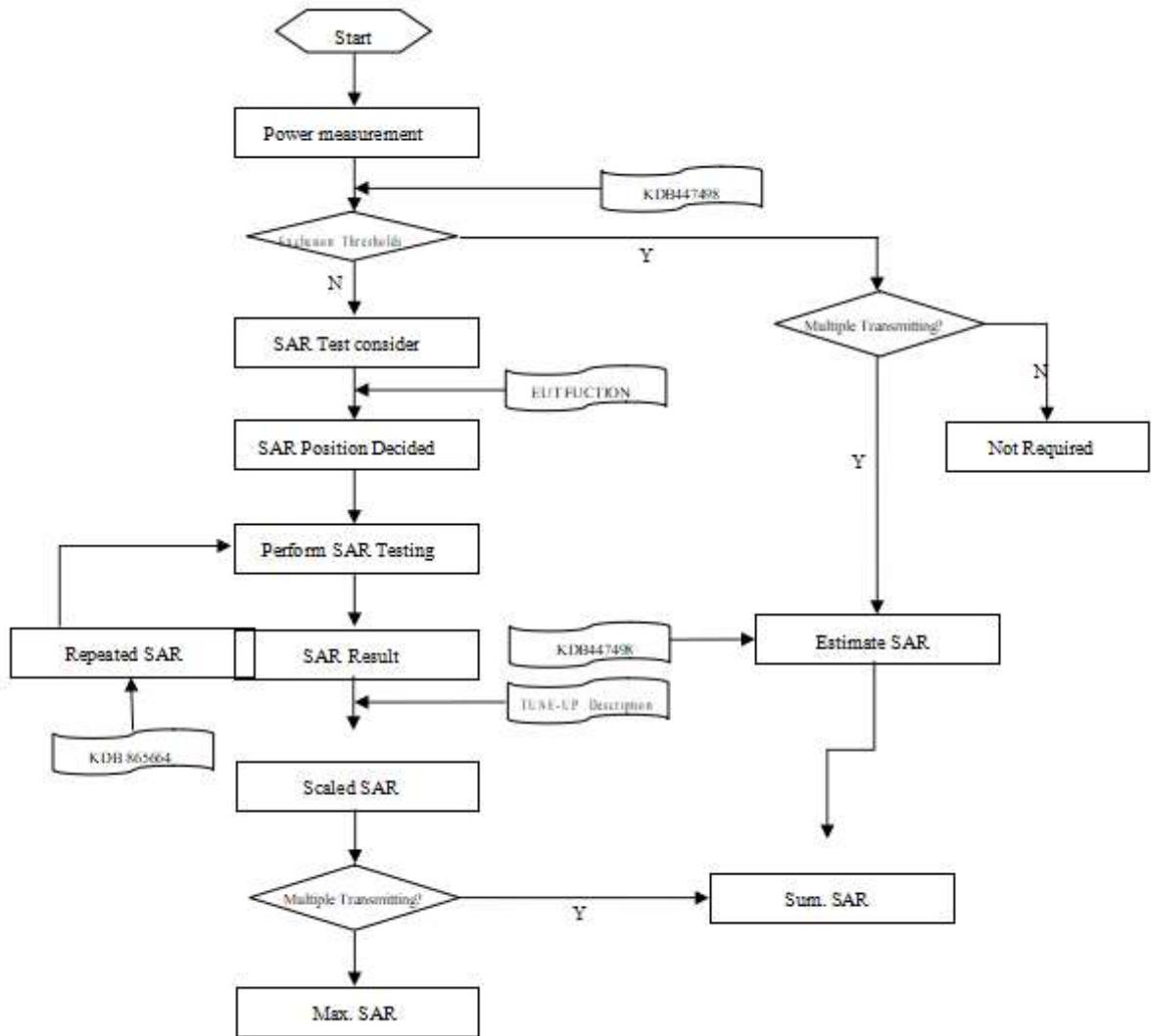
According with FCC KDB 648474 D04, for smart phones with a display diagonal dimension  $> 15.0$  cm or an overall diagonal dimension  $> 16.0$  cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance;

The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at  $\leq 25$  mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR  $> 1.2$  W/kg.

## 7. Measurement Procedure

## 7.1 Measurement Process Diagram

## Body SAR



## 7.2 SAR Scan General Requirement

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1 g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013.

		≤3GHz	>3GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5±1 mm	$\frac{1}{2}\cdot\delta\cdot\ln(2)\pm0.5$ mm	
Maximum probe angle from probe axis to phantom surface normal at the measurement location		30°±1°	20°±1°	
Maximum area scan spatial resolution: $\Delta x$ Area , $\Delta y$ Area		≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3–4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm	
Maximum zoom scan spatial resolution: $\Delta x$ Zoom , $\Delta y$ Zoom		≤ 2 GHz: ≤ 8 mm 2–3 GHz: ≤ 5 mm*	3–4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z$ Zoom (n)  graded grid	≤ 5 mm  ≤ 4 mm	3–4 GHz: ≤ 4 mm 4–5 GHz: ≤ 3 mm 5–6 GHz: ≤ 2 mm	
			3–4 GHz: ≤ 3 mm 4–5 GHz: ≤ 2.5 mm 5–6 GHz: ≤ 2 mm	
Minimum zoom scan volume		≥30 mm	≤ 1.5· $\Delta z$ Zoom (n-1)	
			3–4 GHz: ≥ 28 mm 4–5 GHz: ≥ 25 mm 5–6 GHz: ≥ 22 mm	

Note:

1.  $\delta$  is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528- 2011 for details.
2. \* When zoom scan is required and the reported SAR from the area scan based 1 g SAR estimation procedures of KDB

447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

## 7.3 Measurement Procedure

The following steps are used for each test position

- a. 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
- b. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- c. Measurement of the SAR distribution with a grid of 8 to 16mm \* 8 to 16 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.
- d. 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.

## 7.4 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan 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 D01v01r04 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.

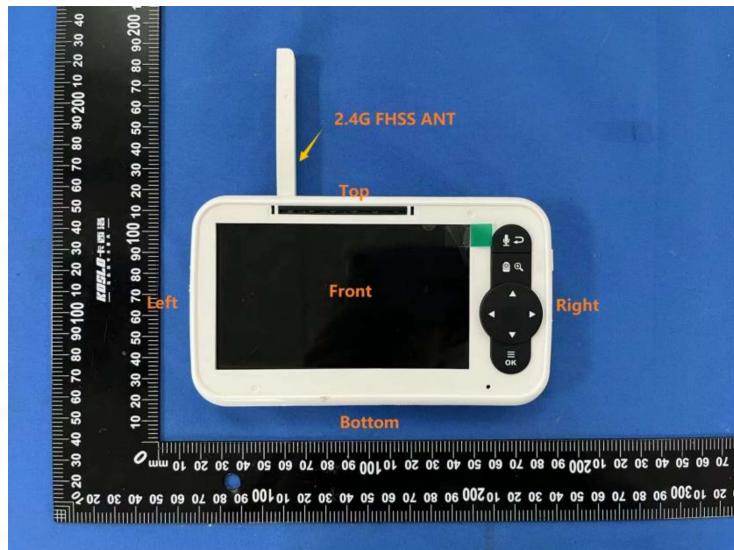
# 8. Conducted RF Output Power

## 2.4G FHSS

Mode	Channel	Frequency(MHz)	Avg. Power(dBm)	Maximum Tune-up(dBm)
GFSK	L	2412	11.89	12.00
	M	2442	10.81	11.00
	H	2469	9.84	10.00

## 9. Test Exclusion Consideration

Antenna information:



2.4G FHSS Antenna	2.4G FHSS TX/RX
Note:	
1. KDB 941225 D07 UMPC Mini Tablet v01r02, UMPC mini-tablet devices must be tested for 1-g SAR on all surfaces and side edges with a transmitting antenna located at $\leq 25$ mm from that surface or edge, at 5 mm separation from a flat phantom, for the data modes, wireless technologies and frequency bands supported by the device to determine SAR compliance.	

Distance of The Antenna to the EUT surface and edge (mm)						
Antenna	Front Side (mm)	Back Side (mm)	Left Edge (mm)	Right Edge (mm)	Top Edge (mm)	Bottom Edge (mm)
Wifi	<25	<25	41	118	<25	93

Positions for SAR tests						
Antenna	Front Side (mm)	Back Side (mm)	Left Edge (mm)	Right Edge (mm)	Top Edge (mm)	Bottom Edge (mm)
Wifi	Yes	Yes	No	No	Yes	No

### 9.1 SAR Test Exclusion Consideration Table

Per KDB 447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following format to determine simultaneous transmission SAR test exclusion:

$(\text{max.power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})} / x]$

W/kg for test separation distances  $\leq 50$  mm;

where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.

0.4 W/Kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is  $> 50$  mm.

## 10. Test Result

With antenna folded													
Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas. SAR (W/kg)	Duty cycle (%)	Duty cycle Factor	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	1g Scaled SAR (W/kg)	Meas. No.
2.4G FHSS GFSK	Front	0	L	2412	-3.000	0.038	100.00	1.000	11.89	12.00	1.026	0.039	/
	Back	0	L	2412	1.360	0.220	100.00	1.000	11.89	12.00	1.026	<b>0.226</b>	1#
	Top	0	L	2412	-3.370	0.055	100.00	1.000	11.89	12.00	1.026	0.056	/
With antenna unfolded													
Mode	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas. SAR (W/kg)	Duty cycle (%)	Duty cycle Factor	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	1g Scaled SAR (W/kg)	Meas. No.
2.4G FHSS GFSK	Front	0	L	2412	-1.960	0.132	100.00	1.000	11.89	12.00	1.026	0.135	/
	Back	0	L	2412	-2.710	0.350	100.00	1.000	11.89	12.00	1.026	<b>0.359</b>	2#
	Top	0	L	2412	-1.470	0.215	100.00	1.000	11.89	12.00	1.026	0.221	/

**Note:**

1. The maximum SAR Value of each test band is marked bold.
2. SAR plot is provided only for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
3. Per KDB 447498 D01 v06, for each exposure position, if the highest output power channel Reported SAR  $\leq 0.8$ W/kg, other channels SAR testing is not necessary.
4. Per KDB 447498 D01 v06, the report SAR is measured SAR value adjusted for maximum tune-up tolerance. Scaling Factor= $10^6 \times [(tune-up limit power(dBm) - Ave. power power (dBm))/10]$ , where tune-up limit is the maximum rated power among all production units.

Reported SAR(W/kg)=Measured SAR (W/kg)\*Scaling Factor.

## 11. SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are  $\leq 1.45$  W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is  $\leq 1.10$ , the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is  $< 0.80$  W/kg, repeated measurement is not required.
2. When the highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
3. If the ratio of largest to smallest SAR for the original and first repeated measurements is  $> 1.20$ , or when the original or repeated measurement is  $\geq 1.45$  W/kg, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ , and the original, first or second repeated measurement is  $\geq 1.5$  W/kg, perform a third repeated measurement.

Note: For 1g SAR, the highest measured 1g SAR is  $0.350 < 0.80$  W/kg, repeated measurement is not required.

## 12. Simultaneous Transmission

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR 1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR 1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR 1g is greater than the SAR limit (SAR 1g 1.6 W/kg), SAR test exclusion is determined by the SAR to Peak Location Ratio (SPLSR).

### 12.1 Simultaneous Transmission Mode Considerations

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. The device only has 1 Tx antenna supporting 2.4G FHSS which can't always transmit simultaneously. So we don't need to consider simultaneous transmission.