REPORT No. : SZ17040265S01

FCC SAR TEST REPORT

APPLICANT	**:**	Shen Zhen Feima Robotics Co.,Ltd
PRODUCT NAME	**:**	DFRONE DRONE REMOTE CONTROL
MODEL NAME	**:**	FM4000
TRADE NAME	**:**	**FEIMA ROBOTICS**
BRAND NAME	**:**	**FEIMA ROBOTICS**
FCC ID	**:**	2AK7UFM4000
STANDARD(S)	**:**	47 CFR 2.1093 IEEE 1528-2013
ISSUE DATE	**:**	2017-08-21

SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.

DIRECTORY

Change History		
Issue	Date	Reason for change
1.0	2017-08-21	First edition

TEST REPORT DECLARATION

Applicant	Shen Zhen Feima Robotics Co.,Ltd		
Applicant Address	Building 16, Zhiheng Wisdomeland Business Park, Nantou Checkpoint Road 2, 518052, Shenzhen, Guangdong		
Manufacturer	Sunwoda Electronic Co., Ltd		
Manufacturer Address	No.2 Yihe Road, Shilong Community, Shiyan Street, Baoan District, Shenzhen City, China		
Product Name	DFRONE DRONE REMOTE CONTROL		
Model Name	FM4000		
Brand Name	FEIMA ROBOTICS		
HW Version	V3		
SW Version	V1.2.9		
Test Standards	47 CFR 2.1093; IEEE 1528-2013;		
Test Date	2017-06-27		
The Highest Reported 1g-SAR(W/kg)	Body-worn	0.379 W/kg	Limit(W/kg): 1.6W/kg

Tested by : Peng Fuwei

Peng Fuwei (Test engineer)

Approved by : Peng Huarui

Peng Huarui (Supervisor)

1.TECHNICAL INFORMATION

Note: the Following data is based on the information by the applicant.

1.1 Identification of Applicant

Company Name:	Shen Zhen Feima Robotics Co.,Ltd
Address:	Building 16, Zhiheng Wisdomeland Business Park, Nantou Checkpoint Road 2, 518052, Shenzhen, Guangdong

1.2 Identification of Manufacturer

Company Name:	Sunwoda Electronic Co., Ltd
Address:	No.2 Yihe Road, Shilong Community, Shiyan Street, Baoan District, Shenzhen City, China

1.3 Equipment Under Test (EUT)

Model Name:	FM4000
Trade Name:	FEIMA ROBOTICS
Brand Name:	FEIMA ROBOTICS
Hardware Version:	V3
Software Version:	V1.2.9
Tx Frequency Bands:	802.11 b/g/n: 2412-2462 MHz;
Uplink Modulations:	Wi-Fi 802.11b: DSSS; Wi-Fi 802.11g: OFDM;
Antenna type:	Glue bar Antenna
Hotspot mode	No support

1.3.1 Photographs of the EUT

Please refer to the External Photos for the Photos of the EUT

1.3.2 Identification of all used EUT

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the Following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
1#	V3	V1.2.9

1.4 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	**IEEE 1528-2013**	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
2	**KDB 447498 D01v06**	General RF Exposure Guidance
3	**KDB 248227 D01v02r02**	SAR Measurement Guidance for IEEE 802.11 Transmitters
4	**KDB 865664 D01v01r04**	SAR Measurement 100 MHz to 6 GHz
5	**KDB 865664 D02v01r02**	SAR Reporting
6	**KDB 941225 D07v01r02**	SAR evaluation procedures for UMPC mini-tablet devices

1.5 Device Category and SAR Limits

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.

2. SPECIFIC ABSORPTION RATE (SAR)

2.1 Introduction

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 Low than the limits for general population/uncontrolled.

2.2 SAR Definition

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:

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

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by,

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

Where C is the specific head capacity, $\delta\mathrm{T}$ is the temperature rise and $\delta\mathrm{t}$ the exposure duration, or related to the electrical field in the tissue by

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

Where σ is the conductivity of the tissue, ρ is the mass density of the tissue and $|\mathrm{E}|$ is the rms electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

3. SAR MEASUREMENT SETUP

3.1 The Measurement System

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 Probe

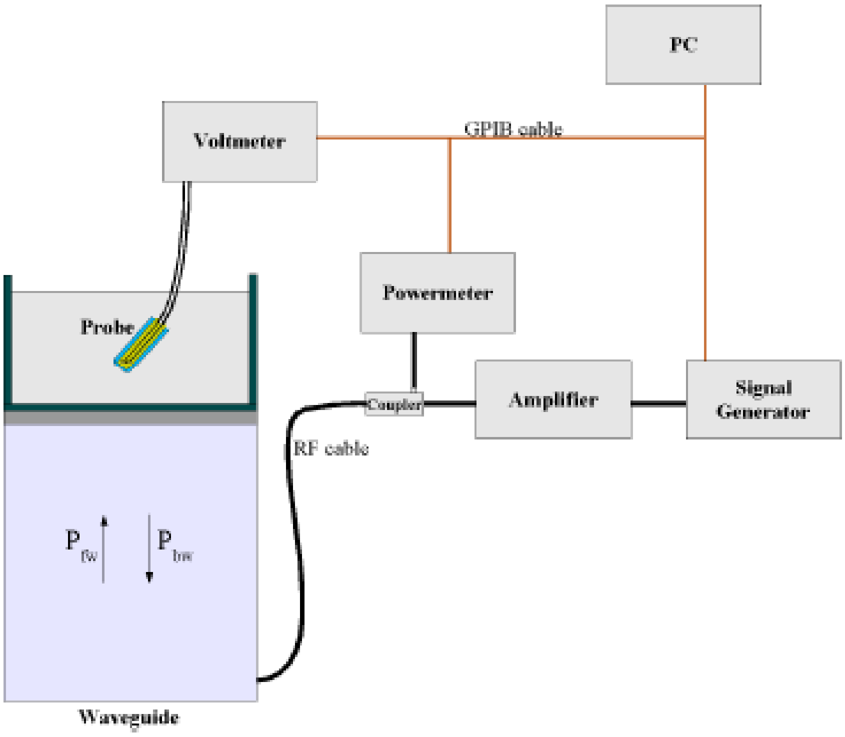
For the measurements the Specific Dosimetric E-Field Probe SN 37/08 EP80 with Following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter: 6.5 mm

- Distance between probe tip and sensor center: 2.5mm
- Distance between sensor center and the inner phantom surface: 4 mm
  (repeatability better than +/- 1mm)
- Probe linearity: <0.25 dB
- Axial Isotropy: <0.25 dB
- Spherical Isotropy: <0.25 dB
- Calibration range: 835to 2500MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and surface normal line: less than 30°

Probe calibration is realized, in compliance with CENELEC EN 62209 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 622091 annex technique using reference guide at the five frequencies.



$$SAR = \frac{4\left(P_{fw} - P_{bw}\right)}{ab\delta}\cos^2\left(\pi\frac{y}{a}\right)e^{(2z/\delta)}$$

Where :

Pfw = Forward Power

Pbw = Backward Power

a and b = Waveguide dimensions

ı = Skin depth

Keithley configuration:

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO
After each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:

$$CF(N)=SAR(N)/Vlin(N) \qquad (N=1,2,3)$$

The linearised output voltage Vlin(N) is obtained from the displayed output voltage V(N) using

$$Vlin(N)=V(N)*(1+V(N)/DCP(N)) \qquad (N=1,2,3)$$

Where DCP is the diode compression point in mV.

3.3 Probe Calibration Process

3.3.1 Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an with CALISAR, Antenna proprietary calibration system.

3.3.2 Free Space Assessment Procedure

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

3.3.3 Temperature Assessment Procedure

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulating head tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Where:

δt = exposure time (30 seconds),

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\delta\mathbf{T}}{\delta\mathbf{t}}\right)$$

C = heat capacity of tissue (brain or muscle),

δT = temperature increase due to RF exposure.

SAR is proportional to ΔT/Δt, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

Where:

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

σ = simulated tissue conductivity,

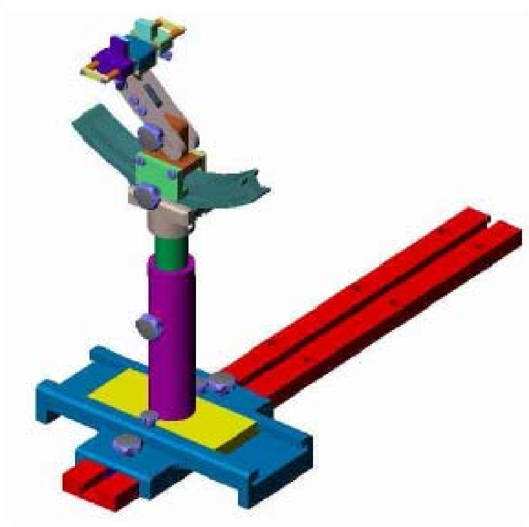
ρ = Tissue density (1.25 g/cm³ for brain tissue)

3.4 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.

3.5 Device Holder

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



Device holder

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

4. TISSUE SIMULATING LIQUIDS

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% are listed in below table.

The following table gives the recipes for tissue simulating liquids

Frequency Band (MHz)	2450
Tissue Type	Body
Ingredients (% by weight)	
Deionised Water	73.20
Salt(NaCl)	0.10
Sugar	0.00
Tween 20	0.00
HEC	0.00
Bactericide	0.00
Triton X-100	0.00
DGBE	26.70
Diethylenglycol monohexylether	0.00
Measured dielectric parameters	
Dielectric Constant	52.70
Conductivity (S/m)	1.95

Note: Please refer to the validation results for dielectric parameters of each frequency band.

FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.com E-mail: service@morlab.cn

The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85033E Dielectric Probe Kit and an Agilent Network Analyzer.

Table 1: Dielectric Performance of Tissue Simulating Liquid

Temperature: 22.0~23.8°C, humidity: 54~60%.						
Date	**Freq.(MHz)**	**Liquid Parameters**	**Meas.**	**Target**	**Delta(%)**	**Limit±(%)**
2017/06/27	Body 2450	Relative Permittivity(ϵr):	52.48	52.70	-0.42	5
		Conductivity(σ):	1.96	1.95	0.51	5

5. UNCERTAINTY ASSESSMENT

The Following table includes the uncertainty table of the IEEE 1528. The values are determined by Antennessa.

5.1 UNCERTAINTY EVALUATION FOR EUT SAR TEST

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	Sec.	Tol (+-%)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	5.83	N	1	1	1	5.83	5.8	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	1	1	1.44	1.4	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	1	1	2.31	2.3	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	4.7	R	$\sqrt{3}$	1	1	2.71	2.7	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Test sample Related									
Test sample positioning	E.4.2.1	0.03	N	1	1	1	0.03	0.03	N-1
Device Holder Uncertainty	E.4.1.	5.00	N	1	1	1	5.00	5.0	N-

	1							0	1
Output power Power drift - SAR drift measurement	6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.3 3	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.0 3	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.1 3	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.1 5	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.0 4	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.0 0	N	1	0.6	0.49	6.00	4.9 0	M
Combined Standard Uncertainty			RSS				11.55	10. 67	
Expanded Uncertainty (95% Confidence interval)			K=2				23.11	21. 33	

5.2 UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK

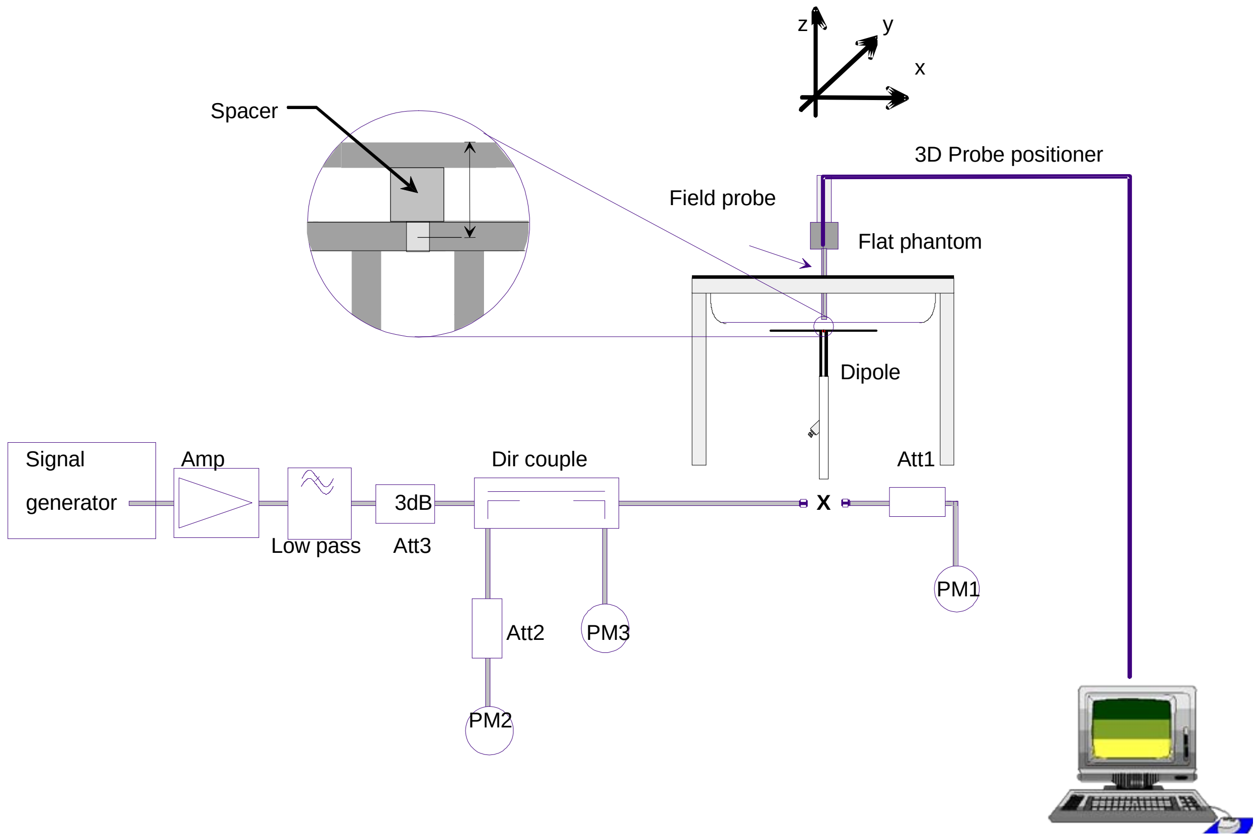
a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/ e	k
Uncertainty Component	Sec.	Tol (+- %)	Prob . Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+- %)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.7	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	1	1	1.44	1.4	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	1	1	2.31	2.3	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.8	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.5	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.0	∞

Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.1	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.7	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	$\sqrt{3}$	1	1	0.58	0.58	∞
Input power and SAR drift measurement	8,6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.33	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	$\sqrt{3}$	0.64	0.43	1.85	1.24	M
Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	$\sqrt{3}$	0.6	0.49	3.46	2.83	M
Combined Standard Uncertainty			RSS				8.81	8.37	
Expanded Uncertainty (95% Confidence interval)			K=2				17.54	16.73	

6. SAR MEASUREMENT EVALUATION

6.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below



The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power at the dipole connector and the power meter PM2 is read at that level.

After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

6.2 Validation Results

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

Frequency	**2450MHz (Body)**
Target value 1W (1g)	50.93 W/Kg
Test value (100 mW input power)	5.086 W/Kg
Normalized to 1W value(1g)	50.86 W/Kg
Deviation (%)	0.13

Note: System checks the specific test data please see Annex C.

7. OPERATIONAL CONDITIONS DURING TEST

7.1 Body-worn Configurations

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration.

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

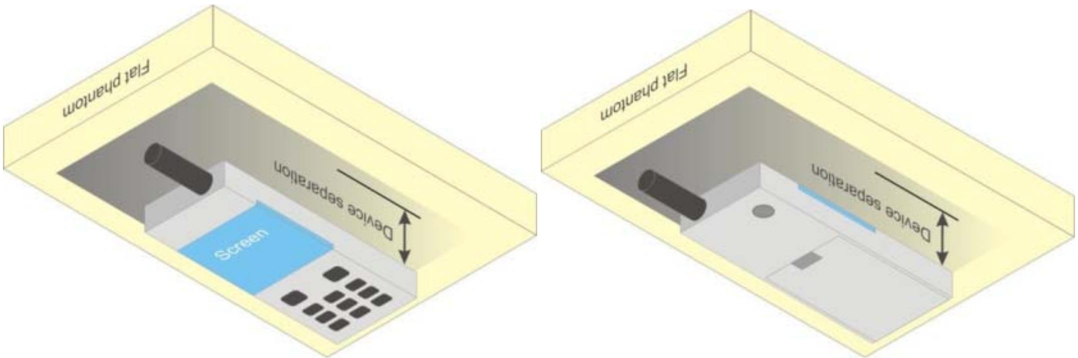


Illustration for Body Worn Position

As per 941225 D07/447498 D01, all sides and edges are subject to be tested, etc. All edges/side with 0cm are tested as the demonstration to hand exposure, and all edges/sides are tested with 10mm as hand exposure.
And the following 2 configuration of antenna are evaluated, and tested to reflect the usage of adjustable external antenna:
1] The antennas in straight mode, parallel with the phantom.
2] The antennas at 90 degrees, perpendicular to the phantom (antenna pointing down and away from the phantom).

7.2 Measurement procedure

The Following steps are used for each test position

1. 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.
2. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.

3. 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.
4. 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.

7.3 Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

8. MEASUREMENT OF CONDUCTED OUTPUT POWER

1. Wi-Fi 2.4GHz Average output power

(Antenna 1)

Band	Channel	Frequency (MHz)	Output Power(dBm)		
			802.11b	802.11g	802.11n20
Wi-Fi	1	2412	14.53	11.60	11.36
	6	2437	15.73	12.42	12.53
	11	2462	16.61	13.14	13.03

(Antenna 2)

Band	Channel	Frequency (MHz)	Output Power(dBm)	
			802.11g	802.11n20
Wi-Fi	1	2412	16.89	16.86
	6	2437	16.84	16.78
	11	2462	17.38	17.32

(Antenna 1+ Antenna 2)

Band	Channel	Frequency (MHz)	Output Power(dBm)	
			802.11g	802.11n20
Wi-Fi	1	2412	18.02	17.94
	6	2437	18.18	18.17
	11	2462	18.77	18.69

9. TEST RESULTS LIST

Summary of Measurement Results (WLAN 2.4GHz 802.11b Band)

(Antenna 1)

Temperature: 21.0~23.8°C, humidity: 54~60%.								
Phantom Configurations	Device Test Positions	Antenna direction	Device Test channel	SAR (W/Kg), 1g	Scaling Factor	Scaling Factor (duty cycle)	Scaled SAR (W/Kg),1g	Plot
Body (10mm Separation)	Back upward	Horizontal to phantom	11	0.357	1.061	1.000	0.379	10#
		Vertical to phantom		0.300			0.318	6#
	Face upward	Horizontal to phantom		0.216			0.229	7#
	Right edge	Horizontal to phantom		0.188			0.199	8#
	Left edge	Horizontal to phantom		0.116			0.123	9#

Summary of Measurement Results (WLAN 2.4GHz 802.11g Band)

(Antenna 2)

Temperature: 21.0~23.8°C, humidity: 54~60%.								
Phantom Configurations	Device Test Positions	Antenna direction	Device Test channel	SAR (W/Kg), 1g	Scaling Factor (power)	Scaling Factor (duty cycle)	Scaled SAR (W/Kg),1g	Plot
Body (10mm Separation)	Back upward	Horizontal to phantom	11	0.324	1.028	1.000	0.333	12#
		Vertical to phantom		0.222			0.228	11#
	Face upward	Horizontal to phantom		0.172			0.177	15#
	Right edge	Horizontal to phantom		0.146			0.150	16#
	Left edge	Horizontal to phantom		0.114			0.117	19#

Summary of Measurement Results (WLAN 2.4GHz 802.11g Band)

(Antenna 1+ Antenna 2)

Temperature: 21.0~23.8°C, humidity: 54~60%.								
Phantom Configurations	Device Test Positions	Antenna direction	Device Test channel	SAR (W/Kg), 1g	Scaling Factor (power)	Scaling Factor (duty cycle)	Scaled SAR (W/Kg), 1g	Plot
Body (10mm Separation)	Back upward	Horizontal to phantom	11	0.290	1.028	1.000	0.298	26#
		Vertical to phantom		0.180			0.185	27#
	Face upward	Horizontal to phantom		0.213			0.219	28#
	Right edge	Horizontal to phantom		0.095			0.098	29#
	Left edge	Horizontal to phantom		0.088			0.090	30#

Limb SAR

Summary of Measurement Results (WLAN 2.4GHz 802.11b Band)

(Antenna 1)

Temperature: 21.0~23.8°C, humidity: 54~60%.								
Phantom Configurations	Device Test Positions	Antenna direction	Device Test channel	SAR (W/Kg), 10g	Scaling Factor	Scaling Factor (duty cycle)	Scaled SAR (W/Kg), 10g	Plot
Body (0mm Separation)	Back upward	Horizontal to phantom	11	0.431	1.061	1.000	0.457	5#
		Vertical to phantom		0.163			0.173	4#
	Face upward	Horizontal to phantom		0.451			0.479	2#
	Right edge	Horizontal to phantom		0.113			0.120	1#
	Left edge	Horizontal to phantom		0.122			0.129	3#

Summary of Measurement Results (WLAN 2.4GHz 802.11g Band)

(Antenna 2)

Temperature: 21.0~23.8°C, humidity: 54~60%.								
Phantom Configurations	Device Test Positions	Antenna direction	Device Test channel	SAR (W/Kg), 10g	Scaling Factor (power)	Scaling Factor (duty cycle)	Scaled SAR (W/Kg), 10g	Plot
Body (0mm Separation)	Back upward	Horizontal to phantom	11	0.353	1.028	1.000	0.363	20#
		Vertical to phantom		0.239			0.246	14#
	Face upward	Horizontal to phantom		0.335			0.344	13#
	Right edge	Horizontal to phantom		0.193			0.198	17#
	Left edge	Horizontal to phantom		0.134			0.138	18#

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Summary of Measurement Results (WLAN 2.4GHz 802.11g Band)

(Antenna 1+ Antenna 2)

Temperature: 21.0~23.8°C, humidity: 54~60%.								
Phantom Configurations	Device Test Positions	Antenna direction	Device Test channel	SAR (W/Kg), 10g	Scaling Factor (power)	Scaling Factor (duty cycle)	Scaled SAR (W/Kg), 10g	Plot
Body (0mm Separation)	Back upward	Horizontal to phantom	11	0.430	1.028	1.000	0.442	23#
		Vertical to phantom		0.254			0.261	24#
	Face upward	Horizontal to phantom		0.212			0.218	25#
	Right edge	Horizontal to phantom		0.161			0.166	22#
	Left edge	Horizontal to phantom		0.111			0.114	21#

Notes:

1. During test, the duty cycle of the EUT was setting to 100%
2. Adjust SAR for OFDM is 0.357*13.14/16.61=0.282W/Kg<1.2, so SAR is not required for OFDM modes.
2. SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
   1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
   2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

3. 2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed.

4. Justification for test configurations for WLAN per KDB Publication 248227 D01DR02-41929 for 2.4 GHz Wi-Fi single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
5. Scaling Factor calculation

Band	Tune-up power tolerance(dBm)	SAR test channel Power (dBm)	Scaling Factor
802.11b (**Antenna 1**)	Max output power =16.5(+0.5 -2)	16.74	1.061
802.11g (**Antenna 2**)	Max output power =17(+0.5 -2)	17.38	1.028
802.11g **(Antenna 1+ Antenna 2)**	Max output power =18.5(+0.5 -2)	18.77	1.054

10. REPEATED SAR MEASUREMENT

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. 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.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only 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 ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

11 ANNEX A PLOTS OF SAR TEST RESULTS

12 ANNEX B GENERAL INFORMATION

13 ANNEX C SYSTEM CHECK DATA

14 ANNEX D SETUP PHOTOS