FCC SAR TEST REPORT

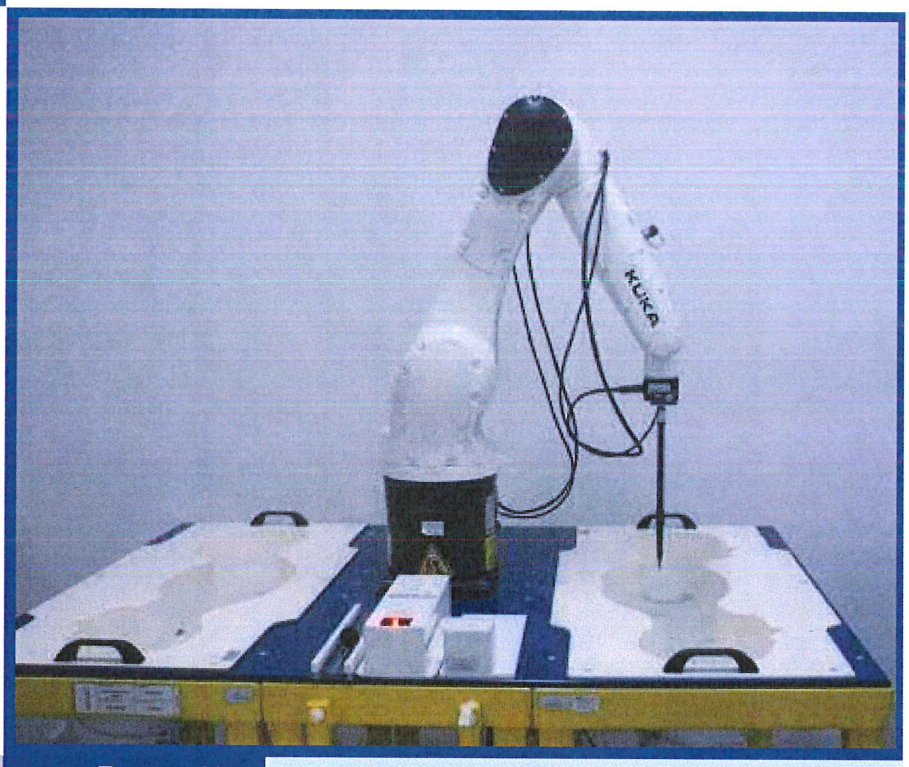
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Personal Ground Station

ISSUED TO
Yuneec Technology Co., Limited

Unit 2301, 23/F, 9 Chong Yip Street, Kwun Tong, Kowloon, Hong Kong.



Report No.:	BL-EC2060327-701
EUT Name:	Personal Ground Station
Model Name:	ST16E
Brand Name:	YUNEEC
FCC ID:	2ACS5-ST16E
Test Standard:	FCC 47 CFR Part 2.1093
	ANSI C95.1: 1999
	IEEE 1528: 2013
Maximum SAR:	Body (1 g): 1.129 W/kg
	Limbs (10 g): 1.271 W/kg
Test Conclusion:	Pass
Test Date:	Jul. 08, 2020 ~ Jul. 09, 2020
Date of Issue:	Jul. 14, 2020

Tested by: Zong Liyao
Date Jul. 14, 2020

Approved by: Wei Yanquan
(Chief Engineer)
Date Jul. 14, 2020

BALUN

NOTE: This test report of test results only related to testing samples, which can be duplicated completely for the legal use with the approval of the applicant; it shall not be reproduced except in full, without the written approval of Shenzhen BALUN Technology Co., Ltd. Any objections should be raised within thirty days from the date of issue. To validate the report, please contact us.

Block B, 1st FL,Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055
TEL: +86-755-66850100, FAX: +86-755-61824271
Email: qc@baluntek.com
www.baluntek.com

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Jul. 14, 2020	Initial Issue

TABLE OF CONTENTS

1 ADMINSTRATIVE DATA (GENERAL INFORMATION) 4
1.1 Identification of the Testing Laboratory 4
1.2 Identification of the Responsible Testing Location 4
1.3 Test Environment Condition 4
1.4 Announce 5
2 PRODUCT INFORMATION 6
2.1 Applicant Information 6
2.2 Manufacturer Information 6
2.3 Factory Information 6
2.4 General Description for Equipment under Test (EUT) 6
2.5 Ancillary Equipment 6
2.6 Technical Information 7
3 SUMMARY OF TEST RESULTS 8
3.1 Test Standards 8
3.2 Device Category and SAR Limit 9
3.3 Test Result Summary 10
3.4 Test Uncertainty 11
4 SAR MEASUREMENT SYSTEM 12
4.1 Definition of Specific Absorption Rate (SAR) 12
4.2 SATIMO SAR System 12
5 SYSTEM VERIFICATION 21
5.1 Antenna Port Test Requirement 21
5.2 Purpose of System Check 21
5.3 System Check Setup 21
6 EUT TEST POSITION CONFIGURATUONS 22
6.1 Body Exposure Condition 22

6.2 Extremity Exposure Condition 22
7 SAR MEASUREMENT PROCEDURES 23
7.1 SAR Measurement Process Diagram 23
7.2 SAR Scan General Requirements 24
7.3 SAR Measurement Procedure 25
7.4 Area & Zoom Scan Procedures 25
8 CONDUCTED RF OUPUT POWER 26
8.1 WIFI 26
9 EUT ANTENNA LOCATION SKETCH 27
9.1 SAR Test Exclusion Consider Table 28
10 TEST RESULTS 30
10.1 2.4GHz OFDM Body SAR 30
10.2 2.4GHz OFDM LIMBS SAR 30
10.3 WIFI 2.4GHz BODY SAR 31
10.4 WIFI 2.4GHz LIMBS SAR 31
10.5 WIFI 5GHz BODY SAR 32
10.6 WIFI 5GHz LIMBS SAR 32
11 SAR Measurement Variability 33
12 SIMULTANEOUS TRANSMISSION 34
12.1 Simultaneous Transmission Mode Consider 34
12.2 Sum SAR of Simultaneous Transmission 34
13 TEST EQUIPMENTS LIST 35
ANNEX A SIMULATING LIQUID VERIFICATION RESULT 36
ANNEX B SYSTEM CHECK RESULT 37
ANNEX C TEST DATA 42
ANNEX D EUT EXTERNAL PHOTOS 48
ANNEX E SAR TEST SETUP PHOTOS 48
ANNEX F CALIBRATION REPORT 48

1 ADMINSTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation (A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Test Environment Condition

Ambient Temperature	20℃ to 23℃
Ambient Relative Humidity	35% to 49%
Ambient Pressure	100 to 102KPa

1.4 Announce

(1) The test report reference to the report template version v2.3.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) 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.

(7) 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 Applicant Information

Applicant	Yuneec Technology Co., Limited
Address	Unit 2301, 23/F, 9 Chong Yip Street, Kwun Tong, Kowloon, Hong Kong.

2.2 Manufacturer Information

Manufacturer	Yuneec International (China) Co., Ltd.
Address	No.388 East Zhengwei Road, Jinxi Town, Kunshan, Jiangsu 215324, China

2.3 Factory Information

Factory	Yuneec International (China) Co., Ltd.
Address	No.388 East Zhengwei Road, Jinxi Town, Kunshan, Jiangsu 215324, China

2.4 General Description for Equipment under Test (EUT)

EUT Name	Personal Ground Station
Model Name Under Test	ST16E
Series Model Name	N/A
Description of Model Name Differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	2.4G WIFI 802.11b, 802.11g, 802.11n 5G WIFI 802.11a 2.4G ISM Band (OFDM modulation), GPS

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	2.4G OFDM, 2.4G WLAN, 5G WLAN	
Frequency Range	2.4G OFDM	2412 ~ 2472 MHz
	802.11b/g/n(HT20)	2412 ~ 2462 MHz
	802.11a	5745 ~ 5825 MHz
Antenna Type	2.4G OFDM: External Antenna 2.4G WLAN: Internal Antenna 5G WLAN: External Antenna	
DTM	N/A	
Hotspot Function	N/A	
Power Reduction	N/A	
Exposure Category	General Population/Uncontrolled exposure	
EUT Stage	Portable Device	
Product	Type	
	☒ Production unit	☐ Identical prototype

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	ANSI/IEEE Std. C95.1-1999	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	IEEE Std. 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
4	FCC KDB 447498 D01 v06	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
5	FCC KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
6	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
7	KDB 248227 D01 v02r02	SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters

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.

Table of Exposure Limits:

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: 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: 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

3.3.1 Highest SAR

Band	Maximum Scaled SAR (W/kg) 1 g	Maximum Report SAR (W/kg) 10 g
	Body	Limbs
2.4G WLAN Antenna A	0.031	0.036
2.4G WLAN Antenna C	0.175	0.122
5G WLAN Antenna D	**1.129**	**1.271**
Limit (W/kg)	1.6	4.0
Verdict	Pass	

3.3.2 Highest Simultaneous SAR

Position	Simultaneous Configuration	Simultaneous SAR (W/kg)	Limit (W/kg)	Verdict
Body	2.4G OFDM TX Antenna A+ WLAN 5.8G TX Antenna D	1.160	1.6	Pass
Limbs	2.4G OFDM TX Antenna A+ WLAN 5.8G TX Antenna D	1.307	4.0	Pass

3.4 Test Uncertainty

According to KDB 865664 D01, When the highest measured 1 g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis is not required in SAR reports submitted for equipment approval.

The maximum 1 g SAR for the EUT in this report is 1.129 W/kg, which is lower than 1.5 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.
The maximum 10 g SAR for the EUT in this report is 1.271 W/kg, which is lower than 3.75 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.

4 SAR MEASUREMENT SYSTEM

4.1 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:

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

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

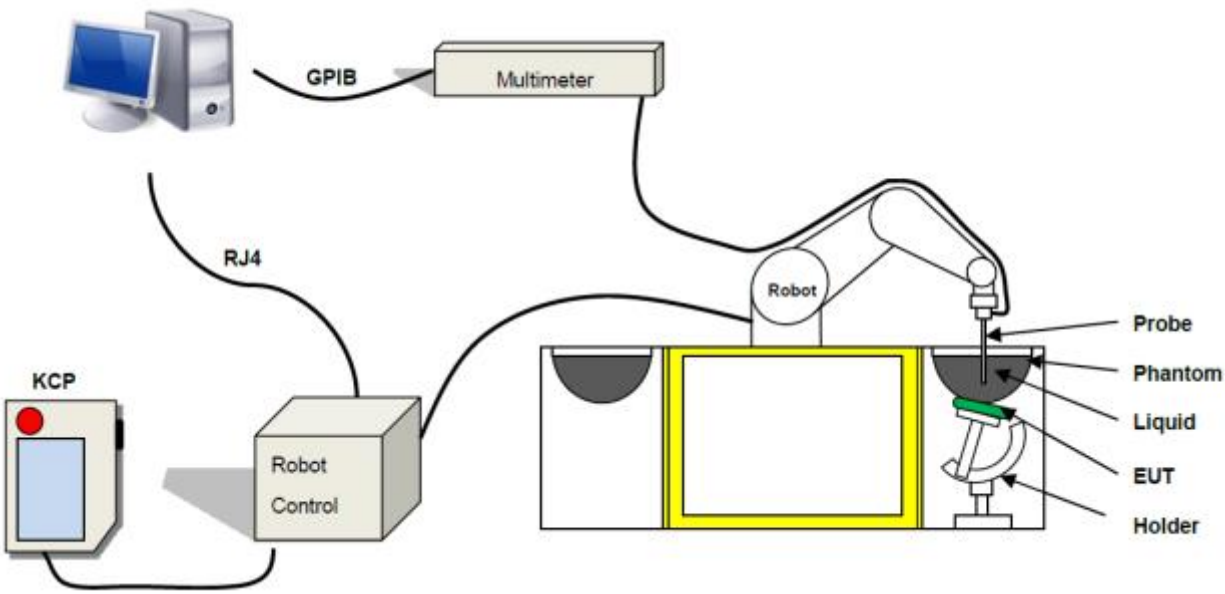
$$\mathbf{SAR} = \frac{\sigma E^2}{\rho}$$

Where: σ is the conductivity of the tissue,

ρ is the mass density of the tissue and E is the RMS electrical field strength.

4.2 SATIMO SAR System

4.2.1 SATIMO SAR System Diagram



These measurements were performed with the automated near-field scanning system OPENSAR from SATIMO. The system is based on a high precision robot (working range: 850 mm), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The SAR measurements were conducted with dosimetric probe (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in SAR standard with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in SAR standard and found to be better than ±0.25 dB. The phantom used was the SAM Phantom as described in FCC supplement C, IEEE P1528.

4.2.2 Robot

The SATIMO SAR system uses the high precision robots from KUKA. For the 6-axis controller system, the robot controller version (KUKA) from KUKA is used. The KUKA robot series have many features that are important for our application:

- High precision (repeatability ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

4.2.3 E-Field Probe

For the measurements the Specific Dosimetric E-Field Probe SN 31 /17 EPGO 321 with following specifications is used

-- Dynamic range: 0.01-100 W/kg

- Tip Diameter : 2.5 mm
- Lower detection limit : 10 mW/kg

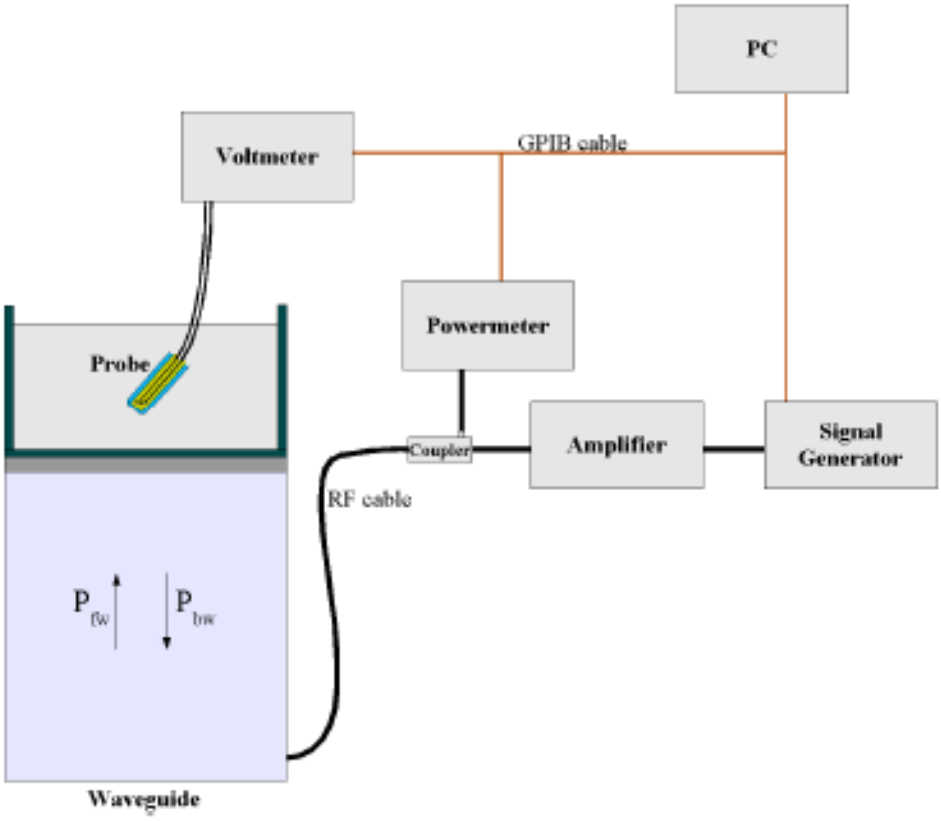
(repeatability better than +/- 1mm)

- Probe linearity: +/- 0.07 dB
- Calibration range: 300 MHz to 6000 MHz for head & body simulating liquid.

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

E-Field Probe Calibration Process

Probe calibration is realized, in compliance with CENELEC EN 62209-1/-2 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the IEC62209-1/2 annexe technique using reference guide at the five frequencies.



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

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) (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)) (N=1,2,3)

Where the DCP is the diode compression point in mV.

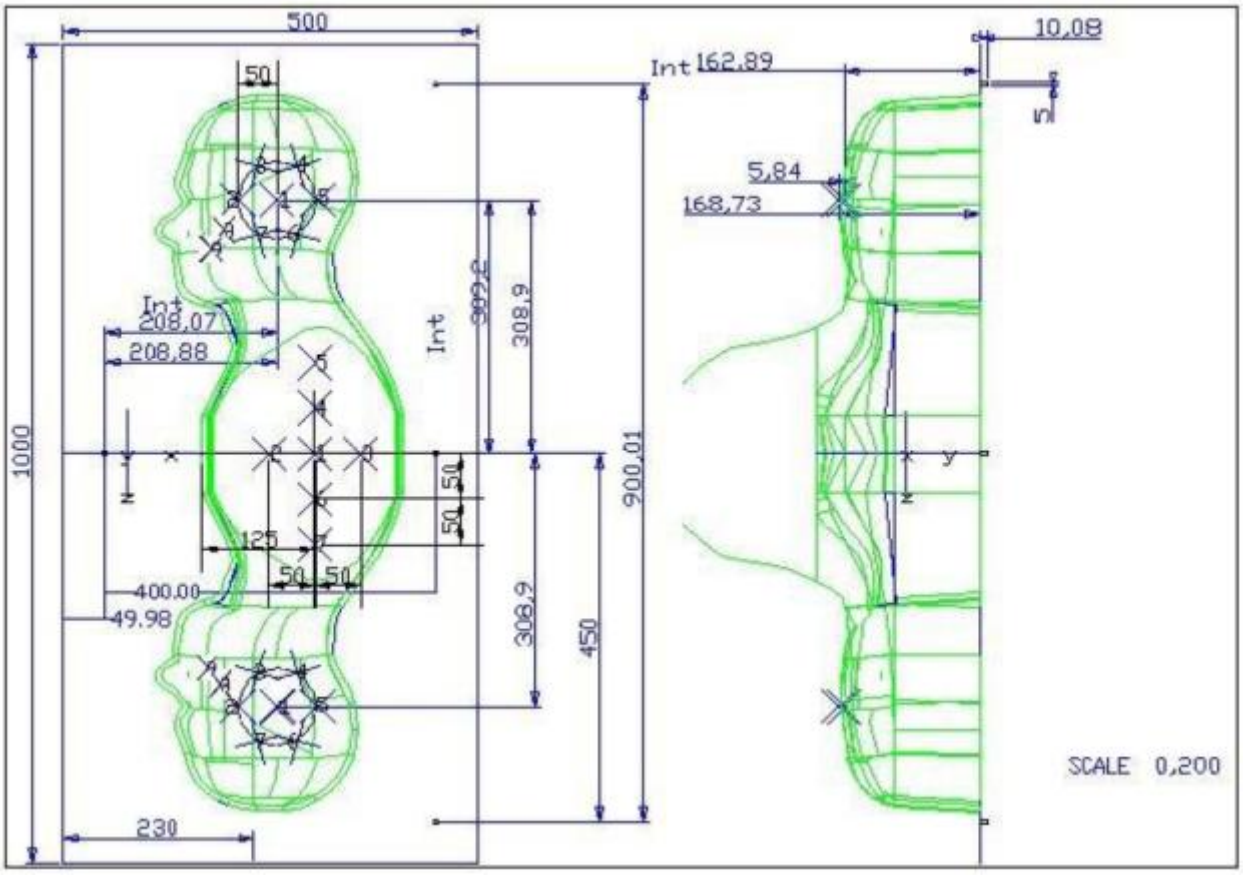
4.2.4 Phantoms

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.

Photo of Phantom SN 30/13 SAM103

Photo of Phantom SN 30/13 SAM104

Serial Number	Positionner Material	Permittivity	Loss Tangent
SN 30/13 SAM103	Gelcoat with fiberglass	3.4	0.02
SN 30/13 SAM104	Gelcoat with fiberglass	3.4	0.02



Serial Number	Left Head		Right Head		Flat Part	
SN 30/13 SAM103	2	2.00	2	2.03	1	2.09
	3	2.02	3	2.05	2	2.10
	4	2.04	4	2.04	3	2.09
	5	2.04	5	2.07	4	2.11
	6	2.02	6	2.07	5	2.11
	7	2.01	7	2.09	6	2.09
	8	2.04	8	2.10	7	2.11
	9	2.02	9	2.09	-	-
SN 30/13 SAM104	2	2.05	2	2.06	1	2.03
	3	2.08	3	2.03	2	2.03
	4	2.05	4	2.03	3	2.01
	5	2.06	5	2.02	4	2.03
	6	2.08	6	2.02	5	2.03
	7	2.06	7	2.04	6	2.00
	8	2.07	8	2.04	7	1.98
	9	2.07	9	2.05	-	-

4.2.5 Device Holder

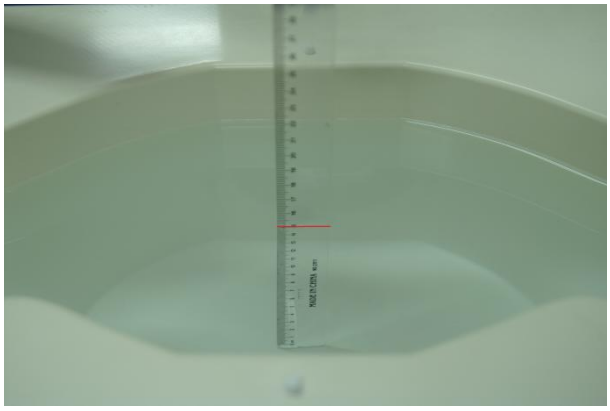
The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for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

Serial Number	Holder Material	Permittivity	Loss Tangent
SN 25/13 MSH87	Deirin	3.7	0.005
SN 25/13 MSH88	Deirin	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°.

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 σ (S/m)	Permittivity ε
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 σ (S/m)	Permittivity ε
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 σ (S/m)	Permittivity ε
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 σ (S/m)	Permittivity ε
5200	78.60	21.40	/	5.54	47.86
5800	78.50	21.40	0.1	6.0	48.20

5 SYSTEM VERIFICATION

5.1 Antenna Port Test Requirement

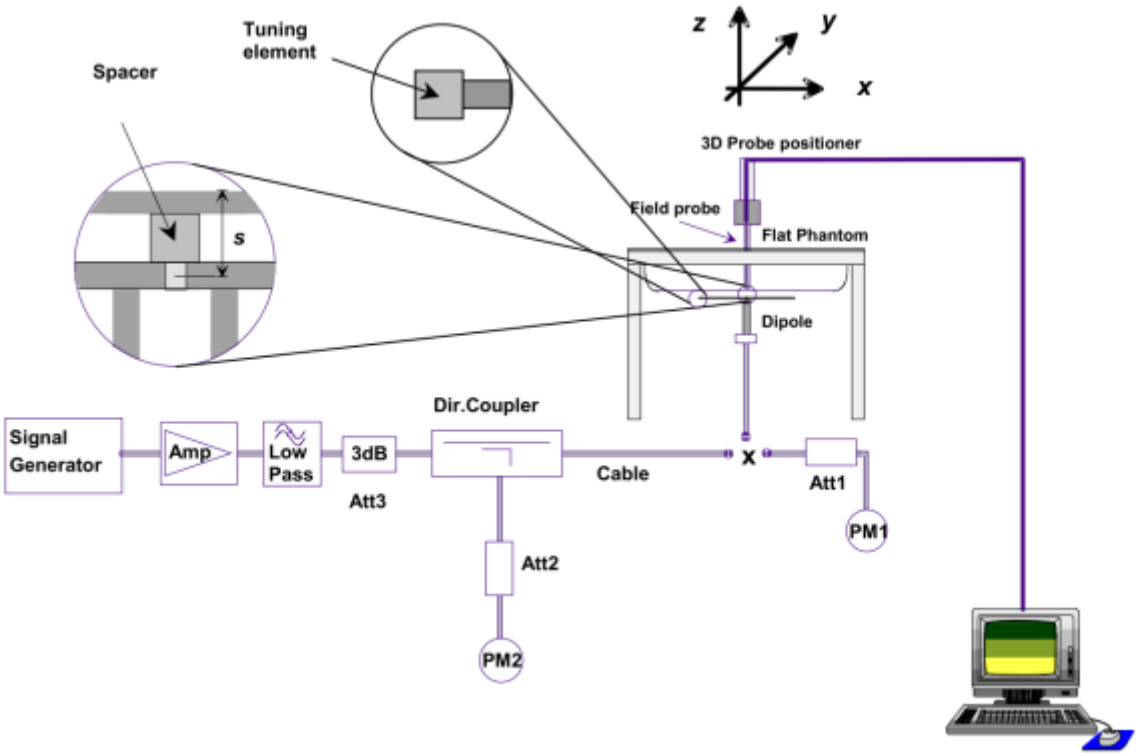
The SATIMO SAR system is equipped with one or more system validation kits. These units together with the predefined measurement procedures within the SATIMO software enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

5.2 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. This 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.

5.3 System Check Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that 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 equipment setup is shown below:



6 EUT TEST POSITION CONFIGURATUONS

6.1 Body Exposure Condition

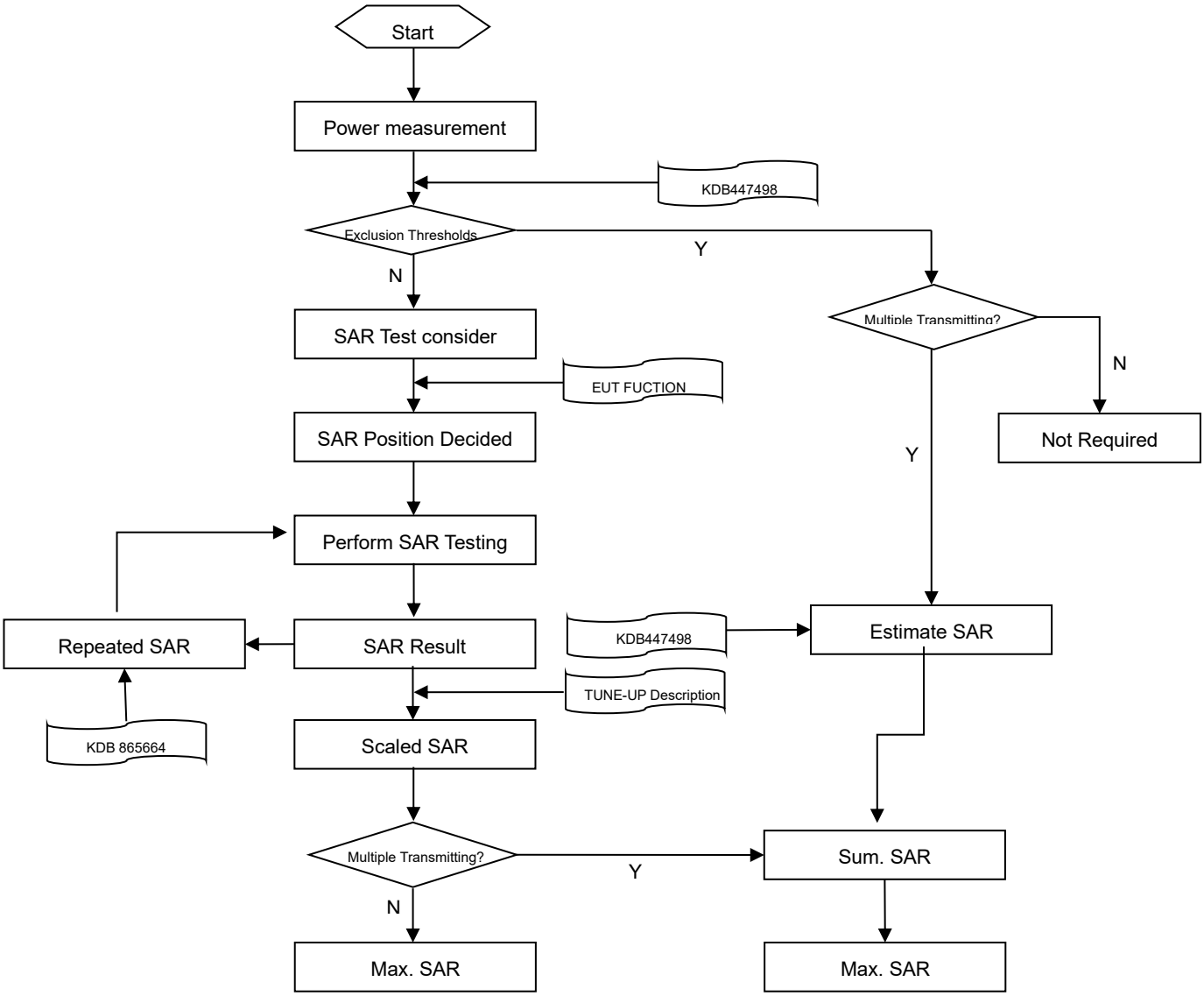
For Close to Body mode(1g Body SAR) the EUT is set 10mm away from the phantom, the test distance is 10mm.

6.2 Extremity Exposure Condition

For Hand-held mode (10g Extremity SAR) the EUT (Equipment Under Test) is set directly against the phantom, the test distance is 0mm.

7 SAR MEASUREMENT PROCEDURES

7.1 SAR Measurement Process Diagram



7.2 SAR Scan General Requirements

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.

<table>
<tr><th colspan="3"></th><th>≤3GHz</th><th>>3GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5±1 mm</td><td>½·δ·ln(2)±0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30°±1°</td><td>20°±1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx Area , Δy Area</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3–4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ⩽ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx Zoom , Δy Zoom</td><td>≤ 2 GHz: ≤ 8 mm
2 –3 GHz: ≤ 5 mm*</td><td>3–4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="6">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2" rowspan="3">uniform grid: Δz Zoom (n)</td><td rowspan="3">≤ 5 mm</td><td>3–4 GHz: ≤ 4 mm</td></tr>
<tr><td>4–5 GHz: ≤ 3 mm</td></tr>
<tr><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td rowspan="2">Δz Zoom (1): between 1st two points closest to phantom surface</td><td rowspan="2">≤ 4 mm</td><td>3–4 GHz: ≤ 3 mm</td></tr>
<tr><td>4–5 GHz: ≤ 2.5 mm
5–6 GHz: ≤ 2 mm</td></tr>
<tr><td></td><td>Δz Zoom (n>1): between subsequent points</td><td colspan="2">≤ 1.5·Δz Zoom (n-1)</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td rowspan="3">≥30 mm</td><td>3–4 GHz: ≥ 28 mm</td></tr>
<tr><td colspan="2"></td><td>4–5 GHz: ≥ 25 mm</td></tr>
<tr><td colspan="2"></td><td>5–6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note:
1. δ 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.</td></tr>
</table>

7.3 SAR Measurement Procedure

The following steps are used for each test position

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

7.4 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01 quoted below.

When the 1-g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

8 CONDUCTED RF OUPUT POWER

8.1 WIFI

8.1.1 2.4G OFDM Antenna A

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Power (dBm)	SAR Test Require.
2.4 (2.412~2.472)	OFDM	Low	2412	**18.98**	19.50	Yes
		Middle	2442	18.09	19.50	Yes
		High	2472	18.10	19.50	Yes

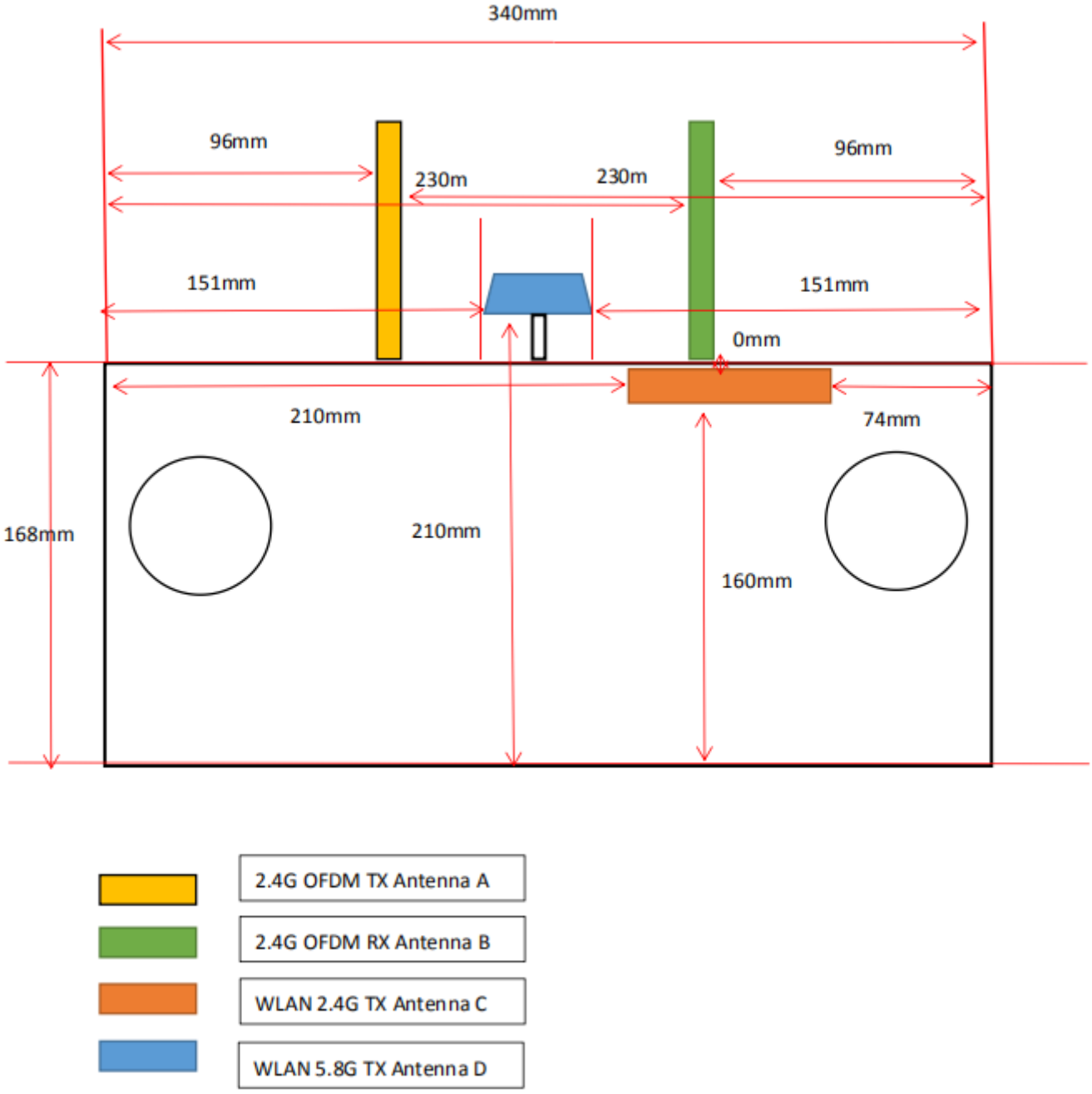
8.1.2 2.4G WIFI Antenna C

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Power (dBm)	SAR Test Require.
2.4 (2.412~2.462)	802.11b	1	2412	7.01	8.00	Yes
		6	2437	7.36	8.00	Yes
		11	2462	**7.45**	8.00	Yes
	802.11g	1	2412	7.09	8.00	No
		6	2437	7.03	8.00	No
		11	2462	7.44	8.00	No
	802.11n(HT20)	1	2412	7.01	8.00	No
		6	2437	7.78	8.00	No
		11	2462	7.39	8.00	No

8.1.3 5G WIFI Antenna D

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Tune-up Power (dBm)	SAR Test Require.
5.8 (5.745~5.825)	802.11a	149	5745	**17.53**	18.00	Yes
		157	5785	17.48	18.00	Yes
		165	5825	17.39	18.00	Yes

9 EUT ANTENNA LOCATION SKETCH



9.1 SAR Test Exclusion Consider Table

According with FCC KDB 447498 D01, Appendix A, <SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm> Table, this Device SAR test configurations consider as following :

Antenna A

Band	Mode	Max. Peak Power		Test Position Configurations					
		dBm	mW	Front Side	Back Side	Left Edge	Right Edge	Top Edge	Bottom Edge
2.4G OFDM	Distance to User			<5mm	<5mm	96mm	230mm	<5mm	168mm
	OFDM	9.50	8.91	Yes	Yes	No	No	Yes	No

Antenna C

Band	Mode	Max. Peak Power		Test Position Configurations					
		dBm	mW	Front Side	Back Side	Left Edge	Right Edge	Top Edge	Bottom Edge
2.4G WLAN	Distance to User			<5mm	<5mm	210mm	74mm	<5mm	160mm
	802.11b	8.00	6.31	Yes	Yes	No	No	Yes	No

Antenna D

Band	Mode	Max. Peak Power		Test Position Configurations					
		dBm	mW	Front Side	Back Side	Left Edge	Right Edge	Top Edge	Bottom Edge
5G WLAN	Distance to User			<5mm	<5mm	151mm	151mm	<5mm	168mm
	802.11a	18.00	63.10	Yes	Yes	No	No	Yes	No

Note:

1. Maximum power is the source-based time-average power and represents the maximum RF output power among production units.
2. Per KDB 447498 D01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. Per KDB 447498 D01, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
4. Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation 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
   a. f(GHz) is the RF channel transmit frequency in GHz
   b. Power and distance are rounded to the nearest mW and mm before calculation
   c. The result is rounded to one decimal place for comparison
   d. For < 50 mm distance, we just calculate mW of the exclusion threshold value (3.0) to do compare.

   This formula is [3.0] / [√f(GHz)] ·[(min. test separation distance, mm)] = exclusion threshold of mW.
5. Per KDB 447498 D01, at 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:
   a. [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b. [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz
6. Per KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions.
   a. 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.

b. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel.

7. Per KDB 248227 D01 SAR is not required for the following 2.4 GHz OFDM conditions.

   a. When KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.

   b. 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.

8. Per KDB 248227 D01 5G WLAN Subsequent Test Configuration Procedures

   SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units.

   a. When SAR test exclusion provisions of KDB Publication 447498 D01 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.

   b. When the highest reported SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

10 TEST RESULTS

10.12.4GHz OFDM Body SAR

Mode	Antenna	Antenna Status	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	1g Scaled SAR (W/kg)	Meas. No.
Body (10mm)													
OFDM	A	Horizontal	Front Side	10	Low	2412	-1.25	0.005	18.98	19.50	1.127	0.006	/
			Back Side	10	Low	2412	3.40	0.003	18.98	19.50	1.127	0.003	/
			Top Edge	10	Low	2412	-1.29	0.023	18.98	19.50	1.127	0.026	/
				10	Middle	2442	0.28	0.021	18.09	19.50	1.384	0.029	/
				10	High	2472	-2.63	0.022	18.10	19.50	1.380	**0.031**	1#
OFDM	A	Vertical	Front Side	10	Low	2412	1.87	0.021	18.98	19.50	1.127	0.023	/
			Back Side	10	Low	2412	-2.39	0.020	18.98	19.50	1.127	0.022	/
			Top Edge	10	Low	2412	-2.56	0.005	18.98	19.50	1.127	0.006	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

10.22.4GHz OFDM LIMBS SAR

Mode	Antenna	Antenna Status	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	10g Scaled SAR (W/kg)	Meas. No.
Limbs (0mm)													
OFDM	A	Horizontal	Front Side	0	Low	2412	3.22	0.005	18.98	19.50	1.127	0.006	/
			Back Side	0	Low	2412	0.80	0.003	18.98	19.50	1.127	0.003	/
			Top Edge	0	Low	2412	0.28	0.032	18.98	19.50	1.127	**0.036**	2#
				0	Middle	2442	-0.08	0.025	18.09	19.50	1.384	0.034	/
				0	High	2472	-2.71	0.023	18.10	19.50	1.380	0.032	/
OFDM	A	Vertical	Front Side	0	Low	2412	-0.40	0.028	18.98	19.50	1.127	0.031	/
			Back Side	0	Low	2412	0.05	0.027	18.98	19.50	1.127	0.030	/
			Top Edge	0	Low	2412	-1.82	0.002	18.98	19.50	1.127	0.002	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.													

10.3WIFI 2.4GHz BODY SAR

Mode	Antenna	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle Setting	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body (10mm)														
802.11b	C	Front Side	10	11	2437	-4.42	0.130	7.45	8.00	1.135	100.0	1.000	0.148	/
			10	1	2412	-4.00	0.139	7.01	8.00	1.256	100.0	1.000	**0.175**	3#
			10	6	2437	4.01	0.141	7.36	8.00	1.159	100.0	1.000	0.163	/
		Back Side	10	11	2462	3.39	0.018	7.45	8.00	1.135	100.0	1.000	0.020	/
		Top Edge	10	11	2462	-1.91	0.013	7.45	8.00	1.135	100.0	1.000	0.015	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.														

10.4WIFI 2.4GHz LIMBS SAR

Mode	Antenna	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle Setting	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Limbs (0mm)														
802.11b	C	Front Side	0	11	2437	-2.12	0.092	7.33	8.00	1.167	100.0	1.000	0.107	/
			0	1	2412	2.32	0.096	6.95	8.00	1.274	100.0	1.000	**0.122**	4#
			0	6	2437	-2.28	0.103	7.29	8.00	1.178	100.0	1.000	0.121	/
		Back Side	0	11	2462	1.74	0.018	7.33	8.00	1.167	100.0	1.000	0.021	/
		Top Edge	0	11	2462	4.61	0.013	7.33	8.00	1.167	100.0	1.000	0.015	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.														

10.5 WIFI 5GHz BODY SAR

Mode	Antenna	Antenna Status	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle Setting	Duty cycle Factor	1g Scaled SAR (W/kg)	Meas. No.
Body (10mm)															
802.11a	D	Horizontal	Front Side	10	149	5745	-2.46	0.449	17.53	19.00	1.403	100.0	1.000	0.630	/
			Back Side	10	149	5745	4.52	0.121	17.53	19.00	1.403	100.0	1.000	0.170	/
			Top Edge	10	149	5745	3.88	0.303	17.53	19.00	1.403	100.0	1.000	0.425	/
802.11a	D	Vertical	Front Side	10	149	5745	-1.26	0.805	17.53	19.00	1.403	100.0	1.000	**1.129**	5#
				10	157	5785	-4.22	0.784	17.48	19.00	1.419	100.0	1.000	1.113	/
				10	165	5825	0.06	0.767	17.39	19.00	1.449	100.0	1.000	1.111	/
			Back Side	10	149	5745	-4.36	0.573	17.53	19.00	1.403	100.0	1.000	0.804	/
			Top Edge	10	149	5745	-0.09	0.430	17.53	19.00	1.403	100.0	1.000	0.603	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.															

10.6 WIFI 5GHz LIMBS SAR

Mode	Antenna	Antenna Status	Position	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	10g Meas SAR (W/kg)	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	Duty cycle Setting	Duty cycle Factor	10g Scaled SAR (W/kg)	Meas. No.
Limbs (0mm)															
802.11a	D	Horizontal	Front Side	0	149	5745	-3.51	0.528	17.53	19.00	1.403	100.0	1.000	0.741	/
			Back Side	0	149	5745	0.75	0.169	17.53	19.00	1.403	100.0	1.000	0.237	/
			Top Edge	0	149	5745	4.56	0.475	17.53	19.00	1.403	100.0	1.000	0.666	/
802.11a	D	Vertical	Front Side	0	149	5745	-1.44	0.906	17.53	19.00	1.403	100.0	1.000	**1.271**	6#
				0	157	5785	-2.72	0.857	17.48	19.00	1.419	100.0	1.000	1.216	/
				0	165	5825	-3.19	0.848	17.39	19.00	1.449	100.0	1.000	1.229	/
			Back Side	0	149	5745	0.35	0.524	17.53	19.00	1.403	100.0	1.000	0.735	/
			Top Edge	0	149	5745	-4.50	0.471	17.53	19.00	1.403	100.0	1.000	0.661	/
Note: Refer to ANNEX C for the detailed test data for each test configuration.															

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 ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 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 >= 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 >= 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 >= 1.5 W/kg, perform a third repeated measurement.

Frequency Band (MHz)	Wireless Band	RF Exposure Conditions	Antenna Status	Test Position	Highest Measured SAR (W/kg)	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Largest to Smallest SAR Radio
5745	802.11a	Body	Vertical	Front Side	0.805	Yes	0.775	1.04
Note: The ratio of largest to smallest SAR for the original and first repeated measurements is < 1.20, the second repeated measurement is not required.								

Note: The highest measurement 10g Limbs SAR is 0.960W/Kg, which is lower than 2.0W/Kg, so the repeated SAR for Limbs exposure conduction is not required.

12 SIMULTANEOUS TRANSMISSION

12.1 Simultaneous Transmission Mode Consider

No.	Simultaneous Tx Combination	Body	Limbs
1	2.4G OFDM TX Antenna A+WLAN 2.4G TX Antenna C	Yes	Yes
2	2.4G OFDM TX Antenna A+WLAN 5.8G TX Antenna D	Yes	Yes

12.2 Sum SAR of Simultaneous Transmission

12.2.1 Sum Body SAR of Simultaneous Transmission

Simultaneous Mode	Mode	Max. 1g SAR (W/kg)	1g Sum SAR (W/kg)	Limit 1g(W/Kg)	SPLSR (Yes/No)
2.4G OFDM TX Antenna A+ WLAN 2.4G TX Antenna C	2.4G OFDM TX Antenna A	0.031	0.206	1.6	No
	WLAN 2.4G TX Antenna C	0.175			
2.4G OFDM TX Antenna A+ WLAN 5.8G TX Antenna D	2.4G OFDM TX Antenna A	0.031	**1.160**	1.6	No
	WLAN 5.8G TX Antenna D	1.129			

12.2.2 Sum Limbs mode SAR of Simultaneous Transmission

Simultaneous Mode	Mode	Max. 10g SAR (W/kg)	10g Sum SAR (W/kg)	Limit 10g(W/Kg)	SPLSR (Yes/No)
2.4G OFDM TX Antenna A+ WLAN 2.4G TX Antenna C	2.4G OFDM TX Antenna A	0.036	0.158	4.0	No
	WLAN 2.4G TX Antenna C	0.122			
2.4G OFDM TX Antenna A+ WLAN 5.8G TX Antenna D	2.4G OFDM TX Antenna A	0.036	**1.307**	4.0	No
	WLAN 5.8G TX Antenna D	1.271			

13 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No./Version	Cal. Date	Cal. Due
Test Software	SATIMO	OpenSAR	V4_02_31	N/A	N/A
2450MHz Dipole	SATIMO	SID 2450	S/N 11/17 DIP 2G450-452	2019/03/20	2021/03/19
Waveguide	SATIMO	SWG5500	S/N 49/16 DIP WGA42	2019/03/20	2021/03/19
E-Field Probe	MVG	SSE2	S/N 34/15 EPGO 321	2020/01/13	2021/01/12
MultiMeter	Keithley	MultiMeter 2000	4024022	2020/06/11	2021/06/10
Signal Generator	R&S	SMB100A	177746	2020/06/08	2021/06/07
Power Meter	R&S	NRVD-B2	7250BJ-0112/2011	2019/10/30	2020/10/29
Power Sensor	R&S	NRV-Z4	100381	2019/10/30	2020/10/29
Power Sensor	R&S	NRV-Z2	100211	2019/10/30	2020/10/29
Network Analyzer	R&S	ZVL-6	101380	2020/06/22	2021/06/21
Thermometer	Elitech	RC-4HC	N/A	2019/11/02	2020/11/01
Power Amplifier	SATIMO	6552B	22374	N/A	N/A
Dielectric Probe Kit	SATIMO	SCLMP	SN 25/13 OCPG56	N/A	N/A
Antenna	SATIMO	ANTA3	SN 17/13 ZNTA45	N/A	N/A
Phantom1	SATIMO	SAM	SN 11/17 SAM133	N/A	N/A
Phantom2	SATIMO	ELLI	SN 11/17 ELLI42	N/A	N/A
Attenuator	COM-MW	ZA-S1-31	1305003187	N/A	N/A
Directional coupler	AA-MCS	AAMCS-UDC	000272	N/A	N/A

Note: Per KDB 865664 Dipole SAR Validation Verification, BALUN LAB has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss in within 20% of calibrated measurement.
4. Impedance (real or imaginary parts) in within 5 Ohms of calibrated measurement.

ANNEX A SIMULATING LIQUID VERIFICATION RESULT

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SCLMP Dielectric Probe Kit.

Date	Liquid Type	Fre. (MHz)	Temp. (℃)	Meas. Conductivity (σ) (S/m)	Meas. Permittivity (ε)	Target Conductivity (σ) (S/m)	Target Permittivity (ε)	Conductivity Tolerance (%)	Permittivity Tolerance (%)
2020.07.08	Head	2450	21.5	1.76	39.58	1.80	39.20	-2.22	0.97
2020.07.09	Head	5800	21.0	5.24	34.98	5.27	35.30	-0.57	-0.91
Note: The tolerance limit of Conductivity and Permittivity is± 5%.									

ANNEX B SYSTEM CHECK RESULT

Comparing to the original SAR value provided by SATIMO, the validation data should be within its specification of 10%(for 1 g).

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)	Targeted SAR(W/kg)	Tolerance (%)
2020.07.08	Head	2450	100	5.084	50.84	54.31	-6.39	52.40	-2.98
2020.07.09	Head	5800	100	18.474	184.74	182.30	1.34	181.20	1.95
Note: The tolerance limit of System validation ±10%.									

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

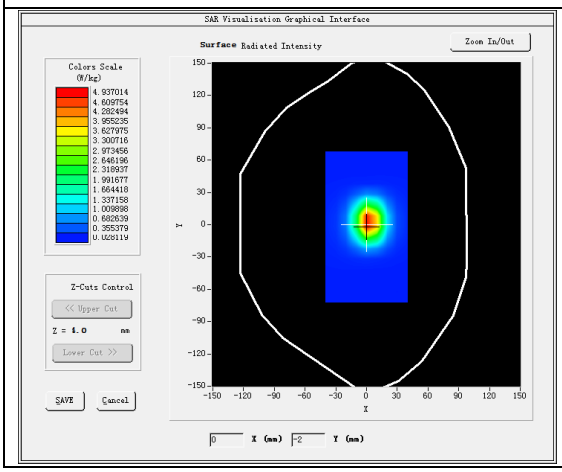
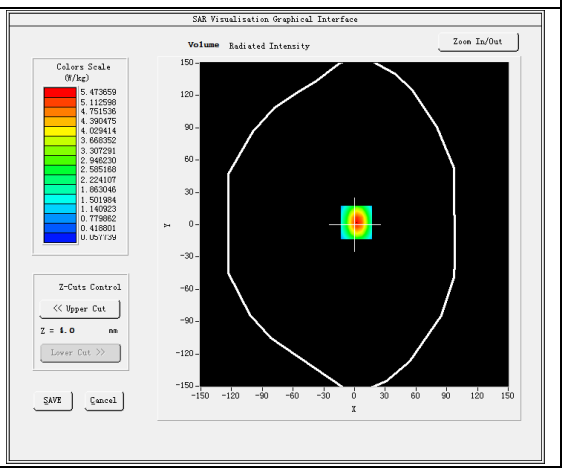
Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)	Targeted SAR(W/kg)	Tolerance (%)
2020.07.08	Head	2450	100	2.319	23.19	24.20	-4.17	24.00	-3.37
2020.07.09	Head	5800	100	6.039	60.39	61.84	-2.34	61.50	-1.80
Note: The tolerance limit of System validation ±10%.									

System Performance Check Data(2450 MHz)

Type: Phone measurement (Complete)
E-Field Probe: SN 31/17 EPGO321
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=5mm, dy=5mm, dz=5mm
Date of measurement: 2020.07.08
Measurement duration: 17 minutes 13 seconds

Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Band	2450MHz
Signal	CW
Frequency (MHz)	2450.000000
Relative permittivity (real part)	39.580155
Conductivity (S/m)	1.756054
Power drift (%)	-1.180000
Ambient Temperature:	22.4°C
Liquid Temperature:	21.5°C
ConvF:	2.33
Crest factor:	1:1

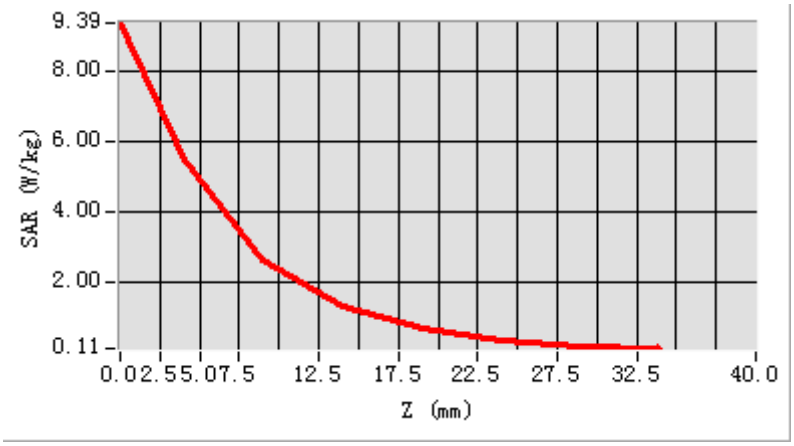
SURFACE SAR	VOLUME SAR
	

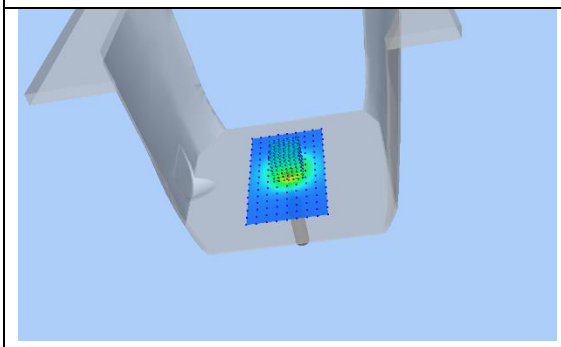
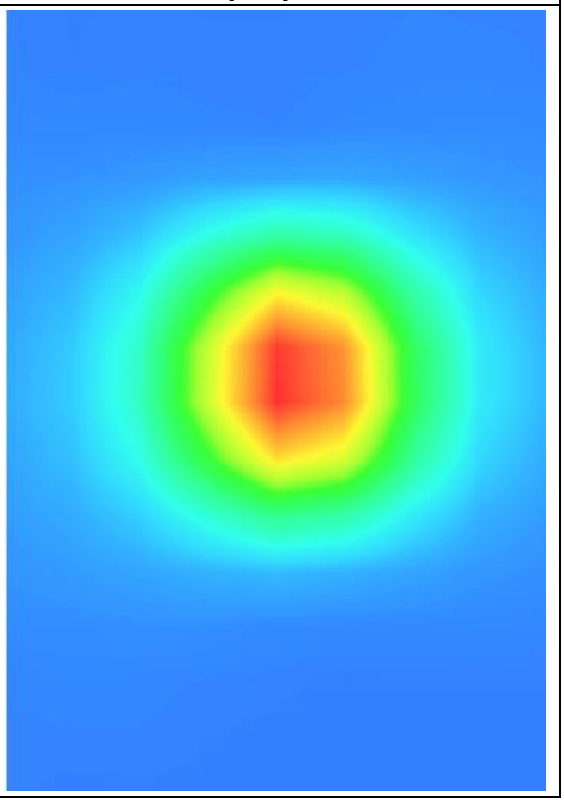
Maximum location: X=0.00, Y=-2.00

SAR Peak: 9.31 W/kg

SAR 10g (W/Kg)	2.318524
SAR 1g (W/Kg)	5.084196

Z Axis Scan



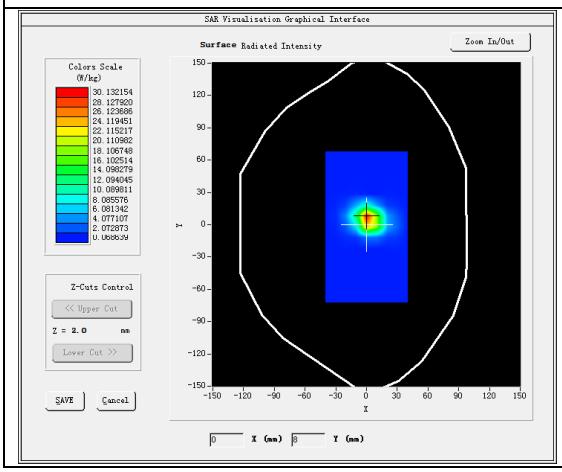
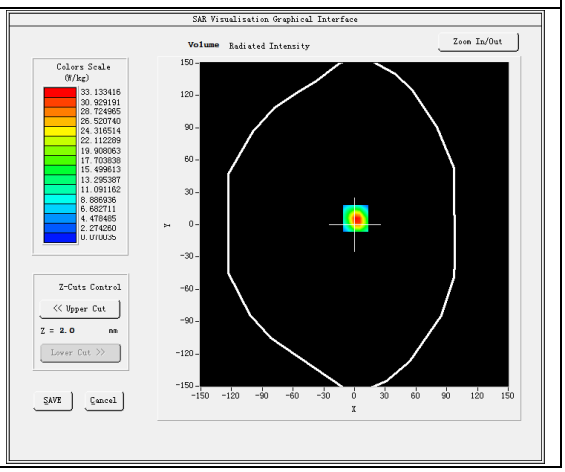
3D screen shot	Hot spot position
	

System Performance Check Data(5800 MHz)

Type: Phone measurement (Complete)
E-Field Probe: SN 31/17 EPGO321
Area scan resolution: dx=8 mm,dy=8 mm
Zoom scan resolution: dx=4 mm, dy=4 mm, dz=2 mm
Date of measurement: 2020.07.09
Measurement duration: 26 minutes 55 seconds

Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Band	5800 MHz
Signal	CW
Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.980147
Conductivity (S/m)	5.237165
Power drift (%)	-1.010000
Ambient Temperature:	22.2°C
Liquid Temperature:	21.0°C
ConvF:	2.33
Crest factor:	1:1

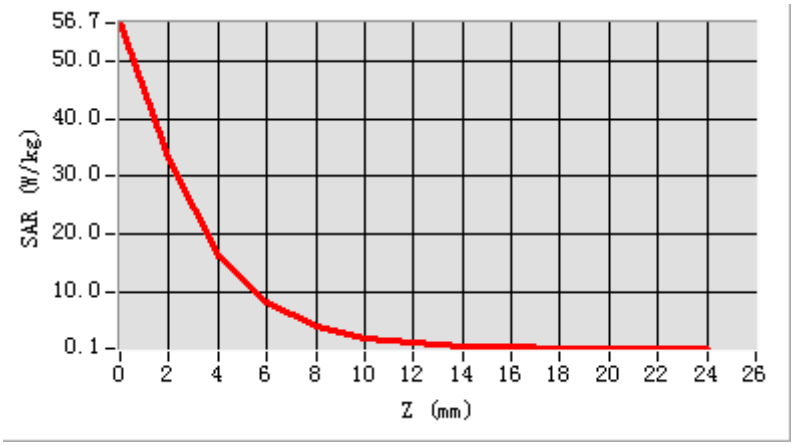
SURFACE SAR	VOLUME SAR
	

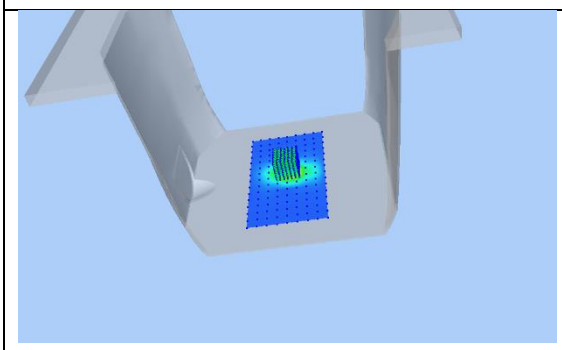
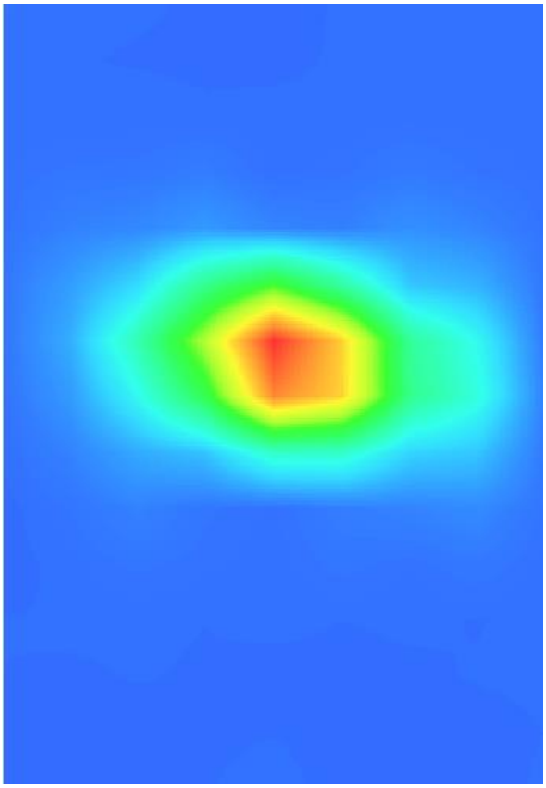
Maximum location: X=0.00, Y=8.00

SAR Peak: 56.64 W/kg

SAR 10 g (W/Kg)	6.038592
SAR 1 g (W/Kg)	18.474318

Z Axis Scan



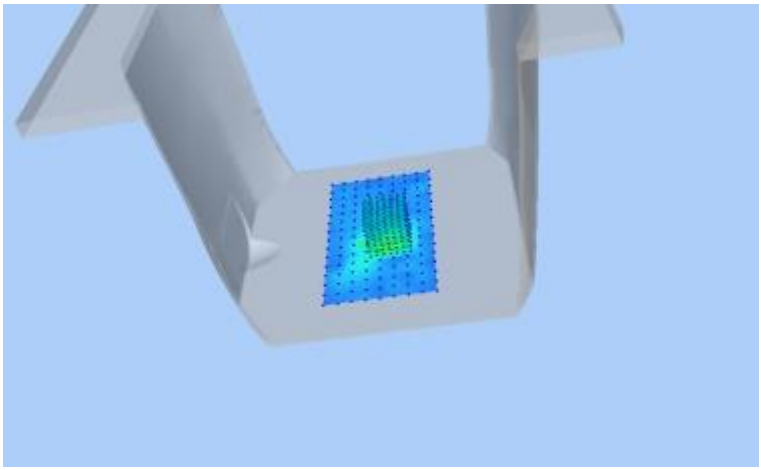
3D screen shot	Hot spot position
	

ANNEX C TEST DATA

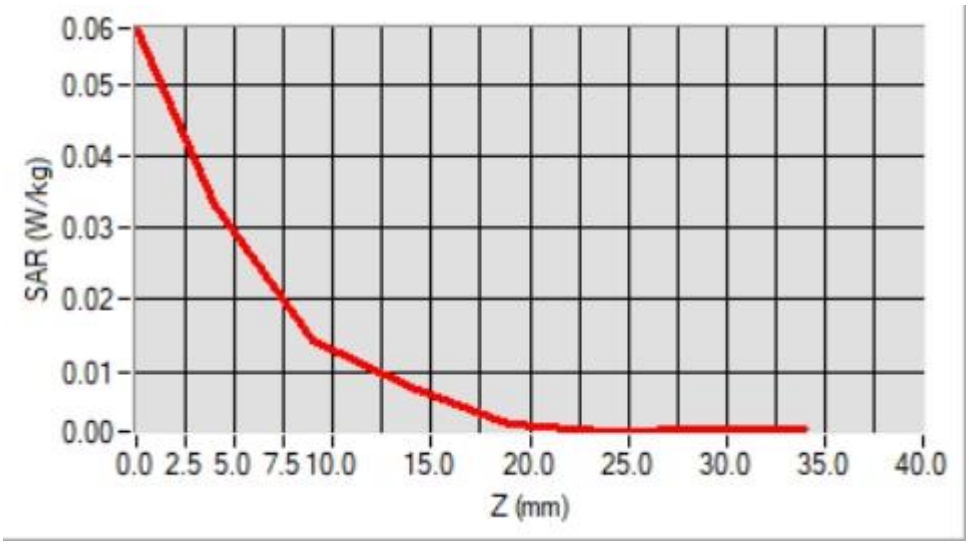
MEAS. 1 Body Plane with H-Top Edge 10 mm on High Channel in 2.4G OFDM mode with Antenna A

Test Date:	8/7/2020
Measurement duration:	16 minutes 27 seconds
Signal:	OFDM, f=2472.0 MHz, Duty Cycle: 1:1.0
Liquid Parameters:	Permittivity: 39.38; Conductivity: 1.80 S/m
Test condition:	Ambient Temperature: 22.4°C, Liquid Temperature: 21.5°C
Probe:	SN 31/17 EPGO321, ConvF: 2.33
Area Scan:	sam_direct_droit2_surf10mm.txt, h= 5.00 mm
Zoom Scan:	7x7x7,dx=5mm, dy=5mm, dz=5mm,Complete
Maximum location:	X=10.000000, Y=18.000000
SAR 10g (W/Kg):	0.009186
SAR 1g (W/Kg):	0.022438
Power drift (%):	-2.63

3D screen shot



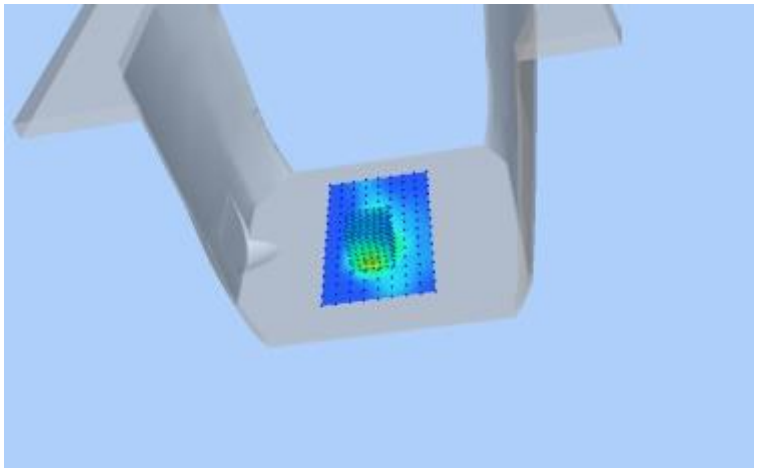
Z Axis Scan



MEAS. 2 Body Plane with H-Top Edge 0 mm on Low Channel in 2.4G OFDM mode with Antenna A

Test Date:	8/7/2020
Measurement duration:	16 minutes 28 seconds
Signal:	OFDM, f=2412.0 MHz, Duty Cycle: 1:1.0
Liquid Parameters:	Permittivity: 39.81; Conductivity: 1.71 S/m
Test condition:	Ambient Temperature: 22.4°C, Liquid Temperature: 21.5°C
Probe:	SN 31/17 EPGO321, ConvF: 2.33
Area Scan:	sam_direct_droit2_surf10mm.txt, h= 5.00 mm
Zoom Scan:	7x7x7,dx=5mm, dy=5mm, dz=5mm,Complete
Maximum location:	X=10.000000, Y=-12.000000
SAR 10g (W/Kg):	0.032193
SAR 1g (W/Kg):	0.069189
Power drift (%):	0.28

3D screen shot

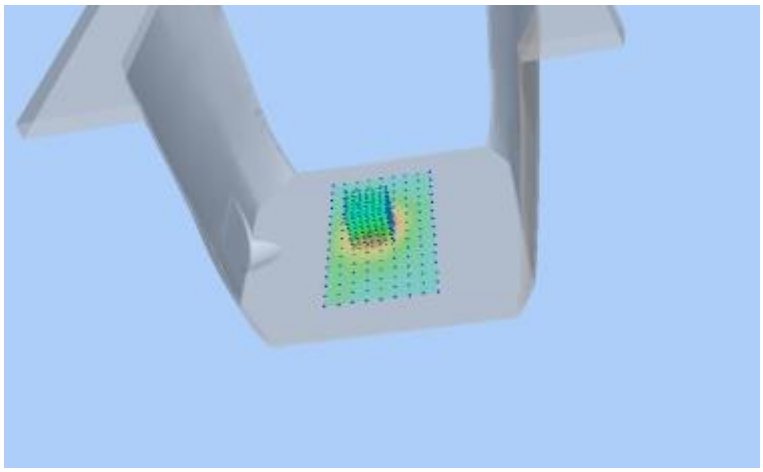


Z Axis Scan

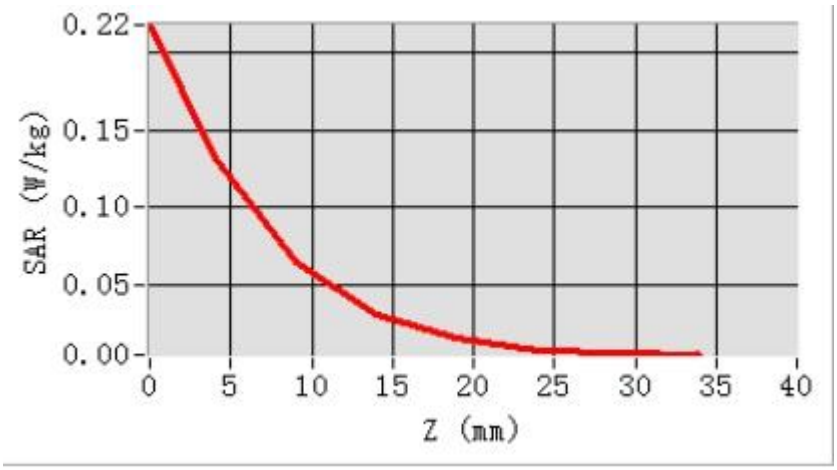
MEAS. 3 Body Plane with Front Side 10 mm on Low Channel in IEEE 802.11b mode with Antenna C

Test Date:	8/7/2020
Measurement duration:	17 minutes 30 seconds
Signal:	WLAN, f=2412.0 MHz, Duty Cycle: 1:1.0
Liquid Parameters:	Permittivity: 39.81; Conductivity: 1.71 S/m
Test condition:	Ambient Temperature: 22.4°C, Liquid Temperature: 21.5°C
Probe:	SN 31/17 EPGO321, ConvF: 2.33
Area Scan:	sam_direct_droit2_surf10mm.txt, h= 5.00 mm
Zoom Scan:	7x7x7,dx=5mm, dy=5mm, dz=5mm,Complete
Maximum location:	X=-10.000000, Y=2.000000
SAR 10g (W/Kg):	0.071354
SAR 1g (W/Kg):	0.139196
Power drift (%):	-4.00

3D screen shot



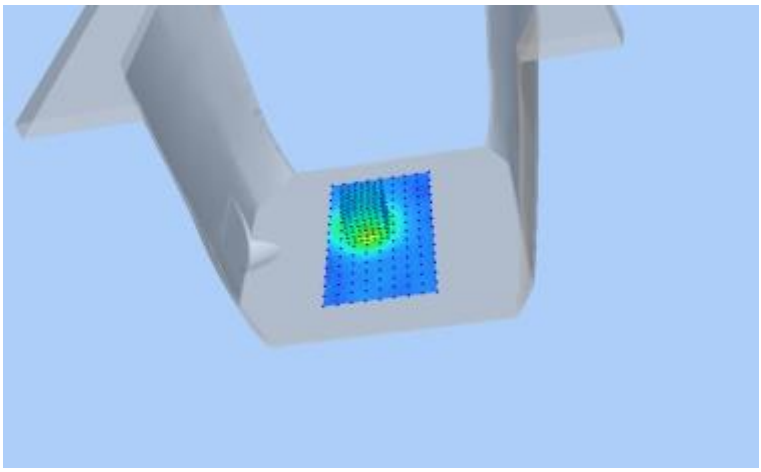
Z Axis Scan



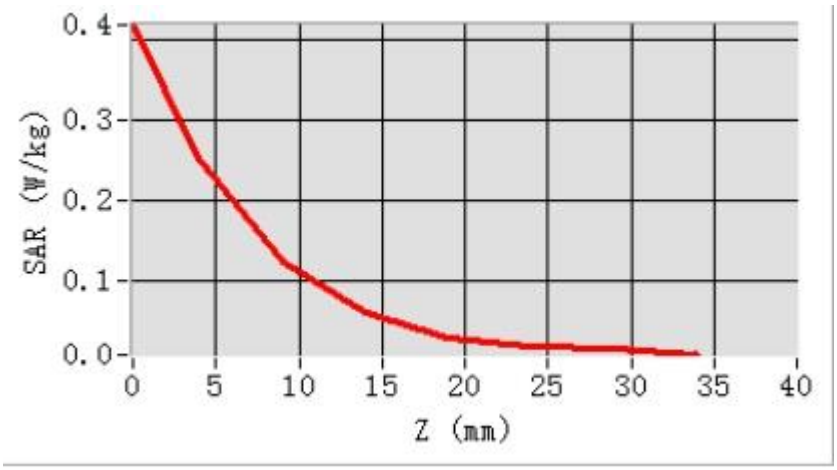
MEAS. 4 Body Plane with Front Side 0 mm on Middle Channel in IEEE 802.11b mode with Antenna C

Test Date:	8/7/2020
Measurement duration:	16 minutes 19 seconds
Signal:	WLAN, f=2437.0 MHz, Duty Cycle: 1:1.0
Liquid Parameters:	Permittivity: 39.63; Conductivity: 1.74 S/m
Test condition:	Ambient Temperature: 22.4°C, Liquid Temperature: 21.5°C
Probe:	SN 31/17 EPGO321, ConvF: 2.33
Area Scan:	sam_direct_droit2_surf10mm.txt, h= 5.00 mm
Zoom Scan:	7x7x7,dx=5mm, dy=5mm, dz=5mm,Complete
Maximum location:	X=-10.000000, Y=8.000000
SAR 10g (W/Kg):	0.096322
SAR 1g (W/Kg):	0.191198
Power drift (%):	2.32

3D screen shot



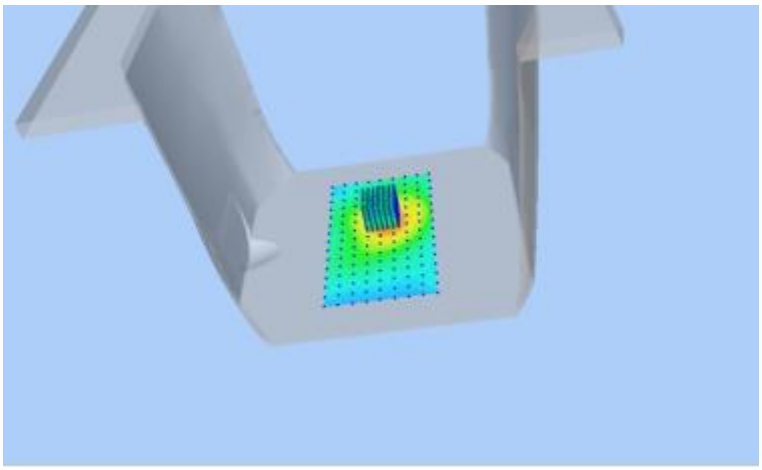
Z Axis Scan



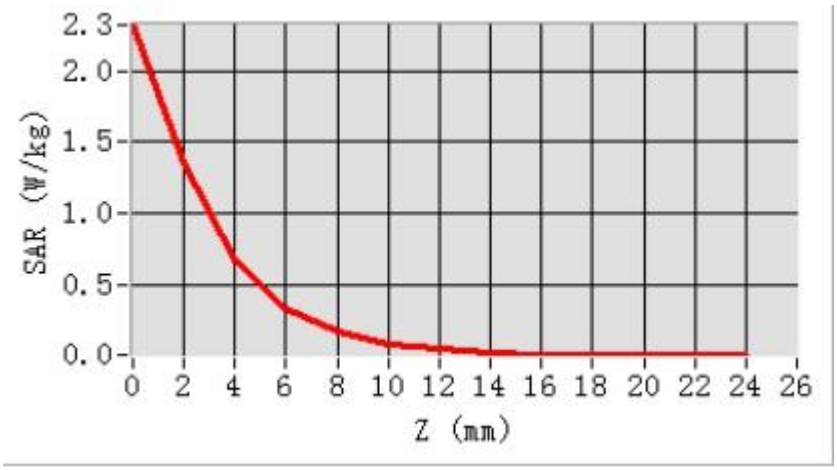
MEAS. 5 Body Plane with V-Front Side 10 mm on 149 Channel in IEEE 802.11a mode with Antenna D

Test Date:	9/7/2020
Measurement duration:	29 minutes 31 seconds
Signal:	WLAN, f=5745.0 MHz, Duty Cycle: 1:1.0
Liquid Parameters:	Permittivity: 35.35; Conductivity: 5.18 S/m
Test condition:	Ambient Temperature: 22.2°C, Liquid Temperature: 21.0°C
Probe:	SN 31/17 EPGO321, ConvF: 2.33
Area Scan:	sam_direct_droit2_surf10mm.txt, h= 5.00 mm
Zoom Scan:	7x7x12,dx=4mm, dy=4mm, dz=2mm,Complete
Maximum location:	X=0.000000, Y=18.000000
SAR 10g (W/Kg):	0.334028
SAR 1g (W/Kg):	0.804597
Power drift (%):	-1.26

3D screen shot



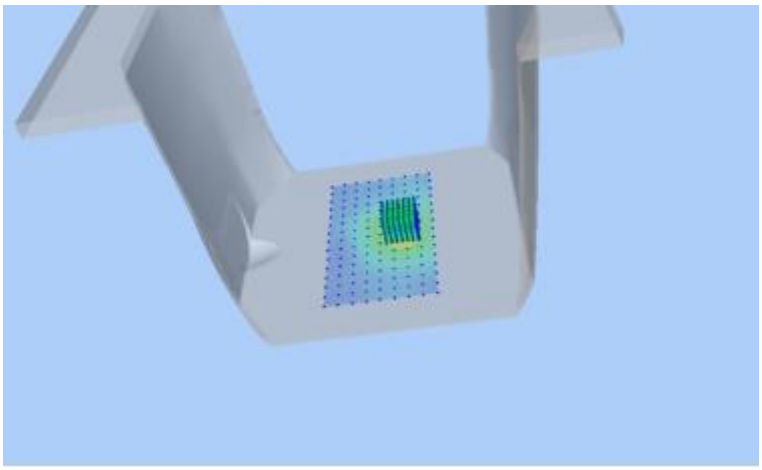
Z Axis Scan



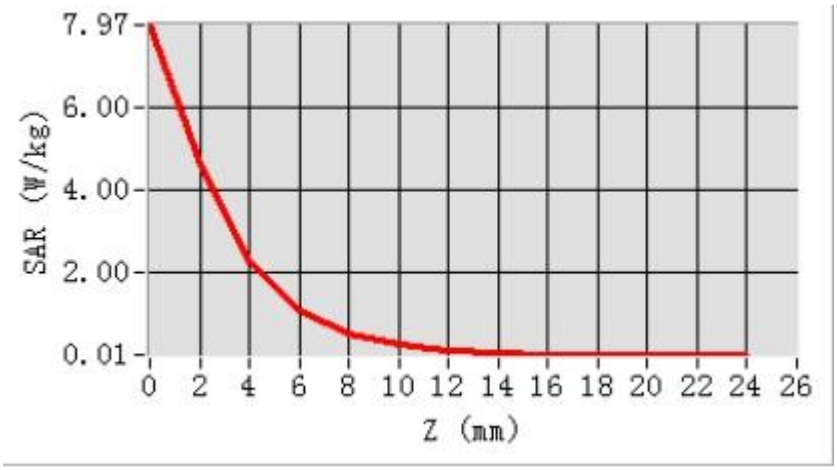
MEAS. 6 Body Plane with V-Front Side 0 mm on 149 Channel in IEEE 802.11a mode with Antenna D

Test Date:	9/7/2020
Measurement duration:	22 minutes 19 seconds
Signal:	WLAN, f=5745.0 MHz, Duty Cycle: 1:1.0
Liquid Parameters:	Permittivity: 35.35; Conductivity: 5.18 S/m
Test condition:	Ambient Temperature: 22.2°C, Liquid Temperature: 21.0°C
Probe:	SN 31/17 EPGO321, ConvF: 2.33
Area Scan:	sam_direct_droit2_surf10mm.txt, h= 5.00 mm
Zoom Scan:	7x7x12,dx=4mm, dy=4mm, dz=2mm,Complete
Maximum location:	X=20.000000, Y=-2.000000
SAR 10g (W/Kg):	0.905857
SAR 1g (W/Kg):	2.614535
Power drift (%):	-1.44

3D screen shot



Z Axis Scan



ANNEX D EUT EXTERNAL PHOTOS

Please refer the document “BL-EC2060327-AW.pdf”.

ANNEX E SAR TEST SETUP PHOTOS

Please refer the document “BL-EC2060327-AS.pdf”.

ANNEX F CALIBRATION REPORT

Please refer the document “CALIBRATION REPORT.pdf”.

--END OF REPORT--