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检测
TESTING
CNAS L4595

SAR TEST REPORT

For

myFirst Tech Asia Pte. Ltd.

myFirst Fone S4

Test Model:KW1601

Prepared for : myFirst Tech Asia Pte. Ltd.
Address : 31 Woodlands Close, #01-22 Woodlands Horizon Singapore 737855

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China
Tel : (+86)755-82591330
Fax : (+86)755-82591332
Web : www.LCS-cert.com
Mail : webmaster@LCS-cert.com

Date of receipt of test sample : April 08, 2025
Number of tested samples : 1
Serial number : Prototype
Sample No. : A250401028-1
Date of Test : April 08, 2025~ April 25, 2025
Date of Report : April 27, 2025



Shenzhen LCS Compliance Testing Laboratory Ltd.
Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com
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SAR TEST REPORT	
Report Reference No.:	LCSA12194118EB
Date Of Issue	April 27, 2025
Testing Laboratory Name	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure	Full application of Harmonised standards <input checked="" type="checkbox"/> Partial application of Harmonised standards <input type="checkbox"/> Other standard testing method <input type="checkbox"/>
Applicant's Name.....:	myFirst Tech Asia Pte. Ltd.
Address	31 Woodlands Close, #01-22Woodlands Horizon Singapore 737855
Test Specification:	
Standard	EN 50663:2017 EN 50566:2017+A1:2023 EN IEC/IEEE 62209-1528:2021 EN 62479:2010
Test Report Form No.:	TRF-4-E-103 A/0
TRF Originator	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	Dated 2017-06
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Test Item Description.:	myFirst Fone S4
Trade Mark	myFirst
Model/Type Reference	KW1601
Ratings	Input:DC 5V, 1000mA DC 3.8V by Rechargeable Li-ion Battery, 605mAh
Result	Positive

Compiled by:

Jay zhan

Jay Zhan/ File administrators

Supervised by:

Jack Liu

Jack Liu/ Technique principal

Approved by:

Gavin Liang

Gavin Liang/ Manager





SAR -- TEST REPORT

Test Report No. : LCSA12194118EBApril 27, 2025
Date of issue

Type / Model..... : KW1601

EUT..... : myFirst Fone S4

Applicant..... : myFirst Tech Asia Pte. Ltd.Address..... : 31 Woodlands Close, #01-22Woodlands Horizon Singapore
737855

Telephone..... : /

Fax..... : /

Manufacturer..... : myFirst Tech Asia Pte. Ltd.Address..... : 31 Woodlands Close, #01-22Woodlands Horizon Singapore
737855

Telephone..... : /

Fax..... : /

Factory..... : Umeox Innovations Co., LtdAddress..... : Floor 19, Block A, Building 8, Shenzhen International
Innovation Valley Phase III, Dashi 1st Road, Nanshan District,
Shenzhen, China

Telephone..... : /

Fax..... : /

Test Result**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street,
Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

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Revision History

Revision	Issue Date	Revision Content	Revised By
000	April 27, 2025	Initial Issue	---





TABLE OF CONTENTS

1. TEST STANDARDS AND TEST DESCRIPTION.....	6
1.1. TEST STANDARDS	6
1.2. TEST DESCRIPTION	6
1.3. PRODUCT DESCRIPTION	7
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	7
1.4. SUMMARY SAR RESULTS	9
1.5. EUT OPERATION MODE.....	9
1.6. EUT CONFIGURATION.....	9
2. TEST ENVIRONMENT	10
2.1. TEST FACILITY	10
2.2. ENVIRONMENTAL CONDITIONS	10
2.3. SAR LIMITS	10
2.4. EQUIPMENTS USED DURING THE TEST	11
3. SAR MEASUREMENTS SYSTEM CONFIGURATION	12
3.1. SARMEASUREMENT SET-UP.....	12
3.2. OPENSAR E-FIELD PROBE SYSTEM.....	13
3.3. PHANTOMS.....	14
3.4. DEVICE HOLDER	14
3.5. SCANNING PROCEDURE	15
3.6. DATA STORAGE AND EVALUATION.....	15
3.7. POSITION OF THE WIRELESS DEVICE IN RELATION TO THE PHANTOM.....	16
3.8. TISSUE DIELECTRIC PARAMETERS FOR HEAD AND BODY PHANTOMS	23
3.9. TEST CONDITIONAND DIELECTRIC PERFORMANCE	24
3.10. SYSTEM CHECK	25
3.11. MEASUREMENT PROCEDURES.....	27
1.1. UMTS TEST CONFIGURATION	27
1.2. LTE TEST CONFIGURATION	33
1.3. WIFI TEST CONFIGURATION.....	35
1.4. POWER REDUCTION	36
1.5. POWER DRIFT	36
4. TEST CONDITIONS AND RESULTS.....	37
4.1. CONDUCTED POWER RESULTS	37
4.2. SAR MEASUREMENT RESULTS	42
4.3. TEST REDUCTION PROCEDURE.....	44
4.5. MEASUREMENT UNCERTAINTY (450MHZ-6GHz)	46
4.6. SYSTEM CHECK RESULTS	48
4.7. SAR TEST GRAPH RESULTS.....	54
5. CALIBRATION CERTIFICATE	74
5.1 PROBE-EPGO376 CALIBRATION CERTIFICATE.....	75
5.1 SID750 DIPOLE CALIBRATION CERITICATE.....	86
5.2SID900 DIPOLE CALIBRATION CERITICATE.....	97
5.3SID1800 DIPOLE CALIBRATION CERTIFICATE	108
5.4SID2000 DIPOLE CALIBRATION CERTIFICATE	119
5.5SID2450 DIPOLE CALIBRATION CERITICATE	130
5.6SID2600 DIPOLE CALIBRATION CERTIFICATE	141
6. SAR SYSTEM PHOTOGRAPHS	152
7. SETUP PHOTOGRAPHS.....	153
8. EUT PHOTOGRAPHS	154





1. TEST STANDARDS AND TEST DESCRIPTION

1.1. Test Standards

The tests were performed according to following standards:

EN IEC/IEEE 62209-1528:2021: Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)

EN 50663:2017: Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10 MHz - 300 GHz)

EN 50566:2017+A1:2023: Product standard to demonstrate the compliance of wireless communication devices with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 30 MHz to 6 GHz: hand-held and body mounted devices in close proximity to the human body

EN 62479:2010: Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

1.2. Test Description

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power





1.3. Product Description

Product Description for Equipment Under Test (EUT)

EUT	: myFirst Fone S4
Test Model	: KW1601
Ratings	: Input:DC 5V, 1000mA DC 3.8V by Rechargeable Li-ion Battery, 605mAh
Hardware Version	: /
Software Version	: /
Bluetooth	:
Frequency Range	: 2402MHz~2480MHz
Channel Number	: 79 channels for Bluetooth V4.2 (BDR/EDR) 40 channels for Bluetooth V4.2 (BT LE)
Channel Spacing	: 1MHz for Bluetooth V4.2 (BDR/EDR) 2MHz for Bluetooth V4.2 (BT LE)
Modulation Type	: GFSK, $\pi/4$ -DQPSK, 8-DPSK for Bluetooth V4.2 (BDR/EDR) GFSK for Bluetooth V4.2 (BT LE)
Bluetooth Version	: V4.2
Antenna Description	: PIFA Antenna, 0.5dBi(Max.)
WIFI(2.4G Band)	:
Frequency Range	: 2412MHz~2472MHz
Channel Spacing	: 5MHz
Channel Number	: 13 Channel for 20MHz bandwidth(2412~2472MHz) 9 channels for 40MHz bandwidth(2422~2462MHz)
Modulation Type	: 802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: PIFA Antenna, 0.5dBi(Max.)
3G	:
Support Band	: <input checked="" type="checkbox"/> WCDMA Band I (EU-Band) <input checked="" type="checkbox"/> WCDMA Band VIII (EU-Band)
Release Version	: R9
Uplink	: WCDMA Band I: 1920MHz~1980MHz WCDMA Band VIII: 880MHz~915MHz
Downlink	: WCDMA Band I: 2110MHz~2170MHz WCDMA Band VIII: 925MHz~960MHz
Type Of Modulation	: QPSK
Antenna Description	: PIFA Antenna -2.8dBi (max.) For WCDMA Band I -6.5dBi (max.) For WCDMA Band VIII
Power Class	: Level 3
LTE	:
Support Band	: <input checked="" type="checkbox"/> E-UTRA Band 1(EU-Band) <input checked="" type="checkbox"/> E-UTRA Band 3(EU-Band) <input checked="" type="checkbox"/> E-UTRA Band 7(EU-Band) <input checked="" type="checkbox"/> E-UTRA Band 8(EU-Band) <input checked="" type="checkbox"/> E-UTRA Band 20(EU-Band) <input checked="" type="checkbox"/> E-UTRA Band 28(EU-Band) <input checked="" type="checkbox"/> E-UTRA Band 41EU-Band)
LTE Release Version	: R12





FDD Band : Uplink: E-UTRA Band 1: 1920MHz~1980MHz
E-UTRA Band 3: 1710MHz~1785MHz
E-UTRA Band 7: 2500MHz~2570MHz
E-UTRA Band 8: 880MHz~915MHz
E-UTRA Band 20: 832MHz~862MHz
E-UTRA Band 28: 703MHz~748MHz
Downlink: E-UTRA Band 1: 2110MHz~2170MHz
E-UTRA Band 3: 1805MHz~1880MHz
E-UTRA Band 7: 2620MHz~2690MHz
E-UTRA Band 8: 925MHz~960MHz
E-UTRA Band 20: 791MHz~821MHz
E-UTRA Band 28: 758MHz~803MHz

TDD Band : E-UTRA Band 41: 2496MHz~2690MHz

Type Of Modulation : QPSK/16QAM

Antenna Description : PIFA Antenna
-1.8dBi (max.) For E-UTRA Band 1
-5.7dBi (max.) For E-UTRA Band 3
-5.4dBi (max.) For E-UTRA Band 7
-5.7dBi (max.) For E-UTRA Band 8
-4.4dBi (max.) For E-UTRA Band 20
-13.4dBi (max.) For E-UTRA Band 28
-5.4dBi (max.) For E-UTRA Band 41

Power Class : Class 3

GPS Receiver :
Receive Frequency : 1575.42MHz
Channel Number : 1
Antenna Description : PIFA Antenna, 0dBi(Max.)

GLONASS Receiver :
Receive Frequency : 1602.5625MHz
Channel Number : 1
Antenna Description : PIFA Antenna, 0dBi(Max.)

Galileo Receiver :
Receive Frequency : 1589.74MHz
Channel Number : 1
Antenna Description : PIFA Antenna, 0dBi(Max.)

BDS Receiver :
Frequency Range : 1561.098MHz
Channel Number : 1
Antenna Description : PIFA Antenna, 0dBi(Max.)

QZSS Receiver :
Receive Frequency : 1575.42MHz
Channel Number : 1
Antenna Description : PIFA Antenna, 0dBi(Max.)

SBAS Receiver :
Receive Frequency : 1575.42MHz
Channel Number : 1
Antenna Description : PIFA Antenna, 0dBi(Max.)





1.4. Summary SAR Results

Table 1:Max. SAR Measured(10g)

Exposure Configuration	Technolohy Band	Highest Measured SAR 10g(W/kg)	Reportedt Measured SAR 10g(W/kg)
Front to face	WCDMA Band VIII	0.198	0.238
	WCDMA Band I	0.970	1.132
	WLAN2450	0.086	0.095
	E-UTRA Band 1	0.462	0.520
	E-UTRA Band 3	0.352	0.388
	E-UTRA Band 7	0.053	0.061
	E-UTRA Band 8	0.305	0.439
	E-UTRA Band 20	0.064	0.064
	E-UTRA Band 28	0.232	0.237
	E-UTRA Band 41	0.035	0.043
Wrist worn	WCDMA Band VIII	0.418	0.501
	WCDMA Band I	1.284	1.498
	WLAN2450	0.088	0.097
	E-UTRA Band 1	1.043	1.173
	E-UTRA Band 3	0.959	1.056
	E-UTRA Band 7	0.202	0.231
	E-UTRA Band 8	0.267	0.384
	E-UTRA Band 20	0.671	0.676
	E-UTRA Band 28	1.110	1.136
	E-UTRA Band 41	0.308	0.381

Note:

1.The SAR values found for the EUT below the maximum recommended levels of 2.0W/Kg as averaged over for 10g tissue according to EN62209.Wrist worn of EUT below the maximum recommended levels of 4.0W/Kg as averaged over for 10g.

2.All test modes were tested, but we only recorded the worst case in this report.

1.5. EUT operation mode

The EUT has been tested under typical operating condition and The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

1.6. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

○ Power Cable	Length (m) :	/
	Shield :	/
	Detachable :	/
○ Multimeter	Manufacturer :	/
	Model No. :	/





2.TEST ENVIRONMENT

2.1. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Site Description
SarLab.

: NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.

2.2. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	18-25 ° C
Humidity:	40-65 %
Atmospheric pressure:	950-1050mbar

2.3. SAR Limits

EXPOSURE LIMITS	CE Limit (10g Tissue)	
	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average(averaged over the whole body)	0.08	0.4
Spatial Peak(averaged over any 10 g of tissue)	2.0	10
Spatial Peak(hands/wrists/ feet/anklesaveraged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).





2.4. Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	PC	Lenovo	G5005	MY42081102	N/A	N/A
2	SAR Measurement system	SATIMO	4014_01	SAR_4014_01	N/A	N/A
3	Signal Generator	Agilent	E4438C	MY49072627	2024-10-08	2025-10-07
4	S-parameter NetworkAnalyzer	Agilent	8753ES	US38432944	2024-10-08	2025-10-07
5	Wideband Radio Communication Tester	R&S	CMW500	103818-1	2024-10-08	2025-10-07
6	E-Field PROBE	MVG	SSE2	SN 25/22 EPGO376	2024-06-21	2025-06-20
7	DIPOLE 750	SATIMO	SID 750	SN 07/14 DIP 0G750-302	2024-09-28	2027-09-27
8	DIPOLE 900	SATIMO	SID 900	SN 07/14 DIP 0G900-300	2024-09-28	2027-09-27
9	DIPOLE 1800	SATIMO	SID 1800	SN 07/14 DIP 1G800-301	2024-09-28	2027-09-27
10	DIPOLE 2000	SATIMO	SID 2000	SN 07/14 DIP 2G000-305	2024-09-28	2027-09-27
11	DIPOLE 2450	SATIMO	SID 2450	SN 07/14 DIP 2G450-306	2024-09-28	2027-09-27
12	DIPOLE 2600	SATIMO	SID 2600	SN 38/18 DIP 2G600-468	2024-09-21	2027-09-20
13	COMOSAR OPENCoaxial Probe	SATIMO	OCPG 68	SN 40/14 OCPG68	2024-10-08	2025-10-07
14	CommunicationAntenna	SATIMO	ANTA57	SN 39/14 ANTA57	2024-10-08	2025-10-07
15	FEATURE PHONEPOSITIONING DEVICE	SATIMO	MSH98	SN 40/14 MSH98	N/A	N/A
16	DUMMY PROBE	SATIMO	DP60	SN 03/14 DP60	N/A	N/A
17	SAM PHANTOM	SATIMO	SAM117	SN 40/14 SAM117	N/A	N/A
18	Liquid measurement Kit	HP	85033D	3423A03482	2024-10-08	2025-10-07
19	Power meter	Agilent	E4419B	MY45104493	2024-10-08	2025-10-07
20	Power meter	Agilent	E4419B	MY45100308	2024-10-08	2025-10-07
21	Power sensor	Agilent	E9301H	MY41495616	2024-10-08	2025-10-07
22	Power sensor	Agilent	E9301H	MY41495234	2024-10-08	2025-10-07
23	Directional Coupler	MCLI/USA	4426-20	03746	2024-10-08	2025-10-07



3.SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1. SAR Measurement Set-up

The OPENSAR system for performing compliance tests consist of the following items:

A standard high precision 6-axis robot (KUKA) with controller and software.

KUKA Control Panel (KCP)

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with a Video Positioning System(VPS).

The stress sensor is composed with mechanical and electronic when the electronic part detects a change on the electro-mechanical switch,It sends an “Emergency signal” to the robot controller that to stop robot’s moves

A computer operating Windows XP.

OPENSAR software

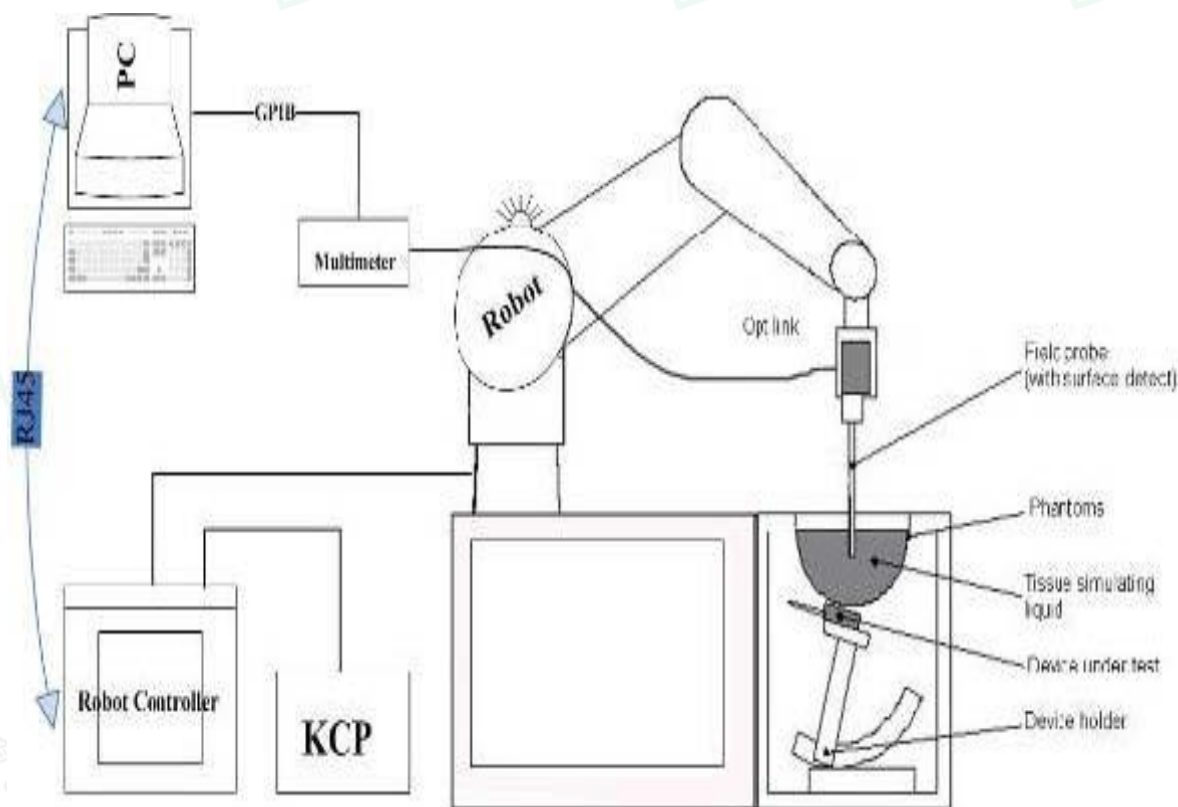
Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

The SAM phantom enabling testing left-hand right-hand and body usage.

The Position device for handheld EUT

Tissue simulating liquid mixed according to the given recipes .

System validation dipoles to validate the proper functioning of the system.





3.2. OPENSAR E-field Probe System

The SAR measurements were conducted with the dosimetric probe EPG0376(manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation.

Probe Specification

Construction Symmetrical design with triangular core

Interleaved sensors

Built-in shielding against static charges

PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

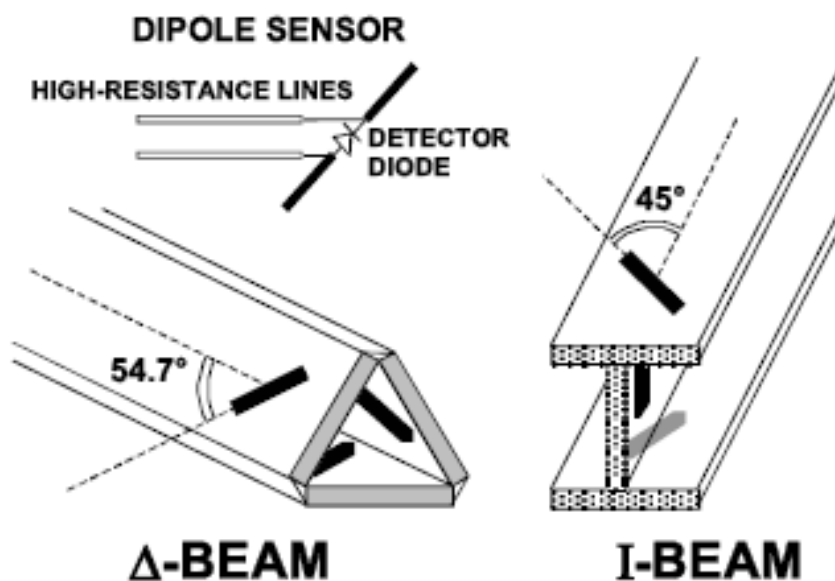
Calibration ISO/IEC 17025 calibration service available.

Frequency	450MHz to 6GHz; Linearity:0.25dB(450MHz to 6 GHz)
Directivity	0.25 dB in HSL (rotation around probe axis) 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	0.01W/kg to > 100 W/kg; Linearity: 0.25 dB
Dimensions	Overall length: 330 mm (Tip: 16mm) Tip diameter: 5 mm (Body: 8 mm) Distance from probe tip to sensor centers: 2.5 mm
Application	General dosimetry up to 6 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

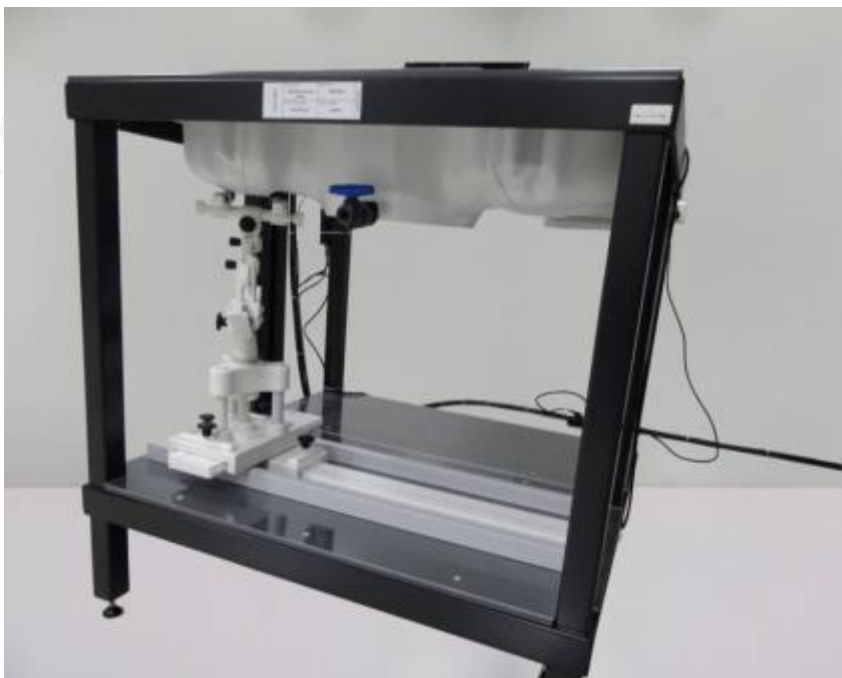
The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



3.3. Phantoms

The SAM Phantom SAM117 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is in compliance with the specification set in IEEE 1528 and EN62209-1, EN62209-2. The phantom enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.



SAM Twin Phantom

3.4. Device Holder

In combination with the Generic Twin Phantom SAM117, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).





Device holder supplied by SATIMO

3.5. Scanning Procedure

The procedure for assessing the peak spatial-average SAR value consists of the following steps

Power Reference Measurement

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in OPENSAR software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to 15 mm by 15 mm and can be edited by a user.

Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures 5 x 5 x 4 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

Power Drift measurement

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have OPENSAR software stop the measurements if this limit is exceeded.

3.6. Data Storage and Evaluation

Data Storage

The OPENSAR software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation

The OPENSAR software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters: - Sensitivity Normi, ai0, ai1, ai2
- Conversion factor ConvFi
- Diode compression point Dcpi

Device parameters: - Frequency f



Shenzhen LCS Compliance Testing Laboratory Ltd.
Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street,
Bao'an District, Shenzhen, Guangdong, China
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com
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Media parameters:

- Crest factor cf
- Conductivity σ
- Density ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the OPENSAR components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcpi}$$

With V_i = compensated signal of channel i ($i = x, y, z$)

U_i = input signal of channel i ($i = x, y, z$)

cf = crest factor of exciting field

$dcpi$ = diode compression point

From the compensated input signals the primary field data for each channel can be evaluated:

$$E - \text{fieldprobes : } E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$H - \text{fieldprobes : } H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

With V_i = compensated signal of channel i ($i = x, y, z$)

$Norm_i$ = sensor sensitivity of channel i ($i = x, y, z$)
[mV/(V/m)²] for E-field Probes

$ConvF$ = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

with SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

3.7. Position of the wireless device in relation to the phantom

General considerations

This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.

The power flow density is calculated assuming the excitation field as a free space field

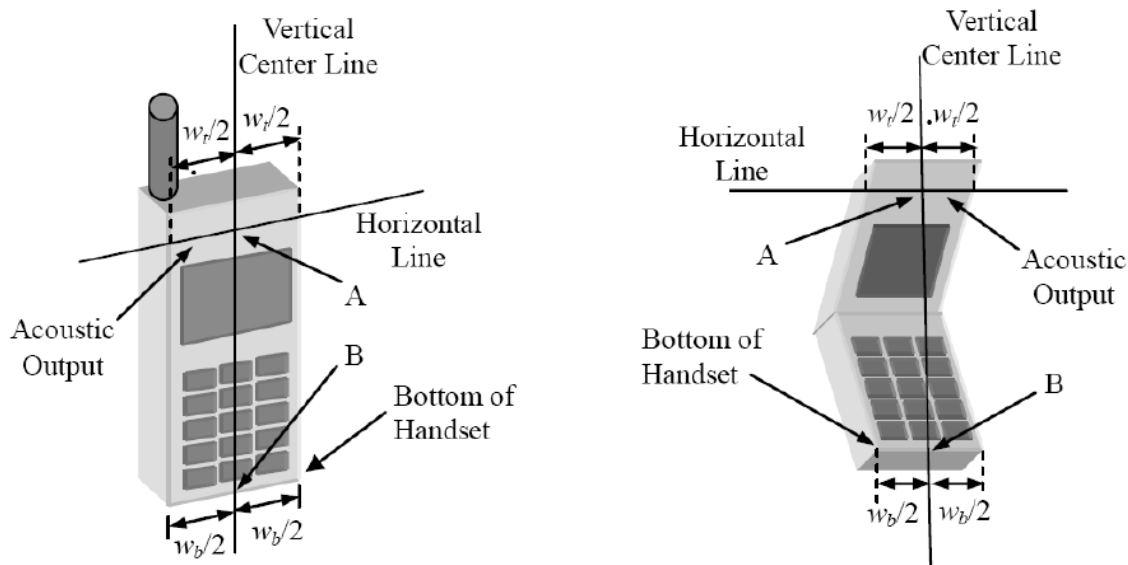
$$P_{(pwe)} = \frac{E_{tot}^2}{3770} \text{ or } P_{(pwe)} = H_{tot}^2 \cdot 37.7$$

Where P_{pwe} = Equivalent power density of a plane wave in mW/cm²

E_{tot} = total electric field strength in V/m



H_{tot} =total magnetic field strength in A/m



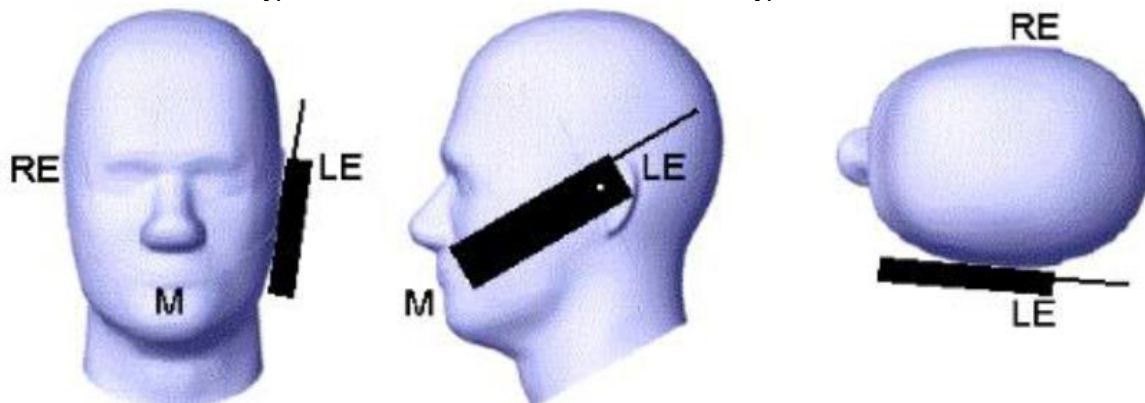
W_t Width of the handset at the level of the acoustic

W_b Width of the bottom of the handset

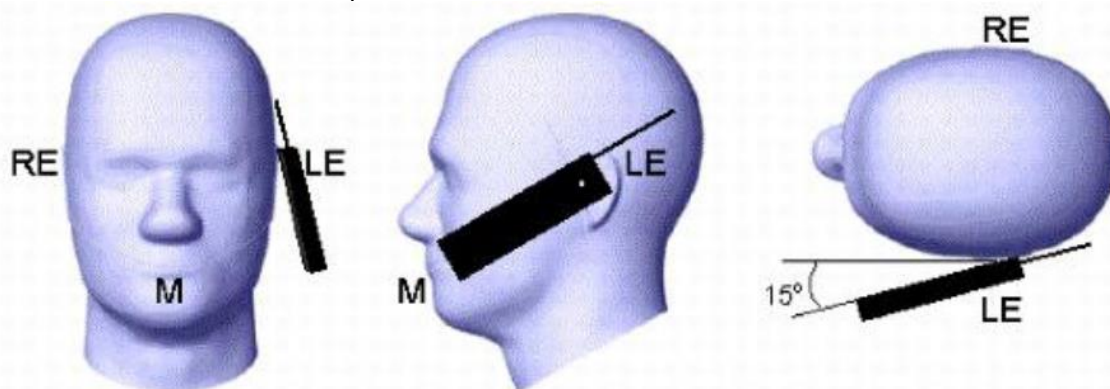
A Midpoint of the width w_t of the handset at the level of the acoustic output

B Midpoint of the width w_b of the bottom of the handset

Picture 1-a Typical "fixed" case handset Picture 1-b Typical "clam-shell" case handset



Picture 2 Cheek position of the wireless device on the left side of SAM



Picture 3 Tilt position of the wireless device on the left side of SAM



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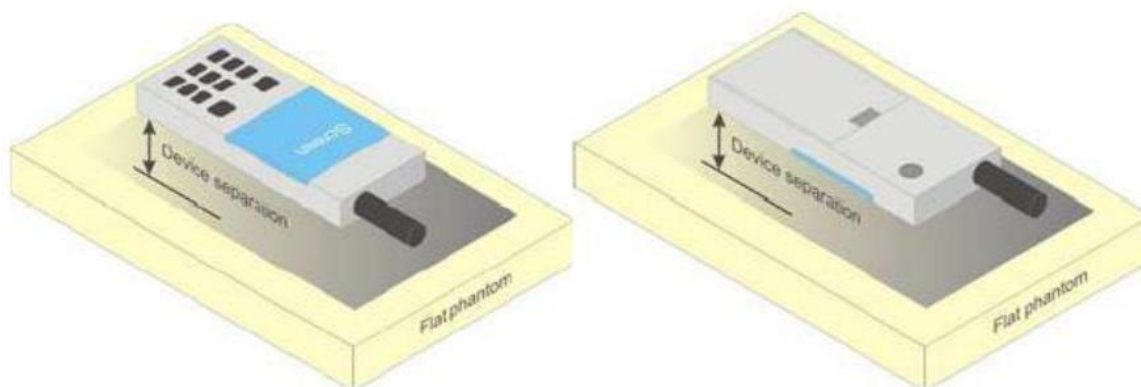
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Body-worn device

A typical example of a body-worn device is a Mobile Phone , wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.



Picture 4 Test positions for body-worn devices

Devices with hinged or swivel antenna(s)

For devices that employ one or more external antennas with variable positions (e.g. antenna extended, retracted, rotated), these shall be positioned in accordance with the user instructions provided by the manufacturer. For a device with only one antenna, if no intended antenna position is specified, tests shall be performed if applicable in both the horizontal and vertical positions relative to the phantom, and with the antenna oriented away from the body of the DUT (Figure 5) and/or with the antenna extended and retracted such as to obtain the highest exposure condition. For antennas that may be rotated through one or two planes, an evaluation should be made and documented in the measurement report to the highest exposure scenario and only that position(s) need(s) to be tested. For devices with multiple detachable antennas see provisions of 6.2.2.

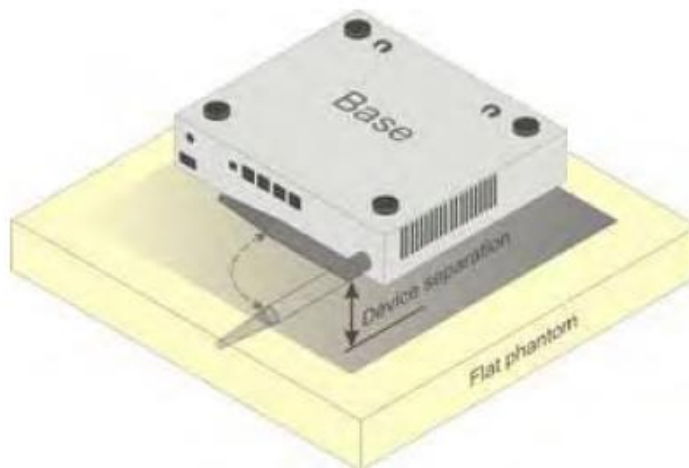


Figure 5– Device with swivel antenna (example of desktop device)

Body-supported device

A typical example of a body supported device is a wireless enabled laptop device that among other orientations may be supported on the thighs of a sitting user. To represent this orientation, the device shall be positioned with its base against the flat phantom. Other orientations may be specified by the manufacturer in the user instructions. If the intended use is not specified, the device shall be tested directly against the flat phantom in all usable orientations.

The screen portion of the device shall be in an open position at a 90° angle as seen in Figure 6a (left side), or at an operating angle specified for intended use by the manufacturer in the operating instructions. Where a body supported device has an integral screen required for normal operation, then the screen-side will not need to be tested if the antenna(s) integrated in it ordinarily remain(s) 200 mm from the body. Where a screen mounted antenna is present, the measurement shall be performed with the screen against the flat phantom as shown in Figure 6a) (right side), if operating the screen against the body is consistent with the intended use.

Other devices that fall into this category include tablet type portable computers and credit card transaction authorisation terminals, point-of-sale and/or inventory terminals. Where these devices may be torso or limb-supported, the same principles for body-supported devices are applied.

The example in Figure 6b) shows a tablet form factor portable computer for which SAR should be separately assessed with



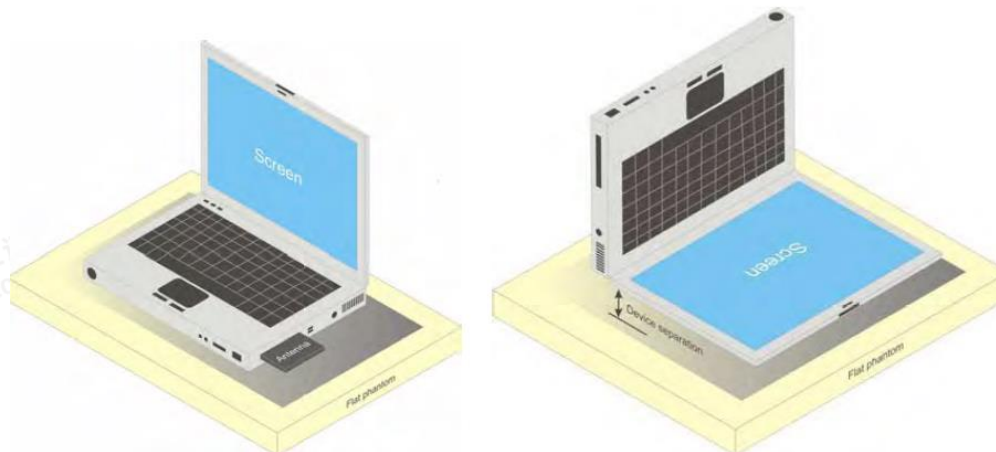
c). each surface and

d). the separation distances

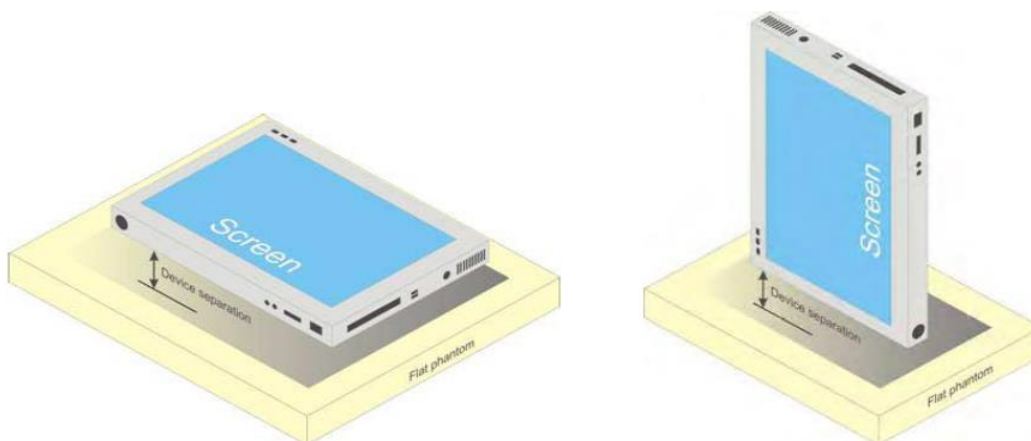
positioned against the flat phantom that correspond to the intended use as specified by the manufacturer. If the intended use is not specified in the user instructions, the device shall be tested directly against the flat phantom in all usable orientations.

Some body-supported devices may allow testing with an external power supply (e.g. a.c. adapter) supplemental to the battery, but it shall be verified and documented in the measurement report that SAR is still conservative.

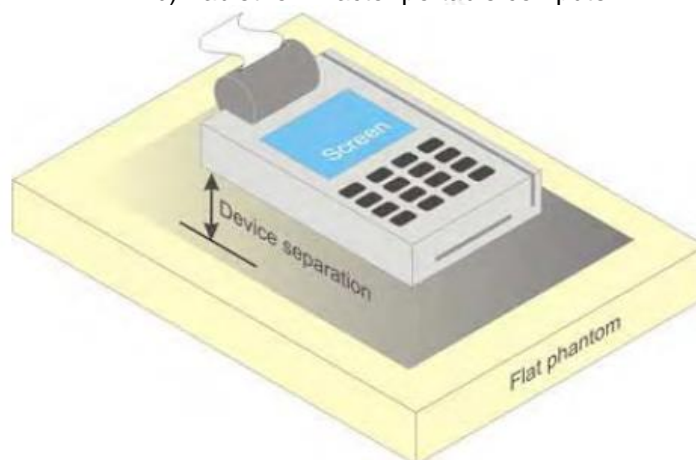
For devices that employ an external antenna with variable positions (e.g. swivel antenna), see 6.1.4.5 and Figure 5.



a) Portable computer with external antenna plug-in-radio-card (left side) or with internal antenna located in screen section (right side)



b) Tablet form factor portable computer



c) Wireless credit card transaction authorisation terminal

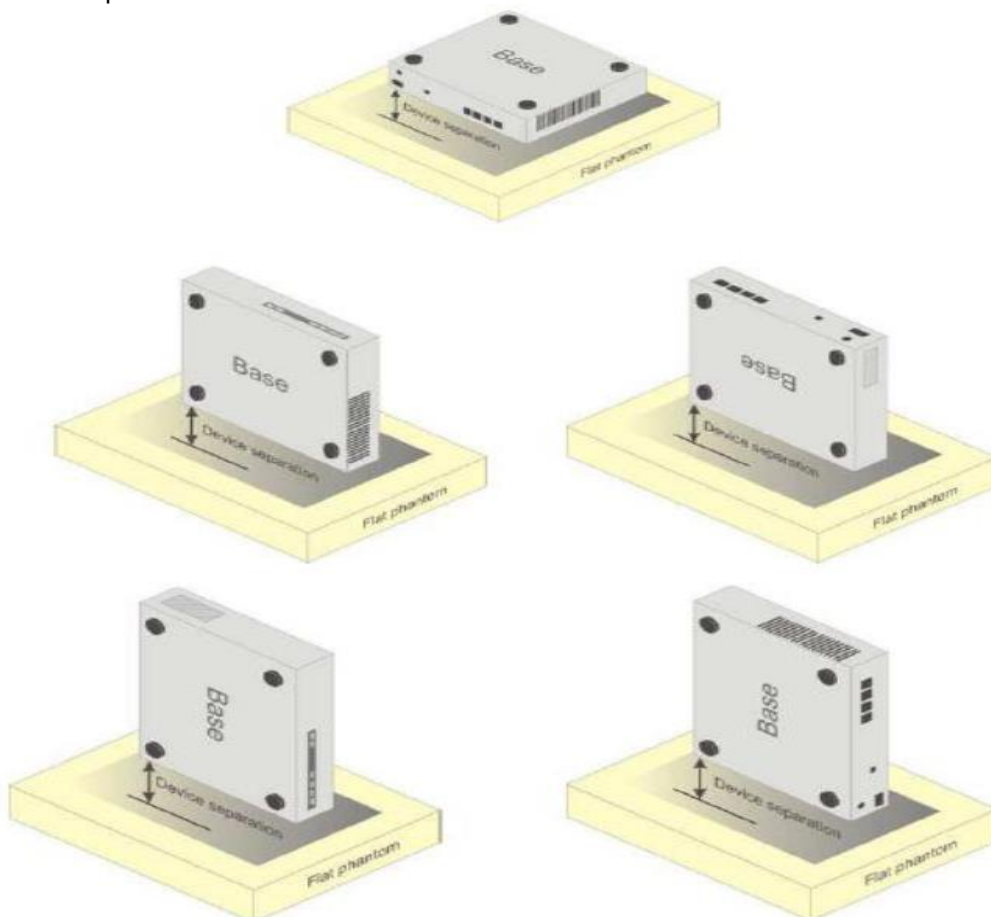
Figure 6 – Test positions for body supported devices



Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

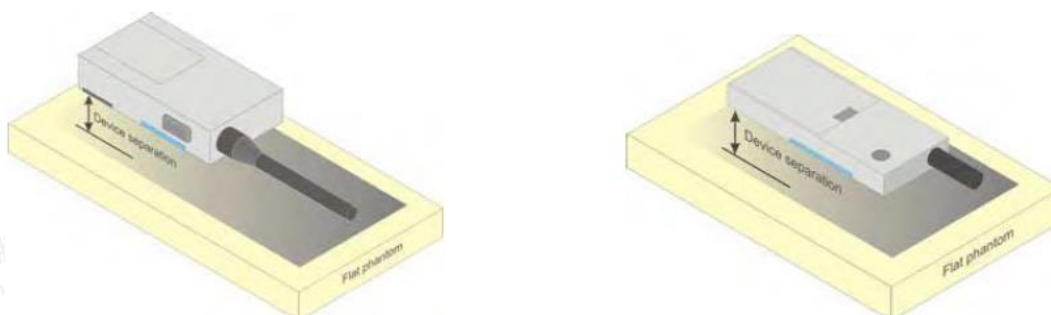
The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture 14 shows positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.



Picture 7 Test positions for desktop devices

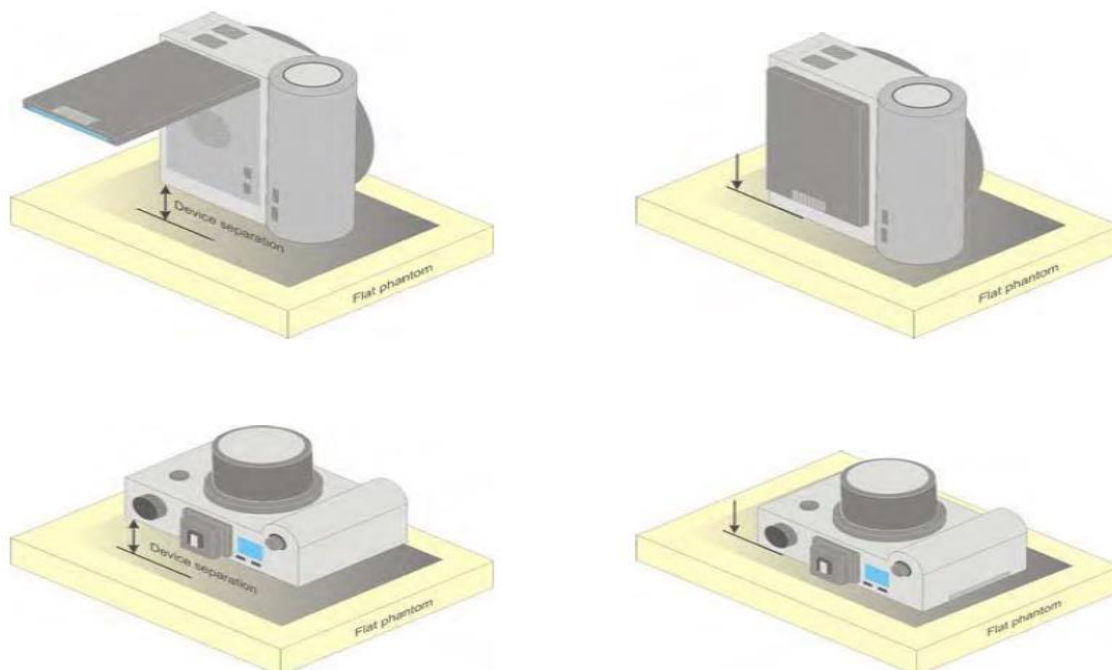
Front-of-face device

A typical example of a front-of-face device is a two-way radio that is held at a distance from the face of the user when transmitting. In these cases the device under test shall be positioned at the distance to the phantom surface that corresponds to the intended use as specified by the manufacturer in the user instructions (Figure 8a). If the intended use is not specified, a separation distance of 25 mm between the phantom surface and the device shall be used.



a) Two-way radios





b) Still cameras and video cameras

Figure 8 – Test positions for front-of-face devices

Other devices that fall into this category include wireless-enabled still cameras and video cameras that can send data to a network or other device (Figure 8b). In the case of a device whose intended use requires a separation distance from the user (e.g., device with a viewing screen), this shall be positioned at the distance to the phantom surface that corresponds to the intended use as specified by the manufacturer in the user instructions (Figure 8b, left side). If the intended use is not specified, a separation distance of 25 mm between the phantom surface and the device shall be used.

For a device whose intended use requires the user's face to be in contact with the device (e.g., device with an optical viewfinder), this shall be placed directly against the phantom (Figure 8b, right side).

Hand-held usage of the device, not at the head or torso

Additional studies remain needed for devising a representative method for evaluating SAR in the hand of hand-held devices. Future versions of this standard are intended to contain a test method based on scientific data and rationale. Annex J presents the currently available test procedure.

Limb-worn device

A limb-worn device is a unit whose intended use includes being strapped to the arm or leg of the user while transmitting (except in idle mode). It is similar to a body-worn device. Therefore, the test positions of 6.1.4.4 also apply. The strap shall be opened so that it is divided into two parts as shown in Figure 9. The device shall be positioned directly against the phantom surface with the strap straightened as much as possible and the back of the device towards the phantom.

If the strap cannot normally be opened to allow placing in direct contact with the phantom surface, it may be necessary to break the strap of the device but ensuring to not damage the antenna.

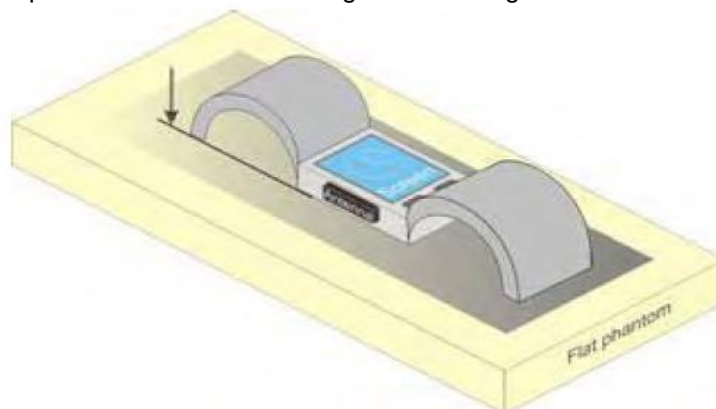


Figure 9 – Test position for limb-worn devices

Clothing-integrated device

A typical example of a clothing-integrated device is a wireless device (Mobile Phone) integrated into a jacket to provide voice communications through an embedded speaker and microphone. This category also includes headgear with integrated wireless devices.

All wireless or RF transmitting components shall be placed in the orientation and at the separation distance to the phantom surface that correspond to intended use of the device when it is integrated into the clothing (Figure 10).

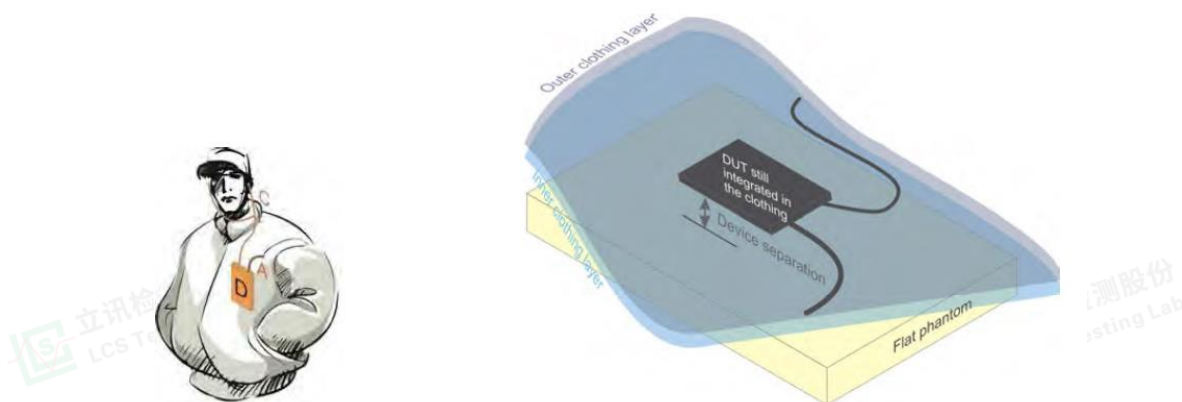


Figure 10– Test position for clothing-integrated wireless devices





3.8. Tissue Dielectric Parameters for Head and Body Phantoms

The liquid used for the frequency range of 700-3000 MHz consisted of water, sugar, salt and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table 3 and 4 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

Table 2. Composition of the Head Tissue Equivalent Matter

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

Table 3. Targets for tissue simulating liquid

Frequency MHz	Real part of the complex relative permittivity, ϵ'_r	Conductivity, σ S/m
30	55,0	0,75
150	52,3	0,76
300	45,3	0,87
450	43,5	0,87
750	41,9	0,89
835	41,5	0,90
900	41,5	0,97
1 450	40,5	1,20
1 800	40,0	1,40
1 900	40,0	1,40
1 950	40,0	1,40
2 000	40,0	1,40
2 100	39,8	1,49
2 450	39,2	1,80
2 600	39,0	1,96
3 000	38,5	2,40
3 500	37,9	2,91
4 000	37,4	3,43
4 500	36,8	3,94
5 000	36,2	4,45
5 200	36,0	4,66
5 400	35,8	4,86
5 600	35,5	5,07
5 800	35,3	5,27
6 000	35,1	5,48





3.9. Test Conditionand Dielectric Performance

TestConditionandTest Date

Test Engineer:Bob Yang			
LiquidFrequency	Measurement temperature	Measurement humidity	Measurement Date
750 MHz	22.3℃	51.3%	April 08, 2025
900 MHz	22.3℃	52.2%	April 10, 2025
1800 MHz	23.1℃	51.2%	April 14, 2025
2000MHz	22.2℃	51.3%	April 18, 2025
2450MHz	22.3℃	52.1%	April 21, 2025
2600MHz	23.1℃	53.2%	April 25, 2025

Dielectric Performance of Head Tissue Simulating Liquid

Measured Frequency (MHz)	Target Tissue		Measured Tissue			
	σ	ϵ_r	σ	Dev.	ϵ_r	Dev.
750	0.89	42.06	0.88	-1.12%	41.90	-0.38%
900	0.97	41.5	0.94	-3.09%	42.58	2.60%
1800	1.40	40.0	1.43	2.14%	40.64	1.60%
2000	1.40	40.0	1.42	1.43%	39.17	-2.08%
2450	1.80	39.2	1.78	-1.11%	38.35	-2.17%
2600	1.96	39.0	1.90	-3.06%	40.35	3.46%



3.10. System Check

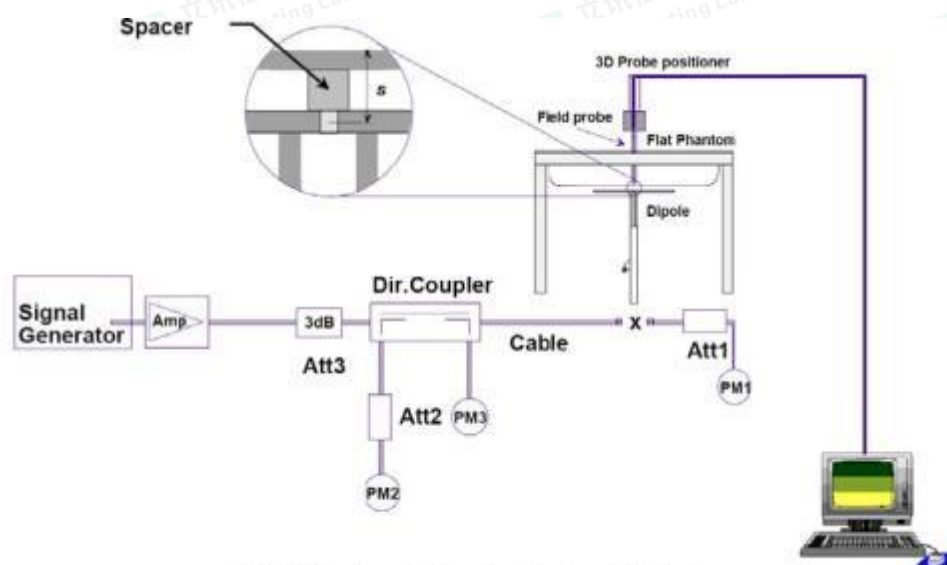


Fig 8.1 System Setup for System Evaluation

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.

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 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:

- 1 Signal Generator
- 2 Amplifier
- 3 Directional Coupler
- 4 Power Meter
- 5 Calibrated Dipole

The output power on dipole port must be calibrated to 20 dBm (100 mW) before dipole is connected.





Photo of Dipole Setup

System Validation of Head

Verification results	Frequency (MHz)	Target value (W/kg)		Measured value (W/kg)		Deviation	
		1 g	10 g	1 g	10 g	1 g	10 g
		Average	Average	Average	Average	Average	Average
	750	8.49	5.55	8.71	5.53	2.59%	-0.36%
	900	10.9	6.99	11.4	7.21	4.59%	3.15%
	1800	38.4	20.1	40.1	18.9	4.43%	-5.97%
	2000	41.1	21.1	40.5	19.6	-1.46%	-7.11%
	2450	52.4	24.0	49.8	23.4	-4.96%	-2.50%
	2600	55.3	24.6	56.1	24.5	1.45%	-0.41%





3.11. Measurement Procedures

The measurement procedures are as follows:

1.1. UMTS Test Configuration

1) . Output Power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1’s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are required in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

2) . Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure

3) . Body SAR

SAR for body configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

4) . HSDPA / HSUPA / DC-HSDPA

RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power for production units in HSDPA / HSUPA / DC-HSDPA is $\leq \frac{1}{4}$ dB higher than RMC 12.2Kbps or when the highest measured SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.5 W/kg, SAR measurement is not required for HSDPA / HSUPA/ DC-HSDPA.

a) HSDPA

HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(β_c , β_d), and HS-DPCCH power offset parameters (Δ_{ACK} , Δ_{NACK} , Δ_{CQI}) are set according to values indicated in the following table. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	β_c	Bd	β_d (SF)	β_c/β_d	β_{hs}	CM(dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0





2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1: ΔACK , ΔNACK and $\Delta\text{CQI} = 8$ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1.A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, ΔACK and $\Delta\text{NACK} = 8$ ($A_{hs} = 30/15$) with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta\text{CQI} = 7$ ($A_{hs} = 24/15$) with $\beta_{hs} = 24/15 * \beta_c$.

Note3: $\text{CM} = 1$ for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI"s
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

Table 1: settings of required H-Set 1 QPSK acc. to 3GPP 34.121

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	Maximum H S-DSCH Transport Block Bits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

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6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

Table 2: HSDPA UE category

b) HSUPA

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSUPA should be configured according to the values indicated below as well as other applicable procedures described in the „WCDMA Handset“ and „Release 5 HSUPA Data Device“ sections of 3G device.

Sub-test ¹	β_c ²	β_d ³	β_d (SF) ³	β_c/β_d ⁴	β_{hs} ¹) ³	β_{ec} ⁵	β_{ed} ⁶	β_c (SF)) ³	β_{ed} (code) ³	CM ⁽²⁾ (dB)) ³	MP R ³ (dB) ³	AG ⁽⁴⁾) ³ Inde x ³	E- TFC I ³
1 ¹	11/15 ⁽³⁾	15/15 ⁽³⁾	64 ³	11/15 ⁽³⁾	22/15 ³	209/22 5 ³	1039/225 ³	4 ³	1 ³	1.0 ³	0.0 ³	20 ³	75 ³
2 ¹	6/15 ³	15/15 ³	64 ³	6/15 ³	12/15 ³	12/15 ³	94/75 ³	4 ³	1 ³	3.0 ³	2.0 ³	12 ³	67 ³
3 ¹	15/15 ³	9/15 ³	64 ³	15/9 ³	30/15 ³	30/15 ³	β_{ad1} :47/1 5 ³ β_{ed2} :47/1 5 ³	4 ³	2 ³	2.0 ³	1.0 ³	15 ³	92 ³
4 ¹	2/15 ³	15/15 ³	64 ³	2/15 ³	4/15 ³	2/15 ³	56/75 ³	4 ³	1 ³	3.0 ³	2.0 ³	17 ³	71 ³
5 ¹	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64 ³	15/15 ⁽⁴⁾	30/15 ³	24/15 ³	134/15 ³	4 ³	1 ³	1.0 ³	0.0 ³	21 ³	81 ³

Note 1: Δ ACK, Δ NACK and Δ CQI=8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference³

Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$ ³

Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$ ³

Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g³

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.³

Table 3: Subtests for UMTS Release 6 HSUPA



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

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UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF	11484	5.76
	4	4	2	4	20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF	22996	?
	4	4	10	4	20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4. UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM. (TS25.306-7.3.0).

Table 4: HSUPA UE category



**c) DC-HSDPA**

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a Second serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS 34.108 v9.5.0.

A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13.

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

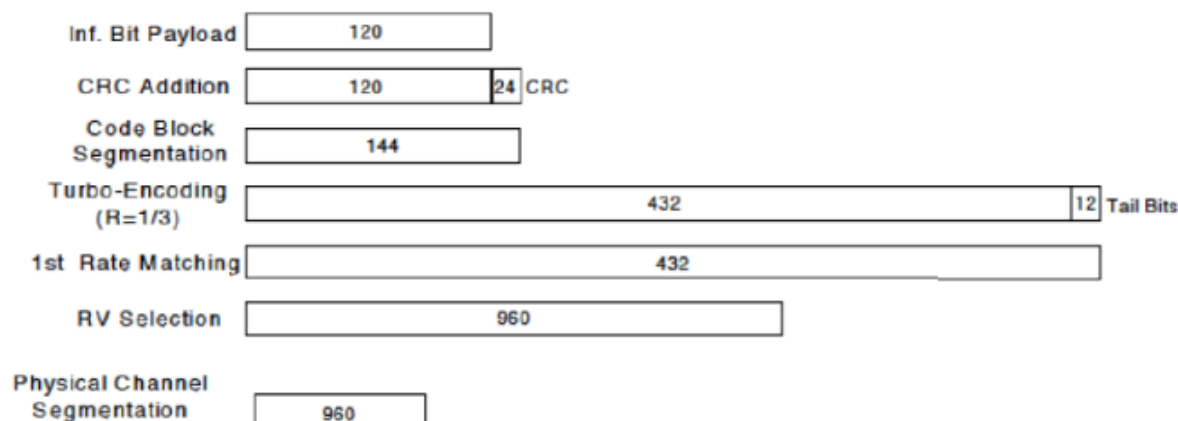
The measurements were performed with a Fixed Reference Channel (FRC) H-Set 12 with QPSK.

Parameter	Value
Nominal average inf. bit rate	60 kbit/s
Inter-TTI Distance	1 TTI's
Number of HARQ Processes	6 Processes
Information Bit Payload	120 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	960 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	3200 SMLs
Coding Rate	0.15
Number of Physical Channel Codes	1

Table 5: settings of required H-Set 12 QPSK acc. to 3GPP 34.121**Note:**

1. The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table above.

2. Maximum number of transmission is limited to 1,i.e.,retransmission is not allowed. The redundancy and constellation version 0 shall be used.

**Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)**

The following 4 Sub-tests for HSDPA were completed according to Release 5 procedures. A summary of subtest settings are illustrated below:





Sub-test ^o	β_c ^o	β_d ^o	β_d (SF) ^o	β_c/β_d ^o	$\beta_{hs}(1)$ ^o	CM(dB)(2) ^o	MPR (dB) ^o
1 ^o	2/15 ^o	15/15 ^o	64 ^o	2/15 ^o	4/15 ^o	0.0 ^o	0 ^o
2 ^o	12/15(3) ^o	15/15(3) ^o	64 ^o	12/15(3) ^o	24/15 ^o	1.0 ^o	0 ^o
3 ^o	15/15 ^o	8/15 ^o	64 ^o	15/8 ^o	30/15 ^o	1.5 ^o	0.5 ^o
4 ^o	15/15 ^o	4/15 ^o	64 ^o	15/4 ^o	30/15 ^o	1.5 ^o	0.5 ^o
Note 1 : ΔACK , $\Delta NACK$ and $\Delta CQI=8$ $A_{hs}=\beta_{hs}/\beta_c=30/15$ $\beta_{hs}=30/15*\beta_c$ Note 2 : CM=1 for $\beta_c/\beta_d=12/15$, $\beta_{hs}/\beta_c=24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases. Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c=11/15$ and $\beta_d=15/15$							

Up commands are set continuously to set the UE to Max power.

Note:

1. The Dual Carriers transmission only applies to HSDPA physical channels
2. The Dual Carriers belong to the same Node and are on adjacent carriers.
3. The Dual Carriers do not support MIMO to serve UEs configured for dual cell operation
4. The Dual Carriers operate in the same frequency band.
5. The device doesn't support the modulation of 16QAM in uplink but 64QAM in downlink for DC-HSDPA mode.
6. The device doesn't support carrier aggregation for it just can operate in Release 8.



d) DC-HSDPA

SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode. Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	$\beta_{c\downarrow}$ (Note 3)	$\beta_{d\downarrow}$	$\beta_{HS\downarrow}$ (Note 1)	$\beta_{ec\downarrow}$	$\beta_{ed\downarrow}$ (2xSF2) (Note 4)	$\beta_{ed\downarrow}$ (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed1} : 30/15 β_{ed2} : 30/15	β_{ed3} : 24/15 β_{ed4} : 24/15	3.5	2.5	14	105	105
<p>Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$.</p> <p>Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).</p> <p>Note 3: DPDCH is not configured, therefore the β_c is set to 1 and $\beta_d = 0$ by default.</p> <p>Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.</p> <p>Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.</p>											

1.2. LTE Test Configuration

Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The Anritsu MT8821C was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

TDD LTE test consideration

For Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.

LTE TDD Band support 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Frame structure type 2:

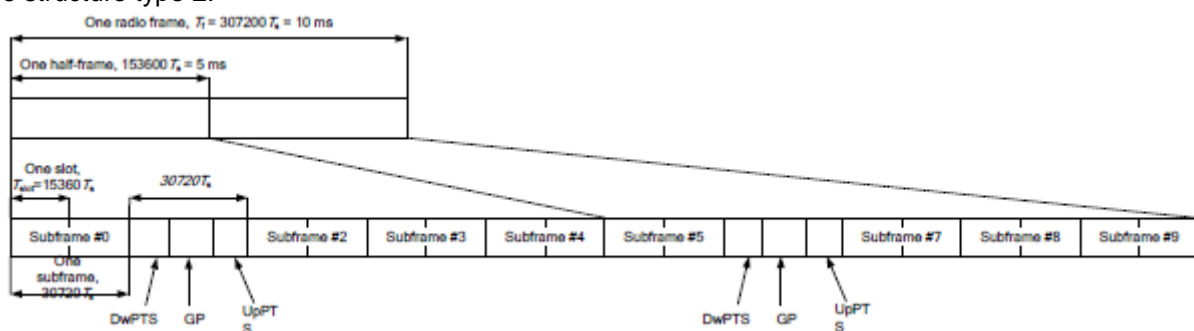


Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink





0	6592.Ts	2192.Ts	2560.Ts	7680.Ts	2192.Ts	2560.Ts
1	19760.Ts			20480.Ts		
2	21952.Ts			23040.Ts		
3	24144.Ts			25600.Ts		
4	26336.Ts	4384.Ts	5120.Ts	7680.Ts	4384.Ts	5120.Ts
5	6592.Ts			20480.Ts		
6	19760.Ts			23040.Ts		
7	21952.Ts			25600.Ts		
8	24144.Ts			-	-	-
9	13168.Ts			-	-	-

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Calculated Duty Cycle=[Extended cyclic prefix in uplink x (Ts) x # of S + # of U]/10ms

Uplink-Downlink Configuration n	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

A) Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

B)MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

C)A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.



**D) Largest channel bandwidth standalone SAR test requirements****1) QPSK with 1 RB allocation**

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 1.0 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.80 W/kg, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50% RB allocation

For QPSK with 50% RB allocation, SAR is only required measure for the worst case of 1RB allocation used the highest maximum output power. SAR is also required for test when the highest reported SAR for 1 RB allocation in 1 at that position is ≥ 1.0 W/kg.

3) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 1.0 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.80 W/kg, the remaining required test channels must also be tested.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.80 W/kg.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.80 W/kg.

1.3. WIFI Test Configuration

For the 802.11b/g/n SAR tests, a communication link is set up with the test mode software for Wi-Fi mode test. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 1, 7 and 13 respectively in the case of 2450 MHz during the test at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest rate. 802.11b/g/n operating modes are tested independently according to the service requirements in each frequency band. 802.11b/g/n modes are tested on channel 1, 7, 13; however if output power reduction is necessary for channels 1 and/or 13 to meet restricted band requirements the highest output channel closest to each of these channels must be tested instead.

SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

WLAN Conducted Power

1. For 2.4GHz WLAN, choose the mode with highest output power, at middle channel to test SAR and determine the worst configuration for further high/low channel testing.
2. For 5.2&5.3&5.5GHz WLAN, choose the mode with highest output power, at middle channel to test SAR and determine the worst configuration for further high/low channel testing.
3. 802.11ax supports full tone size and partial tone size, for full tone size with higher power level, so only chose full tone size to perform SAR testing.





1.4. Power Reduction

The product without any power reduction.

1.5. Power Drift

To control the output power stability during the SAR test, SAR system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. This ensures that the power drift during one measurement is within 5%.





4. TEST CONDITIONS AND RESULTS

4.1. Conducted Power Results

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMW500) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

The conducted power measurement results for WCDMA

Item	band	FDD Band VIII result (dBm)			Tune up (dBm)	FDD Band I result (dBm)			Tune up (dBm)
		Test Channel				Test Channel			
	sub-test	2712	2788	2862		9612	9750	9888	
WCDMA	\	23.08	23.21	23.19	24.00	23.25	23.33	23.18	24.00
HSDPA	1	22.00	22.14	22.10	23.00	22.17	22.22	22.12	23.00
	2	21.91	21.98	21.89	22.00	21.86	21.92	22.08	22.50
	3	21.71	21.80	21.75	22.00	21.83	21.55	21.93	22.00
	4	21.46	21.80	21.44	22.00	21.59	21.20	21.59	22.00
HSUPA	1	22.07	22.24	22.23	23.00	22.28	22.34	22.24	23.00
	2	22.06	22.14	22.02	23.00	22.06	22.28	22.17	23.00
	3	22.13	22.00	21.74	23.00	22.00	22.16	22.26	23.00
	4	22.07	21.76	21.60	22.50	21.95	22.05	22.04	23.00
	5	21.92	21.70	21.51	22.00	21.89	21.80	21.80	22.00

The conducted power measurement results for WLAN

Mode	Channel	Frequency (MHz)	Conducted Output Power	Tune up (dBm)	Test Rate Data
			(dBm)		
802.11b	1	2412	15.32	16.00	1 Mbps
	7	2442	15.56	16.00	1 Mbps
	13	2472	15.21	16.00	1 Mbps
802.11g	1	2412	14.62	15.00	6 Mbps
	7	2442	14.66	15.00	6 Mbps
	13	2472	13.84	15.00	6 Mbps
802.11n(20MHz)	1	2412	13.93	14.00	6.5 Mbps
	7	2442	13.97	14.00	6.5 Mbps
	13	2472	13.17	14.00	6.5 Mbps
802.11n(40MHz)	3	2422	12.41	12.50	13 Mbps
	7	2442	11.74	12.50	13 Mbps
	11	2462	11.92	12.50	13 Mbps

The conducted power measurement results for Bluetooth

Mode	Channel	Frequency (MHz)	Conducted Output Power	Tune up (dBm)
			(dBm)	
BLE	00	2402	0.49	1.00
	19	2440	0.46	1.00
	39	2480	-0.44	0.00
GFSK	00	2402	-0.60	0.00
	78	2480	-0.48	0.00
$\pi/4$ -DQPSK	00	2402	1.08	2.00
	78	2480	0.86	1.00
8DPSK	00	2402	1.68	2.00
	78	2480	2.16	3.00

Note: 1. because the output power (eirp) of Bluetooth of the EUT is less than 20mW(13dBm), so standalone SAR are exempt according EN50663.



**The conducted power measurement results for LTE****LTE-BAND1**

The Conducted Power Measurement Result for LTE Band					
Test Result for LTE Band 1					
Channel Bandwidth	Channel	RB Allocation		Average Power (dBm, QPSK)	Tune up (dBm)
		RB Size	RB Offset		
5MHz	Low Range	1	1RB#0	22.35	23.00
			8RB#0	22.33	23.00
	Mid Range	1	1RB#0	22.46	23.00
			8RB#0	22.48	23.00
	High Range	1	1RB#24	22.49	23.00
			8RB#17	22.49	23.00
20MHz	Low Range	1	1RB#0	22.07	23.00
			18RB#0	22.03	23.00
	Mid Range	1	1RB#0	22.02	23.00
			18RB#0	22.24	23.00
	High Range	1	1RB#99	22.22	23.00
			18RB#82	22.29	23.00

LTE-BAND3

The Conducted Power Measurement Result for LTE Band					
Test Result for LTE Band 3					
Channel Bandwidth	Channel	RB Allocation		Average Power (dBm, QPSK)	Tune up (dBm)
		RB Size	RB Offset		
1.4MHz	Low Range	1	1RB#0	22.58	23.00
	Mid Range	1	1RB#0	22.46	23.00
	High Range	1	1RB#0	22.31	23.00
			5RB#0	22.37	23.00
5MHz	Low Range	1	1RB#0	22.53	23.00
			1RB#24	22.45	23.00
	Mid Range	1	1RB#0	22.40	23.00
			1RB#24	22.40	23.00
	High Range	1	1RB#0	22.36	23.00
			1RB#24	22.27	23.00
20MHz	Low Range	1	8RB#0	22.35	23.00
			1RB#0	22.26	23.00
	Mid Range	1	1RB#99	22.12	23.00
			1RB#0	22.01	23.00
	High Range	1	1RB#99	22.29	23.00
			1RB#0	22.30	23.00
			1RB#99	21.94	23.00
			18RB#0	22.33	23.00



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity

**LTE-BAND7**

The Conducted Power Measurement Result for LTE Band					
Test Result for LTE Band 7					
Channel Bandwidth	Channel	RB Allocation		Average Power (dBm, QPSK)	Tune up (dBm)
		RB Size	RB Offset		
5MHz	Low Range	1	1RB#0	22.22	24.00
			1RB#24	22.18	23.00
	Mid Range	1	1RB#0	23.41	24.00
			1RB#24	23.37	24.00
	High Range	1	1RB#0	22.20	24.00
			1RB#24	22.12	23.00
			8RB#0	22.18	23.00
20MHz	Low Range	1	1RB#0	22.07	23.00
			1RB#99	22.14	23.00
	Mid Range	1	1RB#0	22.60	23.00
			1RB#99	23.20	24.00
	High Range	1	1RB#0	22.05	23.00
			1RB#99	22.07	23.00
			18RB#0	22.18	23.00

LTE-BAND8

The Conducted Power Measurement Result for LTE Band					
Test Result for LTE Band 8					
Channel Bandwidth	Channel	RB Allocation		Average Power (dBm, QPSK)	Tune up (dBm)
		RB Size	RB Offset		
1.4MHz	Low Range	1	1RB#0	24.20	25.00
	Mid Range	1	1RB#0	24.23	25.00
	High Range	1	1RB#0	24.39	25.00
			5RB#0	24.41	25.00
5MHz	Low Range	1	1RB#0	24.23	25.00
			1RB#24	24.29	25.00
	Mid Range	1	1RB#0	24.14	25.00
			1RB#24	24.15	25.00
	High Range	1	1RB#0	24.39	25.00
			1RB#24	24.29	25.00
			8RB#0	24.32	25.00
10MHz	Low Range	1	1RB#0	24.28	25.00
			1RB#49	24.35	25.00
	Mid Range	1	1RB#0	24.35	25.00
			1RB#49	24.20	25.00
	High Range	1	1RB#0	24.42	25.00
			1RB#49	24.30	25.00
			12RB#0	24.41	25.00



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity

**LTE-BAND20**

The Conducted Power Measurement Result for LTE Band					
Test Result for LTE Band 20					
Channel Bandwidth	Channel	RB Allocation		Average Power (dBm, QPSK)	Tune up (dBm)
		RB Size	RB Offset		
5MHz	Low Range	1	1RB#0	24.92	25.00
			1RB#24	24.97	25.00
	Mid Range	1	1RB#0	24.80	25.00
			1RB#24	24.60	25.00
	High Range	1	1RB#0	24.92	25.00
			1RB#24	24.88	25.00
8RB#0			24.97	25.00	
20MHz	Low Range	1	1RB#0	24.66	25.00
			1RB#99	24.74	25.00
	Mid Range	1	1RB#0	24.68	25.00
			1RB#99	24.44	25.00
	High Range	1	1RB#0	24.58	25.00
			1RB#99	24.55	25.00
18RB#0			24.73	25.00	

LTE-BAND28

The Conducted Power Measurement Result for LTE Band					
Test Result for LTE Band 28					
Channel Bandwidth	Channel	RB Allocation		Average Power (dBm, QPSK)	Tune up (dBm)
		RB Size	RB Offset		
3MHz	Low Range	1	1RB#0	24.84	25.00
			4RB#0	24.90	25.00
	Mid Range	1	1RB#0	24.74	25.00
			4RB#0	24.62	25.00
	High Range	1	1RB#14	24.77	25.00
			4RB#11	24.77	25.00
5MHz	Low Range	1	1RB#0	24.78	25.00
			8RB#0	24.71	25.00
	Mid Range	1	1RB#0	24.60	25.00
			8RB#0	24.61	25.00
	High Range	1	1RB#24	24.72	25.00
			8RB#17	24.76	25.00
20MHz	Low Range	1	1RB#0	24.50	25.00
			18RB#0	24.35	25.00
	Mid Range	1	1RB#0	24.37	25.00
			18RB#0	24.36	25.00
	High Range	1	1RB#99	24.49	25.00
			18RB#82	24.57	25.00



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

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LTE-BAND41

The Conducted Power Measurement Result for LTE Band					
Test Result for LTE Band 41					
Channel Bandwidth	Channel	RB Allocation		Average Power (dBm, QPSK)	Tune up (dBm)
		RB Size	RB Offset		
5MHz	Low Range	1	1RB#0	22.70	23.00
			1RB#24	22.71	23.00
	Mid Range	1	1RB#0	22.09	23.00
			1RB#24	22.07	23.00
	High Range	1	1RB#0	23.04	23.50
			1RB#24	23.08	23.50
8RB#0			22.90	23.00	
20MHz	Low Range	1	1RB#0	22.52	23.00
			1RB#99	22.46	23.00
	Mid Range	1	1RB#0	21.99	22.00
			1RB#99	21.95	22.00
	High Range	1	1RB#0	22.80	23.00
			1RB#99	22.95	23.00
18RB#0			22.82	23.00	





4.2. SAR Measurement Results

Front of face SAR Data

10-g SAR

Front of face SAR

Frequency		BW(MHz)	Mode/Band	Separation Distance(m)	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Scaling Factor	SAR(10g) (W/kg)	Reported SAR 10g(W/kg)	Power Drift(%)	Limit (w/kg)	Ref.PI ot #
MHz	Channel												
897.6	2788	/	WCDMA Band VIII	5	Front	23.21	24.00	1.199	0.198	0.238	-1.76	2.0	1
882.4	2712	/	WCDMA Band VIII	5	Front	23.08	24.00	1.236	0.144	0.178	2.26	2.0	
912.6	2863	/	WCDMA Band VIII	5	Front	23.19	24.00	1.205	0.178	0.214	0.32	2.0	
1950.0	9750	/	WCDMA Band I	5	Front	23.33	24.00	1.167	0.970	1.132	-1.02	2.0	2
1922.4	9612	/	WCDMA Band I	5	Front	23.25	24.00	1.189	0.941	1.118	-3.32	2.0	
1977.6	9888	/	WCDMA Band I	5	Front	23.18	24.00	1.208	0.918	1.109	2.15	2.0	
2442	7	/	802.11b	5	Front	15.56	16.00	1.107	0.086	0.095	4.83	2.0	3
2412	1	/	802.11b	5	Front	15.32	16.00	1.169	0.068	0.080	3.33	2.0	
2472	13	/	802.11b	5	Front	15.21	16.00	1.199	0.055	0.066	2.21	2.0	
1977.6	9888	5MHz	LTE1	5	Front	22.49	23.00	1.125	0.462	0.520	-1.78	2.0	4
1922.4	9612	5MHz	LTE1	5	Front	22.35	23.00	1.161	0.444	0.516	-3.25	2.0	
1950.0	9750	5MHz	LTE1	5	Front	22.48	23.00	1.127	0.459	0.517	-1.11	2.0	
1710.7	19207	1.4MHz	LTE3	5	Front	22.58	23.00	1.102	0.352	0.388	0.89	2.0	5
1747.5	19575	1.4MHz	LTE3	5	Front	22.46	23.00	1.132	0.332	0.376	-0.03	2.0	
1784.3	19943	1.4MHz	LTE3	5	Front	22.37	23.00	1.156	0.311	0.360	-0.17	2.0	
2535.0	21100	5MHz	LTE7	5	Front	23.41	24.00	1.146	0.053	0.061	-0.17	2.0	6
2502.5	20775	5MHz	LTE7	5	Front	22.22	24.00	1.507	0.032	0.048	-1.12	2.0	
2567.5	21425	5MHz	LTE7	5	Front	22.20	24.00	1.514	0.027	0.041	2.85	2.0	
910.0	21750	10MHz	LTE8	5	Front	24.42	26.00	1.439	0.305	0.439	0.81	2.0	7
885.0	21500	10MHz	LTE8	5	Front	24.35	25.00	1.161	0.244	0.283	-3.14	2.0	
897.5	21625	10MHz	LTE8	5	Front	24.35	25.00	1.161	0.241	0.280	0.17	2.0	
834.5	24175	5MHz	LTE20	5	Front	24.97	25.00	1.007	0.064	0.064	1.02	2.0	8
847.0	24300	5MHz	LTE20	5	Front	24.80	25.00	1.047	0.049	0.051	-4.52	2.0	
859.5	24425	5MHz	LTE20	5	Front	24.97	25.00	1.007	0.060	0.060	0.09	2.0	
704.5	27225	3MHz	LTE28	5	Front	24.90	25.00	1.023	0.232	0.237	-0.77	2.0	9
725.5	27435	3MHz	LTE28	5	Front	24.74	25.00	1.062	0.200	0.212	-0.25	2.0	
746.5	27645	3MHz	LTE28	5	Front	24.77	25.00	1.054	0.206	0.217	1.41	2.0	
2687.5	41565	5MHz	LTE41	5	Front	23.08	24.00	1.236	0.035	0.043	3.50	2.0	10
2498.5	39675	5MHz	LTE41	5	Front	22.71	23.00	1.069	0.022	0.024	2.22	2.0	
2593.0	40620	5MHz	LTE41	5	Front	22.09	23.00	1.233	0.009	0.011	-1.41	2.0	



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Wrist-Worn SAR Data

10-g SAR

Wrist-Worn SAR

Frequency		BW(M Hz)	Mode/Band	Separation Distance(mm)	Test Position	Conducted Power (dBm)	Maximum Allowed Power (dBm)	Scaling Factor	SAR(10g) (W/kg)	Reported SAR 10g(W/kg)	Power Drift(%)	Limit (w/kg)	Ref.PI ot #
MHz	Channel												
897.6	2788	/	WCDMA Band VIII	0	Back	23.21	24.00	1.199	0.418	0.501	3.17	4.0	11
882.4	2712	/	WCDMA Band VIII	0	Back	23.08	24.00	1.236	0.357	0.441	3.54	4.0	
912.6	2863	/	WCDMA Band VIII	0	Back	23.19	24.00	1.205	0.401	0.483	2.12	4.0	
1950.0	9750	/	WCDMA Band I	0	Back	23.33	24.00	1.167	1.284	1.498	-0.06	4.0	12
1922.4	9612	/	WCDMA Band I	0	Back	23.25	24.00	1.189	1.121	1.332	3.25	4.0	
1977.6	9888	/	WCDMA Band I	0	Back	23.18	24.00	1.208	1.085	1.310	0.06	4.0	
2442.7	7	/	802.11b	0	Back	15.56	16.00	1.107	0.088	0.097	1.39	4.0	13
2412.1	1	/	802.11b	0	Back	15.32	16.00	1.169	0.054	0.063	2.21	4.0	
2472.13	13	/	802.11b	0	Back	15.21	16.00	1.199	0.045	0.054	3.12	4.0	
1977.6	9888	5MHz	LTE1	0	Back	22.49	23.00	1.125	1.043	1.173	1.28	4.0	14
1922.4	9612	5MHz	LTE1	0	Back	22.35	23.00	1.161	0.992	1.152	-2.85	4.0	
1950.0	9750	5MHz	LTE1	0	Back	22.48	23.00	1.127	1.025	1.155	3.32	4.0	
1710.7	19207	1.4MHz	LTE3	0	Back	22.58	23.00	1.102	0.959	1.056	0.03	4.0	15
1747.5	19575	1.4MHz	LTE3	0	Back	22.46	23.00	1.132	0.930	1.053	-2.33	4.0	
1784.3	19943	1.4MHz	LTE3	0	Back	22.37	23.00	1.156	0.904	1.045	4.21	4.0	
2535.0	21100	5MHz	LTE7	0	Back	23.41	24.00	1.146	0.202	0.231	-3.42	4.0	16
2502.5	20775	5MHz	LTE7	0	Back	22.22	24.00	1.507	0.150	0.226	2.12	4.0	
2567.5	21425	5MHz	LTE7	0	Back	22.20	24.00	1.514	0.133	0.201	0.06	4.0	
910.0	21750	10MHz	LTE8	0	Back	24.42	26.00	1.439	0.267	0.384	4.76	4.0	17
885.0	21500	10MHz	LTE8	0	Back	24.35	25.00	1.161	0.222	0.258	1.99	4.0	
897.5	21625	10MHz	LTE8	0	Back	24.35	25.00	1.161	0.219	0.254	0.08	4.0	
834.5	24175	5MHz	LTE20	0	Back	24.97	25.00	1.007	0.671	0.676	-3.98	4.0	18
847.0	24300	5MHz	LTE20	0	Back	24.80	25.00	1.047	0.635	0.665	2.14	4.0	
859.5	24425	5MHz	LTE20	0	Back	24.97	25.00	1.007	0.668	0.673	0.04	4.0	
704.5	27225	3MHz	LTE28	0	Back	24.90	25.00	1.023	1.110	1.136	-0.97	4.0	19
725.5	27435	3MHz	LTE28	0	Back	24.74	25.00	1.062	0.995	1.056	3.11	4.0	
746.5	27645	3MHz	LTE28	0	Back	24.77	25.00	1.054	1.002	1.056	-0.04	4.0	
2687.5	41565	5MHz	LTE41	0	Back	23.08	24.00	1.236	0.308	0.381	-0.92	4.0	20
2498.5	39675	5MHz	LTE41	0	Back	22.71	23.00	1.069	0.255	0.273	-1.12	4.0	
2593.0	40620	5MHz	LTE41	0	Back	22.09	23.00	1.233	0.232	0.286	3.21	4.0	



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4.3. Test reduction procedure

Maximum power level

The maximum power level, $P_{\max,m}$, that can be transmitted by a device before the SAR averaged over a mass, m , exceeds a given limit, SAR_{\lim} , can be defined. Any device transmitting at power levels below $P_{\max,m}$ can then be excluded from SAR testing. The lowest possible value for $P_{\max,m}$ is: $P_{\max,m} = SAR_{\lim} \cdot m$.

When working alone, the averages transmit power of BT module should be less than 20mW. According to the test results, when working alone, the testing of BT module is not necessary.

Simultaneous Multi-band Transmission SAR Analysis List of Mode for Simultaneous Multi-band

Transmission

No.	Configurations	Front to face SAR	Body SAR
1	WCDMA + 2.4G WLAN	Yes	Yes
2	LTE + 2.4G WLAN	Yes	Yes
3	WCDMA + Bluetooth	No	No
4	LTE + Bluetooth	No	No

Remark:

One way of determining the threshold power level available to the secondary transmitter ($P_{\text{available}}$) is to calculate it from the measured peak spatial-average SAR of the primary transmitter (SAR_1) according to the equation:

$$P_{\text{available}} = P_{\text{th},m} \times (SAR_{\lim} - SAR_1) / SAR_{\lim}$$

where $P_{\text{th},m}$ is the threshold exclusion power level taken from Annex B of EN 50663 for the frequency of the secondary transmitter at the separation distance used in the testing.

For simultaneous transmission analysis, Bluetooth SAR is below:

Bluetooth:

Test Position	Average Power (dBm)	Output Power (mW)	$P_{\text{th},m}$ (mW)	SAR_{\lim} (W/kg)	SAR_1 (W/kg)	$P_{\text{available}}$ (mW)
Front to face	3.00	1.995	20	2.0	1.132	8.68
Body Worn	3.00	1.995	20	4.0	1.498	12.51

The Bluetooth output power of the secondary transmitter is less than $P_{\text{available}}$, So SAR measurement for the secondary transmitter is not necessary.

Maximum SAR value and the sum of the 10-g SAR for WWAN & WLAN- Front to face

WWAN Band	WWAN Max SAR (W/kg)	2.4G WLAN Max SAR (W/kg)	Max SAR Sum (W/kg)	Limit (W/kg)
WCDMA900	0.238	0.095	0.333	2.0
WCDMA2100	1.132	0.095	1.227	
LTE Band 1	0.520	0.095	0.615	
LTE Band 3	0.388	0.095	0.483	
LTE Band 7	0.061	0.095	0.156	
LTE Band 8	0.439	0.095	0.534	
LTE Band 20	0.064	0.095	0.159	
LTE Band 28	0.237	0.095	0.332	
LTE Band 41	0.043	0.095	0.138	



**Maximum SAR value and the sum of the 10-g SAR for WWAN & WLAN–Wrist worn**

WWAN Band	WWAN Max SAR (W/kg)	2.4GWLAN Max SAR (W/kg)	Max SAR Sum (W/kg)	Limit (W/kg)
WCDMA900	0.501	0.097	0.598	4.0
WCDMA2100	1.498	0.097	1.595	
LTE Band 1	1.173	0.097	1.270	
LTE Band 3	1.056	0.097	1.153	
LTE Band 7	0.231	0.097	0.328	
LTE Band 8	0.384	0.097	0.481	
LTE Band 20	0.676	0.097	0.773	
LTE Band 28	1.136	0.097	1.233	
LTE Band 41	0.381	0.097	0.478	

Remark:

- 1 WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
- 2 GSM ,WCDMAand LTE share the same antenna, and cannot transmit simultaneously.
- 3 The maximum SAR summation is calculated based on the same configuration and test position.
If 10g-SAR summation < 2.0W/kg for Front to face or 10g-SAR summation < 4.0W/kg for Wrist worn, simultaneous SAR measurement is not necessary.
- 4 When the maximum SAR summation $\geq 1.0W/kg$ on Front to face and the maximum SAR summation $\geq 2.0W/kg$ on Wrist worn,WWAN, WLAN2.4Gfor low and high Channels are necessary to be tested and the test results please refer to the SAR Measurement Results.





4.5. Measurement Uncertainty (450MHz-6GHz)

Measurement uncertainty evaluation for SAR test and System check

Uncertainty Component	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Veff
Measurement System								
Probe calibration	5.8	N	1	1	1	5.80	5.80	∞
Axial Isotropy	3.5	R	$\sqrt{3}$	$\sqrt{1 - C_p}$	$\sqrt{1 - C_p}$	1.43	1.43	∞
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
System detection limits	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.5	N	1	1	1	0.50	0.50	∞
Response Time	0.0	R	$\sqrt{3}$	1	1	0.00	0.00	∞
Integration Time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF ambient Conditions - Noise	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF ambient Conditions - Reflections	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Max. SAR Evaluation	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample Related								
Device positioning	2.6	N	1	1	1	2.6	2.6	11
Device holder	3.0	N	1	1	1	3.0	3.0	7
Drift of output power	5.0	N	$\sqrt{3}$	1	1	2.89	2.89	∞
System check source(dipole)								
Deviation between experimental dipoles	2.0	N	1	1	1	2.0	2.0	∞
Input power and SAR drift measurement	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
Dipole axis to liquid distance	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
System check source								
Deviation between experimental source	—	N	1	0	0	—	—	7
Input power and SAR drift measurement	—	R	$\sqrt{3}$	1	1	—	—	∞
Other source contributions	—	R	$\sqrt{3}$	1	1	—	—	∞
Phantom and Tissue Parameters								
Phantom uncertainty	4.00	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid conductivity (target)	2.50	N	1	0.78	0.71	1.95	1.78	5
Liquid conductivity (meas)	4.00	N	1	0.23	0.26	0.92	1.04	5
Liquid Permittivity (target)	2.50	N	1	0.78	0.71	1.95	1.78	∞





Liquid Permittivity (meas)	5.00	N	1	0.23	0.26	1.15	1.30	∞
Combined Standard		RSS	$U_c = \sqrt{\sum_{i=1}^n C_i^2 U_i^2}$			10.63%	10.54%	
Expanded Uncertainty (95% Confidence interval)	U = k U _C , k=2					21.26%	21.08%	





4.6. System Check Results

Test mode:750MHz

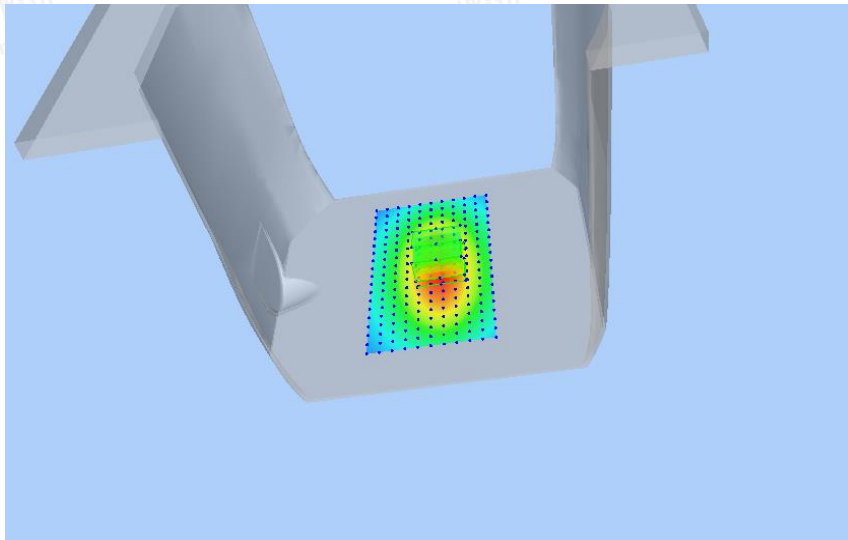
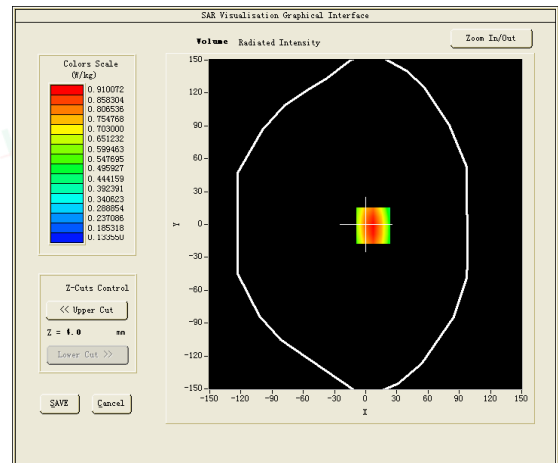
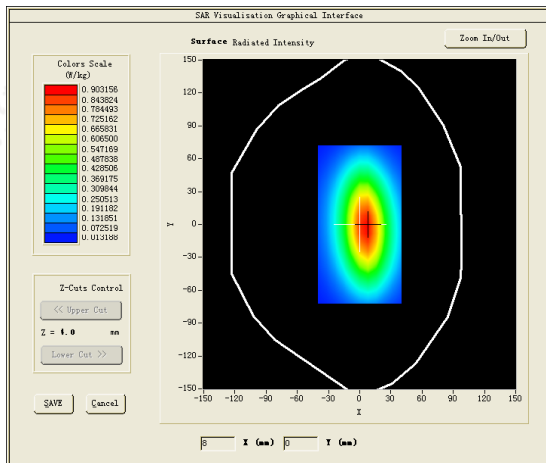
Product Description:Validation

Model:Dipole SID750

E-Field Probe: SSE2(SN 25/22 EPGO376)

Test Date: April 08, 2025

Medium(liquid type)	HSL_750
Frequency (MHz)	750.0000
Relative permittivity (real part)	41.90
Conductivity (S/m)	0.88
Input power	100mW
Crest Factor	1.0
Conversion Factor	1.69
Variation (%)	-0.100000
SAR 10g (W/Kg)	0.541559
SAR 1g (W/Kg)	0.863200
SURFACE SAR	VOLUME SAR



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Test mode:900MHz

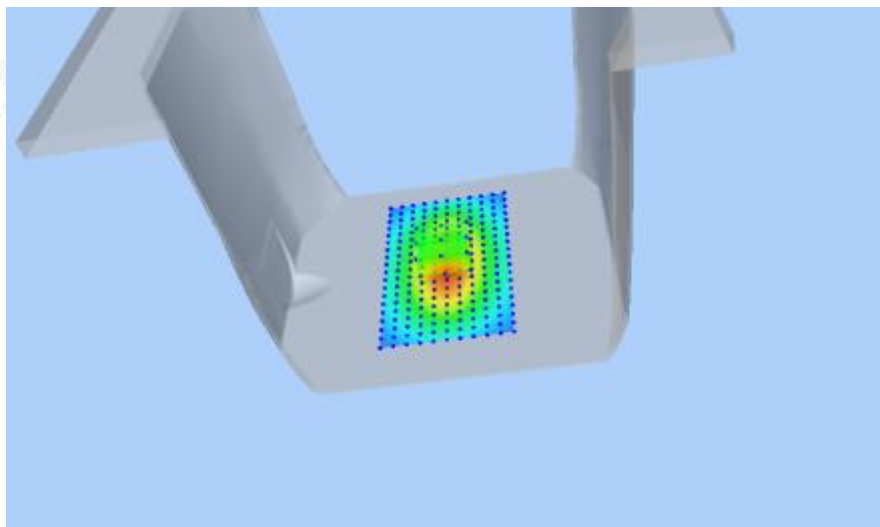
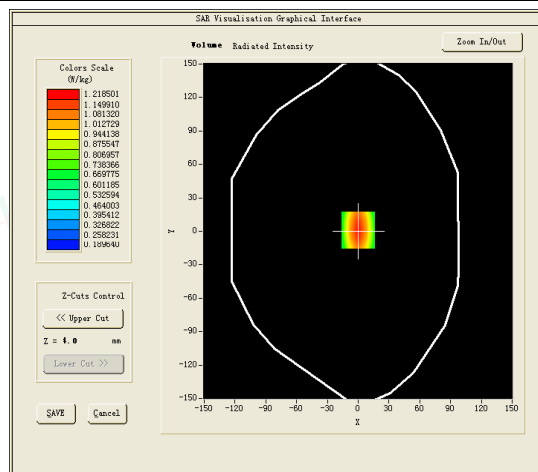
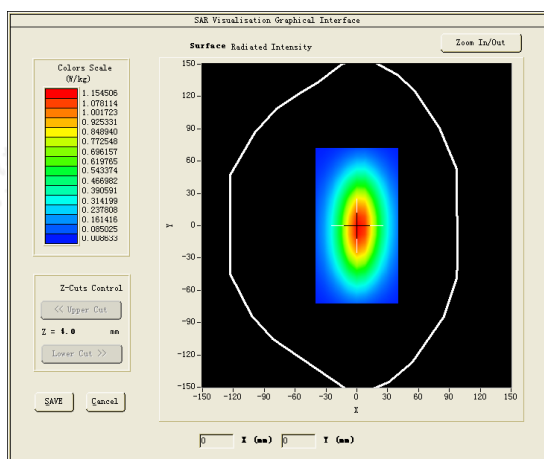
Product Description:Validation

Model:Dipole SID900

E-Field Probe:SSE2(SN 25/22 EPGO376)

Test Date:April 10, 2025

Medium(liquid type)	HSL_900
Frequency (MHz)	900.0000
Relative permittivity (real part)	42.58
Conductivity (S/m)	0.94
Input power	100mW
Crest Factor	1.0
Conversion Factor	1.87
Variation (%)	-1.410000
SAR 10g (W/Kg)	0.721496
SAR 1g (W/Kg)	1.143251
SURFACE SAR	VOLUME SAR



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Test mode:1800MHz

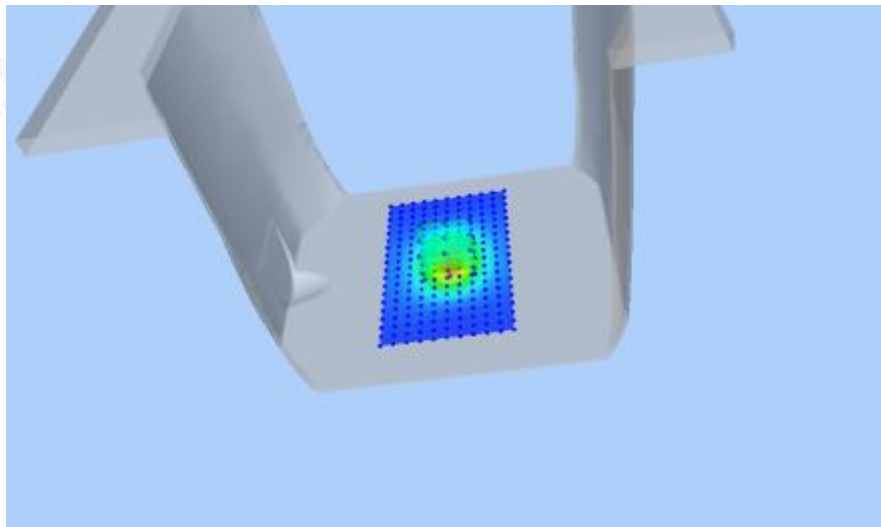
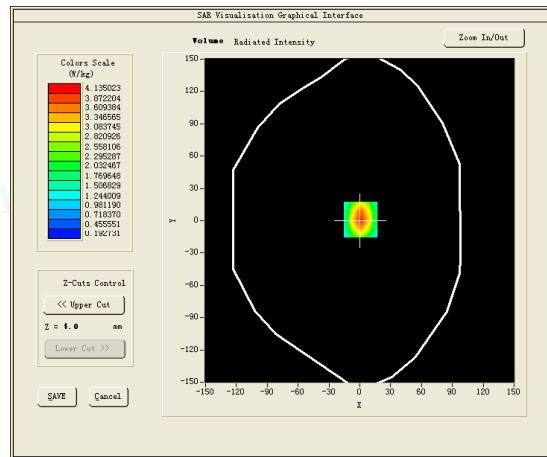
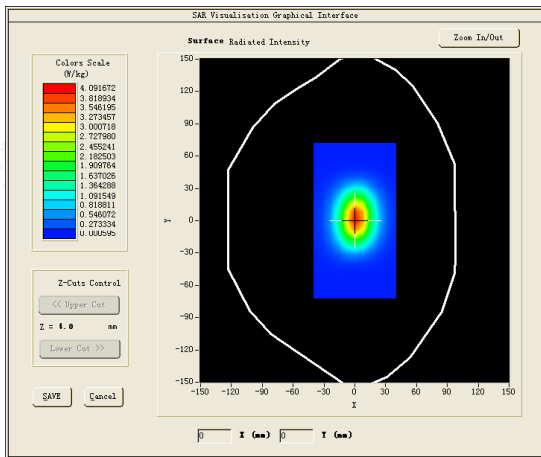
Product Description:Validation

Model:Dipole SID1800

E-Field Probe:SSE2(SN 25/22 EPGO376)

Test Date: April 14, 2025

Medium(liquid type)	HSL_1800
Frequency (MHz)	1800.0000
Relative permittivity (real part)	40.64
Conductivity (S/m)	1.43
Input power	100mW
Crest Factor	1.0
Conversion Factor	2.09
Variation (%)	-3.460000
SAR 10g (W/Kg)	1.887692
SAR 1g (W/Kg)	4.013524

SURFACE SAR**VOLUME SAR**

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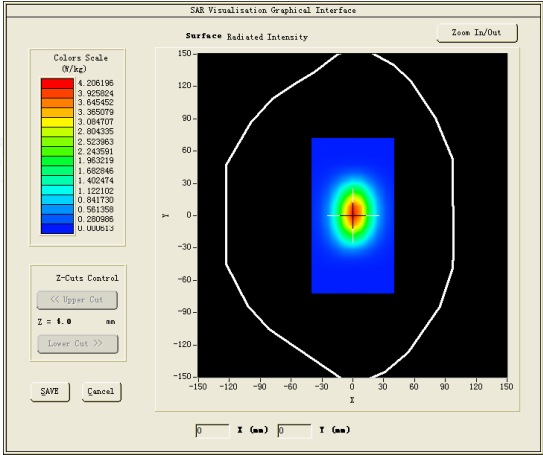
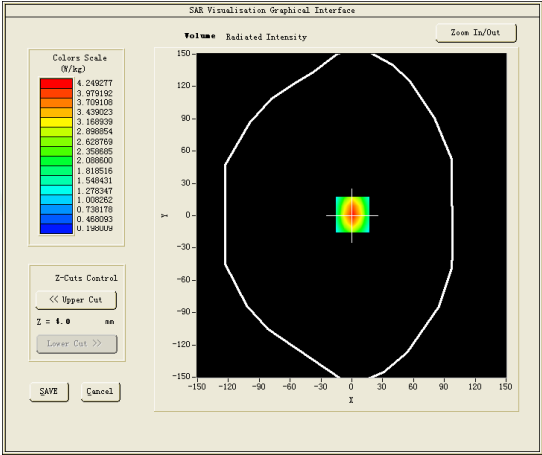
Test mode:2000MHz

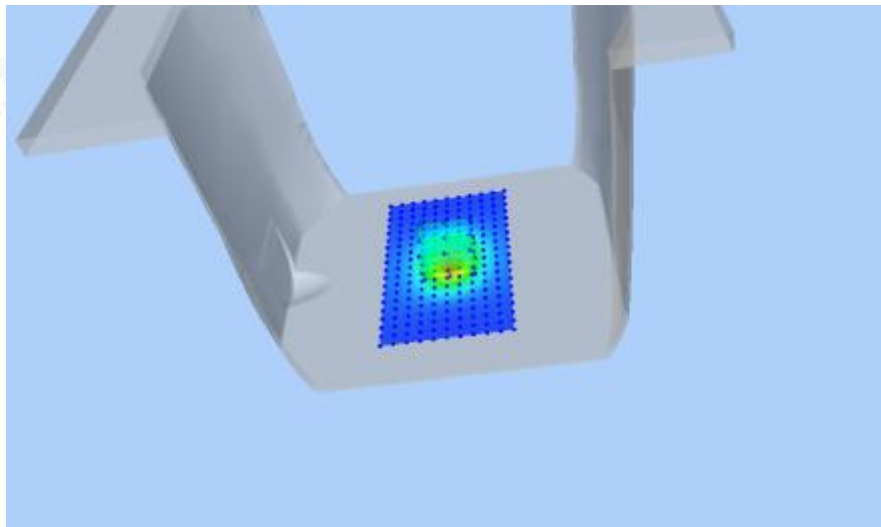
Product Description:Validation

Model:Dipole SID2000

E-Field Probe:SSE2(SN 25/22 EPGO376)

Test Date:April 18, 2025

Medium(liquid type)	HSL_2000
Frequency (MHz)	2000.0000
Relative permittivity (real part)	39.17
Conductivity (S/m)	1.42
Input power	100mW
Crest Factor	1.0
Conversion Factor	2.31
Variation (%)	-3.970000
SAR 10g (W/Kg)	1.957112
SAR 1g (W/Kg)	4.046892
SURFACE SAR	VOLUME SAR
	



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Test mode:2450MHz

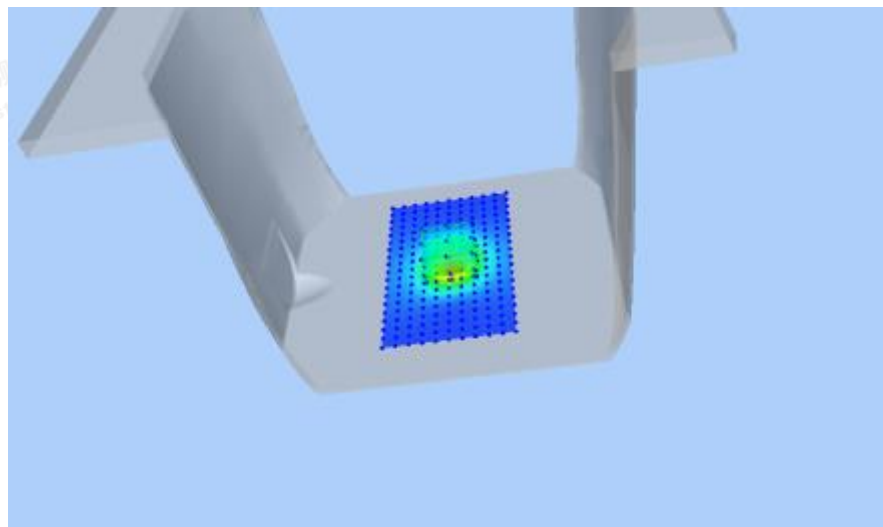
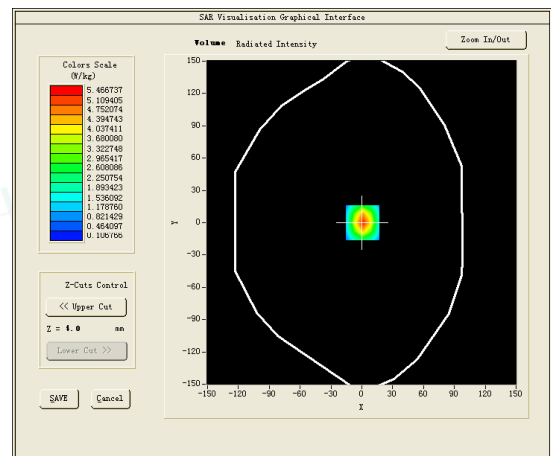
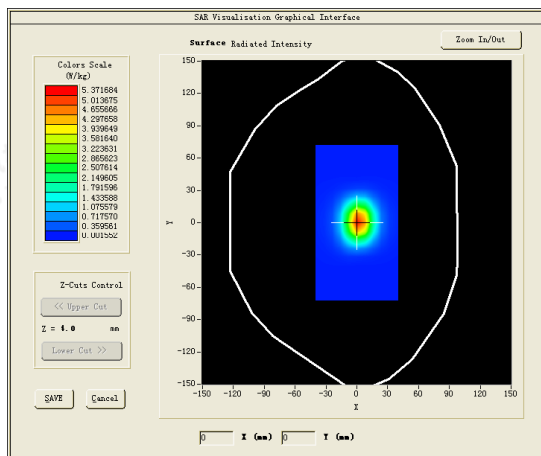
Product Description:Validation

Model:Dipole SID2450

E-Field Probe:SSE2(SN 25/22 EPGO376)

Test Date: April 21, 2025

Medium(liquid type)	HSL_2450
Frequency (MHz)	2450.0000
Relative permittivity (real part)	38.35
Conductivity (S/m)	1.78
Input power	100mW
Crest Factor	1.0
Conversion Factor	2.60
Variation (%)	-1.790000
SAR 10g (W/Kg)	2.339756
SAR 1g (W/Kg)	4.976425
SURFACE SAR	VOLUME SAR



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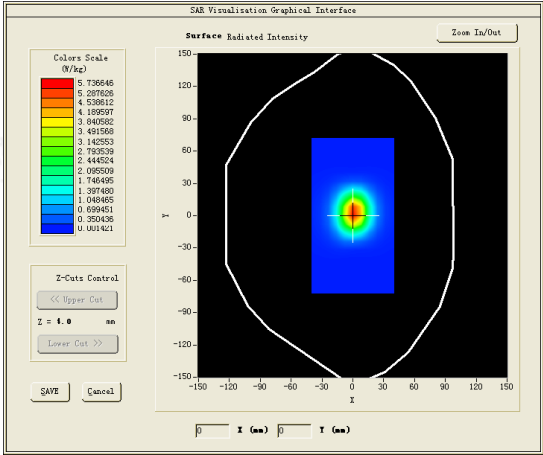
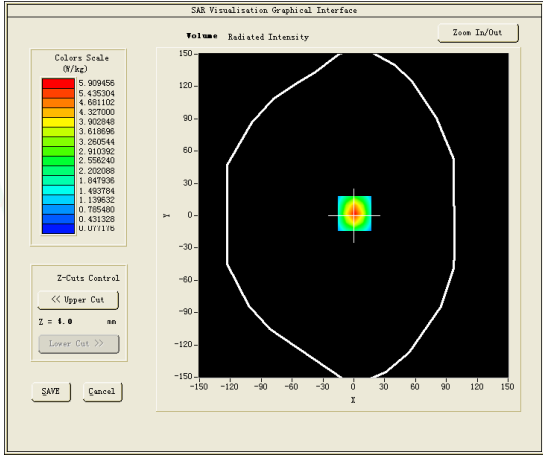
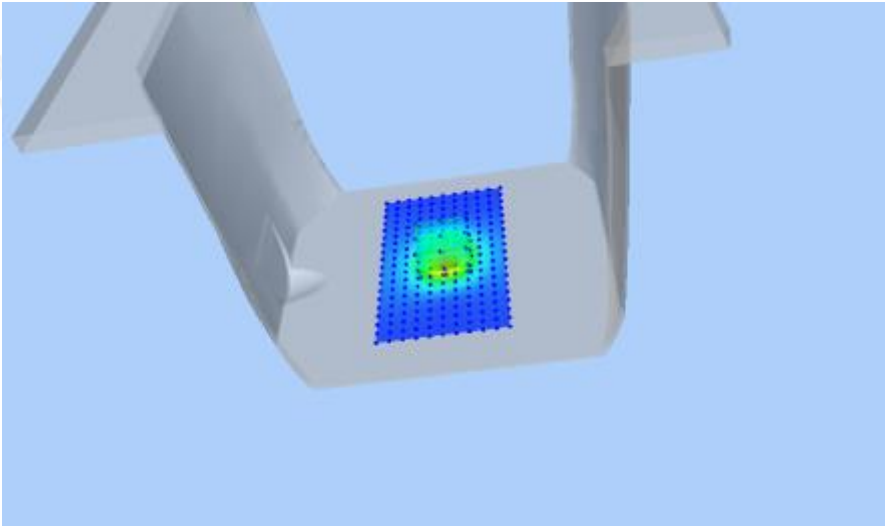
Test mode:2600MHz

Product Description:Validation

Model:Dipole SID2600

E-Field Probe:SSE2(SN 25/22 EPGO376)

Test Date: April 25, 2025

Medium(liquid type)	HSL_2600
Frequency (MHz)	2600.0000
Relative permittivity (real part)	40.35
Conductivity (S/m)	1.90
Input power	100mW
Crest Factor	1.0
Conversion Factor	2.39
Variation (%)	-1.270000
SAR 10g (W/Kg)	2.453607
SAR 1g (W/Kg)	5.610637
SURFACE SAR	VOLUME SAR
	
	



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4.7. SAR Test Graph Results

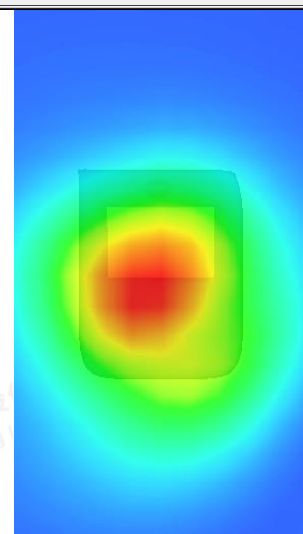
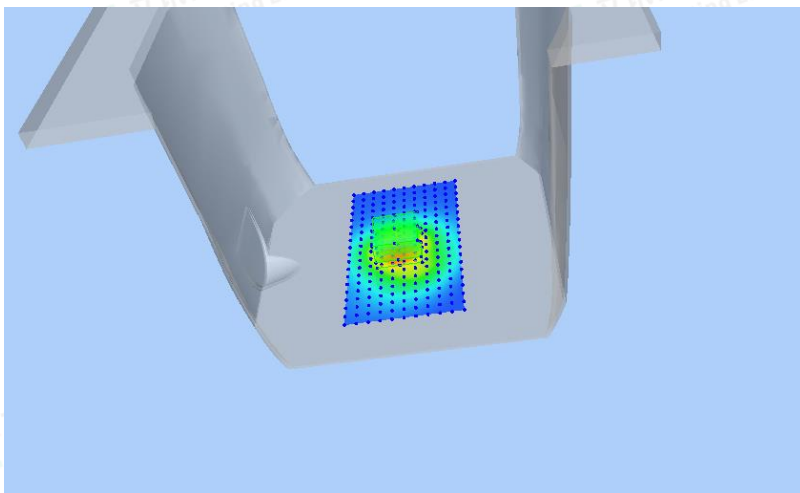
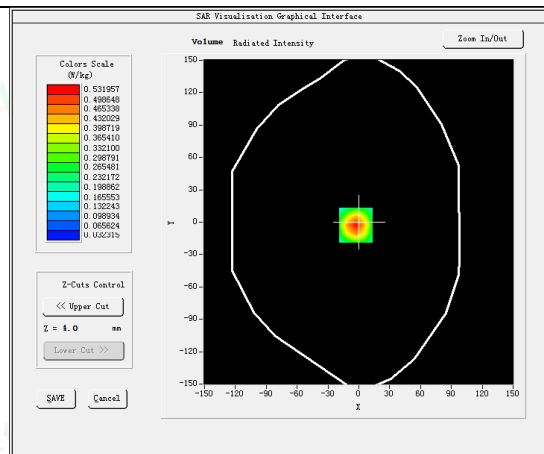
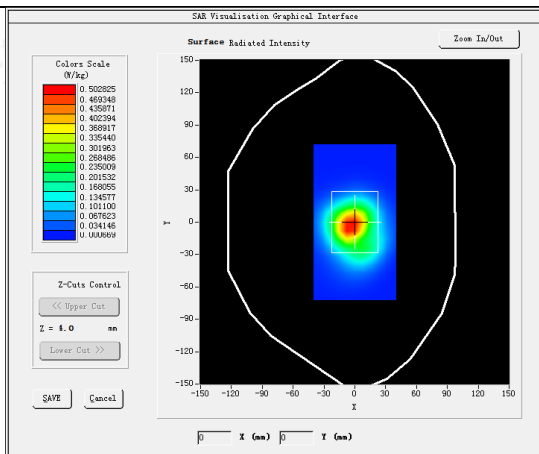
#1 Test Mode: WCDMA 900MHz, Middle channel (Front of face)

Product Description: myFirst Fone S4

Model: KW1601

Test Date: April 10, 2025

Medium (liquid type)	HSL_900
Frequency (MHz)	897.6000
Relative permittivity (real part)	42.58
Conductivity (S/m)	0.94
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.87
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7, dx=8mm dy=8mm dz=5mm
Variation (%)	-1.760000
SAR 10g (W/Kg)	0.198284
SAR 1g (W/Kg)	0.305024
SURFACE SAR	VOLUME SAR



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#2

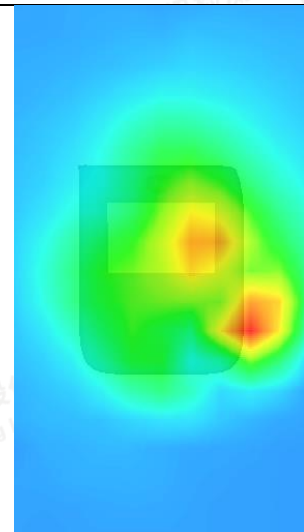
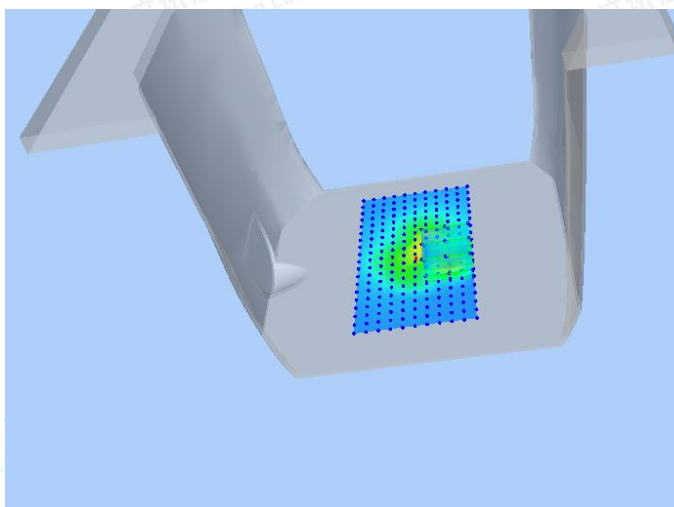
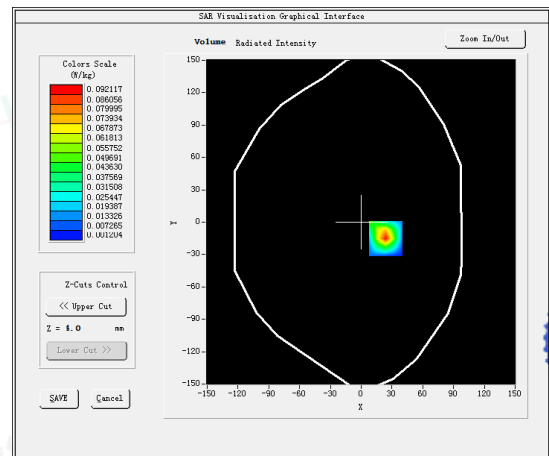
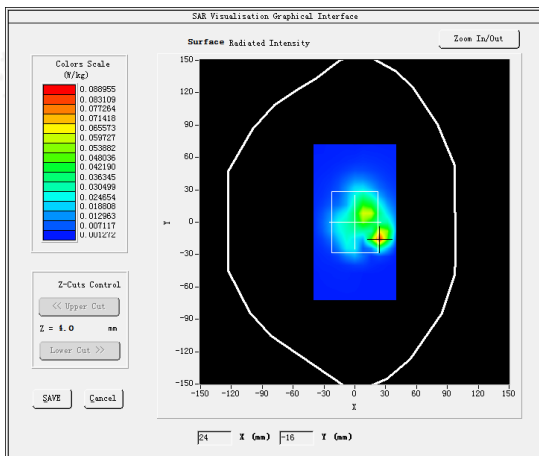
Test Mode:WCDMA2100MHz,Middle channel(Front of face)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 18, 2025

Medium(liquid type)	HSL_2000
Frequency (MHz)	1950.0000
Relative permittivity (real part)	39.17
Conductivity (S/m)	1.42
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.31
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.020000
SAR 10g (W/Kg)	0.969807
SAR 1g (W/Kg)	1.621582
SURFACE SAR	VOLUME SAR



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#3

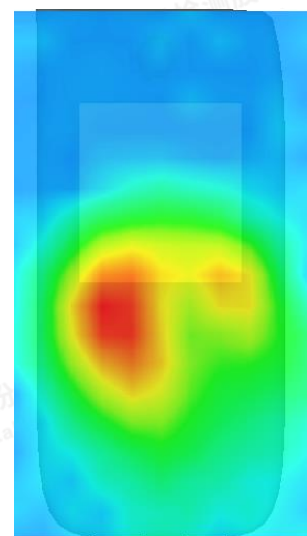
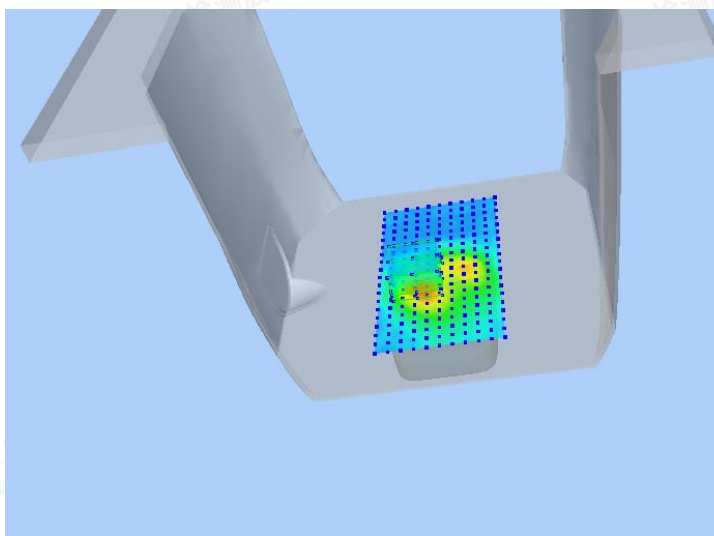
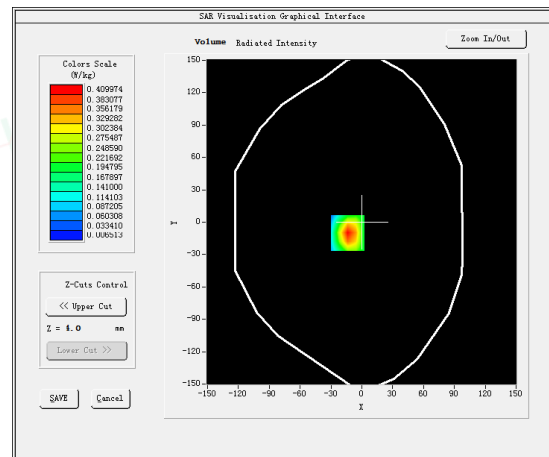
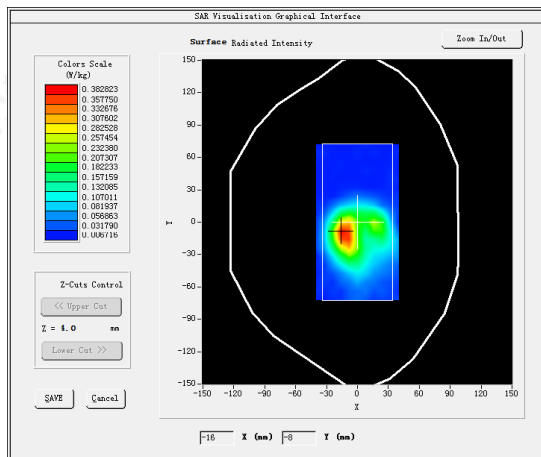
Test Mode:802.11B,Middle channel(Front of face)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 21, 2025

Medium(liquid type)	HSL_2450
Frequency (MHz)	2442.0000
Relative permittivity (real part)	38.35
Conductivity (S/m)	1.78
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.60
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	4.830000
SAR 10g (W/Kg)	0.086363
SAR 1g (W/Kg)	0.192140
SURFACE SAR	VOLUME SAR



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#4

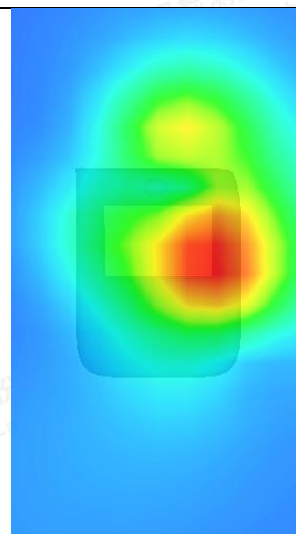
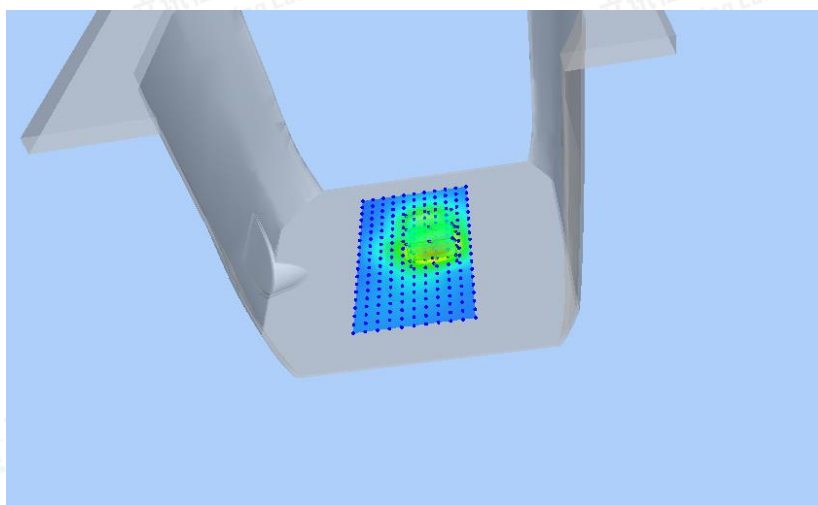
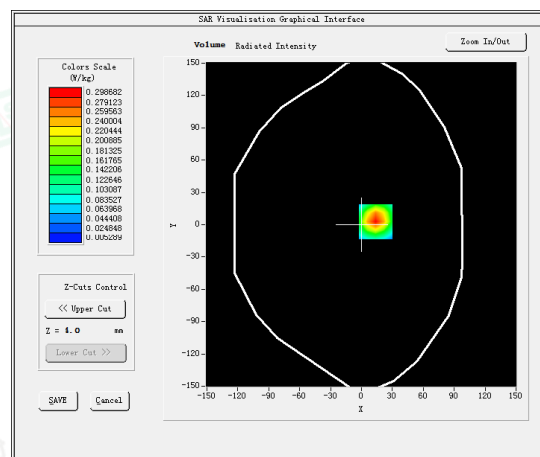
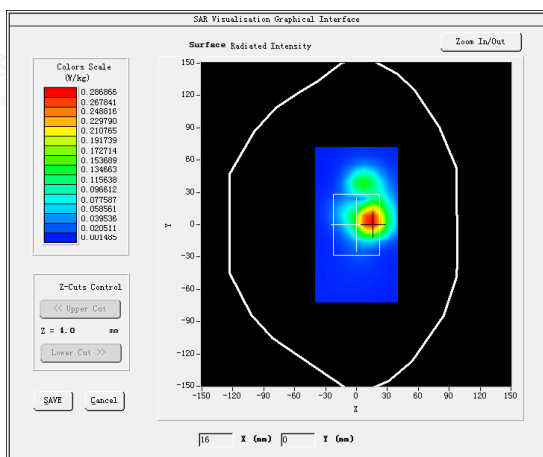
Test Mode:E-UTRA Band1,High channel(Front of face)

Product Description: myFirst Fone S4

Model: KW1601

Test Date: April 18, 2025

Medium(liquid type)	HSL_2000
Frequency (MHz)	1977.6000
Relative permittivity (real part)	39.17
Conductivity (S/m)	1.42
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.31
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-1.780000
SAR 10g (W/Kg)	0.462248
SAR 1g (W/Kg)	0.781965
SURFACE SAR	VOLUME SAR



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#5

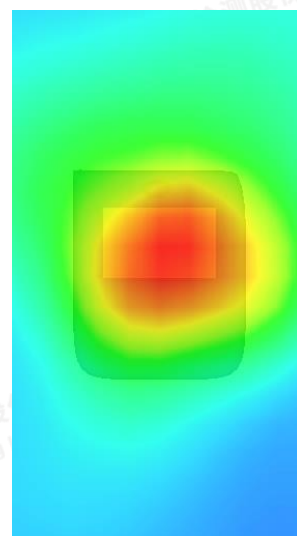
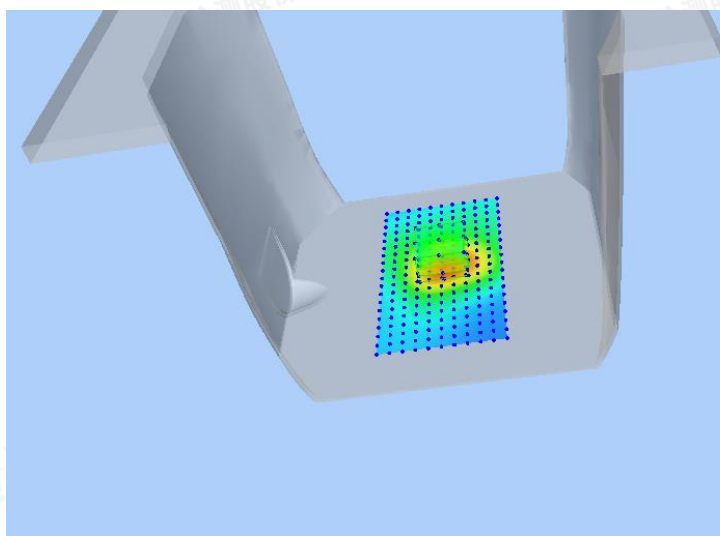
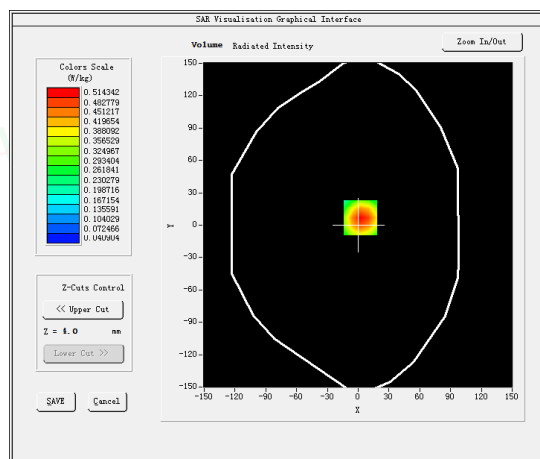
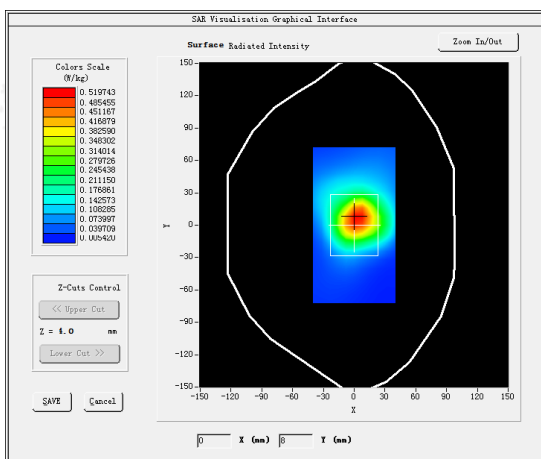
Test Mode:E-UTRA3,Low channel(Front of face)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 14, 2025

Medium(liquid type)	HSL_1800
Frequency (MHz)	1710.7000
Relative permittivity (real part)	40.64
Conductivity (S/m)	1.43
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.09
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.890000
SAR 10g (W/Kg)	0.352198
SAR 1g (W/Kg)	0.580763
SURFACE SAR	VOLUME SAR



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#6

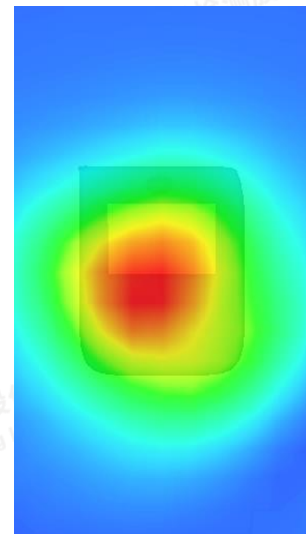
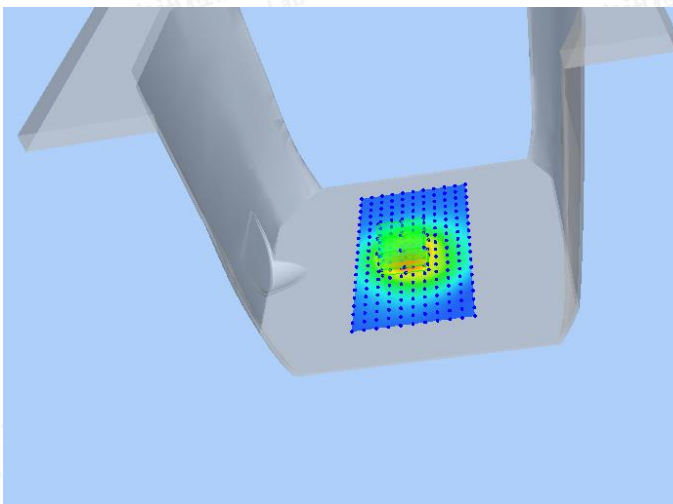
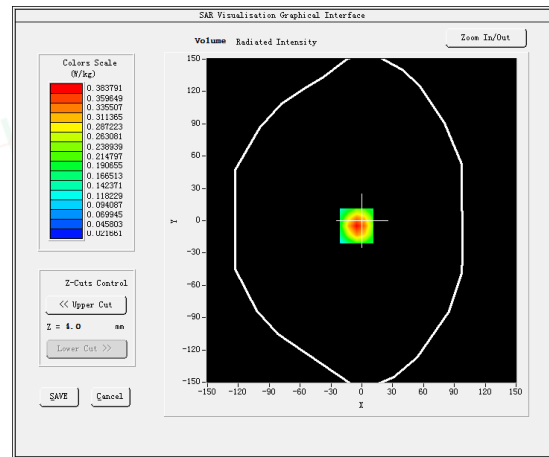
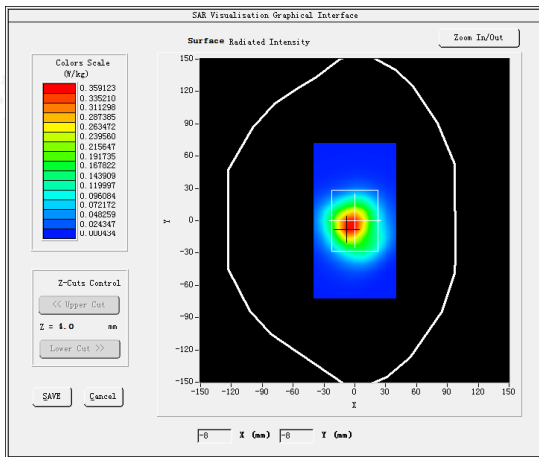
Test Mode: E-UTRA7,Middle channel(Front of face)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 25, 2025

Medium(liquid type)	HSL_2600
Frequency (MHz)	2535.0000
Relative permittivity (real part)	40.35
Conductivity (S/m)	1.90
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.39
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.170000
SAR 10g (W/Kg)	0.053322
SAR 1g (W/Kg)	0.106130
SURFACE SAR	VOLUME SAR



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#7

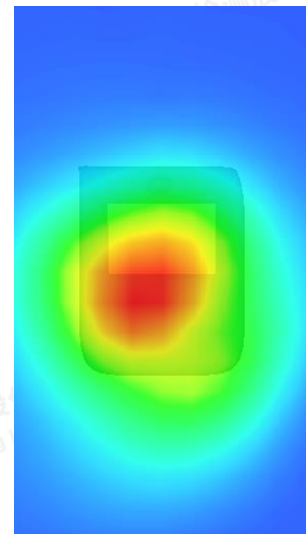
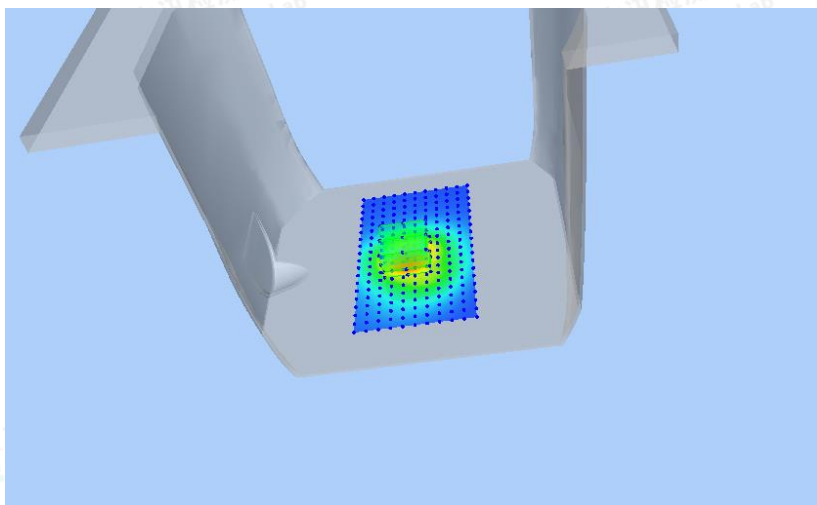
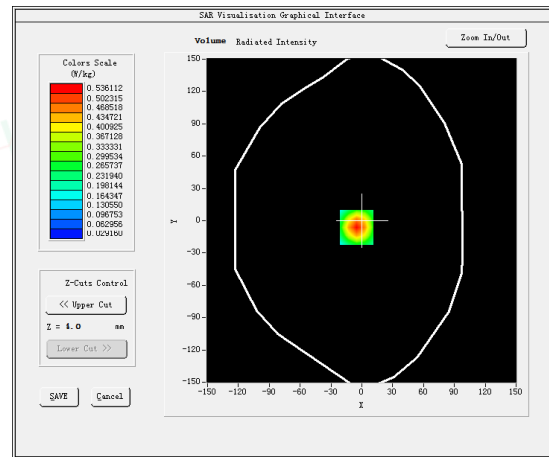
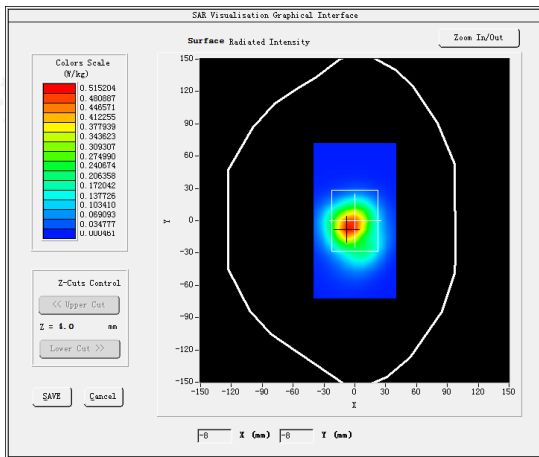
Test Mode: E-UTRA8,High channel(Front of face)

Product Description: myFirst Fone S4

Model: KW1601

Test Date: April 10, 2025

Medium(liquid type)	HSL_900
Frequency (MHz)	910.0000
Relative permittivity (real part)	42.58
Conductivity (S/m)	0.94
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.87
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.810000
SAR 10g (W/Kg)	0.304809
SAR 1g (W/Kg)	0.467803
SURFACE SAR	VOLUME SAR



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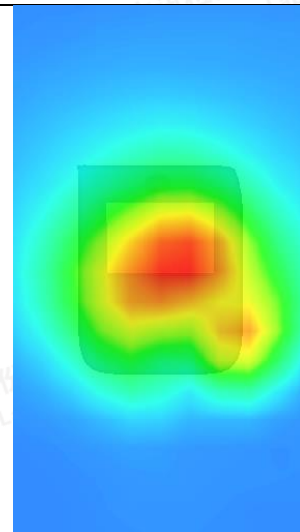
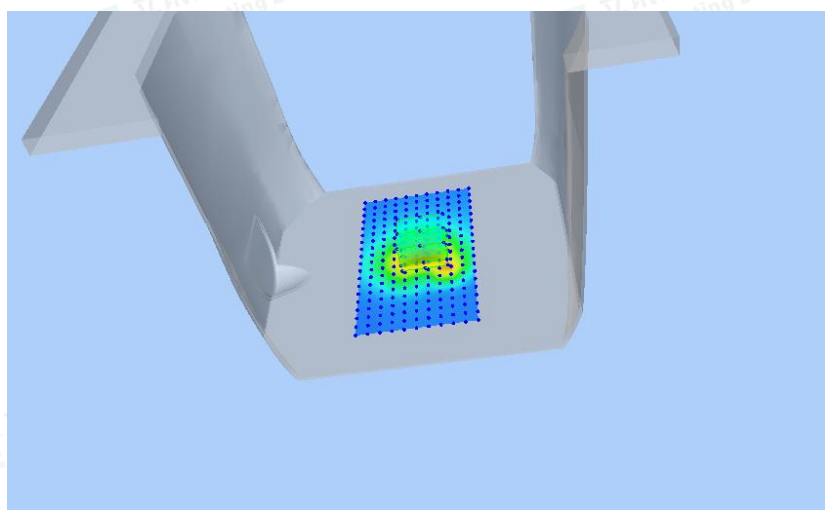
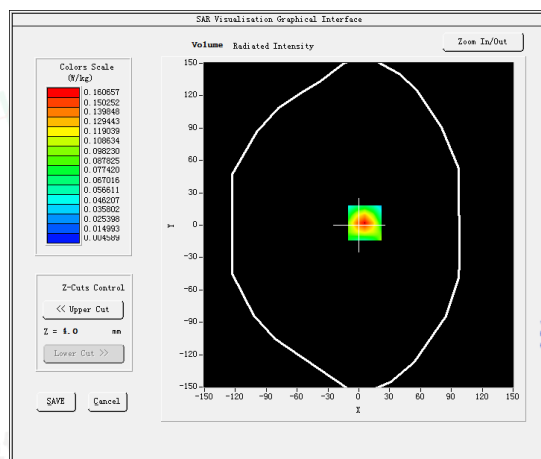
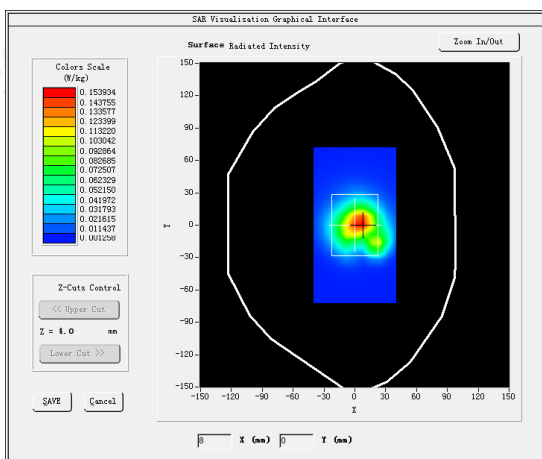
Test Mode: E-UTRA20,Low channel(Front of face)

Product Description: myFirst Fone S4

Model: KW1601

Test Date:April 10, 2025

Medium(liquid type)	HSL_900
Frequency (MHz)	834.5000
Relative permittivity (real part)	42.52
Conductivity (S/m)	0.95
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.87
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	1.020000
SAR 10g (W/Kg)	0.074261
SAR 1g (W/Kg)	0.115692
SURFACE SAR	VOLUME SAR



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#9

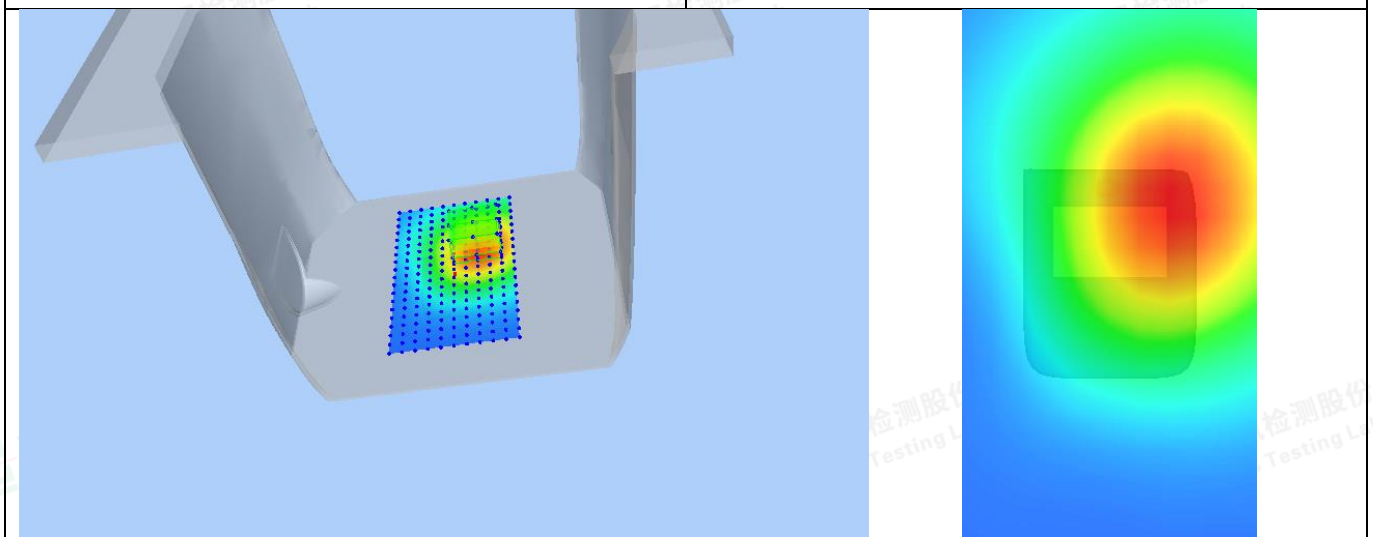
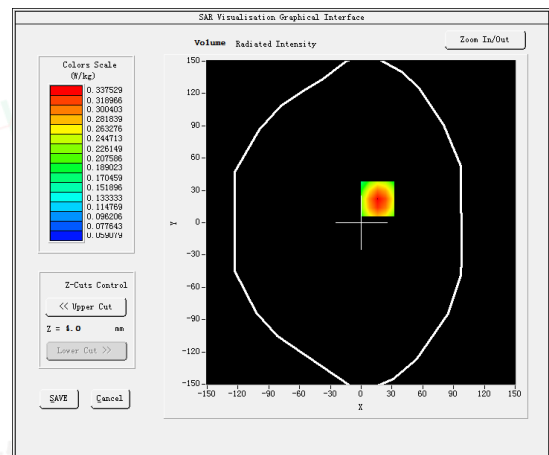
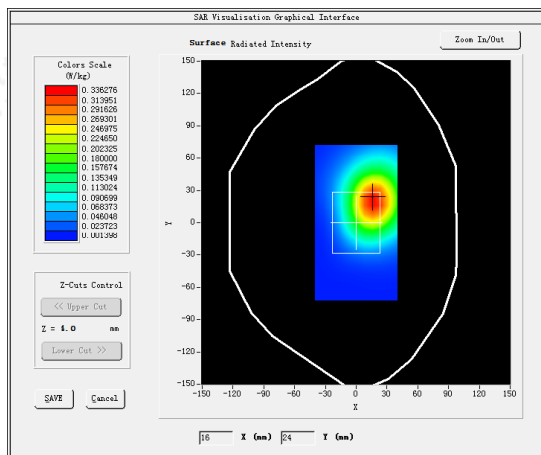
Test Mode: E-UTRA28,Low channel(Front of face)

Product Description: myFirst Fone S4

Model: KW1601

Test Date: April 08, 2025

Medium(liquid type)	HSL_750
Frequency (MHz)	704.5000
Relative permittivity (real part)	41.88
Conductivity (S/m)	0.91
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.69
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.770000
SAR 10g (W/Kg)	0.232125
SAR 1g (W/Kg)	0.341272
SURFACE SAR	VOLUME SAR



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#10

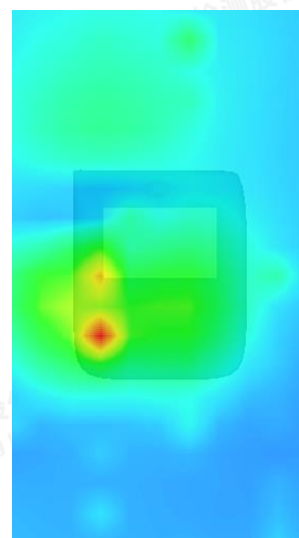
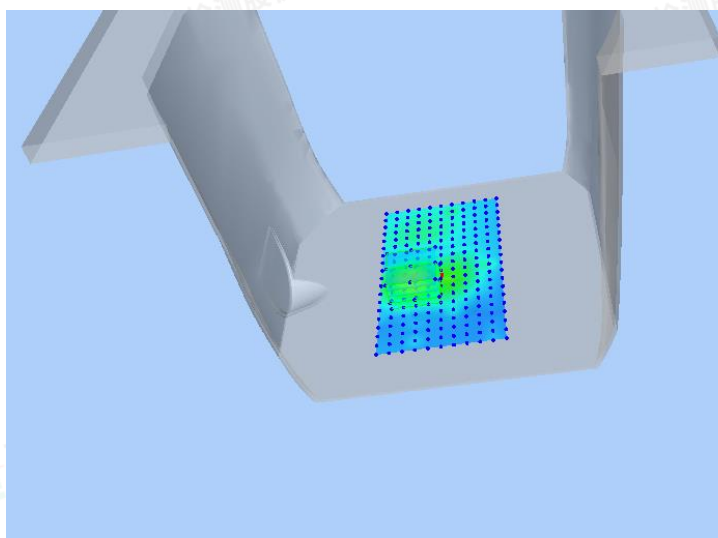
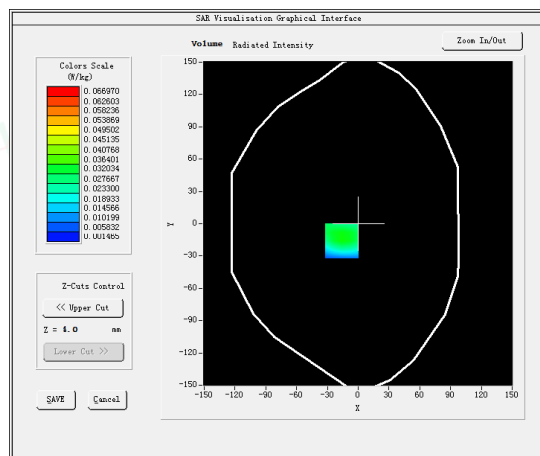
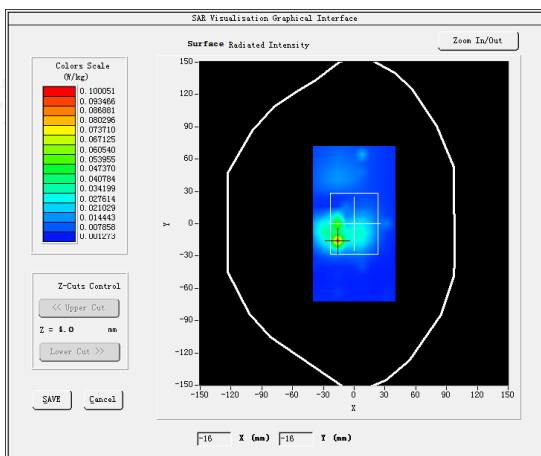
Test Mode: E-UTRA41,High channel(Front of face)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 25, 2025

Medium(liquid type)	HSL_2600
Frequency (MHz)	2687.5000
Relative permittivity (real part)	40.35
Conductivity (S/m)	1.90
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.39
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	3.500000
SAR 10g (W/Kg)	0.034798
SAR 1g (W/Kg)	0.045431
SURFACE SAR	VOLUME SAR



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#11

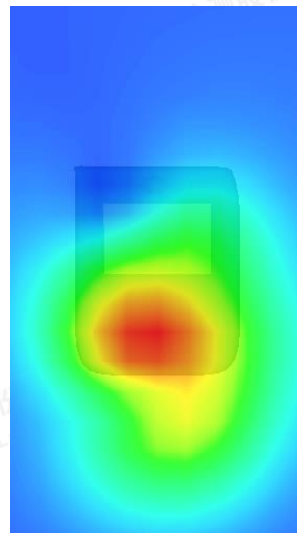
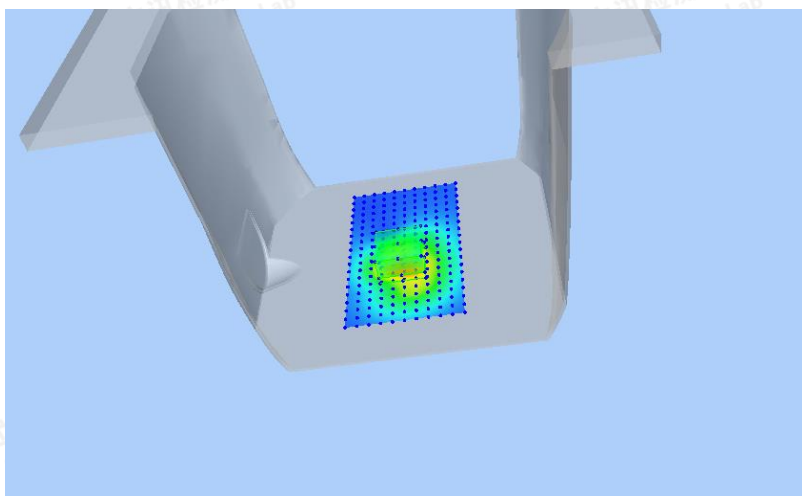
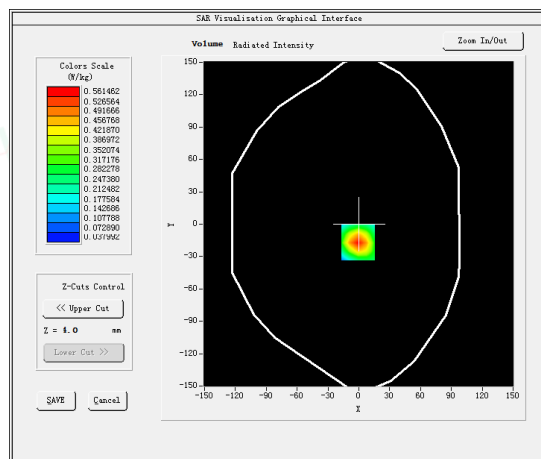
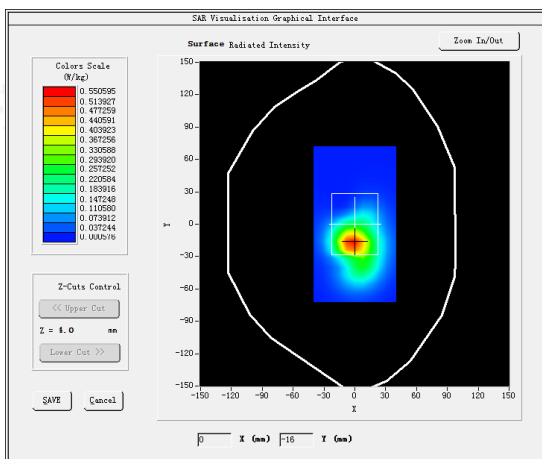
Test Mode:WCDMA 900MHz,Middlechannel(Rear side 0mm)

Product Description: myFirst Fone S4

Model:KW1601

Test Date:April 10, 2025

Medium(liquid type)	HSL_900
Frequency (MHz)	897.6000
Relative permittivity (real part)	42.58
Conductivity (S/m)	0.94
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.87
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	3.170000
SAR 10g (W/Kg)	0.418365
SAR 1g (W/Kg)	0.848640
SURFACE SAR	VOLUME SAR



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#12

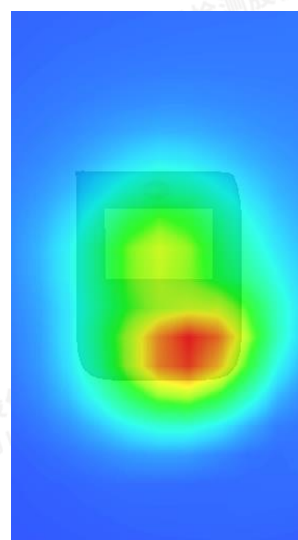
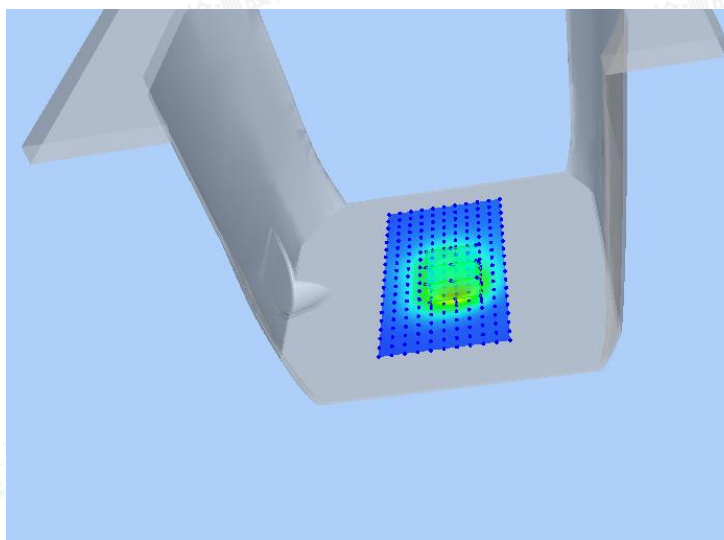
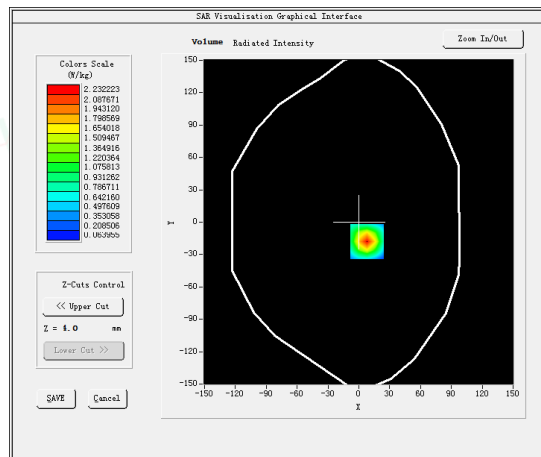
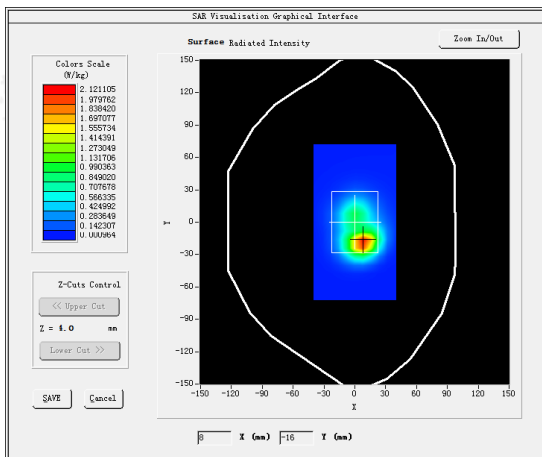
Test Mode:WCDMA2100MHz,Middle channel(Rear side 0mm)

Product Description:myFirst Fone S4

Model:KW1601

Test Date:April 18, 2025

Medium(liquid type)	HSL_2000
Frequency (MHz)	1950.0000
Relative permittivity (real part)	39.17
Conductivity (S/m)	1.42
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.31
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.060000
SAR 10g (W/Kg)	1.283762
SAR 1g (W/Kg)	2.897296
SURFACE SAR	VOLUME SAR



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#13

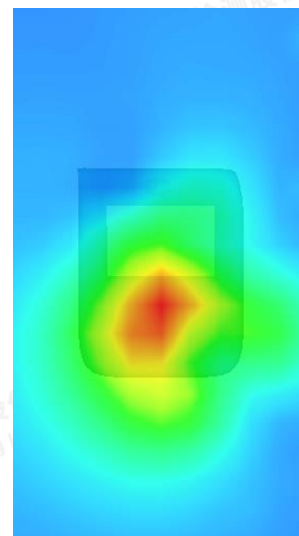
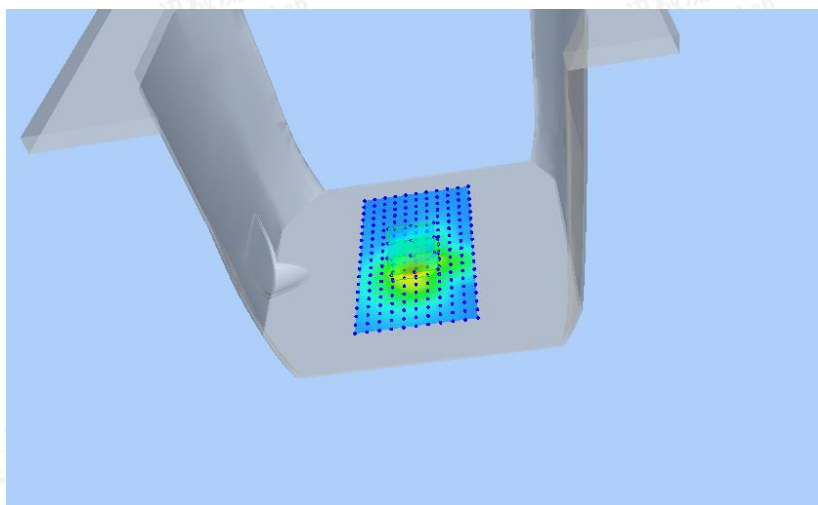
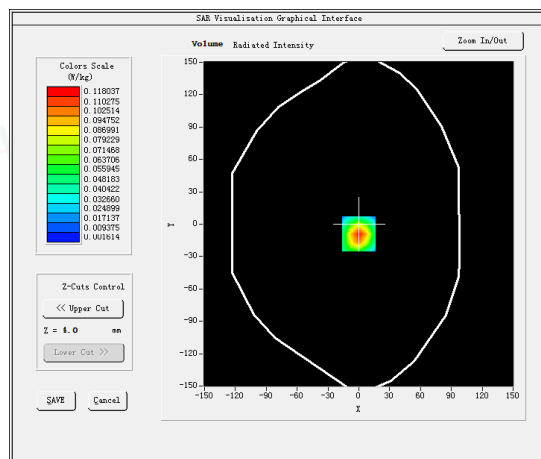
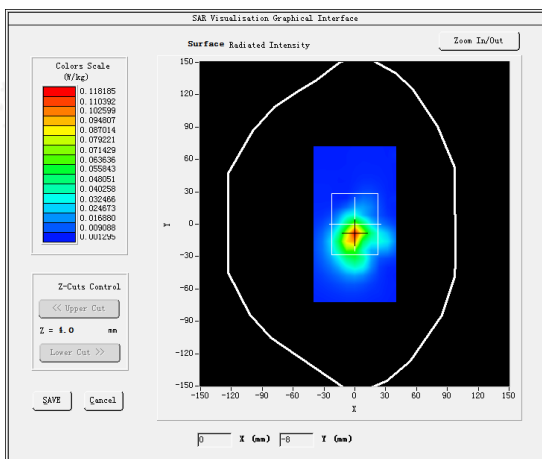
Test Mode:802.11B,Middlechannel(Rear side 0mm)

Product Description:myFirst Fone S4

Model:KW1601

Test Date: April 21, 2025

Medium(liquid type)	HSL_2450
Frequency (MHz)	2442.0000
Relative permittivity (real part)	38.35
Conductivity (S/m)	1.78
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.60
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	1.390000
SAR 10g (W/Kg)	0.088199
SAR 1g (W/Kg)	0.215651
SURFACE SAR	VOLUME SAR



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#14

Test Mode: E-UTRA Band1, High channel(Rear side 0mm)

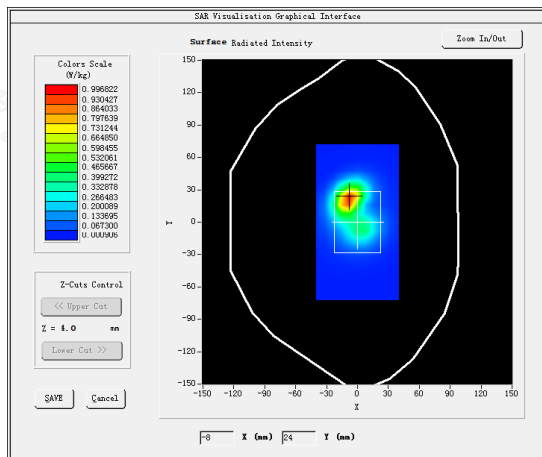
Product Description: myFirst Fone S4

Model: KW1601

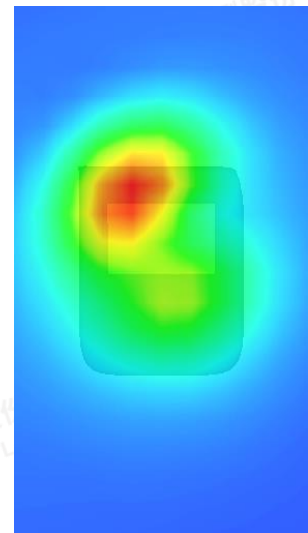
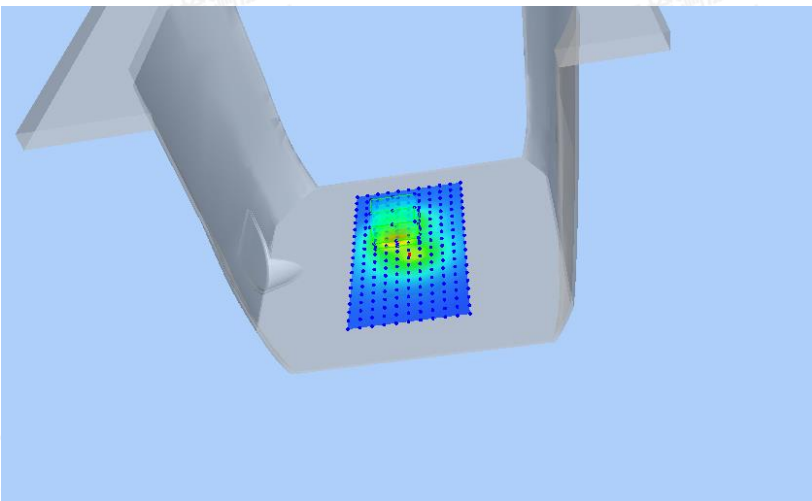
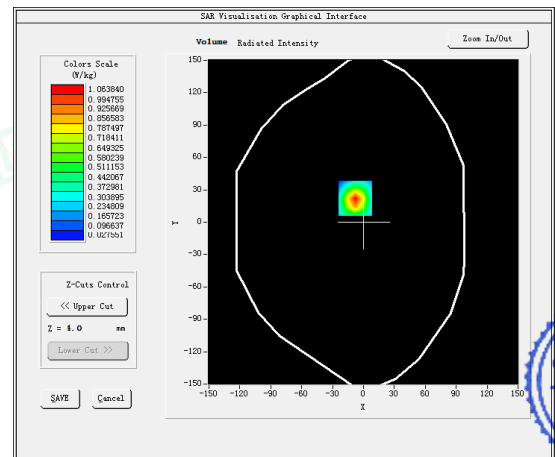
Test Date: April 18, 2025

Medium(liquid type)	HSL_2000
Frequency (MHz)	1977.6000
Relative permittivity (real part)	39.17
Conductivity (S/m)	1.42
E-Field Probe	SN 25/22 EPG0376
Crest Factor	1.0
Conversion Factor	2.31
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	1.280000
SAR 10g (W/Kg)	1.043299
SAR 1g (W/Kg)	2.349753

SURFACE SAR



VOLUME SAR



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#15

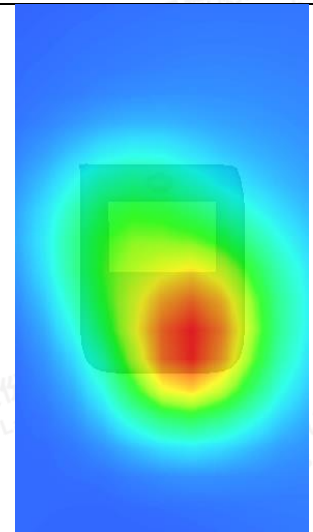
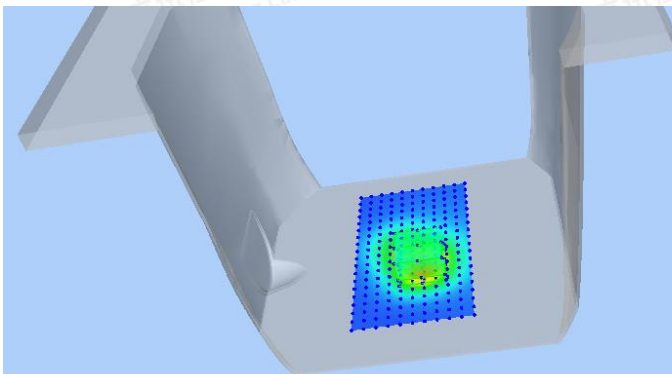
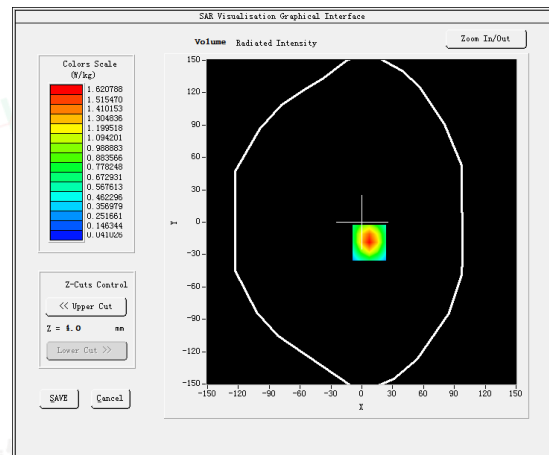
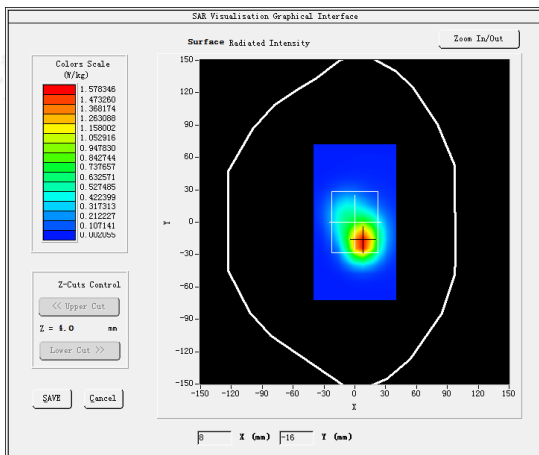
Test Mode: E-UTRA3, Low channel(Rear side 0mm)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 14, 2025

Medium(liquid type)	HSL_1800
Frequency (MHz)	1710.7000
Relative permittivity (real part)	40.64
Conductivity (S/m)	1.43
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.09
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.030000
SAR 10g (W/Kg)	0.959424
SAR 1g (W/Kg)	2.036754
SURFACE SAR	VOLUME SAR



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#16

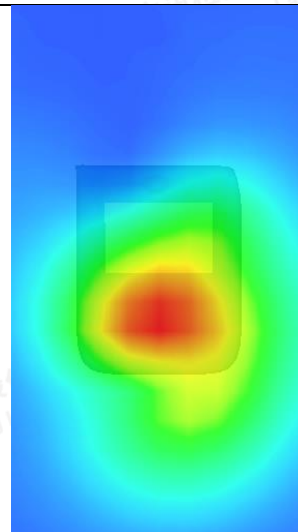
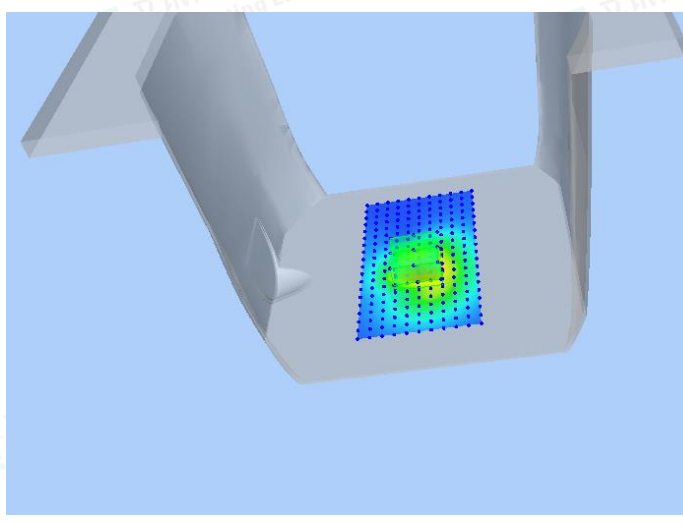
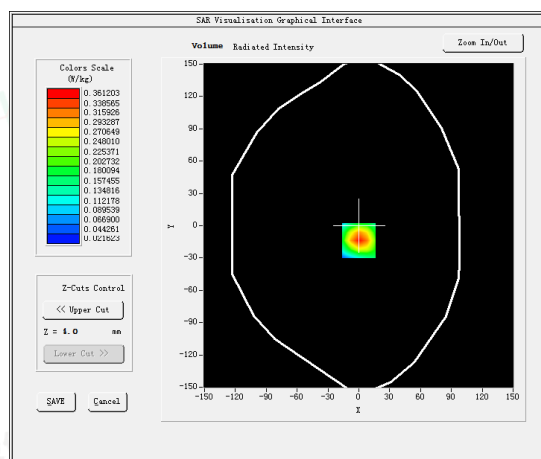
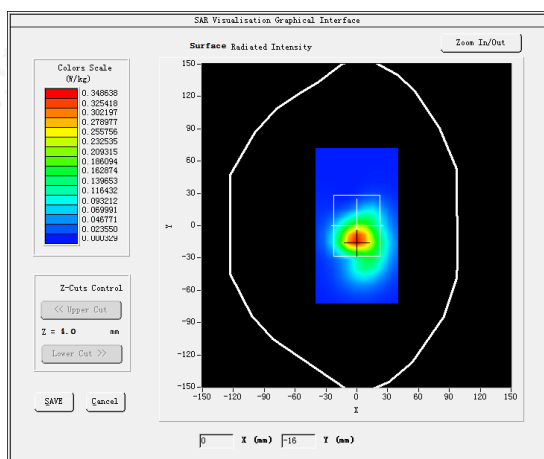
Test Mode: E-UTRA7,Middle channel(Rear side 0mm)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 25, 2025

Medium(liquid type)	HSL_2600
Frequency (MHz)	2535.0000
Relative permittivity (real part)	40.35
Conductivity (S/m)	1.90
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.39
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-3.420000
SAR 10g (W/Kg)	0.201743
SAR 1g (W/Kg)	0.461017
SURFACE SAR	VOLUME SAR



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#17

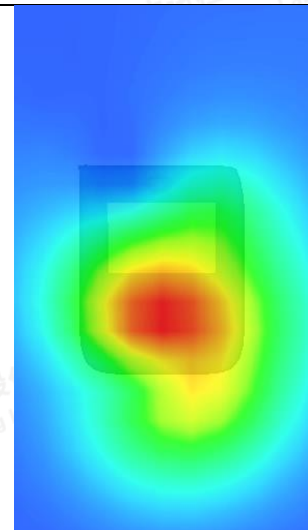
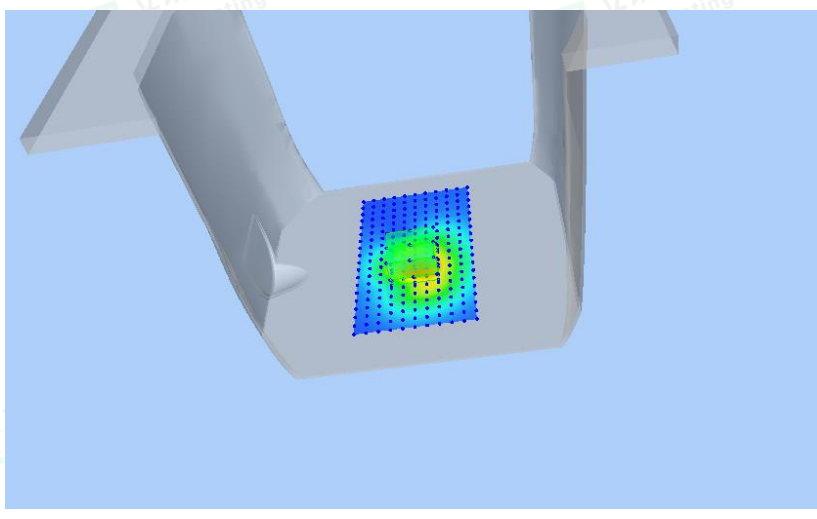
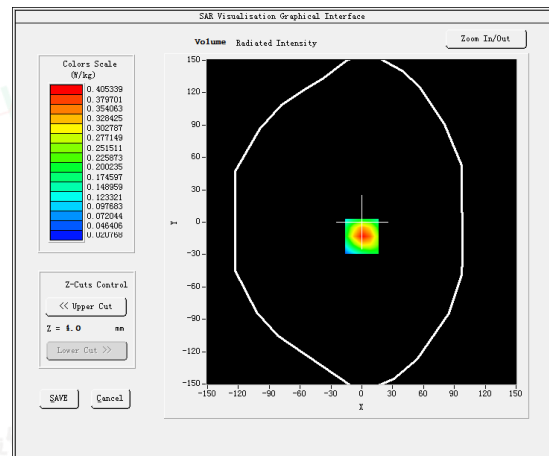
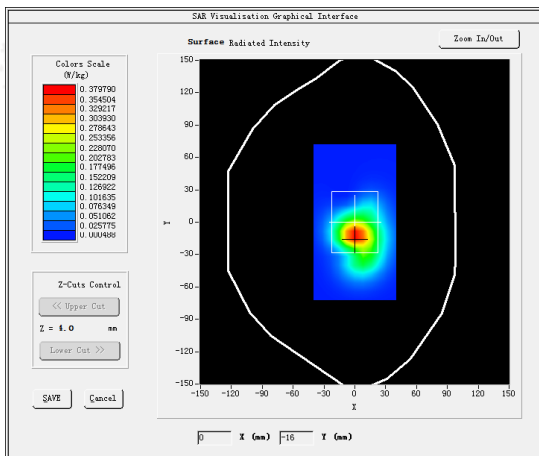
Test Mode: E-UTRA8, High channel(Rear side 0mm)

Product Description: myFirst Fone S4

Model: KW1601

Test Date: April 10, 2025

Medium(liquid type)	HSL_900
Frequency (MHz)	910.0000
Relative permittivity (real part)	42.58
Conductivity (S/m)	0.94
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.87
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	4.760000
SAR 10g (W/Kg)	0.124146
SAR 1g (W/Kg)	0.236669
SURFACE SAR	VOLUME SAR



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#18

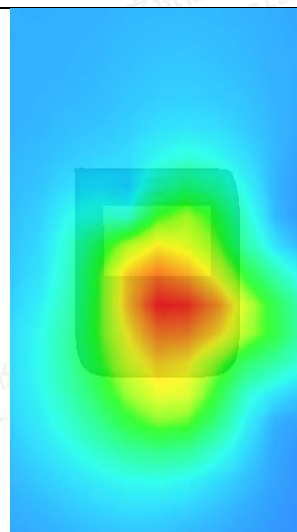
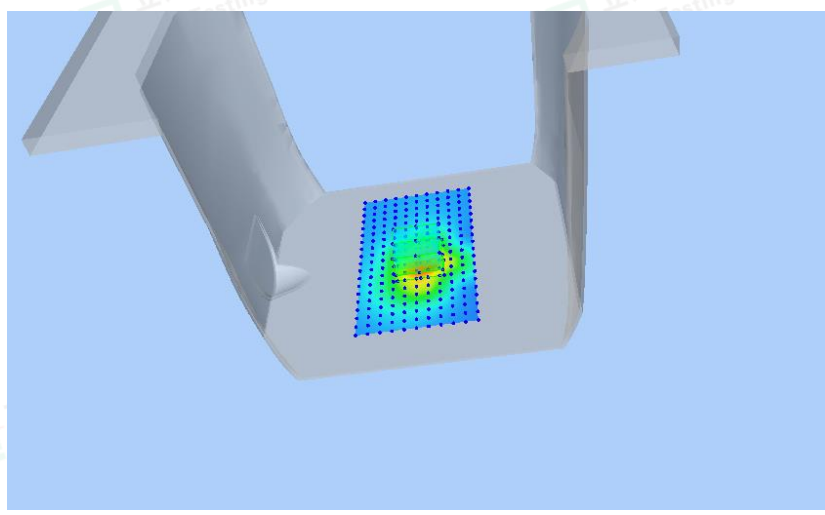
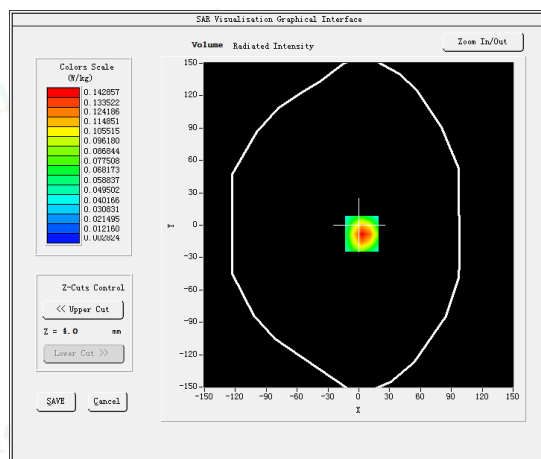
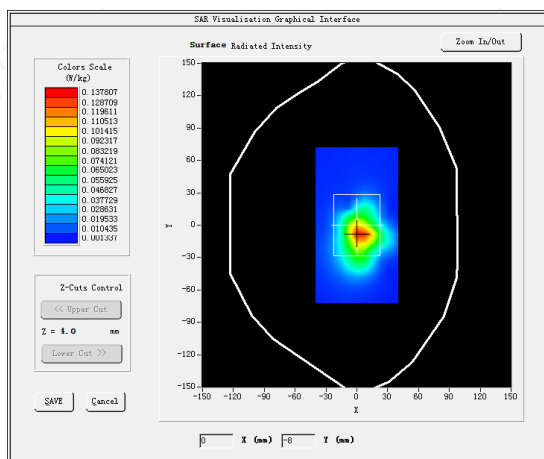
Test Mode: E-UTRA20, Low channel(Rear side 0mm)

Product Description: myFirst Fone S4

Model: KW1601

Test Date:April 10, 2025

Medium(liquid type)	HSL_900
Frequency (MHz)	834.5000
Relative permittivity (real part)	42.58
Conductivity (S/m)	0.94
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.87
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-3.980000
SAR 10g (W/Kg)	0.063851
SAR 1g (W/Kg)	0.120582
SURFACE SAR	VOLUME SAR



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#19

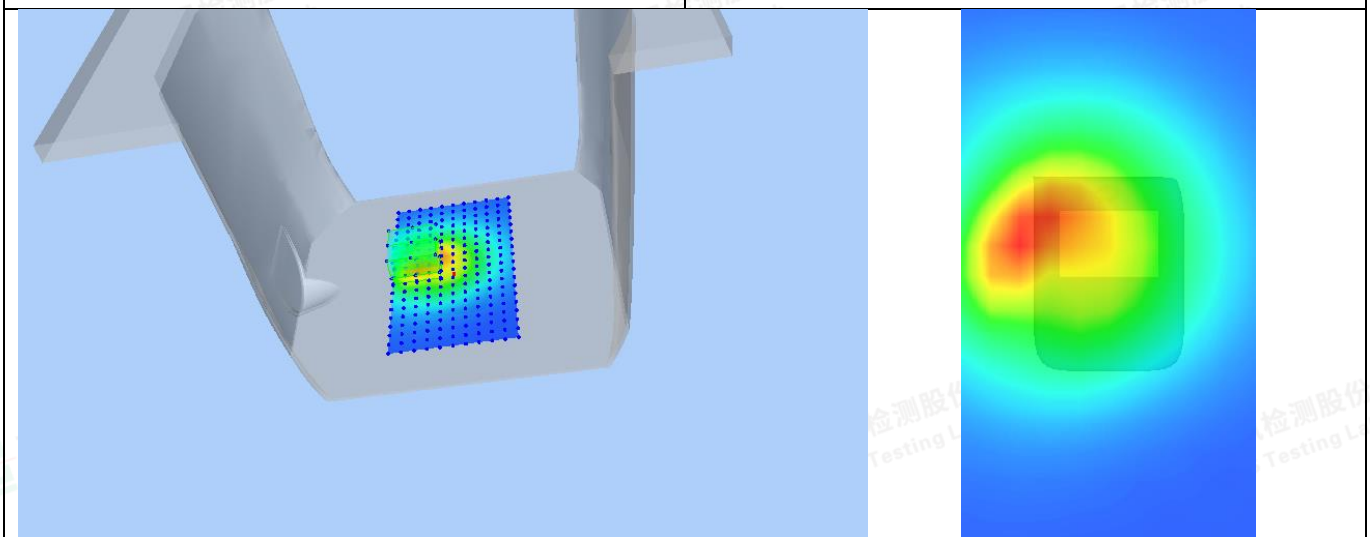
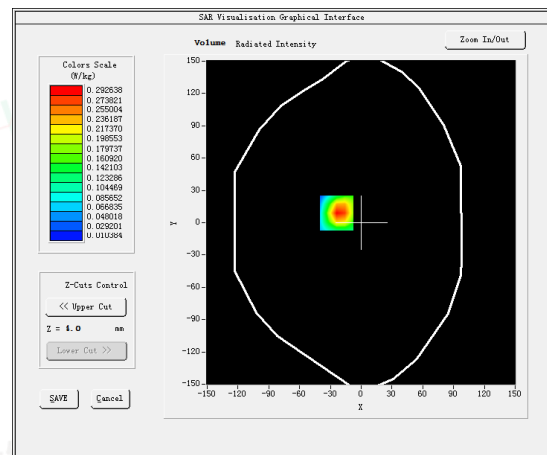
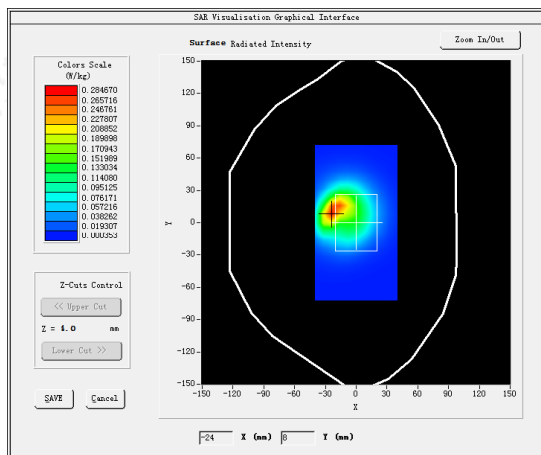
Test Mode: E-UTRA28, Low channel(Rear side 0mm)

Product Description: myFirst Fone S4

Model: KW1601

Test Date: April 08, 2025

Medium(liquid type)	HSL_750
Frequency (MHz)	704.5000
Relative permittivity (real part)	41.88
Conductivity (S/m)	0.91
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	1.69
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.970000
SAR 10g (W/Kg)	1.109797
SAR 1g (W/Kg)	:2.225651
SURFACE SAR	VOLUME SAR



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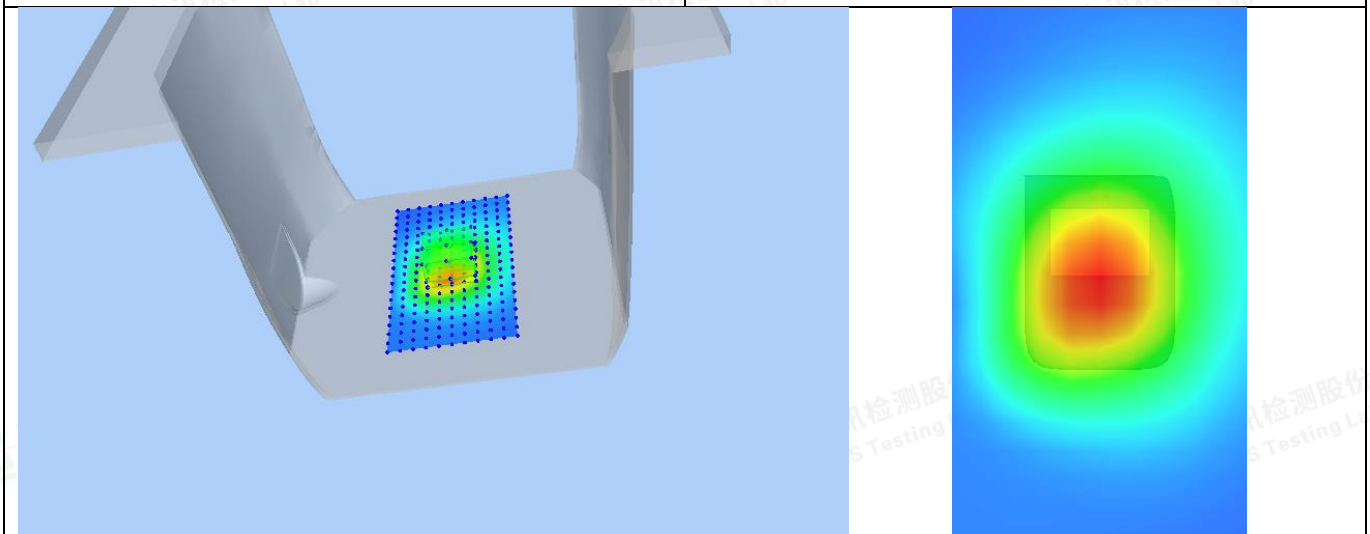
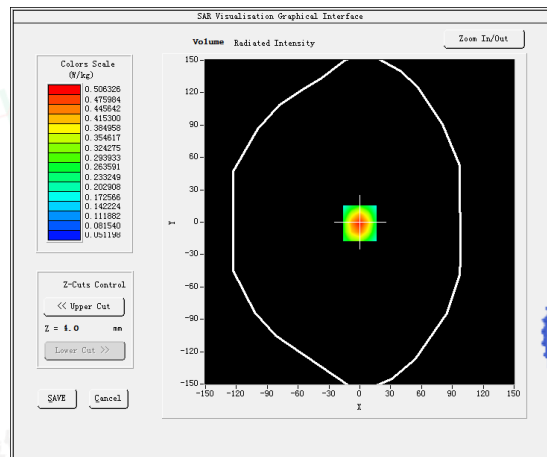
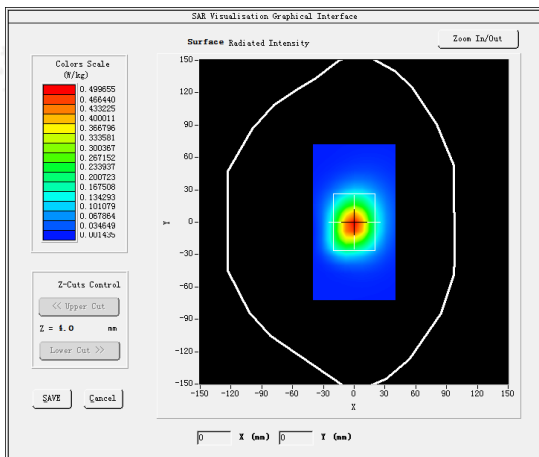
Test Mode: E-UTRA41, High channel(Rear side 0mm)

Product Description: myFirst Fone S4

Model:KW1601

Test Date: April 25, 2025

Medium(liquid type)	HSL_2600
Frequency (MHz)	2687.5000
Relative permittivity (real part)	40.35
Conductivity (S/m)	1.90
E-Field Probe	SN 25/22 EPGO376
Crest Factor	1.0
Conversion Factor	2.39
Sensor	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	0.760000
SAR 10g (W/Kg)	0.290299
SAR 1g (W/Kg)	0.473985
SURFACE SAR	VOLUME SAR



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5.CALIBRATION CERTIFICATE

SARTIMO Calibration Certificate-Extended Dipole Calibrations

According to KDB 450824 D02, Dipoles must be recalibrated at least once every three years; however, immediate re-calibration is required for following conditions. The test laboratory must ensure that the required supporting information and documentation have been included in the SAR report to qualify for extended 3-year calibration interval.

- 1) When the most recent return-loss, measured at least annually, deviates by more than 20% from the previous measurement (i.e. 0.2 of the dB value) or not meeting the required -20 dB return-loss specification
- 2) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, deviates by more than 5Ω from the previous measurement

Summary Result:



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5.1 Probe-EPGO376 Calibration Certificate



COMOSAR E-Field Probe Calibration Report

Ref : ACR.180.4.42.BES.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD, BAO'AN
BLVD

BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA

MVG COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: SN 25/22 EPGO376

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 06/22/2024



Accreditations #2-6792
Scope available on www.cofrac.fr

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Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed at MVG, using the CALIPROBE test bench, for use with a MVG COMOSAR system only. The test results covered by accreditation are traceable to the International System of Units (SI).





COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.4.42.BES.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Jérôme Le Gall	Measurement Responsible	6/22/2024	
<i>Checked & approved by:</i>	Jérôme Luc	Technical Manager	6/22/2024	
<i>Authorized by:</i>	Yann Toutain	Laboratory Director	6/22/2024	

	<i>Customer Name</i>
<i>Distribution :</i>	Shenzhen LCS Compliance Testing Laboratory Ltd.

<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Jérôme Le Gall	6/22/2024	Initial release

Page: 2/11

Template_ACR.DDD.N.VV.MVGB.ISSUE_COMOSAR Probe vK

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.4.42.BES.A

TABLE OF CONTENTS

1	Device Under Test	4
2	Product Description	4
2.1	General Information	4
3	Measurement Method	4
3.1	Linearity	4
3.2	Sensitivity	4
3.3	Lower Detection Limit	5
3.4	Isotropy	5
3.1	Boundary Effect	5
4	Measurement Uncertainty	6
5	Calibration Measurement Results	6
5.1	Sensitivity in air	6
5.2	Linearity	7
5.3	Sensitivity in liquid	8
5.4	Isotropy	9
6	List of Equipment	10

Page: 3/11

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.4.42.BES.A

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 25/22 EPG0376
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.193 MΩ Dipole 2: R2=0.188 MΩ Dipole 3: R3=0.198 MΩ

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

MVG's COMOSAR E field Probes are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards.



Figure 1 – MVG COMOSAR Dosimetric E field Probe

Probe Length	330 mm
Length of Individual Dipoles	2 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	2.5 mm
Distance between dipoles / probe extremity	1 mm

3 MEASUREMENT METHOD

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

Page: 4/11

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3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 to 360 degrees in 15-degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

3.1 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

The boundary effect uncertainty can be estimated according to the following uncertainty approximation formula based on linear and exponential extrapolations between the surface and $d_{be} + d_{step}$ along lines that are approximately normal to the surface:

$$SAR_{uncertainty} [\%] = \Delta SAR_{be} \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{(e^{-\alpha(d_{be} + d_{step})})}{\delta/2} \text{ for } (d_{be} + d_{step}) < 10 \text{ mm}$$

where

$SAR_{uncertainty}$ is the uncertainty in percent of the probe boundary effect

d_{be} is the distance between the surface and the closest zoom-scan measurement point, in millimetre

Δ_{step} is the separation distance between the first and second measurement points that are closest to the phantom surface, in millimetre, assuming the boundary effect at the second location is negligible

δ is the minimum penetration depth in millimetres of the head tissue-equivalent liquids defined in this standard, i.e., $\delta \approx 14 \text{ mm}$ at 3 GHz;

ΔSAR_{be} in percent of SAR is the deviation between the measured SAR value, at the distance d_{be} from the boundary, and the analytical SAR value.

The measured worst case boundary effect SAR uncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).

Page: 5/11

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4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Expanded uncertainty 95 % confidence level $k = 2$					14 %

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

5.1 SENSITIVITY IN AIR

Normx dipole 1 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normy dipole 2 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normz dipole 3 ($\mu\text{V}/(\text{V}/\text{m})^2$)
0.76	0.78	0.76

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
106	107	108

Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$

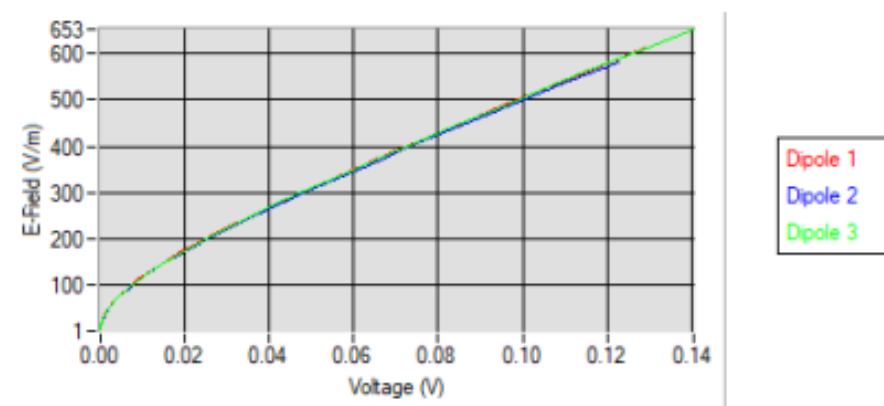




COMOSAR E-FIELD PROBE CALIBRATION REPORT

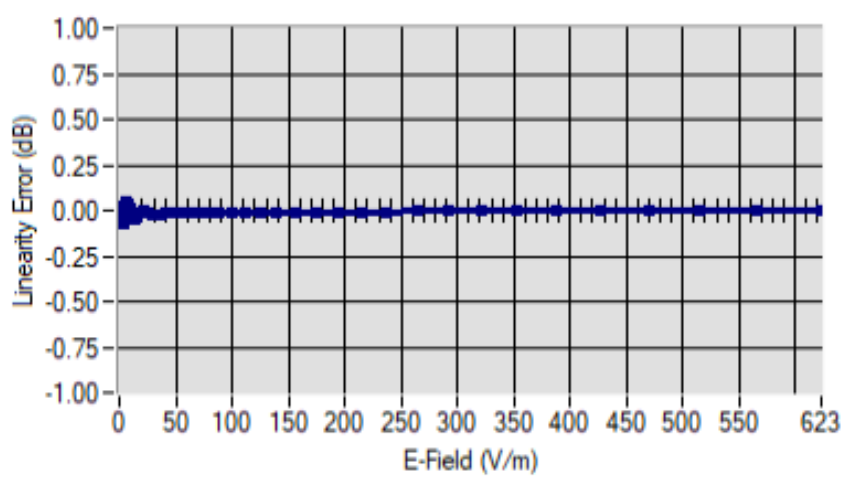
Ref: ACR.180.442.BES.A

Calibration curves



5.2 LINEARITY

Linearity



Linearity: $\pm 1.81\%$ ($\pm 0.08\text{dB}$)





COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.4.42.BES.A

5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	ConvF
HL450*	450*	1.74*
BL450*	450*	1.67*
HL750	750	1.69
BL750	750	1.73
HL850	835	1.75
BL850	835	1.80
HL900	900	1.87
BL900	900	1.85
HL1800	1800	2.09
BL1800	1800	2.15
HL1900	1900	2.14
BL1900	1900	2.27
HL2000	2000	2.31
BL2000	2000	2.34
HL2300	2300	2.46
BL2300	2300	2.51
HL2450	2450	2.60
BL2450	2450	2.70
HL2600	2600	2.39
BL2600	2600	2.50
HL5200	5200	1.85
BL5200	5200	1.81
HL5400	5400	2.07
BL5400	5400	2.00
HL5600	5600	2.19
BL5600	5600	2.11
HL5800	5800	2.01
BL5800	5800	1.97

* Frequency not cover by COFRAC scope, calibration not accredited

LOWER DETECTION LIMIT: 7mW/kg



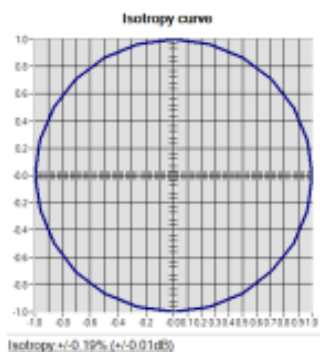


COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.4.42.BES.A

5.4 ISOTROPY

HL1800 MHz



Page: 9/11

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Shenzhen LCS Compliance Testing Laboratory Ltd.
Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com
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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR180.4.42.BES.A

6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
CALIPROBE Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer	Agilent 8753ES	MY40003210	10/2022	10/2025
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Multimeter	Keithley 2000	1160271	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2024	06/2027
Power Meter	Rohde & Schwarz NRVD	832839-056	11/2022	11/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	MVG	SN 32/16 WG4_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G900_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG6_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG8_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800B_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800H_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG10_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_3G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG12_1	Validated. No cal required.	Validated. No cal required.

Page: 10/11

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.4.42.BESA

Liquid transition	MVG	SN 32/16 WGLIQ_5G000_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2024	06/2027

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5.1 SID750 Dipole Calibration Certificate



SAR Reference Dipole Calibration Report

Ref : ACR.287.3.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

**1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD,
BAO'AN BLVD**

BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA

SATIMO COMOSAR REFERENCE DIPOLE

FREQUENCY: 750 MHZ

SERIAL NO.: SN 07/14 DIP 0G750-302

Calibrated at SATIMO US

2105 Barrett Park Dr. - Kennesaw, GA 30144



09/28/2024

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.3.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/12/2024	<i>JS</i>
Checked by :	Jérôme LUC	Product Manager	10/12/2024	<i>JS</i>
Approved by :	Kim RUTKOWSKI	Quality Manager	10/12/2024	<i>Kim Rutkowski</i>

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/12/2024	Initial release

Page: 2/11

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TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Return Loss Requirements	5
4.2	Mechanical Requirements	5
5	Measurement Uncertainty.....	5
5.1	Return Loss	5
5.2	Dimension Measurement	5
5.3	Validation Measurement	5
6	Calibration Measurement Results	6
6.1	Return Loss and Impedance	6
6.2	Mechanical Dimensions	6
7	Validation measurement	7
7.1	Head Liquid Measurement	7
7.2	SAR Measurement Result With Head Liquid	7
7.3	Body Liquid Measurement	9
7.4	SAR Measurement Result With Body Liquid	9
8	List of Equipment	11



1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 750 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID750
Serial Number	SN 07/14 DIP 0G750-302
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – Satimo COMOSAR Validation Dipole





4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

Page: 5/11

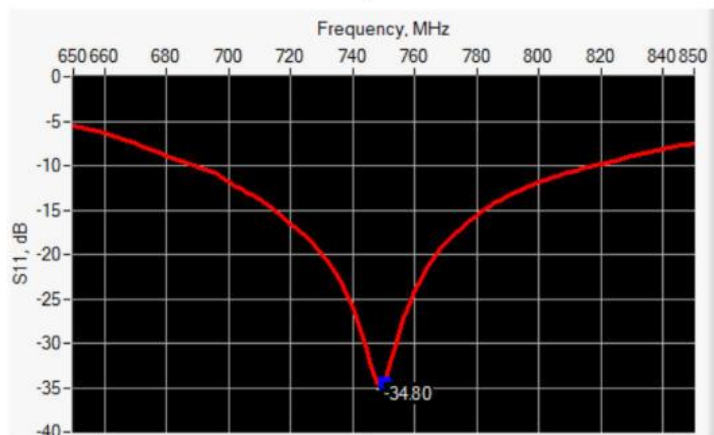
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6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
750	-34.80	-20	$50.7 \Omega + 1.6 j\Omega$

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.	PASS	100.0 ±1 %.	PASS	6.35 ±1 %.	PASS
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

Page: 6/11

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7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r)		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 \pm 5 %		0.87 \pm 5 %	
450	43.5 \pm 5 %		0.87 \pm 5 %	
750	41.9 \pm 5 %	PASS	0.89 \pm 5 %	PASS
835	41.5 \pm 5 %		0.90 \pm 5 %	
900	41.5 \pm 5 %		0.97 \pm 5 %	
1450	40.5 \pm 5 %		1.20 \pm 5 %	
1500	40.4 \pm 5 %		1.23 \pm 5 %	
1640	40.2 \pm 5 %		1.31 \pm 5 %	
1750	40.1 \pm 5 %		1.37 \pm 5 %	
1800	40.0 \pm 5 %		1.40 \pm 5 %	
1900	40.0 \pm 5 %		1.40 \pm 5 %	
1950	40.0 \pm 5 %		1.40 \pm 5 %	
2000	40.0 \pm 5 %		1.40 \pm 5 %	
2100	39.8 \pm 5 %		1.49 \pm 5 %	
2300	39.5 \pm 5 %		1.67 \pm 5 %	
2450	39.2 \pm 5 %		1.80 \pm 5 %	
2600	39.0 \pm 5 %		1.96 \pm 5 %	
3000	38.5 \pm 5 %		2.40 \pm 5 %	
3500	37.9 \pm 5 %		2.91 \pm 5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: ϵ_r : 42.1 σ : 0.89
Distance between dipole center and liquid	15.0 mm
Area scan resolution	$dx=8mm/dy=8mm$

Page: 7/11

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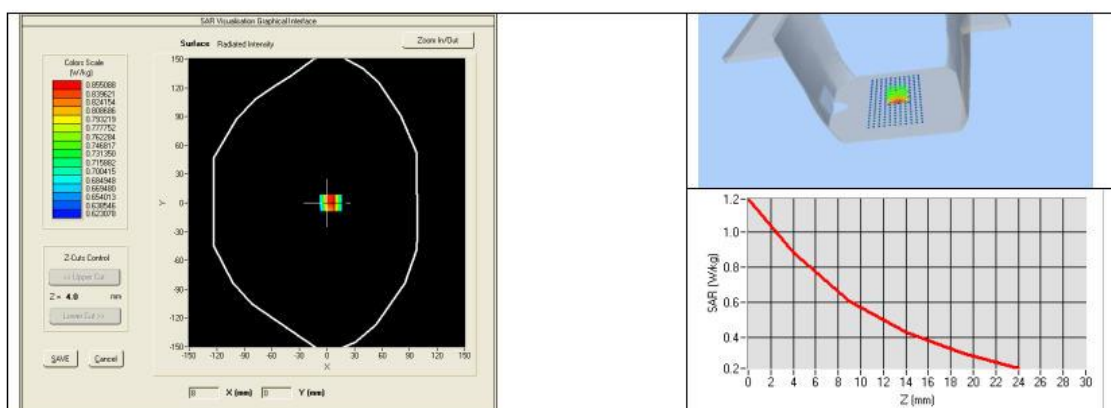


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.3.14.SATIM.A

Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	750 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %H

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49	8.38 {0.84}	5.55	5.53 {0.55}
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	





7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 \pm 5 %		0.80 \pm 5 %	
300	58.2 \pm 5 %		0.92 \pm 5 %	
450	56.7 \pm 5 %		0.94 \pm 5 %	
750	55.5 \pm 5 %	PASS	0.96 \pm 5 %	PASS
835	55.2 \pm 5 %		0.97 \pm 5 %	
900	55.0 \pm 5 %		1.05 \pm 5 %	
915	55.0 \pm 5 %		1.06 \pm 5 %	
1450	54.0 \pm 5 %		1.30 \pm 5 %	
1610	53.8 \pm 5 %		1.40 \pm 5 %	
1800	53.3 \pm 5 %		1.52 \pm 5 %	
1900	53.3 \pm 5 %		1.52 \pm 5 %	
2000	53.3 \pm 5 %		1.52 \pm 5 %	
2100	53.2 \pm 5 %		1.62 \pm 5 %	
2450	52.7 \pm 5 %		1.95 \pm 5 %	
2600	52.5 \pm 5 %		2.16 \pm 5 %	
3000	52.0 \pm 5 %		2.73 \pm 5 %	
3500	51.3 \pm 5 %		3.31 \pm 5 %	
5200	49.0 \pm 10 %		5.30 \pm 10 %	
5300	48.9 \pm 10 %		5.42 \pm 10 %	
5400	48.7 \pm 10 %		5.53 \pm 10 %	
5500	48.6 \pm 10 %		5.65 \pm 10 %	
5600	48.5 \pm 10 %		5.77 \pm 10 %	
5800	48.2 \pm 10 %		6.00 \pm 10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: ϵ_{ps}' : 56.6 sigma : 0.99
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	750 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Page: 9/11

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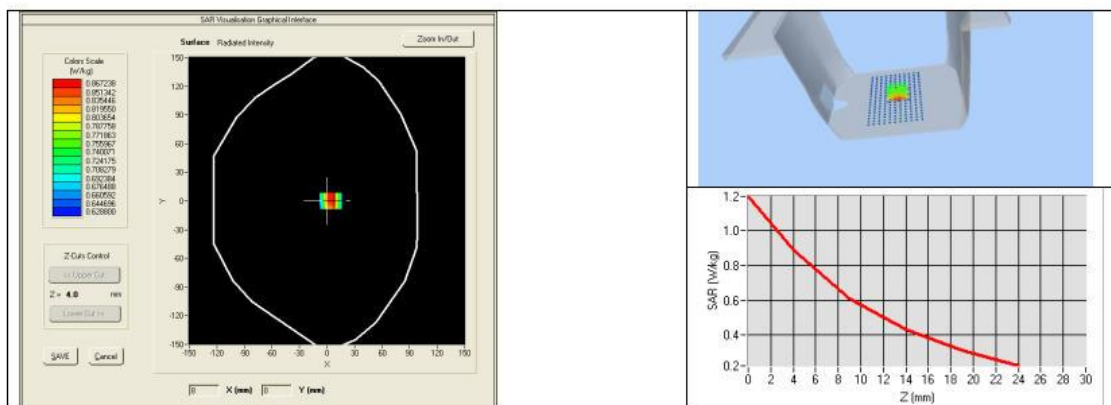




SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.3.14.SATU.A

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
750	8.77 (0.88)	5.78 (0.58)



Page: 10/11

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.273.1.18.SATU.A

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	06/2024	06/2027
Calipers	Carrera	CALIPER-01	01/2023	01/2026
Reference Probe	MVG	EPG122 SN 18/11	08/2024	08/2025
Multimeter	Keithley 2000	1188656	01/2023	01/2026
Signal Generator	Agilent E4438C	MY49070581	01/2023	01/2026
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2023	11/2026
Power Sensor	HP ECP-E26A	US37181460	01/2023	01/2026
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	150798832	11/2023	11/2026

Page: 11/11

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**5.2SID900 Dipole Calibration Certificate****SAR Reference Dipole Calibration Report**

Ref : ACR.287.5.14.SATU.A

**SHENZHEN LCS COMPLIANCE TESTING
LABORATORY LTD.****1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD,
BAO'AN BLVD****BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA****SATIMO COMOSAR REFERENCE DIPOLE****FREQUENCY: 900 MHZ****SERIAL NO.: SN 07/14 DIP 0G900-300****Calibrated at SATIMO US****2105 Barrett Park Dr. - Kennesaw, GA 30144****09/28/2024***Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.5.14.SATIMU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/12/2024	
Checked by :	Jérôme LUC	Product Manager	10/12/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/12/2024	

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/12/2024	Initial release

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TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Return Loss Requirements	5
4.2	Mechanical Requirements	5
5	Measurement Uncertainty.....	5
5.1	Return Loss	5
5.2	Dimension Measurement	5
5.3	Validation Measurement	5
6	Calibration Measurement Results	6
6.1	Return Loss and Impedance	6
6.2	Mechanical Dimensions	6
7	Validation measurement	7
7.1	Head Liquid Measurement	7
7.2	SAR Measurement Result With Head Liquid	7
7.3	Body Liquid Measurement	9
7.4	SAR Measurement Result With Body Liquid	9
8	List of Equipment	11



1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 900 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID900
Serial Number	SN 07/14 DIP 0G900-300
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – Satimo COMOSAR Validation Dipole





4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

Page: 5/11

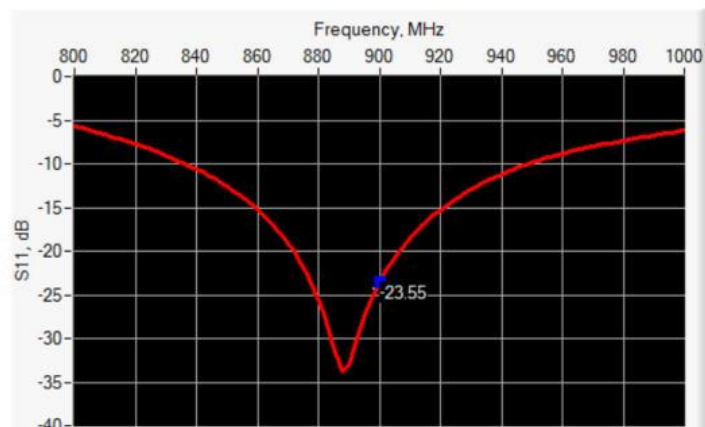
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6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
900	-23.55	-20	52.8 Ω - 5.4 j Ω

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 \pm 1 %		250.0 \pm 1 %		6.35 \pm 1 %	
450	290.0 \pm 1 %		166.7 \pm 1 %		6.35 \pm 1 %	
750	176.0 \pm 1 %		100.0 \pm 1 %		6.35 \pm 1 %	
835	161.0 \pm 1 %		89.8 \pm 1 %		3.6 \pm 1 %	
900	149.0 \pm 1 %	PASS	83.3 \pm 1 %	PASS	3.6 \pm 1 %	PASS
1450	89.1 \pm 1 %		51.7 \pm 1 %		3.6 \pm 1 %	
1500	80.5 \pm 1 %		50.0 \pm 1 %		3.6 \pm 1 %	
1640	79.0 \pm 1 %		45.7 \pm 1 %		3.6 \pm 1 %	
1750	75.2 \pm 1 %		42.9 \pm 1 %		3.6 \pm 1 %	
1800	72.0 \pm 1 %		41.7 \pm 1 %		3.6 \pm 1 %	
1900	68.0 \pm 1 %		39.5 \pm 1 %		3.6 \pm 1 %	
1950	66.3 \pm 1 %		38.5 \pm 1 %		3.6 \pm 1 %	
2000	64.5 \pm 1 %		37.5 \pm 1 %		3.6 \pm 1 %	
2100	61.0 \pm 1 %		35.7 \pm 1 %		3.6 \pm 1 %	
2300	55.5 \pm 1 %		32.6 \pm 1 %		3.6 \pm 1 %	
2450	51.5 \pm 1 %		30.4 \pm 1 %		3.6 \pm 1 %	
2600	48.5 \pm 1 %		28.8 \pm 1 %		3.6 \pm 1 %	
3000	41.5 \pm 1 %		25.0 \pm 1 %		3.6 \pm 1 %	
3500	37.0 \pm 1 %		26.4 \pm 1 %		3.6 \pm 1 %	
3700	34.7 \pm 1 %		26.4 \pm 1 %		3.6 \pm 1 %	

Page: 6/11

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7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r)		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 \pm 5 %		0.87 \pm 5 %	
450	43.5 \pm 5 %		0.87 \pm 5 %	
750	41.9 \pm 5 %		0.89 \pm 5 %	
835	41.5 \pm 5 %		0.90 \pm 5 %	
900	41.5 \pm 5 %	PASS	0.97 \pm 5 %	PASS
1450	40.5 \pm 5 %		1.20 \pm 5 %	
1500	40.4 \pm 5 %		1.23 \pm 5 %	
1640	40.2 \pm 5 %		1.31 \pm 5 %	
1750	40.1 \pm 5 %		1.37 \pm 5 %	
1800	40.0 \pm 5 %		1.40 \pm 5 %	
1900	40.0 \pm 5 %		1.40 \pm 5 %	
1950	40.0 \pm 5 %		1.40 \pm 5 %	
2000	40.0 \pm 5 %		1.40 \pm 5 %	
2100	39.8 \pm 5 %		1.49 \pm 5 %	
2300	39.5 \pm 5 %		1.67 \pm 5 %	
2450	39.2 \pm 5 %		1.80 \pm 5 %	
2600	39.0 \pm 5 %		1.96 \pm 5 %	
3000	38.5 \pm 5 %		2.40 \pm 5 %	
3500	37.9 \pm 5 %		2.91 \pm 5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: ϵ_r : 42.5 sigma : 0.96
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm

Page: 7/11

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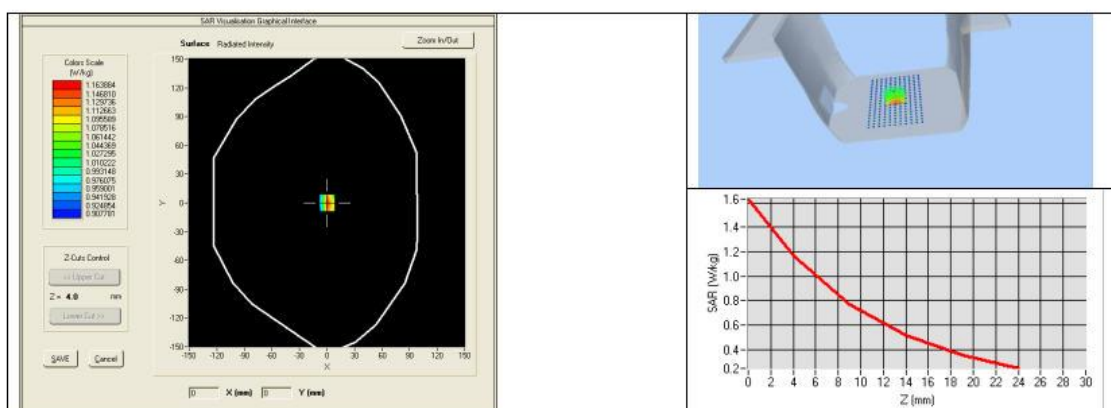


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.5.14.SATIM.A

Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9	11.12 (1.11)	6.99	7.01 (0.70)
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



Page: 8/11

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7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 \pm 5 %		0.80 \pm 5 %	
300	58.2 \pm 5 %		0.92 \pm 5 %	
450	56.7 \pm 5 %		0.94 \pm 5 %	
750	55.5 \pm 5 %		0.96 \pm 5 %	
835	55.2 \pm 5 %		0.97 \pm 5 %	
900	55.0 \pm 5 %	PASS	1.05 \pm 5 %	PASS
915	55.0 \pm 5 %		1.06 \pm 5 %	
1450	54.0 \pm 5 %		1.30 \pm 5 %	
1610	53.8 \pm 5 %		1.40 \pm 5 %	
1800	53.3 \pm 5 %		1.52 \pm 5 %	
1900	53.3 \pm 5 %		1.52 \pm 5 %	
2000	53.3 \pm 5 %		1.52 \pm 5 %	
2100	53.2 \pm 5 %		1.62 \pm 5 %	
2450	52.7 \pm 5 %		1.95 \pm 5 %	
2600	52.5 \pm 5 %		2.16 \pm 5 %	
3000	52.0 \pm 5 %		2.73 \pm 5 %	
3500	51.3 \pm 5 %		3.31 \pm 5 %	
5200	49.0 \pm 10 %		5.30 \pm 10 %	
5300	48.9 \pm 10 %		5.42 \pm 10 %	
5400	48.7 \pm 10 %		5.53 \pm 10 %	
5500	48.6 \pm 10 %		5.65 \pm 10 %	
5600	48.5 \pm 10 %		5.77 \pm 10 %	
5800	48.2 \pm 10 %		6.00 \pm 10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: ϵ_{ps}' : 56.7 sigma : 1.08
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Page: 9/11

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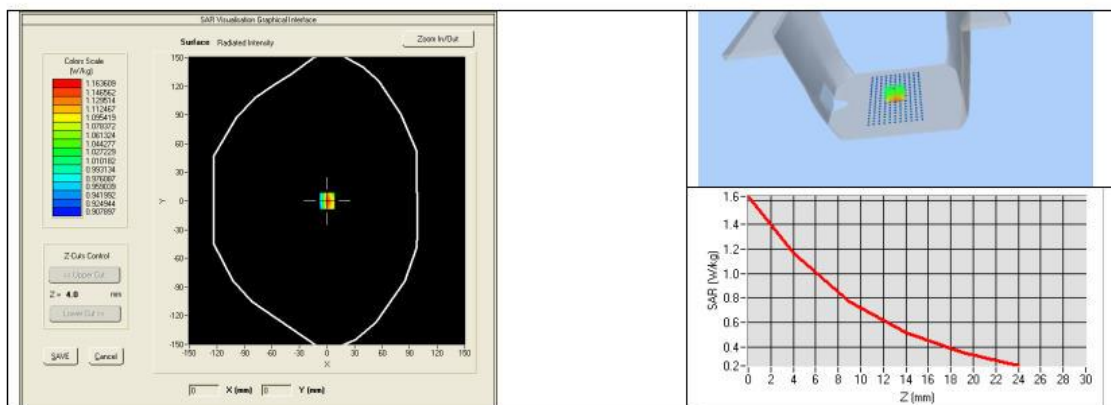




SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.5.14.SATU.A

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
900	11.34 (1.13)	7.15 (0.72)





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.5.14.SATU.A

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2022	02/2025
Calipers	Carrera	CALIPER-01	12/2022	12/2025
Reference Probe	Satimo	EPG122 SN 18/11	10/2023	10/2024
Multimeter	Keithley 2000	1188656	12/2022	12/2025
Signal Generator	Agilent E4438C	MY49070581	12/2022	12/2025
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2022	12/2025
Power Sensor	HP ECP-E26A	US37181460	12/2022	12/2025
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2016	8/2025

Page: 11/11

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**5.3SID1800 Dipole Calibration Certificate****SAR Reference Dipole Calibration Report**

Ref : ACR.287.6.14.SATU.A

**SHENZHEN LCS COMPLIANCE TESTING
LABORATORY LTD.****1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD,
BAO'AN BLVD****BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA****SATIMO COMOSAR REFERENCE DIPOLE****FREQUENCY: 1800 MHZ****SERIAL NO.: SN 07/14 DIP 1G800-301****Calibrated at SATIMO US****2105 Barrett Park Dr. - Kennesaw, GA 30144****09/28/2024***Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.6.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/12/2024	
Checked by :	Jérôme LUC	Product Manager	10/12/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/12/2024	

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/12/2024	Initial release



Page: 2/11

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TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Return Loss Requirements	5
4.2	Mechanical Requirements	5
5	Measurement Uncertainty.....	5
5.1	Return Loss	5
5.2	Dimension Measurement	5
5.3	Validation Measurement	5
6	Calibration Measurement Results	6
6.1	Return Loss and Impedance	6
6.2	Mechanical Dimensions	6
7	Validation measurement	7
7.1	Head Liquid Measurement	7
7.2	SAR Measurement Result With Head Liquid	7
7.3	Body Liquid Measurement	9
7.4	SAR Measurement Result With Body Liquid	9
8	List of Equipment	11

Page: 3/11

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1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 1800 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID1800
Serial Number	SN 07/14 DIP 1G800-301
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – Satimo COMOSAR Validation Dipole

Page: 4/11

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4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

Page: 5/11

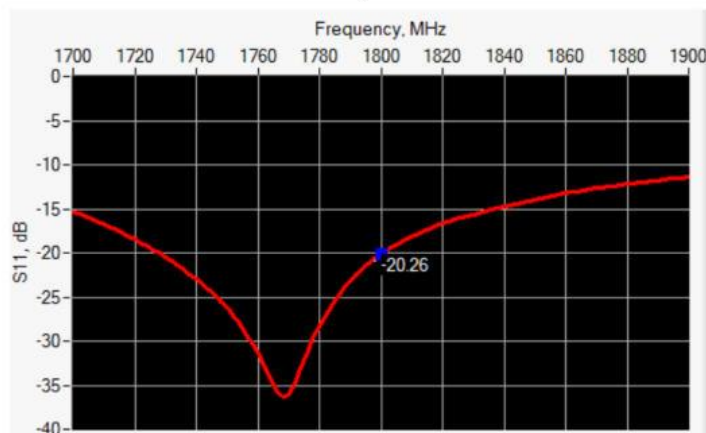
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6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1800	-20.26	-20	43.1 Ω + 6.9 j Ω

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 \pm 1 %.		250.0 \pm 1 %.		6.35 \pm 1 %.	
450	290.0 \pm 1 %.		166.7 \pm 1 %.		6.35 \pm 1 %.	
750	176.0 \pm 1 %.		100.0 \pm 1 %.		6.35 \pm 1 %.	
835	161.0 \pm 1 %.		89.8 \pm 1 %.		3.6 \pm 1 %.	
900	149.0 \pm 1 %.		83.3 \pm 1 %.		3.6 \pm 1 %.	
1450	89.1 \pm 1 %.		51.7 \pm 1 %.		3.6 \pm 1 %.	
1500	80.5 \pm 1 %.		50.0 \pm 1 %.		3.6 \pm 1 %.	
1640	79.0 \pm 1 %.		45.7 \pm 1 %.		3.6 \pm 1 %.	
1750	75.2 \pm 1 %.		42.9 \pm 1 %.		3.6 \pm 1 %.	
1800	72.0 \pm 1 %.	PASS	41.7 \pm 1 %.	PASS	3.6 \pm 1 %.	PASS
1900	68.0 \pm 1 %.		39.5 \pm 1 %.		3.6 \pm 1 %.	
1950	66.3 \pm 1 %.		38.5 \pm 1 %.		3.6 \pm 1 %.	
2000	64.5 \pm 1 %.		37.5 \pm 1 %.		3.6 \pm 1 %.	
2100	61.0 \pm 1 %.		35.7 \pm 1 %.		3.6 \pm 1 %.	
2300	55.5 \pm 1 %.		32.6 \pm 1 %.		3.6 \pm 1 %.	
2450	51.5 \pm 1 %.		30.4 \pm 1 %.		3.6 \pm 1 %.	
2600	48.5 \pm 1 %.		28.8 \pm 1 %.		3.6 \pm 1 %.	
3000	41.5 \pm 1 %.		25.0 \pm 1 %.		3.6 \pm 1 %.	
3500	37.0 \pm 1 %.		26.4 \pm 1 %.		3.6 \pm 1 %.	
3700	34.7 \pm 1 %.		26.4 \pm 1 %.		3.6 \pm 1 %.	

Page: 6/11

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7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CIE/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r)		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 \pm 5 %		0.87 \pm 5 %	
450	43.5 \pm 5 %		0.87 \pm 5 %	
750	41.9 \pm 5 %		0.89 \pm 5 %	
835	41.5 \pm 5 %		0.90 \pm 5 %	
900	41.5 \pm 5 %		0.97 \pm 5 %	
1450	40.5 \pm 5 %		1.20 \pm 5 %	
1500	40.4 \pm 5 %		1.23 \pm 5 %	
1640	40.2 \pm 5 %		1.31 \pm 5 %	
1750	40.1 \pm 5 %		1.37 \pm 5 %	
1800	40.0 \pm 5 %	PASS	1.40 \pm 5 %	PASS
1900	40.0 \pm 5 %		1.40 \pm 5 %	
1950	40.0 \pm 5 %		1.40 \pm 5 %	
2000	40.0 \pm 5 %		1.40 \pm 5 %	
2100	39.8 \pm 5 %		1.49 \pm 5 %	
2300	39.5 \pm 5 %		1.67 \pm 5 %	
2450	39.2 \pm 5 %		1.80 \pm 5 %	
2600	39.0 \pm 5 %		1.96 \pm 5 %	
3000	38.5 \pm 5 %		2.40 \pm 5 %	
3500	37.9 \pm 5 %		2.91 \pm 5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CIE/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: ϵ_{ps}' : 41.3 sigma : 1.38
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm

Page: 7/11

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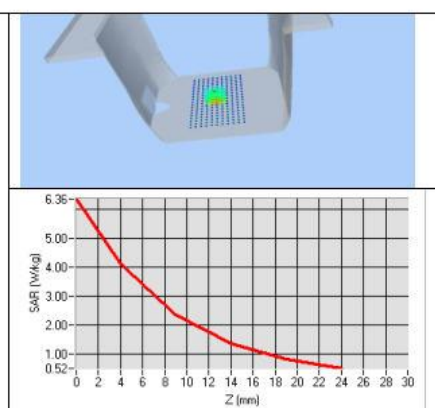
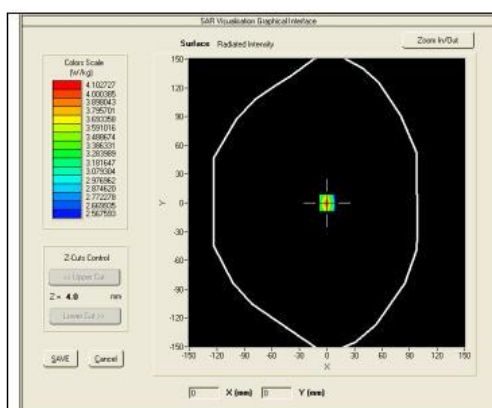


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.6.14.SATU..A

Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	1800 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4	38.13 (3.81)	20.1	20.20 (2.02)
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



Page: 8/11

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7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 \pm 5 %		0.80 \pm 5 %	
300	58.2 \pm 5 %		0.92 \pm 5 %	
450	56.7 \pm 5 %		0.94 \pm 5 %	
750	55.5 \pm 5 %		0.96 \pm 5 %	
835	55.2 \pm 5 %		0.97 \pm 5 %	
900	55.0 \pm 5 %		1.05 \pm 5 %	
915	55.0 \pm 5 %		1.06 \pm 5 %	
1450	54.0 \pm 5 %		1.30 \pm 5 %	
1610	53.8 \pm 5 %		1.40 \pm 5 %	
1800	53.3 \pm 5 %	PASS	1.52 \pm 5 %	PASS
1900	53.3 \pm 5 %		1.52 \pm 5 %	
2000	53.3 \pm 5 %		1.52 \pm 5 %	
2100	53.2 \pm 5 %		1.62 \pm 5 %	
2450	52.7 \pm 5 %		1.95 \pm 5 %	
2600	52.5 \pm 5 %		2.16 \pm 5 %	
3000	52.0 \pm 5 %		2.73 \pm 5 %	
3500	51.3 \pm 5 %		3.31 \pm 5 %	
5200	49.0 \pm 10 %		5.30 \pm 10 %	
5300	48.9 \pm 10 %		5.42 \pm 10 %	
5400	48.7 \pm 10 %		5.53 \pm 10 %	
5500	48.6 \pm 10 %		5.65 \pm 10 %	
5600	48.5 \pm 10 %		5.77 \pm 10 %	
5800	48.2 \pm 10 %		6.00 \pm 10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: ϵ_{ps}' : 53.3 sigma : 1.51
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	1800 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Page: 9/11

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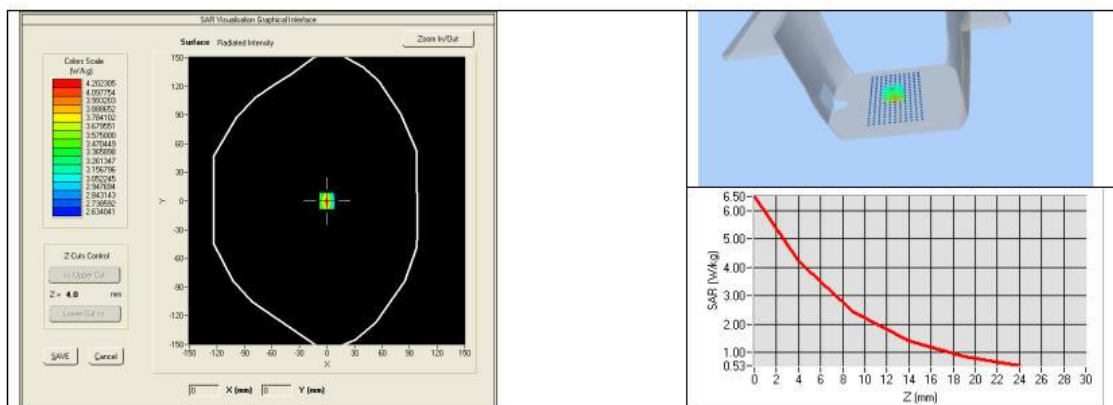




SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.6.14.SATU.A

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
1800	39.03 (3.90)	20.65 (2.07)



Page: 10/11

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**8 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	12/2021	12/2024
Reference Probe	Satimo	EPG122 SN 18/11	10/2023	10/2024
Multimeter	Keithley 2000	1188656	12/2021	12/2024
Signal Generator	Agilent E4438C	MY49070581	12/2021	12/2024
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2021	12/2024
Power Sensor	HP ECP-E26A	US37181460	12/2021	12/2024
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2024	8/2027

Page: 11/11

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5.4SID2000 Dipole Calibration Certificate



SAR Reference Dipole Calibration Report

Ref : ACR.287.7.14.SATU.A

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.

**1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD,
BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 2000 MHZ
SERIAL NO.: SN 07/14 DIP 2G000-305**

**Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144**



09/28/2024

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.7.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/12/2024	
Checked by :	Jérôme LUC	Product Manager	10/12/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/12/2024	

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/12/2024	Initial release

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TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test.....	4
3	Product Description.....	4
3.1	General Information.....	4
4	Measurement Method.....	5
4.1	Return Loss Requirements.....	5
4.2	Mechanical Requirements.....	5
5	Measurement Uncertainty.....	5
5.1	Return Loss.....	5
5.2	Dimension Measurement.....	5
5.3	Validation Measurement.....	5
6	Calibration Measurement Results.....	6
6.1	Return Loss and Impedance.....	6
6.2	Mechanical Dimensions.....	6
7	Validation measurement.....	7
7.1	Head Liquid Measurement.....	7
7.2	SAR Measurement Result With Head Liquid.....	7
7.3	Body Liquid Measurement.....	9
7.4	SAR Measurement Result With Body Liquid.....	9
8	List of Equipment.....	11





1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2000 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID2000
Serial Number	SN 07/14 DIP 2G000-305
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – Satimo COMOSAR Validation Dipole

Page: 4/11

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4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

Page: 5/11

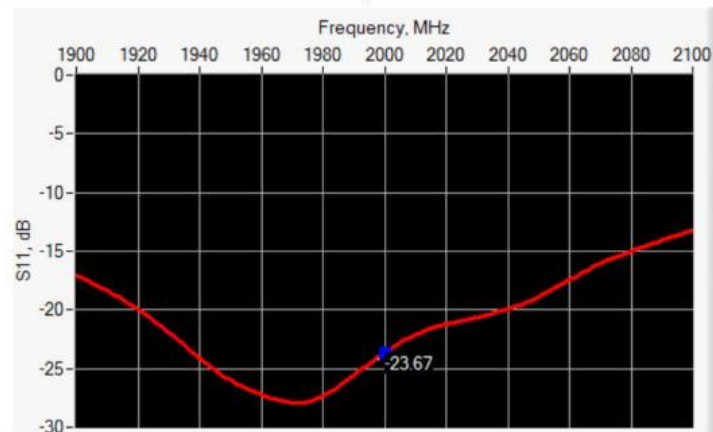
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6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2000	-23.67	-20	50.8 Ω - 6.2 j Ω

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 \pm 1 %.		250.0 \pm 1 %.		6.35 \pm 1 %.	
450	290.0 \pm 1 %.		166.7 \pm 1 %.		6.35 \pm 1 %.	
750	176.0 \pm 1 %.		100.0 \pm 1 %.		6.35 \pm 1 %.	
835	161.0 \pm 1 %.		89.8 \pm 1 %.		3.6 \pm 1 %.	
900	149.0 \pm 1 %.		83.3 \pm 1 %.		3.6 \pm 1 %.	
1450	89.1 \pm 1 %.		51.7 \pm 1 %.		3.6 \pm 1 %.	
1500	80.5 \pm 1 %.		50.0 \pm 1 %.		3.6 \pm 1 %.	
1640	79.0 \pm 1 %.		45.7 \pm 1 %.		3.6 \pm 1 %.	
1750	75.2 \pm 1 %.		42.9 \pm 1 %.		3.6 \pm 1 %.	
1800	72.0 \pm 1 %.		41.7 \pm 1 %.		3.6 \pm 1 %.	
1900	68.0 \pm 1 %.		39.5 \pm 1 %.		3.6 \pm 1 %.	
1950	66.3 \pm 1 %.		38.5 \pm 1 %.		3.6 \pm 1 %.	
2000	64.5 \pm 1 %.	PASS	37.5 \pm 1 %.	PASS	3.6 \pm 1 %.	PASS
2100	61.0 \pm 1 %.		35.7 \pm 1 %.		3.6 \pm 1 %.	
2300	55.5 \pm 1 %.		32.6 \pm 1 %.		3.6 \pm 1 %.	
2450	51.5 \pm 1 %.		30.4 \pm 1 %.		3.6 \pm 1 %.	
2600	48.5 \pm 1 %.		28.8 \pm 1 %.		3.6 \pm 1 %.	
3000	41.5 \pm 1 %.		25.0 \pm 1 %.		3.6 \pm 1 %.	
3500	37.0 \pm 1 %.		26.4 \pm 1 %.		3.6 \pm 1 %.	
3700	34.7 \pm 1 %.		26.4 \pm 1 %.		3.6 \pm 1 %.	

Page: 6/11

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7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r)		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 \pm 5 %		0.87 \pm 5 %	
450	43.5 \pm 5 %		0.87 \pm 5 %	
750	41.9 \pm 5 %		0.89 \pm 5 %	
835	41.5 \pm 5 %		0.90 \pm 5 %	
900	41.5 \pm 5 %		0.97 \pm 5 %	
1450	40.5 \pm 5 %		1.20 \pm 5 %	
1500	40.4 \pm 5 %		1.23 \pm 5 %	
1640	40.2 \pm 5 %		1.31 \pm 5 %	
1750	40.1 \pm 5 %		1.37 \pm 5 %	
1800	40.0 \pm 5 %		1.40 \pm 5 %	
1900	40.0 \pm 5 %		1.40 \pm 5 %	
1950	40.0 \pm 5 %		1.40 \pm 5 %	
2000	40.0 \pm 5 %	PASS	1.40 \pm 5 %	PASS
2100	39.8 \pm 5 %		1.49 \pm 5 %	
2300	39.5 \pm 5 %		1.67 \pm 5 %	
2450	39.2 \pm 5 %		1.80 \pm 5 %	
2600	39.0 \pm 5 %		1.96 \pm 5 %	
3000	38.5 \pm 5 %		2.40 \pm 5 %	
3500	37.9 \pm 5 %		2.91 \pm 5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: ϵ_r : 39.7 sigma : 1.43
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm

Page: 7/11

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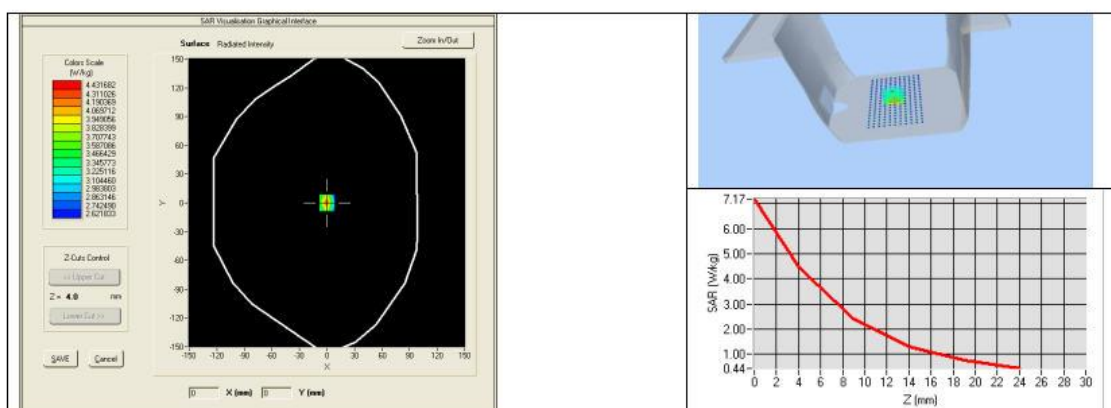


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.7.14.SATIM.A

Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	2000 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1	43.00 (4.30)	21.1	21.20 (2.12)
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



Page: 8/11

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7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 \pm 5 %		0.80 \pm 5 %	
300	58.2 \pm 5 %		0.92 \pm 5 %	
450	56.7 \pm 5 %		0.94 \pm 5 %	
750	55.5 \pm 5 %		0.96 \pm 5 %	
835	55.2 \pm 5 %		0.97 \pm 5 %	
900	55.0 \pm 5 %		1.05 \pm 5 %	
915	55.0 \pm 5 %		1.06 \pm 5 %	
1450	54.0 \pm 5 %		1.30 \pm 5 %	
1610	53.8 \pm 5 %		1.40 \pm 5 %	
1800	53.3 \pm 5 %		1.52 \pm 5 %	
1900	53.3 \pm 5 %		1.52 \pm 5 %	
2000	53.3 \pm 5 %	PASS	1.52 \pm 5 %	PASS
2100	53.2 \pm 5 %		1.62 \pm 5 %	
2450	52.7 \pm 5 %		1.95 \pm 5 %	
2600	52.5 \pm 5 %		2.16 \pm 5 %	
3000	52.0 \pm 5 %		2.73 \pm 5 %	
3500	51.3 \pm 5 %		3.31 \pm 5 %	
5200	49.0 \pm 10 %		5.30 \pm 10 %	
5300	48.9 \pm 10 %		5.42 \pm 10 %	
5400	48.7 \pm 10 %		5.53 \pm 10 %	
5500	48.6 \pm 10 %		5.65 \pm 10 %	
5600	48.5 \pm 10 %		5.77 \pm 10 %	
5800	48.2 \pm 10 %		6.00 \pm 10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: ϵ_{ps}' : 53.9 sigma : 1.53
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	2000 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Page: 9/11

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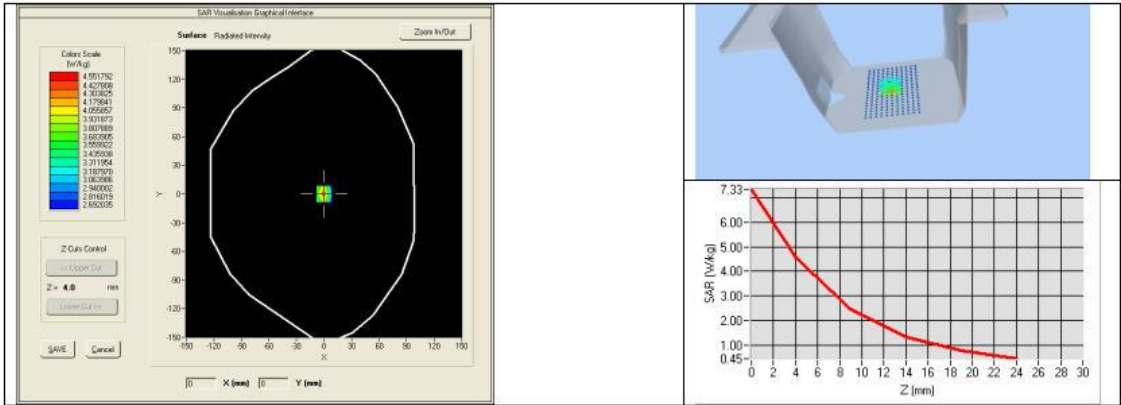




SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.7.14.SATU.A

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2000	45.84 (4.58)	22.30 (2.23)



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8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2022	02/2025
Calipers	Carrera	CALIPER-01	12/2022	12/2025
Reference Probe	Satimo	EPG122 SN 18/11	10/2023	10/2024
Multimeter	Keithley 2000	1188656	12/2022	12/2025
Signal Generator	Agilent E4438C	MY49070581	12/2022	12/2025
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2022	12/2025
Power Sensor	HP ECP-E26A	US37181460	12/2022	12/2025
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2022	8/2025

Page: 11/11

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**5.5SID2450 Dipole Calibration Certificate****SAR Reference Dipole Calibration Report**

Ref : ACR.287.8.14.SATU.A

**SHENZHEN LCS COMPLIANCE TESTING
LABORATORY LTD.****1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD,
BAO'AN BLVD****BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA****SATIMO COMOSAR REFERENCE DIPOLE****FREQUENCY: 2450 MHZ****SERIAL NO.: SN 07/14 DIP 2G450-306****Calibrated at SATIMO US****2105 Barrett Park Dr. - Kennesaw, GA 30144****09/28/2024***Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.8.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	10/12/2024	
Checked by :	Jérôme LUC	Product Manager	10/12/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/12/2024	

	Customer Name
Distribution :	Shenzhen LCS Compliance Testing Laboratory Ltd.

Issue	Date	Modifications
A	10/12/2024	Initial release

Page: 2/11

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TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Return Loss Requirements	5
4.2	Mechanical Requirements	5
5	Measurement Uncertainty.....	5
5.1	Return Loss	5
5.2	Dimension Measurement	5
5.3	Validation Measurement	5
6	Calibration Measurement Results	6
6.1	Return Loss and Impedance	6
6.2	Mechanical Dimensions	6
7	Validation measurement	7
7.1	Head Liquid Measurement	7
7.2	SAR Measurement Result With Head Liquid	7
7.3	Body Liquid Measurement	9
7.4	SAR Measurement Result With Body Liquid	9
8	List of Equipment	11





1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2450 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID2450
Serial Number	SN 07/14 DIP 2G450-306
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – Satimo COMOSAR Validation Dipole

Page: 4/11

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4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

Page: 5/11

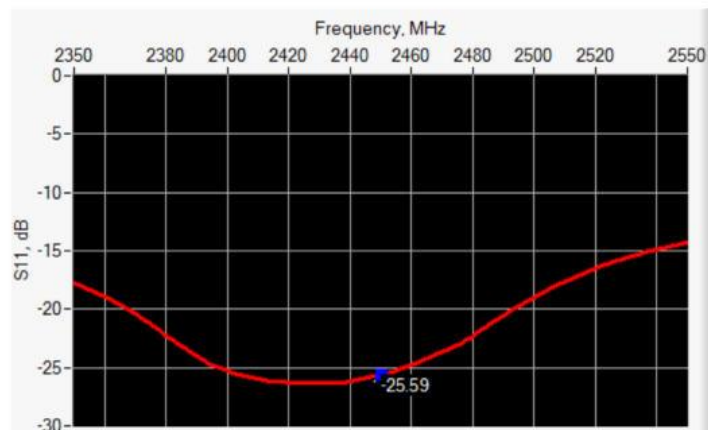
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6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-25.59	-20	44.7 Ω - 1.1 j Ω

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 \pm 1 %.		250.0 \pm 1 %.		6.35 \pm 1 %.	
450	290.0 \pm 1 %.		166.7 \pm 1 %.		6.35 \pm 1 %.	
750	176.0 \pm 1 %.		100.0 \pm 1 %.		6.35 \pm 1 %.	
835	161.0 \pm 1 %.		89.8 \pm 1 %.		3.6 \pm 1 %.	
900	149.0 \pm 1 %.		83.3 \pm 1 %.		3.6 \pm 1 %.	
1450	89.1 \pm 1 %.		51.7 \pm 1 %.		3.6 \pm 1 %.	
1500	80.5 \pm 1 %.		50.0 \pm 1 %.		3.6 \pm 1 %.	
1640	79.0 \pm 1 %.		45.7 \pm 1 %.		3.6 \pm 1 %.	
1750	75.2 \pm 1 %.		42.9 \pm 1 %.		3.6 \pm 1 %.	
1800	72.0 \pm 1 %.		41.7 \pm 1 %.		3.6 \pm 1 %.	
1900	68.0 \pm 1 %.		39.5 \pm 1 %.		3.6 \pm 1 %.	
1950	66.3 \pm 1 %.		38.5 \pm 1 %.		3.6 \pm 1 %.	
2000	64.5 \pm 1 %.		37.5 \pm 1 %.		3.6 \pm 1 %.	
2100	61.0 \pm 1 %.		35.7 \pm 1 %.		3.6 \pm 1 %.	
2300	55.5 \pm 1 %.		32.6 \pm 1 %.		3.6 \pm 1 %.	
2450	51.5 \pm 1 %.	PASS	30.4 \pm 1 %.	PASS	3.6 \pm 1 %.	PASS
2600	48.5 \pm 1 %.		28.8 \pm 1 %.		3.6 \pm 1 %.	
3000	41.5 \pm 1 %.		25.0 \pm 1 %.		3.6 \pm 1 %.	
3500	37.0 \pm 1 %.		26.4 \pm 1 %.		3.6 \pm 1 %.	
3700	34.7 \pm 1 %.		26.4 \pm 1 %.		3.6 \pm 1 %.	

Page: 6/11

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7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r)		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 \pm 5 %		0.87 \pm 5 %	
450	43.5 \pm 5 %		0.87 \pm 5 %	
750	41.9 \pm 5 %		0.89 \pm 5 %	
835	41.5 \pm 5 %		0.90 \pm 5 %	
900	41.5 \pm 5 %		0.97 \pm 5 %	
1450	40.5 \pm 5 %		1.20 \pm 5 %	
1500	40.4 \pm 5 %		1.23 \pm 5 %	
1640	40.2 \pm 5 %		1.31 \pm 5 %	
1750	40.1 \pm 5 %		1.37 \pm 5 %	
1800	40.0 \pm 5 %		1.40 \pm 5 %	
1900	40.0 \pm 5 %		1.40 \pm 5 %	
1950	40.0 \pm 5 %		1.40 \pm 5 %	
2000	40.0 \pm 5 %		1.40 \pm 5 %	
2100	39.8 \pm 5 %		1.49 \pm 5 %	
2300	39.5 \pm 5 %		1.67 \pm 5 %	
2450	39.2 \pm 5 %	PASS	1.80 \pm 5 %	PASS
2600	39.0 \pm 5 %		1.96 \pm 5 %	
3000	38.5 \pm 5 %		2.40 \pm 5 %	
3500	37.9 \pm 5 %		2.91 \pm 5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: ϵ_r : 39.0 sigma : 1.77
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm

Page: 7/11

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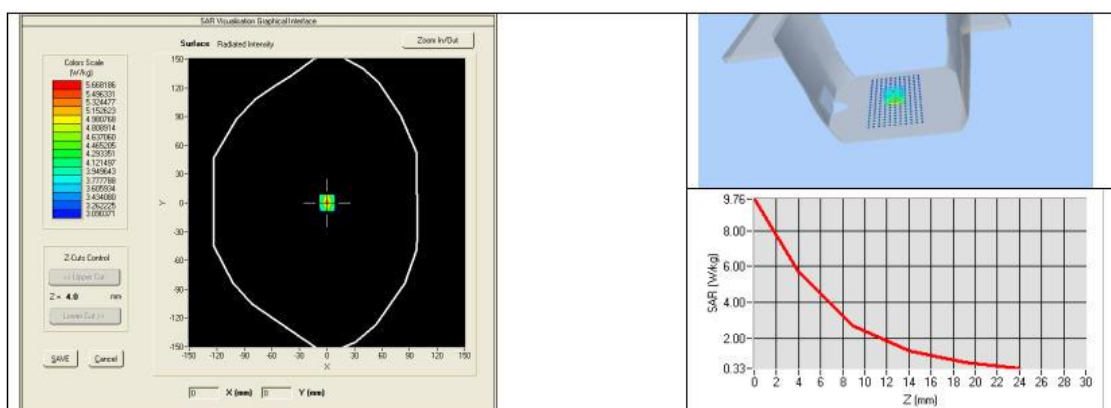


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.8.14.SATIM.A

Zoon Scan Resolution	$dx=8mm/dy=8mm/dz=5mm$
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4	53.89 (5.39)	24	24.15 (2.42)
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



Page: 8/11

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7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 \pm 5 %		0.80 \pm 5 %	
300	58.2 \pm 5 %		0.92 \pm 5 %	
450	56.7 \pm 5 %		0.94 \pm 5 %	
750	55.5 \pm 5 %		0.96 \pm 5 %	
835	55.2 \pm 5 %		0.97 \pm 5 %	
900	55.0 \pm 5 %		1.05 \pm 5 %	
915	55.0 \pm 5 %		1.06 \pm 5 %	
1450	54.0 \pm 5 %		1.30 \pm 5 %	
1610	53.8 \pm 5 %		1.40 \pm 5 %	
1800	53.3 \pm 5 %		1.52 \pm 5 %	
1900	53.3 \pm 5 %		1.52 \pm 5 %	
2000	53.3 \pm 5 %		1.52 \pm 5 %	
2100	53.2 \pm 5 %		1.62 \pm 5 %	
2450	52.7 \pm 5 %	PASS	1.95 \pm 5 %	PASS
2600	52.5 \pm 5 %		2.16 \pm 5 %	
3000	52.0 \pm 5 %		2.73 \pm 5 %	
3500	51.3 \pm 5 %		3.31 \pm 5 %	
5200	49.0 \pm 10 %		5.30 \pm 10 %	
5300	48.9 \pm 10 %		5.42 \pm 10 %	
5400	48.7 \pm 10 %		5.53 \pm 10 %	
5500	48.6 \pm 10 %		5.65 \pm 10 %	
5600	48.5 \pm 10 %		5.77 \pm 10 %	
5800	48.2 \pm 10 %		6.00 \pm 10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: ϵ_{ps}' : 53.0 sigma : 1.93
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Page: 9/11

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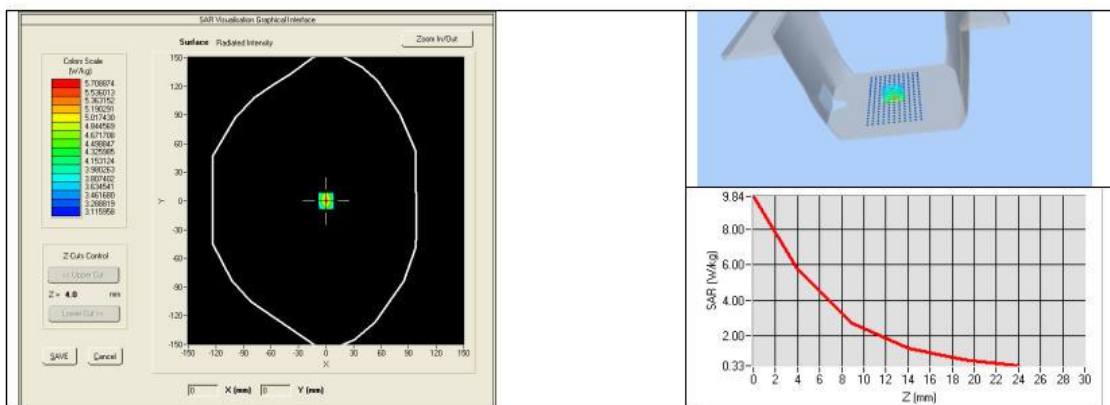




SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.287.8.14.SATIM.A

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2450	54.65 (5.46)	24.58 (2.46)





8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	12/2023	12/2026
Reference Probe	Satimo	EPG122 SN 18/11	10/2023	10/2024
Multimeter	Keithley 2000	1188656	12/2023	12/2026
Signal Generator	Agilent E4438C	MY49070581	12/2023	12/2026
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2023	12/2026
Power Sensor	HP ECP-E26A	US37181460	12/2023	12/2026
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2024	8/2027

Page: 11/11

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**5.6SID2600 Dipole Calibration Certificate****SAR Reference Dipole Calibration Report**

Ref : ACR.273.4.18.SATU.A

**SHENZHEN LCS COMPLIANCE TESTING
LABORATORY LTD.**

**1F., XINGYUAN INDUSTRIAL PARK, TONGDA ROAD,
BAO'AN BLVD
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA
MVG COMOSAR REFERENCE DIPOLE**

FREQUENCY: 2600 MHZ**SERIAL NO.: SN 38/18 DIP 2G600-468****Calibrated at MVG US****2105 Barrett Park Dr. - Kennesaw, GA 30144****Calibration Date: 09/21/2024***Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.273.4.18.SATU.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Jérôme LUC	Product Manager	09/28/2024	
<i>Checked by :</i>	Jérôme LUC	Product Manager	09/28/2024	
<i>Approved by :</i>	Kim RUTKOWSKI	Quality Manager	09/28/2024	

	<i>Customer Name</i>
<i>Distribution :</i>	Shenzhen LCS Compliance Testing Laboratory Ltd.

<i>Issue</i>	<i>Date</i>	<i>Mod.ifications</i>
A	09/28/2024	Initial release

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TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Return Loss Requirements	5
4.2	Mechanical Requirements	5
5	Measurement Uncertainty.....	5
5.1	Return Loss	5
5.2	Dimension Measurement	5
5.3	Validation Measurement	5
6	Calibration Measurement Results	6
6.1	Return Loss and Impedance In Head Liquid	6
6.2	Return Loss and Impedance In Body Liquid	6
6.3	Mechanical Dimensions	6
7	Validation measurement	7
7.1	Head Liquid Measurement	7
7.2	SAR Measurement Result With Head Liquid	8
7.3	Body Liquid Measurement	9
7.4	SAR Measurement Result With Body Liquid	10
8	List of Equipment	11





1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2600 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID2600
Serial Number	SN 38/18 DIP 2G600-468
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – MVG COMOSAR Validation Dipole





4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %

Page: 5/11

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SAR REFERENCE DIPOLE CALIBRATION REPORT

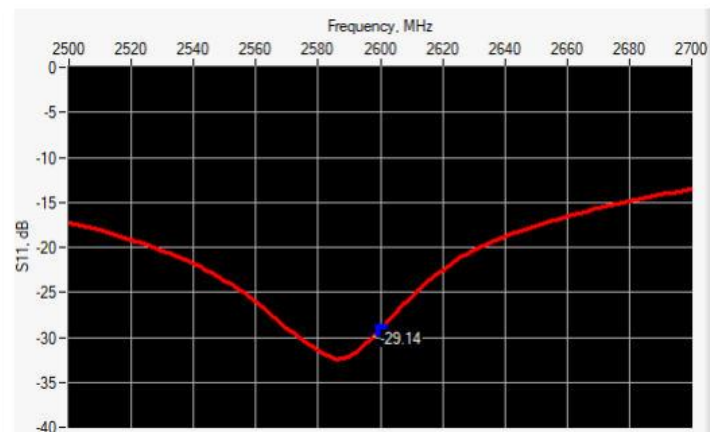
Ref: ACR.273.4.18.SATU.A

10 g

20.1 %

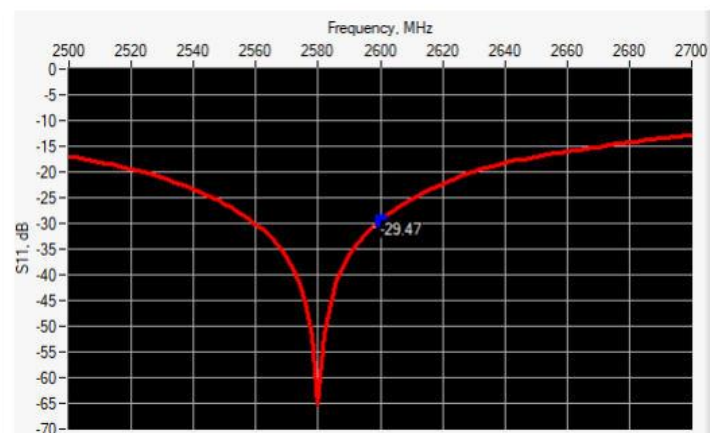
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2600	-29.14	-20	$49.2 \Omega + 3.4 j\Omega$

6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2600	-29.47	-20	$47.5 \Omega + 2.2 j\Omega$

6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %		250.0 ±1 %		6.35 ±1 %	

Page: 6/11

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.273.4.18.SATU.A

450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.	PASS	28.8 ±1 %.	PASS	3.6 ±1 %.	PASS
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r)		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	

Page: 7/11

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.273.4.18.SATU.A

1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %	PASS	1.96 ±5 %	PASS
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: ϵ_{ps}' : 39.8 σ : 1.99
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=5mm/dy=5mm/dz=5mm$
Frequency	2600 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	

Page: 8/11

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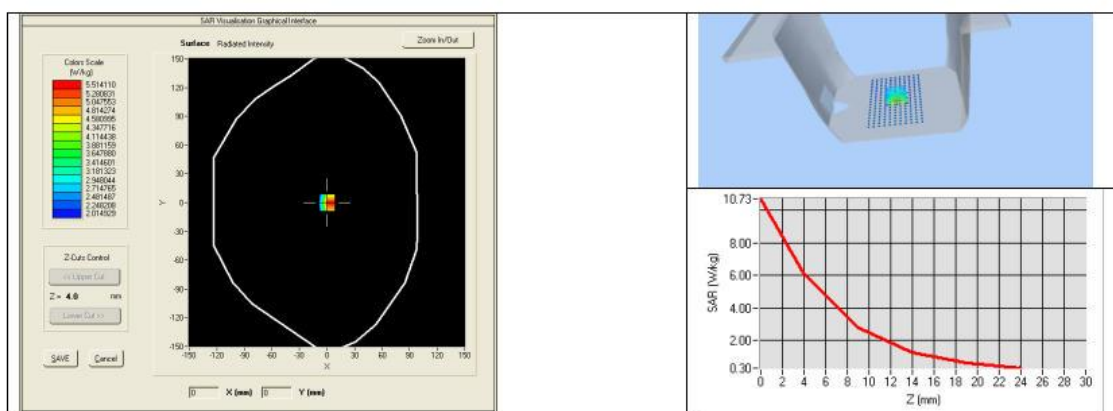




SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.273.4.18.SATU.A

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3	56.91 (5.69)	24.6	24.69 (2.47)
3000	63.8		25.7	
3500	67.1		25	
3700	67.4		24.2	



7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ϵ_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 \pm 5 %		0.80 \pm 5 %	
300	58.2 \pm 5 %		0.92 \pm 5 %	
450	56.7 \pm 5 %		0.94 \pm 5 %	
750	55.5 \pm 5 %		0.96 \pm 5 %	
835	55.2 \pm 5 %		0.97 \pm 5 %	
900	55.0 \pm 5 %		1.05 \pm 5 %	
915	55.0 \pm 5 %		1.06 \pm 5 %	
1450	54.0 \pm 5 %		1.30 \pm 5 %	
1610	53.8 \pm 5 %		1.40 \pm 5 %	
1800	53.3 \pm 5 %		1.52 \pm 5 %	
1900	53.3 \pm 5 %		1.52 \pm 5 %	
2000	53.3 \pm 5 %		1.52 \pm 5 %	
2100	53.2 \pm 5 %		1.62 \pm 5 %	

Page: 9/11

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SAR REFERENCE DIPOLE CALIBRATION REPORT

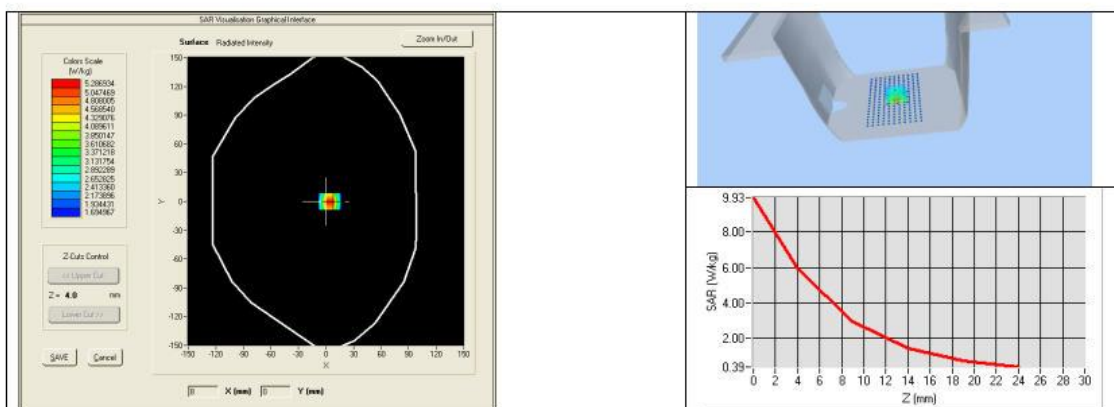
Ref: ACR.273.4.18.SATU.A

2300	52.9 ±5 %		1.81 ±5 %	
2450	52.7 ±5 %		1.95 ±5 %	
2600	52.5 ±5 %	PASS	2.16 ±5 %	PASS
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
3700	51.0 ±5 %		3.55 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: ϵ_{ps}' : 52.5 sigma : 2.23
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=5mm/dy=5mm/dz=5mm
Frequency	2600 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2600	54.14 (5.41)	24.13 (2.41)



Page: 10/11

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.273.4.18.SATC..A

检测股份
Testing Lab

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	06/2024	06/2027
Calipers	Carrera	CALIPER-01	01/2023	01/2026
Reference Probe	MVG	EPG122 SN 18/11	08/2024	08/2027
Multimeter	Keithley 2000	1188656	01/2023	01/2026
Signal Generator	Agilent E4438C	MY49070581	01/2023	01/2026
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2023	11/2026
Power Sensor	HP ECP-E26A	US37181460	01/2023	01/2026
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	150798832	11/2023	11/2026

检测股份
Testing Lab

Page: 11/11

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检测股份
Testing Lab



6.SAR System PHOTOGRAPHS



Liquid depth $\geq 15\text{cm}$



Shenzhen LCS Compliance Testing Laboratory Ltd.

Add: Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao'an District, Shenzhen, Guangdong, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity



7.SETUP PHOTOGRAPHS

Body Setup Photo(Front to face 5mm)



Body Setup Photo(Wrist worn 0mm)





8.EUT PHOTOGRAPHS



Fig.1

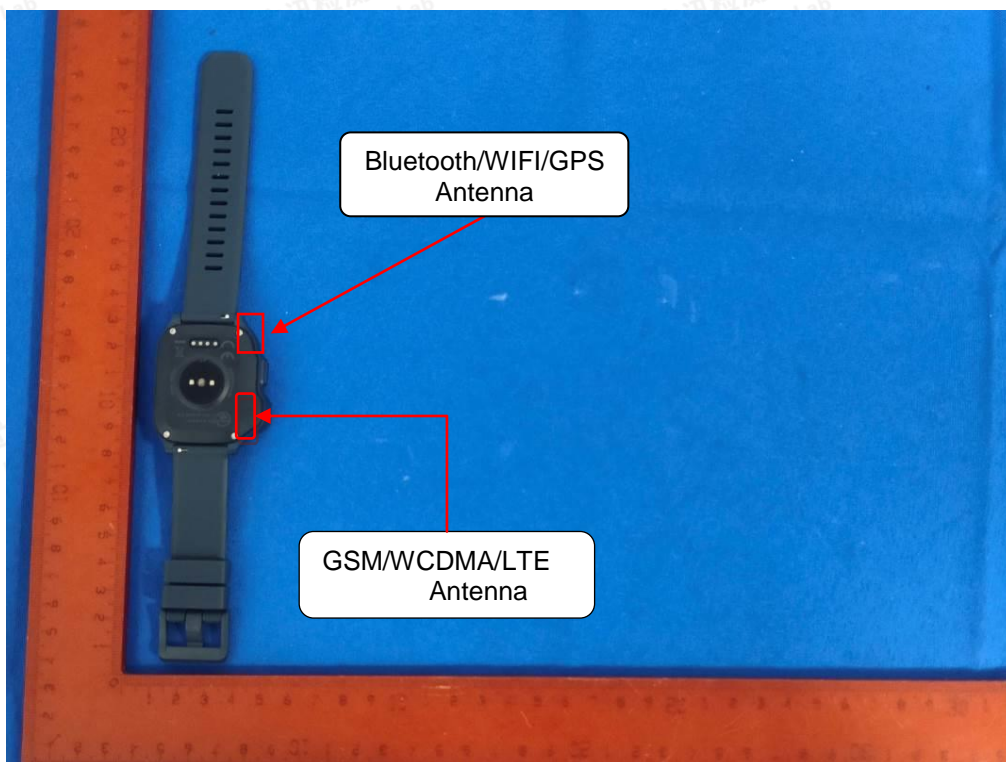


Fig.2

.....The End of Test Report.....

