# TEST REPORT

| | | |
|---|---|---|
| **APPLICANT** | : | TWELVE SOUTH, LLC |
| **PRODUCT NAME** | : | AirFly Pro 2 |
| **MODEL NAME** | : | AFP2 |
| **BRAND NAME** | : | twelve south |
| **FCC ID** | : | 2AREB-AFP2 |
| **STANDARD(S)** | : | FCC 47 CFR Part 2 (2.1093)<br>IEEE 1528-2013 |
| **RECEIPT DATE** | : | 2025-11-28 |
| **TEST DATE** | : | 2026-01-26 |
| **ISSUE DATE** | : | 2026-01-27 |

Edited by: Pang Siyu

Pang Siyu (Rapporteur)

Approved by: Shen Junsheng

Shen Junsheng (Supervisor)

**NOTE:** This document is issued by Shenzhen Morlab Communications Technology Co., the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.

MORLAB
Shenzhen Morlab Communications Technology Co., Ltd.
FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.cn E-mail: service@morlab.cn

# DIRECTORY

1. Statement of Compliance ..... 5
2. Technical Information ..... 6
2.1. Applicant and Manufacturer Information ..... 6
2.2. Equipment under Test (EUT) Description ..... 6
2.3. Environment of Test Site/Conditions ..... 7
3. Specific Absorption Rate (SAR) ..... 8
3.1. Introduction ..... 8
3.2. SAR Definition ..... 8
4. RF Exposure Limits ..... 9
4.1. Uncontrolled Environment ..... 9
4.2. Controlled Environment ..... 9
5. Applied Reference Documents ..... 10
6. SAR Measurement System ..... 11
6.1. E-Field Probe ..... 12
6.2. Data Acquisition Electronics (DAE) ..... 13
6.3. Robot ..... 13
6.4. Measurement Server ..... 14
6.5. Light Beam Unit ..... 14
6.6. Phantom ..... 14
6.7. Device Holder ..... 15
6.8. Data Storage and Evaluation ..... 16
6.9. Test Equipment List ..... 18
7. Tissue Simulating Liquids ..... 19
8. SAR System Verification ..... 21
8.1. Purpose of System Performance Check ..... 21
8.2. System Setup ..... 21

8.3. Validation Results ..... 22
9. EUT Testing Position ..... 24
9.1. Body-worn Configurations ..... 24
9.2. Hotspot Mode Exposure Position Conditions ..... 24
10. Measurement Procedures ..... 25
10.1. Spatial Peak SAR Evaluation ..... 26
10.2. Power Reference Measurement ..... 26
10.3. Area Scan Procedures ..... 26
10.4. Zoom Scan Procedures ..... 27
10.5. SAR Averaged Methods ..... 27
10.6. Power Drift Monitoring ..... 27
11. SAR Test Procedure ..... 28
11.1. General Scan Requirements ..... 28
11.2. Test Procedure ..... 29
11.3. Description of Interpolation/Extrapolation Scheme ..... 29
11.4. Wireless Router ..... 29
12. Conducted Power List ..... 31
13. Hotspot Mode Evaluation Procedure ..... 31
14. Block Diagram of the Tests to be Performed ..... 32
14.1. Body ..... 32
15. Test Results List ..... 33
15.1. Test Guidance ..... 33
15.2. Body SAR Data ..... 34
16. Simultaneous Transmission Evaluation ..... 34
17. Uncertainty Assessment ..... 34
Annex A General Information ..... 35
Annex B Test Setup Photos ..... 36
Annex C Plots of System Performance Check ..... 36

**Annex D Plots of Maximum SAR Test Results** ..... 36

**Annex E Conducted Power** ..... 36

**Annex F DASY Calibration Certificate** ..... 36

**Notes** ..... 37

| Changed History | | |
|---|---|---|
| **Version** | **Date** | **Reason for Change** |
| 1.0 | 2026-01-27 | First edition |
| | | |

**Note:** The latest revision of the report supersedes all previous version.

# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during test as bellows:
<Highest Reported SAR Summary>

| Frequency Band | | Highest SAR Summary |
|---|---|---|
| | | Body (Gap 0 mm) |
| | | 1g SAR (W/kg) |
| 2.4GHz Band | Bluetooth | 0.716 |

**Note:**

1. This device is in compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits (1.6 W/kg as averaged over any 1 gram of tissue; specified in FCC 47 CFR part 1 (1.1310) and ANSI/IEEE C95.1-1992), and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.
2. The declarations of EUT presented in the report are provided by applicant and/or manufacturer, and the test laboratory is not responsible for the accuracy of the information.

# 2. Technical Information

**Note:** Provide by applicant.

## 2.1. Applicant and Manufacturer Information

| | |
|---|---|
| **Applicant:** | TWELVE SOUTH, LLC |
| **Applicant Address:** | 1503 KING ST STE201 Charleston, SC29405, USA |
| **Manufacturer:** | TWELVE SOUTH, LLC |
| **Manufacturer Address:** | 1503 KING ST STE201 Charleston, SC29405, USA |

## 2.2. Equipment under Test (EUT) Description

| | |
|---|---|
| **Product Name:** | AirFly Pro 2 |
| **EUT No.:** | 2# |
| **Hardware Version:** | SV03 |
| **Software Version:** | V026 |
| **Frequency Bands:** | Bluetooth: 2402 MHz ~ 2480 MHz |
| **Modulation Mode:** | BR+EDR: GFSK (1Mbps), π/4-DQPSK (2Mbps), 8-DPSK (3Mbps) |
| **Antenna Type:** | Chip Antenna |

**Note:** For more detailed description, please refer to specification or user manual supplied by the applicant and/or manufacturer.

## 2.3. Environment of Test Site/Conditions

| | |
|---|---|
| Normal Temperature (NT): | 18-25 °C |
| Relative Humidity: | 30-75 % |

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the Factory. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset.
The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 35 dB.

# 3. Specific Absorption Rate (SAR)

## 3.1. Introduction

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

## 3.2. SAR Definition

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

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

SAR is expressed in units of Watts per kilogram (W/kg).
SAR measurement can be either related to the temperature elevation in tissue by,

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

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

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

Where σ is the conductivity of the tissue, ρ is the mass density of the tissue and $|E|$ is the rmselectrical field strength.

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

# 4. RF Exposure Limits

## 4.1. Uncontrolled Environment

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

**Limits for General Population/Uncontrolled Exposure (W/kg)**

| Type Exposure | Uncontrolled Environment Limit |
|---|---|
| Spatial Peak SAR (1g cube tissue for head and trunk) | 1.6 W/kg |
| Spatial Peak SAR (10g cube tissue for limbs) | 4.0 W/kg |
| Spatial Peak SAR (1g cube tissue for whole body) | 0.08 W/kg |

**Note:**

1. Occupational/Uncontrolled 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. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

## 4.2. Controlled Environment

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

# 5. Applied Reference Documents

Leading reference documents for testing:

| Identity | Document Title | Remark |
|---|---|---|
| FCC 47 CFR Part 2 (2.1093) | Radio Frequency Radiation Exposure Evaluation: Portable Devices | / |
| IEEE 1528-2013 | IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques | / |
| KDB 447498 D01v06 | General RF Exposure Guidance | / |
| KDB 865664 D01v01r04 | SAR Measurement 100 MHz to 6 GHz | / |
| KDB 865664 D02v01r02 | RF Exposure Reporting | / |
| KDB 648474 D04v01r03 | Handset SAR | / |
| KDB 941225 D06v02r01 | SAR Evaluation Procedures For Portable Devices With Wireless Router Capabilities | / |
| **Note:** Any additions, deviation, or exclusions from the method shall be noted in the “Remark”. | | |

# 6. SAR Measurement System

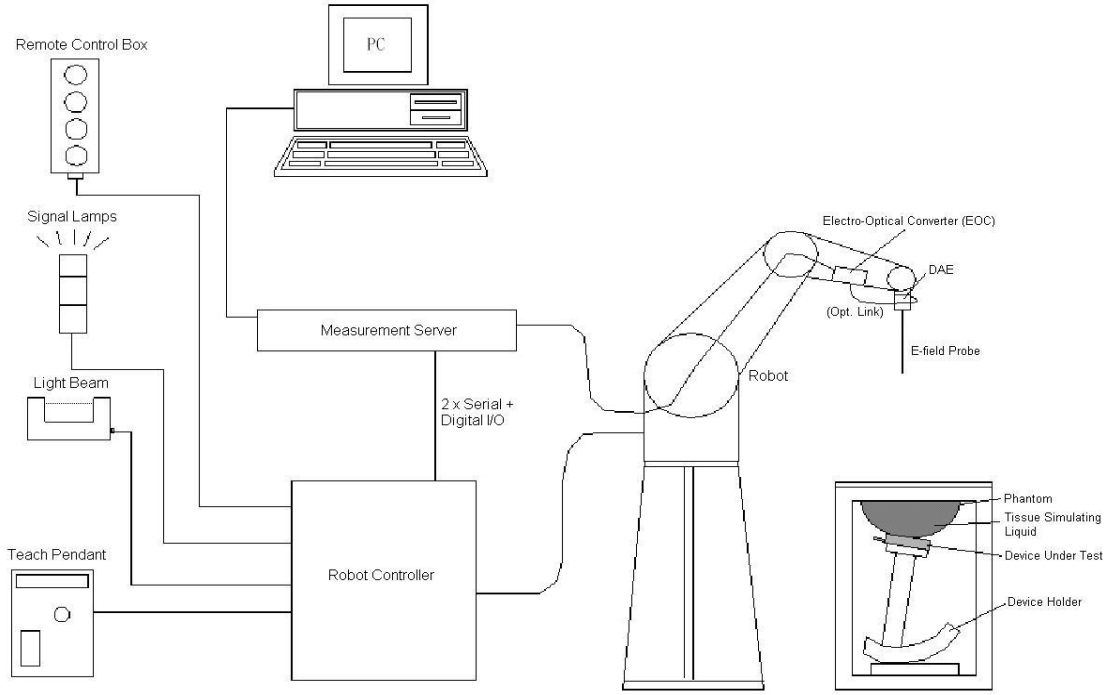



**Fig 6.1 SPEAG DASY System Configurations**

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

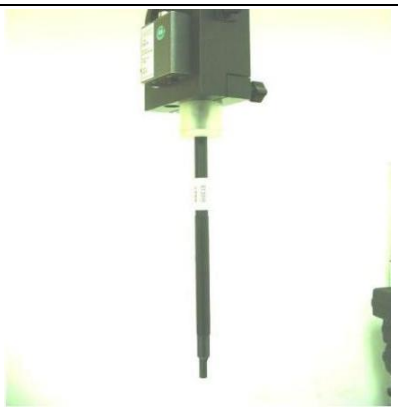
- A standard high precision 6-axis robot with controller, a teach pendant and software.
- A data acquisition electronic (DAE) attached to the robot arm extension.
- A dosimetric probe equipped with an optical surface detector system.
- The electro-optical converter (ECO) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning.
- A computer operating Windows XP.
- DASY software.
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom.
- A device holder.
- Tissue simulating liquid.
- Dipole for evaluating the proper functioning of the system.
- Some of the components are described in details in the following sub-sections.

## 6.1. E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

➢ **E-Field Probe Specification**

**<ES3DV3 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetrical design with triangular core<br>Built-in optical fiber for surface detection system.<br>Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  <br>**Fig 6.2 Photo of ES3DV3** |
| **Frequency** | 10 MHz to 3 GHz; Linearity: ± 0.2 dB | |
| **Directivity** | ± 0.2 dB in HSL (rotation around probe axis)<br>± 0.4 dB in HSL (rotation normal to probe axis) | |
| **Dynamic Range** | 5 µW/g to 100 mW/g; Linearity: ± 0.2 dB | |
| **Dimensions** | Overall length: 330 mm (Tip: 16 mm)<br>Tip diameter: 6.8 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.7 mm | |

**<EX3DV4 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) | <br>**Fig 6.3 Photo of EX3DV4** |
| **Frequency** | 10 MHz to 6 GHz; Linearity: ± 0.2 dB | |
| **Directivity** | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) | |
| **Dynamic Range** | 10 µW/g to 100 mW/g; Linearity: ± 0.2 dB | |
| **Dimensions** | Overall length: 330 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm | |

➢ **E-Field Probe Calibration**

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to annex C of this report.

## 6.2. Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast16 bit AD-converter and a command decoder and control logic unit. AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**Fig 6.4 Photo of DAE**

## 6.3. Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

High precision (repeatability ±0.035 mm)

High reliability (industrial design)

Jerk-free straight movements

Low ELF interference (the closed metallic construction shields against motor control fields)

**Fig 6.5 Photo of DASY5**

## 6.4. Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chip disk (DASY4: 32 MB; DASY5: 128 MB), RAM (DASY4: 64 MB, DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bits AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board. The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

**Fig 6.6 Photo of Server for DASY5**

## 6.5. Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

**Fig. 6.7 Photo of Light Beam**

## 6.6. Phantom

**<SAM Twin Phantom>**

| | | |
|---|---|---|
| **Shell Thickness** | 2 ± 0.2 mm (sagging: <1%)<br>Center ear point: 6 ± 0.2 mm | |
| **Filling Volume** | Approx. 25 liters | |
| **Dimensions** | Length: 1000 mm; Width: 500 mm; Height: adjustable feet | |
| **Measurement Areas** | Left Head, Right Head, Flat Phantom | **Fig. 6.8 Photo of SAM Phantom** |

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

## 6.7. Device Holder

**<Device Holder for SAM Twin Phantom>**

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

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

**<Laptop Extension Kit>**

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

**Fig 6.9 Device Holder**

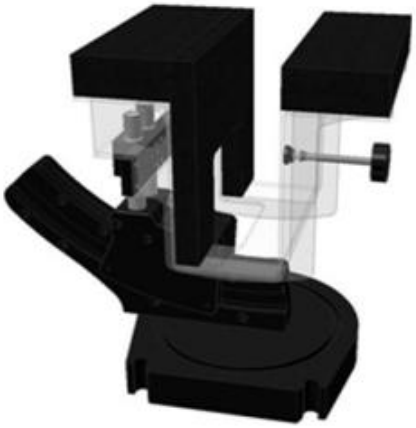


**Fig 6.10 Laptop Extension Kit**

## 6.8. Data Storage and Evaluation

➢ **Data Storage**

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing 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 erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.
The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [Mw/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

➢ **Data Evaluation**

The DASY post-processing software (SEMCAD) 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 | $Norm_i$, $a_{i0}$, $a_{i1}$, $a_{i2}$ |
| | - Conversion factor | $ConvF_i$ |
| | - Diode compression point | dcpi |
| **Device parameters:** | - Frequency | f |
| | - Crest factor | cf |
| **Media parameters:** | - 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 DASY components. In the direct measuring mode of the multi-meter 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:

$$V_i = U_i + U_i^2 \times \frac{cf}{dcp_i}$$

With Vi = compensated signal of channel I, (I = x, y, z)
Ui = input signal of channel I, (I = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcpi = diode compression point (DASY parameter)

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

E-field Probes: $E_i = \sqrt{\frac{V_i}{Norm_i \times ConvF}}$

H-field Probes: $H_i = \sqrt{V_i} \times \frac{a_{i0}+a_{i1}+a_{i2}f^2}{f}$

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)$^2$ forE-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.

$$SAR = E_{tot}^2 \times \frac{\sigma}{\rho \times 1000}$$

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/cm$^3$

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

## 6.9. Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial No./ SW Version | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 805 | 2024.10.22 | 2027.10.21 |
| SPEAG | DOSIMETRIC ASSESSMENT SYSTEM Software | DASY52 | 52.10.4.1527 | NCR | NCR |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 7608 | 2025.03.20 | 2026.03.19 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1324 | 2025.08.15 | 2026.08.14 |
| SPEAG | SAM 1 | QD000P40CD | 1811 | NCR | NCR |
| SPEAG | Phone Positioner | N/A | N/A | NCR | NCR |
| Agilent | Network Analyzer | E5071B | MY42404762 | 2025.12.24 | 2026.12.23 |
| SPEAG | Dielectric Assessment KIT | DAK-3.5 | 1279 | 2025.03.18 | 2026.03.17 |
| mini-circuits | Amplifier | ZHL-42W+ | 608501717 | NCR | NCR |
| Agilent | Signal Generator | N5182B | MY53050509 | 2025.09.02 | 2026.09.01 |
| R&S | Power Senor | NRP8S | 103215 | 2025.12.24 | 2026.12.23 |
| Agilent | Power Meter | E4416A | MY45102093 | 2025.09.02 | 2026.09.01 |
| R&S | Power Sensor | NRP8S | 103240 | 2025.12.24 | 2026.12.23 |
| Anritsu | Power Meter | E4418B | GB43318055 | 2025.05.15 | 2026.05.14 |
| Agilent | Dual Directional Coupler | 778D | 50422 | NA | NA |
| MCL | Attenuation | 351-218-010 | N/A | NA | NA |
| R&S | Spectrum Analyzer | N9030A | MY54170556 | 2025.09.02 | 2026.09.01 |
| KTJ | Thermo meter | TA298 | N/A | 2025.11.13 | 2026.11.12 |
| SPEAG | Tissue Simulating Liquids | HBBL600-10000V6 | | 24H | |

**Note:**

1. The calibration certificate of DASY can be referred to annex F of this report.
2. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
3. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by SPEAG.
4. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1 W input power according to the ratio of 1 W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it.
5. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid,

before system check.

6. N.C.R means No Calibration Requirement.

# 7. Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 7.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 7.2. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in below table.

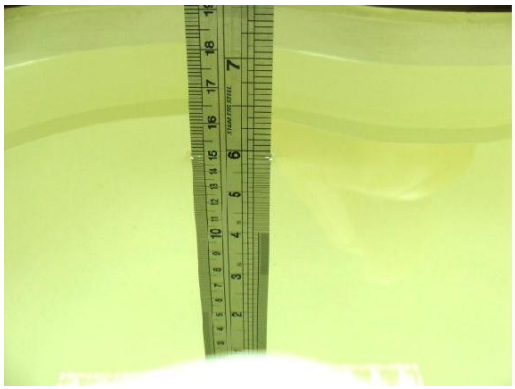


**Fig 7.1 Photo of Liquid Height for Head SAR**

**Fig 7.2 Photo of Liquid Height for Body SAR**

**The following table gives the recipes for tissue simulating liquids**

| Frequency (MHz) | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity (σ) | Permittivity (εr) |
|---|---|---|---|---|---|---|---|---|
| Head | | | | | | | | |
| 750 | 41.1 | 57.0 | 0.2 | 1.4 | 0.2 | 0 | 0.89 | 41.9 |
| 835 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.90 | 41.5 |
| 1800,1900,2000 | 55.2 | 0 | 0 | 0.3 | 0 | 44.5 | 1.40 | 40.0 |
| 2450 | 55.0 | 0 | 0 | 0 | 0 | 45.0 | 1.80 | 39.2 |
| 2600 | 54.8 | 0 | 0 | 0.1 | 0 | 45.1 | 1.96 | 39.0 |
| Body | | | | | | | | |
| 750 | 51.7 | 47.2 | 0 | 0.9 | 0.1 | 0 | 0.96 | 55.5 |
| 835 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 0.97 | 55.2 |
| 1800,1900,2000 | 70.2 | 0 | 0 | 0.4 | 0 | 29.4 | 1.52 | 53.3 |
| 2450 | 68.6 | 0 | 0 | 0 | 0 | 31.4 | 1.95 | 52.7 |
| 2600 | 68.1 | 0 | 0 | 0.1 | 0 | 31.8 | 2.16 | 52.5 |

Simulating Liquid for 5GHz, Manufactured by SPEAG.

| Ingredients | (% by weight) |
|---|---|
| Water | 64~78% |
| Mineral oil | 11~18% |
| Emulsifiers | 9~15% |
| Additives and Salt | 2~3% |

**Note:** Please refer to the validation results for dielectric parameters of each frequency band.
The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a SPEAG Dielectric Assessment KIT and an Agilent Network Analyzer.

**Table 1: Dielectric Performance of Tissue Simulating Liquid**

| Frequency (MHz) | Tissue Type | Liquid Temp. (℃) | Conductivity (σ) | Conductivity Target (σ) | Delta (σ) (%) | Limit (%) | Date |
|---|---|---|---|---|---|---|---|
| 2450 | HSL | 22.1 | 1.823 | 1.80 | 1.28 | ±5 | 2026/1/26 |
| | | | | | | | |
| **Frequency (MHz)** | **Tissue Type** | **Liquid Temp. (℃)** | **Permittivity (εr)** | **Permittivity Target (εr)** | **Delta (εr) (%)** | **Limit (%)** | **Date** |
| 2450 | HSL | 22.1 | 38.791 | 39.20 | -1.04 | ±5 | 2026/1/26 |

# 8. SAR System Verification

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

## 8.1. Purpose of System Performance Check

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

## 8.2. System Setup

The output power on dipole port must be calibrated to 250 mW or 100 mW before dipole is connected. In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

**Fig 8.1 Photo of Dipole Setup**

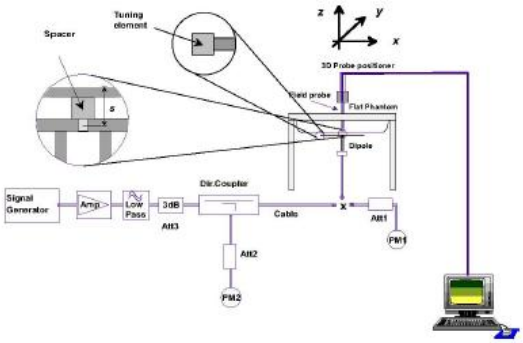



**Fig 8.2 System Setup for System Evaluation**

## 8.3. Validation Results

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

**<Validation Setup>**

| Frequency (MHz) | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N |
|---|---|---|---|---|
| 2450 | 100 | D2450V2-805 | 7608 | 1324 |

**<System Validation>**

| Frequency (MHz) | Tissue Type | Conductivity (σ) | Permittivity (εr) | CW Signal Validation | | |
|---|---|---|---|---|---|---|
| | | | | Sensitivity | Probe Linearity | Probe Isotropy |
| 750 | HSL | 0.851 | 42.43 | PASS | PASS | PASS |
| 835 | HSL | 0.898 | 41.88 | PASS | PASS | PASS |
| 1750 | HSL | 1.386 | 39.91 | PASS | PASS | PASS |
| 1800 | HSL | 1.449 | 41.26 | PASS | PASS | PASS |
| 1900 | HSL | 1.435 | 39.65 | PASS | PASS | PASS |
| 2000 | HSL | 1.451 | 39.42 | PASS | PASS | PASS |
| 2300 | HSL | 1.764 | 38.99 | PASS | PASS | PASS |
| 2450 | HSL | 1.863 | 38.85 | PASS | PASS | PASS |
| 2600 | HSL | 1.973 | 38.58 | PASS | PASS | PASS |
| 3400 | HSL | 2.88 | 38.10 | PASS | PASS | PASS |
| 3500 | HSL | 2.91 | 37.90 | PASS | PASS | PASS |
| 3700 | HSL | 3.05 | 37.70 | PASS | PASS | PASS |
| 3900 | HSL | 3.15 | 37.50 | PASS | PASS | PASS |
| 4100 | HSL | 3.25 | 37.20 | PASS | PASS | PASS |
| 4200 | HSL | 3.34 | 37.00 | PASS | PASS | PASS |
| 4400 | HSL | 3.58 | 36.70 | PASS | PASS | PASS |
| 4600 | HSL | 3.70 | 36.60 | PASS | PASS | PASS |
| 4800 | HSL | 3.82 | 36.40 | PASS | PASS | PASS |
| 4900 | HSL | 3.96 | 36.20 | PASS | PASS | PASS |
| 5250 | HSL | 4.528 | 35.32 | PASS | PASS | PASS |
| 5600 | HSL | 4.905 | 34.89 | PASS | PASS | PASS |
| 5750 | HSL | 5.077 | 34.28 | PASS | PASS | PASS |

| Frequency (MHz) | Tissue Type | Conductivity (σ) | Permittivity (εr) | Modulation Signal Validation | | |
|---|---|---|---|---|---|---|
| | | | | Mod. Type | Duty Factor | PAR |
| 750 | HSL | 0.851 | 42.43 | N/A | N/A | N/A |
| 835 | HSL | 0.898 | 41.88 | GMSK | PASS | N/A |
| 1750 | HSL | 1.386 | 39.91 | N/A | N/A | N/A |
| 1800 | HSL | 1.449 | 41.26 | N/A | N/A | N/A |
| 1900 | HSL | 1.435 | 39.65 | GMSK | PASS | N/A |
| 2000 | HSL | 1.451 | 39.42 | GMSK | PASS | N/A |
| 2300 | HSL | 1.764 | 38.99 | OFDM | PASS | PASS |
| 2450 | HSL | 1.863 | 38.85 | OFDM | PASS | PASS |
| 2600 | HSL | 1.973 | 38.58 | TDD | PASS | N/A |
| 3400 | HSL | 2.88 | 38.10 | OFDM | PASS | PASS |
| 3500 | HSL | 2.91 | 37.90 | OFDM | PASS | PASS |
| 3700 | HSL | 3.05 | 37.70 | OFDM | PASS | PASS |
| 3900 | HSL | 3.15 | 37.50 | OFDM | PASS | PASS |
| 4100 | HSL | 3.25 | 37.20 | OFDM | PASS | PASS |
| 4200 | HSL | 3.34 | 37.00 | OFDM | PASS | PASS |
| 4400 | HSL | 3.58 | 36.70 | OFDM | PASS | PASS |
| 4600 | HSL | 3.70 | 36.60 | OFDM | PASS | PASS |
| 4800 | HSL | 3.82 | 36.40 | OFDM | PASS | PASS |
| 4900 | HSL | 3.96 | 36.20 | OFDM | PASS | PASS |
| 5250 | HSL | 4.528 | 35.32 | OFDM | N/A | PASS |
| 5600 | HSL | 4.905 | 34.89 | OFDM | N/A | PASS |
| 5750 | HSL | 5.077 | 34.28 | OFDM | N/A | PASS |

**<Validation Results>**

| Date | Frequency (MHz) | Tissue Type | Measured 1g SAR (W/kg) | Targeted 1g SAR (W/kg) | Normalized 1g SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|
| 2026/1/26 | 2450 | HSL | 5.17 | 52.80 | 51.7 | -2.08 |

| Date | Frequency (MHz) | Tissue Type | Measured 10g SAR (W/kg) | Targeted 10g SAR (W/kg) | Normalized 10g SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|
| 2026/1/26 | 2450 | HSL | 2.43 | 24.50 | 24.3 | -0.82 |

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

# 9. EUT Testing Position

This EUT was tested in six different positions. They are front/back/left/right/top/bottom of the EUT with phantom 0 mm gap, as illustrated below, please refer to annex B for the test setup photos.

## 9.1. Body-worn Configurations

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration.
For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

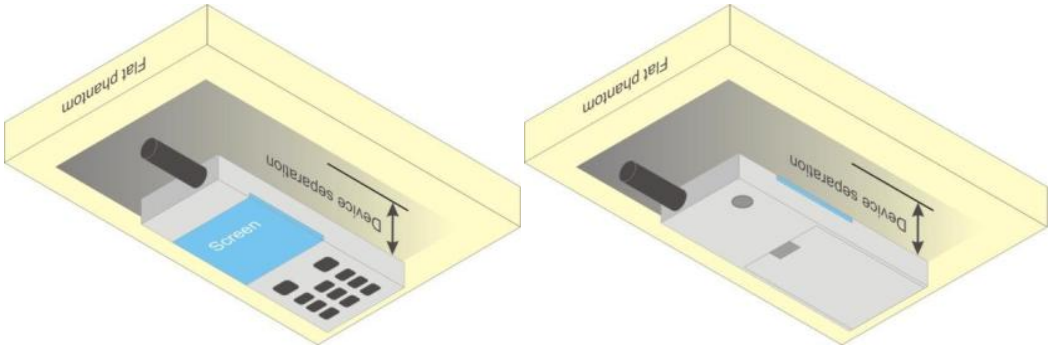



**Fig 9.1 Illustration for Body Worn Position**

## 9.2. Hotspot Mode Exposure Position Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).

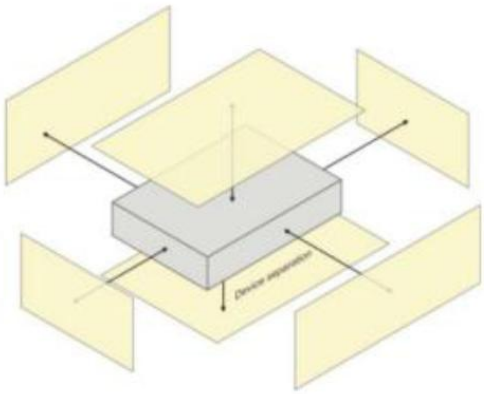



**Fig 9.2 Illustration for Hotspot Position**

# 10. Measurement Procedures

The measurement procedures are as follows:

**<Conducted power measurement>**

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.

(b) Read the WWAN RF power level from the base station simulator.

(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band.

(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power.

**<SAR measurement>**

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.

(b) Place the EUT in the positions as annex B demonstrates.

(c) Set scan area, grid size and other setting on the DASY software.

(d) Measure SAR results for the highest power channel on each testing position.

(e) Find out the largest SAR result on these testing positions of each band.

(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg.

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement.
(b) Area scan.
(c) Zoom scan.
(d) Power drift measurement.

## 10.1. Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1 g and 10 g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.
The base for the evaluation is a "cube" measurement. The measured volume must include the 1 g and 10 g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.
The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan.
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters).
(c) Generation of a high-resolution mesh within the measured volume.
(d) Interpolation of all measured values from the measurement grid to the high-resolution grid.
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface.
(f)Calculation of the averaged SAR within masses of 1 g and 10 g.

## 10.2. Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

## 10.3. Area Scan Procedures

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements

to be conducted. Scans defined for FCC applications utilize a 10 mm² step integral, with 1 mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima founding the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003.

## 10.4. Zoom Scan Procedures

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. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10 mm, with the side length of the 10 g cube 21.5 mm. The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 5 x 5 x 7 (8 mm x 8 mm x 5 mm) providing a volume of 32 mm in the X & Y axis, and 30 mm in the Z axis.

## 10.5. SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Sheppard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

## 10.6. Power Drift Monitoring

All SAR testing is under the DUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of DUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

# 11. SAR Test Procedure

## 11.1. General Scan Requirements

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

| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | | | 5 mm ± 1 mm | ½·$\delta$·ln(2) mm ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | | | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | | | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | | | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | ≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |

Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

## 11.2. Test Procedure

The Following steps are used for each test position

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

## 11.3. Description of Interpolation/Extrapolation Scheme

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

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

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

## 11.4. Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges,

determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

# 12. Conducted Power List

Remark: The output power of Bluetooth was recorded in annex E of this report.

# 13. Hotspot Mode Evaluation Procedure

➢ **EUT Antenna Location**

| |
|---|
| The location of antenna was recorded in annex B |
| BT ANT: Bluetooth |

➢ **EUT Antenna Distance**

| Antenna | Antenna distance to surface or edges (mm) | | | | | |
|---|---|---|---|---|---|---|
| | Front | Back | Left | Right | Top | Bottom |
| BT ANT | <5 | <5 | <25 | <25 | <25 | >25 |

➢ **Hotspot Evaluation**

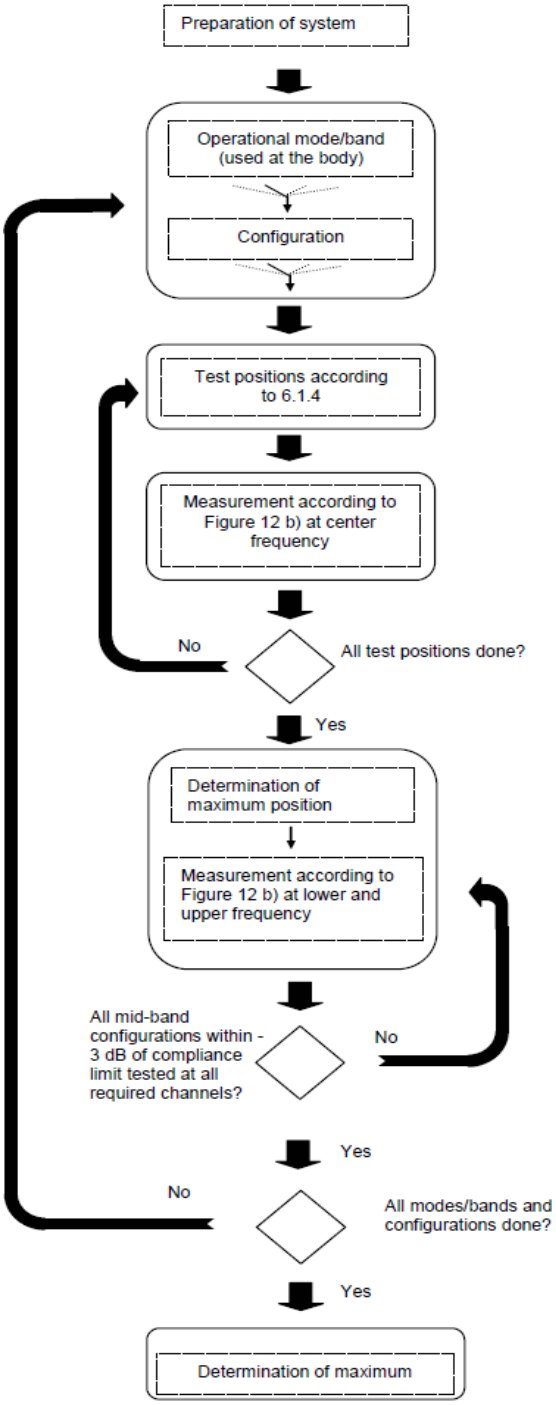
| Assessment | Hotspot Side for SAR Test Distance: 0 mm | | | | | |
|---|---|---|---|---|---|---|
| Antenna | Front | Back | Left | Right | Top | Bottom |
| BT ANT | Yes | Yes | Yes | Yes | Yes | No |

**Note :**

1. The SAR evaluation procedures for Portable Devices with Wireless Router function is according to KDB 941225 D06 Hotspot SAR v02r01.
2. Body mode SAR assessments are required.
3. Referring to KDB 941225 D06, when the overall device length and width are ≥ 9 cm * 5 cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25 mm from that surface or edge.
4. This product is used directly on the human body, so the testing distance is set to 0 mm.
5. At the top of this product, there is a permanently attached data cable. This side can be excluded from testing

# 14. Block Diagram of the Tests to be Performed

## 14.1. Body



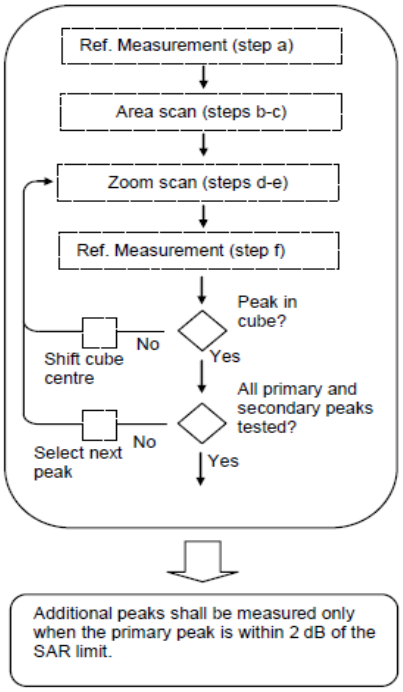




**Figure 12b – General procedure**

# 15. Test Results List

## 15.1. Test Guidance

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   a. ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   b. ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   c. ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for tablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

## 15.2. Body SAR Data

➢ **Bluetooth Body SAR**

| Plot No. | Band/Mode | Test Position | CH. | Ave. Power (dBm) | Tune-up Limit (dBm) | Tune-up Scaling Factor | Meas. $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|
| 1# | Bluetooth/DH5 | Front Side | 39 | 11.29 | 12.00 | 1.178 | 0.563 | 0.716 |
| | Bluetooth/DH5 | Back Side | 39 | 11.29 | 12.00 | 1.178 | 0.325 | 0.414 |
| | Bluetooth/DH5 | Left Side | 39 | 11.29 | 12.00 | 1.178 | 0.218 | 0.277 |
| | Bluetooth/DH5 | Right Side | 39 | 11.29 | 12.00 | 1.178 | 0.051 | 0.065 |

**Note:**

According to 2016 Oct. TCB workshop for Bluetooth SAR consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation. The duty cycle of Bluetooth is 77.16 /77.23%, Therefore the duty cycle scaling factor 1.080/1.079 should be used to calculating the reported SAR.

# 16. Simultaneous Transmission Evaluation

Remark: This product only supports Bluetooth mode, so simultaneous transmission is not required

# 17. Uncertainty Assessment

According to KDB 865664 D01 SAR measurement 100 MHz to 6GHz, when the highest measured 1-g SAR is less than 1.5 W/kg and 10-g extremity SAR less than 3.75 W/kg, the expanded SAR measurement uncertainty must be less than 30% with a confidence interval of k=2. When these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE 1528-2013 is not required in the SAR report and submitted for equipment approval. For this device, both the 1-g SAR is less than 1.5 W/kg. Therefore the measurement uncertainty table is not required in this report.

# Annex A General Information

## 1. Identification of the Responsible Testing Laboratory

| | |
|---|---|
| Laboratory Name: | Shenzhen Morlab Communications Technology Co., Ltd. |
| Laboratory Address: | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |
| Telephone: | +86 755 36698555 |
| Facsimile: | +86 755 36698525 |

## 2. Identification of the Responsible Testing Location

| | |
|---|---|
| Name: | Shenzhen Morlab Communications Technology Co., Ltd. |
| Address: | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |

## 3. Facilities and Accreditations

The FCC designation number is CN1192, the test firm registration number is 226174.

# Annex B Test Setup Photos

The annex B will be submitted separately.

# Annex C Plots of System Performance Check

The annex C will be submitted separately.

# Annex D Plots of Maximum SAR Test Results

The annex D will be submitted separately.

# Annex E Conducted Power

The annex E will be submitted separately.

# Annex F DASY Calibration Certificate

The annex F will be submitted separately.

# Notes

1. The report shall have report stamp or our company stamp.
2. The report shall be invalid without all the signatures of the editor and approver.
3. The report shall not be changed.
4. Any objections must be raised to Morlab within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.
5. Conformity declaration:
   ☑ Morlab issues a statement of conformity based on the corresponding standards（default）
   ☐ Morlab issues a statement of conformity based on the applicant requirement
6. Use of uncertainty of measurement for decisions on conformity (decision rule):
   No decision rule is specified by the testing standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty (“simple acceptance” decision rule).

****** END OF MAIN REPORT ******