| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | **CN22CQQL 003** | **Auftrags-Nr.:** *Order no.:* | 168395327 | Seite 1 von 28 *Page 1 of 28* |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | N/A | **Auftragsdatum:** *Order date:* | 2022-10-21 | |
| **Auftraggeber:** *Client:* | **Harman International Industries, Inc** 8500 Balboa Blvd, Northridge, California, 91329, United States | | | |
| **Prüfgegenstand:** *Test item:* | BLUETOOTH HEADSET | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.:* | QUANTUM TWS AIR (Trademark: JBL) | | | |
| **Auftrags-Inhalt:** *Order content:* | FCC & IC approval | | | |
| **Prüfgrundlage:** *Test specification:* | FCC 47 CFR § 2.1093<br>IEEE Std 1528-2013<br>IC RSS-102 Issue 5: March 2015<br>IEC62209-1: 2016<br>Published RF exposure KDB procedures | | | |
| **Wareneingangsdatum:** *Date of sample receipt:* | 2022-10-20 | Please refer to Photo Document | | |
| **Prüfmuster-Nr.:** *Test sample no:* | A003358854 | | | |
| **Prüfzeitraum:** *Testing period:* | 2022-10-26 – 2022-11-07 | | | |
| **Ort der Prüfung:** *Place of testing:* | TÜV Rheinland (Shenzhen) Co., Ltd. | | | |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland (Shenzhen) Co., Ltd. | | | |
| **Prüfergebnis*:** *Test result*:* | Pass | | | |
| **geprüft von:** *tested by:* | X Alex Lu (signature) | **genehmigt von:** *authorized by:* | X Wind Hon (signature) | |
| **Datum:** *Date:* 2022-11-17 | | **Ausstellungsdatum:** *Issue date:* 2022-12-07 | | |
| **Stellung** / *Position:* | Assistant Project Manager | **Stellung** / *Position:* | Department Manager | |
| **Sonstiges** / *Other:* | FCC ID: APIJBLQTWSAIR<br>IC: 6132A-JBLQTWSAIR HVIN: QTWSAIRL, QTWSAIRR | | | |

**Zustand des Prüfgegenstandes bei Anlieferung:** Prüfmuster vollständig und unbeschädigt
*Condition of the test item at delivery:* *Test item complete and undamaged*

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| ** Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |

# Table of Contents

# 1. General Information

## 1.1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

| Equipment | Mode | Highest Reported Head $SAR_{1g}$ (W/kg) |
|---|---|---|
| **Left earbud** | **Bluetooth** | **0.36** |
| **Right earbud** | **Bluetooth** | **0.39** |

**Note:**
This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; 10-gram SAR for Product Specific 10g SAR, limit: 4.0W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992/ IC RSS-102 Issue 5:2015, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

## 1.2. Equipment Under Test (EUT) Information

### 1.2.1. General Information

| | |
|---|---|
| **Equipment Name** | BLUETOOTH HEADSET |
| **FCC ID** | APIJBLQTWSAIR |
| **IC** | 6132A-JBLQTWSAIR |
| **HVIN** | QTWSAIRL, QTWSAIRR |
| **Brand Name** | JBL |
| **Model Name** | QUANTUM TWS AIR |
| **HW Version** | V0.3 |
| **SW Version** | V1.0.0 |
| **Antenna Type** | PIFA LDS antenna |
| **EUT Stage** | Production Unit |

### 1.2.2. Wireless Technologies

| | |
|---|---|
| **Wireless Technology and Frequency Range** | Bluetooth: 2402 MHz ~ 2480 MHz |
| **Uplink Modulations** | Bluetooth® GFSK, π/4-DQPSK, 8-DPSK, LE |

**Note:**

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. There is no difference except the PCB layout of left and right earbuds.

### 1.2.3. List of Accessory

| | | |
|---|---|---|
| **Battery** | **Brand Name** | VDL |
| | **Model Name** | 1150PF4A |
| | **Power Rating** | 3.85Vdc, 50mAh |
| | **Type** | Li-ion |

# 2. Test Sites

## 2.1. Test Facilities

**TÜV Rheinland (Shenzhen) Co., Ltd.**

No. 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China

A2LA Cert. No.: 5162.01

FCC Registration No.: 694916

IC Registration No.: 25069

## 2.2. Ambient Condition

| | |
|---|---|
| Ambient Temperature | 18°C - 25°C |
| Relative Humidity | 30% - 70% |

## 2.3. List of Test and Measurement Instruments

| Equipment | Manufacturer | Model | SN | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|
| System Validation Dipole | SPEAG | D450V3 | 1102 | Jan. 20, 2021 | 3 years |
| System Validation Dipole | SPEAG | D750V3 | 1109 | May. 17, 2021 | 3 years |
| System Validation Dipole | SPEAG | D835V2 | 4d242 | May. 17, 2021 | 3 years |
| System Validation Dipole | SPEAG | D900V2 | 1d200 | May. 17, 2021 | 3 years |
| System Validation Dipole | SPEAG | D1450V2 | 1084 | Nov. 18, 2020 | 3 years |
| System Validation Dipole | SPEAG | D1750V2 | 1166 | May. 17, 2021 | 3 years |
| System Validation Dipole | SPEAG | D1800V2 | 2d219 | May. 20, 2021 | 3 years |
| System Validation Dipole | SPEAG | D1900V2 | 5d229 | May. 20, 2021 | 3 years |
| System Validation Dipole | SPEAG | D2000V2 | 1089 | May. 21, 2021 | 3 years |
| System Validation Dipole | SPEAG | D2300V2 | 1087 | May. 19, 2021 | 3 years |
| System Validation Dipole | SPEAG | D2450V2 | 1014 | May. 19, 2021 | 3 years |
| System Validation Dipole | SPEAG | D2600V2 | 1153 | May. 19, 2021 | 3 years |
| System Validation Dipole | SPEAG | D3500V2 | 1063 | May. 21, 2021 | 3 years |
| System Validation Dipole | SPEAG | D3700V2 | 1020 | May. 21, 2021 | 3 years |
| System Validation Dipole | SPEAG | D5GHzV2 | 1280 | May. 17, 2021 | 3 years |
| Dosimetric E-Field Probe | SPEAG | EX3DV4 | 7506 | May. 31, 2022 | 1 year |
| Data Acquisition Electronics | SPEAG | DAE4 | 1557 | Jan. 20, 2022 | 1 year |
| Wideband Radio Communication Tester | R&S | CMW500 | 166305 | Aug. 09, 2022 | 1 year |
| Signal Analyzer | R&S | FSV 7 | 103665 | Aug. 09, 2022 | 1 year |
| Vector Network Analyzer | R&S | ZNB 8 | 107040 | Aug. 09, 2022 | 1 year |
| Dielectric assessment Kit | SPEAG | DAK-3.5 | 1269 | May. 30, 2022 | 1 year |
| Signal Generator | R&S | SMB 100A | 180840 | Aug. 09, 2022 | 1 year |
| EPM Series Power Meter | Keysight | N1914A | MY58240005 | Dec. 02, 2021 | 2 years |
| Power Sensor | Keysight | N8481H | MY58250002 | Dec. 02, 2021 | 1 year |
| Power Sensor | Keysight | N8481H | MY58250006 | Dec. 02, 2021 | 1 year |
| DC Power Supply | Topward | 3303D | 809332 | Dec. 02, 2021 | 1 year |
| Coaxial Directional Couper | Keysight | 773D | MY52180552 | Dec. 02, 2021 | 1 year |
| Coaxial Directional Couper | shhuaxiang | DTO-0.4/3.9-10 | 18052101 | Dec. 02, 2021 | 1 year |
| Coaxial attenuator | Keysight | 8491A | MY52463219 | Dec. 02, 2021 | 1 year |
| Coaxial attenuator | Keysight | 8491A | MY52463210 | Dec. 02, 2021 | 1 year |
| Coaxial attenuator | Keysight | 8491A | MY52463222 | Dec. 02, 2021 | 1 year |
| Digital Thermometer | LKM | DTM3000 | 3116 | Dec. 02, 2021 | 1 year |
| Power Amplifier Mini circuit | mini-circuits | ZHL-42W | SN002101809 | N/A | N/A |
| Power Amplifier Mini circuit | mini-circuits | ZVE-8G | SN070501814 | N/A | N/A |
| PHANTOM | SPEAG | ELI V8.0 | 2094 | N/A | N/A |
| PHANTOM | SPEAG | SAM-Twin V8.0 | 1961 | N/A | N/A |

# 3. Measurement Uncertainty

| Source of Uncertainty | Tolerance (± %) | Probability Distribution | Divisor | Ci 1g | Ci 10g | Standard Uncertainty 1g (± %) | Standard Uncertainty 10g (± %) | Vi Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe Calibration | 6.65 | Normal | 1 | 1 | 1 | 6.65 | 6.65 | ∞ |
| Axial Isotropy | 4.7 | Rectangular | √3 | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| Hemispherical Isotropy | 9.6 | Rectangular | √3 | 0.7 | 0.7 | 3.9 | 3.9 | ∞ |
| Boundary Effects | 1 | Rectangular | √3 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Detection Limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.1 | 0.1 | ∞ |
| Modulation Response | 2.4 | Rectangular | √3 | 1 | 1 | 1.4 | 1.4 | ∞ |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | 0.3 | 0.3 | ∞ |
| Response Time | 0 | Rectangular | √3 | 1 | 1 | 0.0 | 0.0 | ∞ |
| Integration Time | 1.7 | Rectangular | √3 | 1 | 1 | 1.0 | 1.0 | ∞ |
| RF Ambient – Noise | 3 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient – Reflections | 3 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.2 | 0.2 | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Max. SAR Evaluation | 2 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.2 / 2.6 | Normal | 1 | 1 | 1 | 2.2 | 2.6 | 30 |
| Device Holder | 3.3 / 3.4 | Normal | 1 | 1 | 1 | 3.3 | 3.4 | 30 |
| Power Drift | 5 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| Power Scaling | 0 | Rectangular | √3 | 1 | 1 | 0.0 | 0.0 | ∞ |
| **Phantom and Setup** | | | | | | | | |
| Phantom Uncertainty | 7.5 | Rectangular | √3 | 1 | 1 | 4.3 | 4.3 | ∞ |
| SAR correction | 1.2 / 0.97 | Rectangular | √3 | 1 | 0.84 | 0.7 | 0.5 | ∞ |
| Liquid Conductivity (Meas.) | 2.5 | Normal | 1 | 0.78 | 0.71 | 2.0 | 1.8 | 20 |
| Liquid Permittivity (Meas.) | 2.5 | Normal | 1 | 0.23 | 0.26 | 0.6 | 0.7 | 20 |
| Temp. unc. - Conductivity | 5.2 | Rectangular | √3 | 0.78 | 0.71 | 2.3 | 2.1 | ∞ |
| Temp. unc. - Permittivity | 0.8 | Rectangular | √3 | 0.23 | 0.26 | 0.1 | 0.1 | ∞ |
| **Combined Standard Uncertainty (K = 1)** | | | | | | 11.11 | 11.13 | |
| **Expanded Uncertainty (K = 2)** | | | | | | **22.2** | **22.3** | |

**Uncertainty budget for frequency range 300 MHz to 3 GHz**

| Source of Uncertainty | Tolerance (± %) | Probability Distribution | Divisor | Ci 1g | Ci 10g | Standard Uncertainty 1g (± %) | Standard Uncertainty 10g (± %) | Vi Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe Calibration | 6.65 | Normal | 1 | 1 | 1 | 6.65 | 6.65 | ∞ |
| Axial Isotropy | 4.7 | Rectangular | √3 | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| Hemispherical Isotropy | 9.6 | Rectangular | √3 | 0.7 | 0.7 | 3.9 | 3.9 | ∞ |
| Boundary Effects | 2 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Detection Limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.1 | 0.1 | ∞ |
| Modulation Response | 2.4 | Rectangular | √3 | 1 | 1 | 1.4 | 1.4 | ∞ |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | 0.3 | 0.3 | ∞ |
| Response Time | 0 | Rectangular | √3 | 1 | 1 | 0.0 | 0.0 | ∞ |
| Integration Time | 1.7 | Rectangular | √3 | 1 | 1 | 1.0 | 1.0 | ∞ |
| RF Ambient – Noise | 3 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient – Reflections | 3 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.2 | 0.2 | ∞ |
| Probe Positioning | 6.7 | Rectangular | √3 | 1 | 1 | 3.9 | 3.9 | ∞ |
| Max. SAR Evaluation | 4 | Rectangular | √3 | 1 | 1 | 2.3 | 2.3 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.2 / 2.6 | Normal | 1 | 1 | 1 | 2.2 | 2.6 | 30 |
| Device Holder | 3.3 / 3.4 | Normal | 1 | 1 | 1 | 3.3 | 3.4 | 30 |
| Power Drift | 5 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| Power Scaling | 0 | Rectangular | √3 | 1 | 1 | 0.0 | 0.0 | ∞ |
| **Phantom and Setup** | | | | | | | | |
| Phantom Uncertainty | 7.9 | Rectangular | √3 | 1 | 1 | 4.6 | 4.6 | ∞ |
| SAR correction | 1.2 / 0.97 | Rectangular | √3 | 1 | 0.84 | 0.7 | 0.5 | ∞ |
| Liquid Conductivity (Meas.) | 2.5 | Normal | 1 | 0.78 | 0.71 | 2.0 | 1.8 | 20 |
| Liquid Permittivity (Meas.) | 2.5 | Normal | 1 | 0.23 | 0.26 | 0.6 | 0.7 | 20 |
| Temp. unc. - Conductivity | 3.4 | Rectangular | √3 | 0.78 | 0.71 | 1.5 | 1.4 | ∞ |
| Temp. unc. - Permittivity | 0.4 | Rectangular | √3 | 0.23 | 0.26 | 0.1 | 0.1 | ∞ |
| **Combined Standard Uncertainty (K = 1)** | | | | | | 11.86 | 11.91 | |
| **Expanded Uncertainty (K = 2)** | | | | | | **23.7** | **23.8** | |

**Uncertainty budget for frequency range 3 GHz to 6 GHz**

# 4. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528- 2013, the following FCC Published RF exposure KDB procedures & manufacturer KDB inquiries:

- KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- KDB 865664 D02 RF Exposure Reporting v01r02
- KDB 447498 D01 General RF Exposure Guidance v06
- IC RSS-102 Issue 5: March 2015
- IEEE 1528:2013
- IEC/IEEE 62209-1528:2020 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)

In addition to the above, the following information was used:

- TCB workshop October, 2014; Page 36, RF Exposure Procedures Update (Overlapping LTE Bands)
- TCB workshop October, 2014; Page 37, LTE Considerations (LTE Band 41 Test Channels)
- TCB workshop April, 2019; Page 19, Tissue Simulating Liquids(TSL)

# 5. SAR Measurement System

## 5.1. Definition of Specific Absorption Rate (SAR)

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

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

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

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

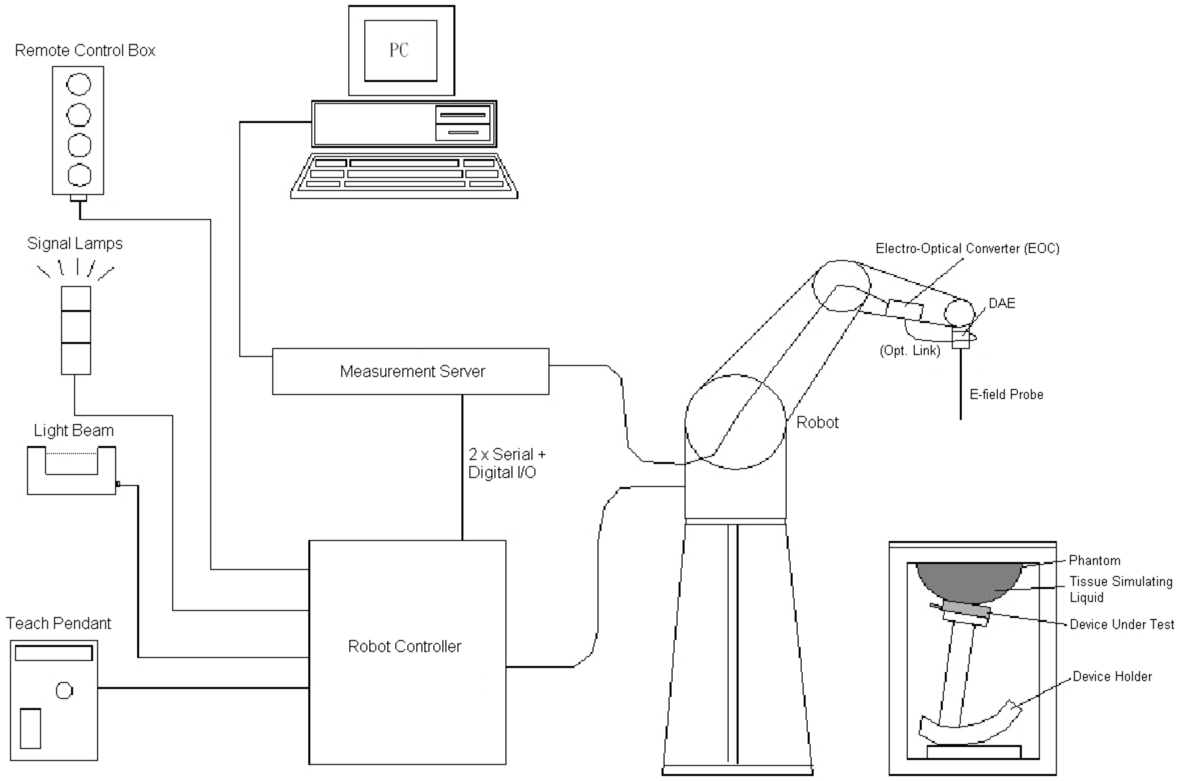
SAR measurement can be related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

## 5.2. SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.




**DASY System Setup**

**5.2.1.Robot**

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (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)


**DASY6**

### 5.2.2. Probes

The SAR measurement is conducted with the dosimetric probe. 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.

| | | |
|---|---|---|
| **Model** | EX3DV4 |  |
| **Construction** | Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE). | |
| **Frequency** | 10 MHz to 6 GHz<br>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<br>Linearity: ± 0.2 dB (noise: typically < 1 µW/g) | |
| **Dimensions** | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm | |

### 5.2.3.Data Acquisition Electronics (DAE)

| | | |
|---|---|---|
| **Model** | DAE4 |  |
| **Construction** | Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop. | |
| **Measurement Range** | -100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV) | |
| **Input Offset Voltage** | < 5µV (with auto zero) | |
| **Input Bias Current** | < 50 fA | |
| **Dimensions** | 60 x 60 x 68 mm | |

**5.2.4. Phantoms**

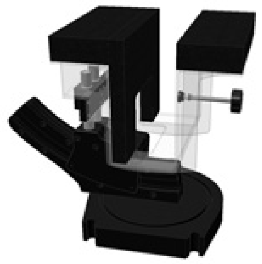
| **Model** | Twin SAM |  |
|---|---|---|
| **Construction** | The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. | |
| **Material** | Vinylester, glass fiber reinforced (VE-GF) | |
| **Shell Thickness** | 2 ± 0.2 mm (6 ± 0.2 mm at ear point) | |
| **Dimensions** | Length: 1000 mm<br>Width: 500 mm<br>Height: adjustable feet | |
| **Filling Volume** | approx. 25 liters | |

| **Model** | ELI |  |
|---|---|---|
| **Construction** | Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. | |
| **Material** | Vinylester, glass fiber reinforced (VE-GF) | |
| **Shell Thickness** | 2.0 ± 0.2 mm (bottom plate) | |
| **Dimensions** | Major axis: 600 mm<br>Minor axis: 400 mm | |
| **Filling Volume** | approx. 30 liters | |

### 5.2.5. Device Holder

| | |
|---|---|
| **Model** | Mounting Device |
| **Construction** | In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). |
| **Material** | POM |

| | |
|---|---|
| **Model** | Laptop Extensions Kit |
| **Construction** | Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. |
| **Material** | POM, Acrylic glass, Foam |

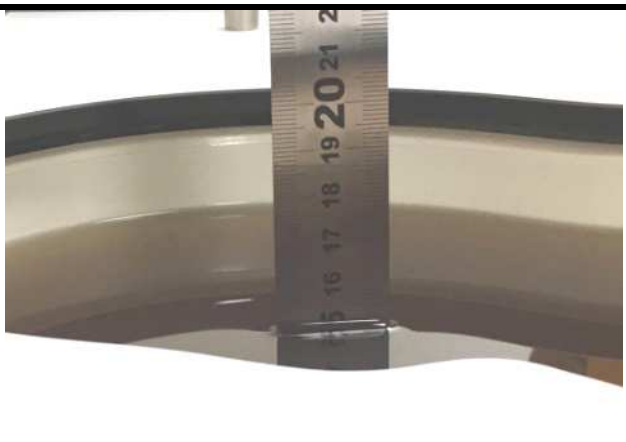
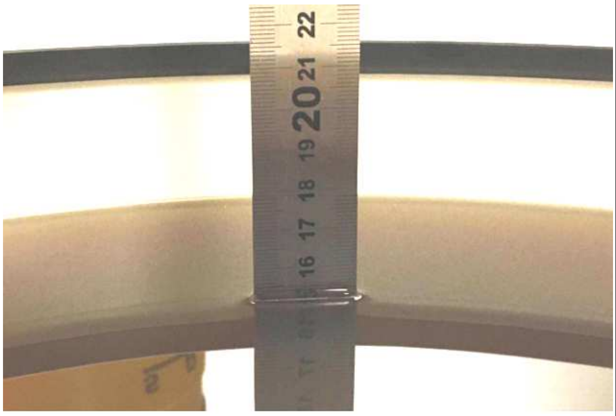


### 5.2.6.System Validation Dipoles

| | |
|---|---|
| **Model** | D-Serial |
| **Construction** | Symmetrical dipole with l/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions. |
| **Frequency** | 750 MHz to 5800 MHz |
| **Return Loss** | > 20 dB |
| **Power Capability** | > 100 W (f < 1GHz), > 40 W (f > 1GHz) |

**5.2.7. 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. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed.

|  |  |
|---|---|
| **Photo of Liquid Height for Head Position** | **Photo of Liquid Height for Body Position** |

The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528, and KDB 865664 D01 Appendix A. For the body tissue simulating liquids, the dielectric properties are defined in KDB 865664 D01 Appendix A. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a dielectric assessment kit and a network analyzer.

**Targets of Tissue Simulating Liquid**

| Frequency (MHz) | Target Permittivity | Range of ±5% | Target Conductivity | Range of ±5% |
|---|---|---|---|---|
| **For Head** | | | | |
| 750 | 41.9 | 39.8 ~ 44.0 | 0.89 | 0.85 ~ 0.93 |
| 835 | 41.5 | 39.4 ~ 43.6 | 0.90 | 0.86 ~ 0.95 |
| 900 | 41.5 | 39.4 ~ 43.6 | 0.97 | 0.92 ~ 1.02 |
| 1450 | 40.5 | 38.5 ~ 42.5 | 1.20 | 1.14 ~ 1.26 |
| 1640 | 40.3 | 38.3 ~ 42.3 | 1.29 | 1.23 ~ 1.35 |
| 1750 | 40.1 | 38.1 ~ 42.1 | 1.37 | 1.30 ~ 1.44 |
| 1800 | 40.0 | 38.0 ~ 42.0 | 1.40 | 1.33 ~ 1.47 |
| 1900 | 40.0 | 38.0 ~ 42.0 | 1.40 | 1.33 ~ 1.47 |
| 2000 | 40.0 | 38.0 ~ 42.0 | 1.40 | 1.33 ~ 1.47 |
| 2300 | 39.5 | 37.5 ~ 41.5 | 1.67 | 1.59 ~ 1.75 |
| 2450 | 39.2 | 37.2 ~ 41.2 | 1.80 | 1.71 ~ 1.89 |
| 2600 | 39.0 | 37.1 ~ 41.0 | 1.96 | 1.86 ~ 2.06 |
| 3500 | 37.9 | 36.0 ~ 39.8 | 2.91 | 2.76 ~ 3.06 |
| 5200 | 36.0 | 34.2 ~ 37.8 | 4.66 | 4.43 ~ 4.89 |
| 5300 | 35.9 | 34.1 ~ 37.7 | 4.76 | 4.52 ~ 5.00 |
| 5500 | 35.6 | 33.8 ~ 37.4 | 4.96 | 4.71 ~ 5.21 |
| 5600 | 35.5 | 33.7 ~ 37.3 | 5.07 | 4.82 ~ 5.32 |
| 5800 | 35.3 | 33.5 ~ 37.1 | 5.27 | 5.01 ~ 5.53 |
| **For Body** | | | | |
| 750 | 55.5 | 52.7 ~ 58.3 | 0.96 | 0.91 ~ 1.01 |
| 835 | 55.2 | 52.4 ~ 58.0 | 0.97 | 0.92 ~ 1.02 |
| 900 | 55.0 | 52.3 ~ 57.8 | 1.05 | 1.00 ~ 1.10 |
| 1450 | 54.0 | 51.3 ~ 56.7 | 1.30 | 1.24 ~ 1.37 |
| 1640 | 53.8 | 51.1 ~ 56.5 | 1.40 | 1.33 ~ 1.47 |
| 1750 | 53.4 | 50.7 ~ 56.1 | 1.49 | 1.42 ~ 1.56 |
| 1800 | 53.3 | 50.6 ~ 56.0 | 1.52 | 1.44 ~ 1.60 |
| 1900 | 53.3 | 50.6 ~ 56.0 | 1.52 | 1.44 ~ 1.60 |
| 2000 | 53.3 | 50.6 ~ 56.0 | 1.52 | 1.44 ~ 1.60 |
| 2300 | 52.9 | 50.3 ~ 55.5 | 1.81 | 1.72 ~ 1.90 |
| 2450 | 52.7 | 50.1 ~ 55.3 | 1.95 | 1.85 ~ 2.05 |
| 2600 | 52.5 | 49.9 ~ 55.1 | 2.16 | 2.05 ~ 2.27 |
| 3500 | 51.3 | 48.7 ~ 53.9 | 3.31 | 3.14 ~ 3.48 |
| 5200 | 49.0 | 46.6 ~ 51.5 | 5.30 | 5.04 ~ 5.57 |
| 5300 | 48.9 | 46.5 ~ 51.3 | 5.42 | 5.15 ~ 5.69 |
| 5500 | 48.6 | 46.2 ~ 51.0 | 5.65 | 5.37 ~ 5.93 |
| 5600 | 48.5 | 46.1 ~ 50.9 | 5.77 | 5.48 ~ 6.06 |
| 5800 | 48.2 | 45.8 ~ 50.6 | 6.00 | 5.70 ~ 6.30 |

The following table gives the recipes for tissue simulating liquids.

**Recipes of Tissue Simulating Liquid**

| Tissue Type | Bactericide | DGBE | HEC | NaCl | Sucrose | Triton X-100 | Water | Diethylene Glycol Mono-hexylether |
|---|---|---|---|---|---|---|---|---|
| H750 | 0.2 | - | 0.2 | 1.5 | 56.0 | - | 42.1 | - |
| H835 | 0.2 | - | 0.2 | 1.5 | 57.0 | - | 41.1 | - |
| H900 | 0.2 | - | 0.2 | 1.4 | 58.0 | - | 40.2 | - |
| H1450 | - | 43.3 | - | 0.6 | - | - | 56.1 | - |
| H1640 | - | 45.8 | - | 0.5 | - | - | 53.7 | - |
| H1750 | - | 47.0 | - | 0.4 | - | - | 52.6 | - |
| H1800 | - | 44.5 | - | 0.3 | - | - | 55.2 | - |
| H1900 | - | 44.5 | - | 0.2 | - | - | 55.3 | - |
| H2000 | - | 44.5 | - | 0.1 | - | - | 55.4 | - |
| H2300 | - | 44.9 | - | 0.1 | - | - | 55.0 | - |
| H2450 | - | 45.0 | - | 0.1 | - | - | 54.9 | - |
| H2600 | - | 45.1 | - | 0.1 | - | - | 54.8 | - |
| H3500 | - | 8.0 | - | 0.2 | - | 20.0 | 71.8 | - |
| H5G | - | - | - | - | - | 17.2 | 65.5 | 17.3 |
| B750 | 0.2 | - | 0.2 | 0.8 | 48.8 | - | 50.0 | - |
| B835 | 0.2 | - | 0.2 | 0.9 | 48.5 | - | 50.2 | - |
| B900 | 0.2 | - | 0.2 | 0.9 | 48.2 | - | 50.5 | - |
| B1450 | - | 34.0 | - | 0.3 | - | - | 65.7 | - |
| B1640 | - | 32.5 | - | 0.3 | - | - | 67.2 | - |
| B1750 | - | 31.0 | - | 0.2 | - | - | 68.8 | - |
| B1800 | - | 29.5 | - | 0.4 | - | - | 70.1 | - |
| B1900 | - | 29.5 | - | 0.3 | - | - | 70.2 | - |
| B2000 | - | 30.0 | - | 0.2 | - | - | 69.8 | - |
| B2300 | - | 31.0 | - | 0.1 | - | - | 68.9 | - |
| B2450 | - | 31.4 | - | 0.1 | - | - | 68.5 | - |
| B2600 | - | 31.8 | - | 0.1 | - | - | 68.1 | - |
| B3500 | - | 28.8 | - | 0.1 | - | - | 71.1 | - |
| B5G | - | - | - | - | - | 10.7 | 78.6 | 10.7 |

**Simulating Head Liquid (HBBL600-6000MHz), Manufactured by SPEAG:**

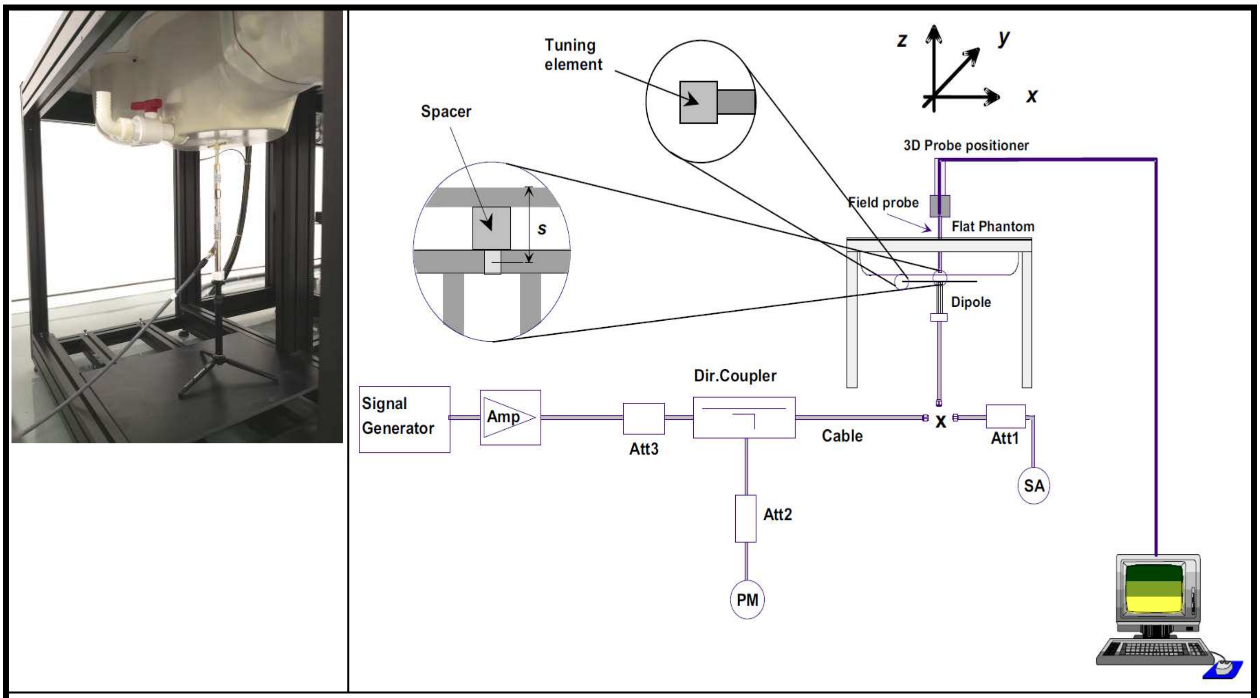
| Water (% by weight) | Esters, Emulsifiers, Inhibitors (% by weight) | Sodium salt (% by weight) |
|---|---|---|
| 50 - 65% | 10 - 30% | 8 - 25% |

**Simulating Body Liquid (MBBL600-6000MHz), Manufactured by SPEAG:**

| Water (% by weight) | Esters, Emulsifiers, Inhibitors (% by weight) | Sodium salt (% by weight) |
|---|---|---|
| 60 - 80% | 20 - 40% | 0 – 1.5% |

**5.2.8.SAR System Verification**

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.




**System Verification Setup**

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The spectrum analyzer measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter.

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 %.

# 6. SAR Measurement Procedure

According to the SAR 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

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the DASY system
(e) Record the SAR value

## 6.1. Area & Zoom Scan Procedure

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

| Items | <= 2 GHz | 2-3 GHz | 3-4 GHz | 4-5 GHz | 5-6 GHz |
|---|---|---|---|---|---|
| Area Scan ($\Delta x$, $\Delta y$) | <= 15 mm | <= 12 mm | <= 12 mm | <= 10 mm | <= 10 mm |
| Zoom Scan ($\Delta x$, $\Delta y$) | <= 8 mm | <= 5 mm | <= 5 mm | <= 4 mm | <= 4 mm |
| Zoom Scan ($\Delta z$) | <= 5 mm | <= 5 mm | <= 4 mm | <= 3 mm | <= 2 mm |
| Zoom Scan Volume | >= 30 mm | >= 30 mm | >= 28 mm | >= 25 mm | >= 22 mm |

**Note:**
When zoom scan is required and report SAR is <= 1.4 W/kg, the zoom scan resolution of $\Delta x$ / $\Delta y$ (2-3GHz: <= 8 mm, 3-4GHz: <= 7 mm, 4-6GHz: <= 5 mm) may be applied.

## 6.2. Volume Scan Procedure

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

## 6.3. Power Drift Monitoring

All SAR testing is under the EUT 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 EUT 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.

## 6.4. Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, 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 1g and 10g 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 1g and 10g 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 form 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 1g and 10g

## 6.5. SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard’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.

# 7. SAR Measurement Evaluation

## 7.1. EUT Configuration and Setting

**<Considerations Related to Bluetooth for Setup and Testing>**

This device has installed Bluetooth engineering testing software which can provide continuous transmitting RF signal. During Bluetooth SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

## 7.2. EUT Testing Position

This variant report is made for verification. All the worst SAR configurations specified in the original SAR report was repeated and verified to ensure the device remains compliant.

### 7.2.1. Head Exposure Conditions

Head exposure is limited to next to the ear voice mode operations. Head SAR compliance is tested according to the test positions defined in IEEE Std 1528-2003 using the SAM phantom illustrated as below.

1. Define two imaginary lines on the handset

(a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width $w_t$ of the handset at the level of the acoustic output, and the midpoint of the width $w_b$ of the bottom of the handset.

(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

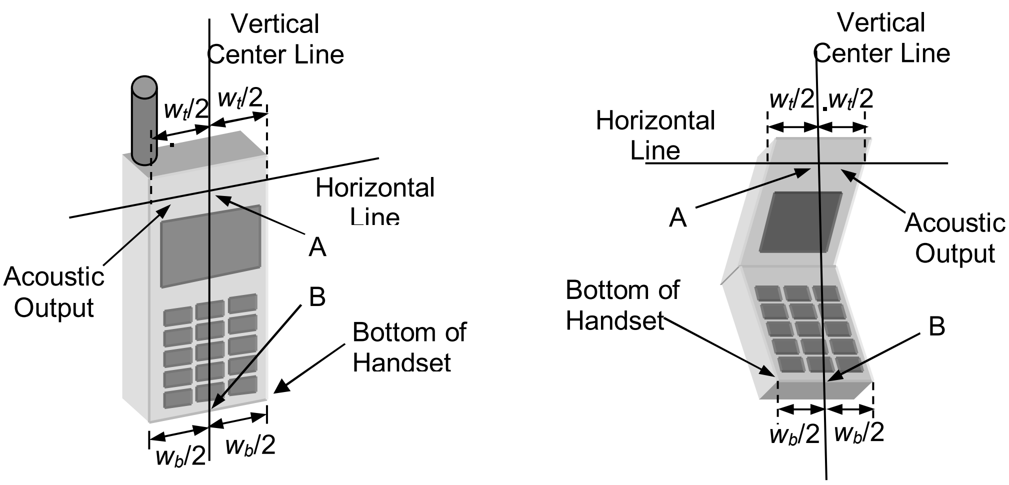



**Illustration for Handset Vertical and Horizontal Reference Lines**

2. Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig-4.2).

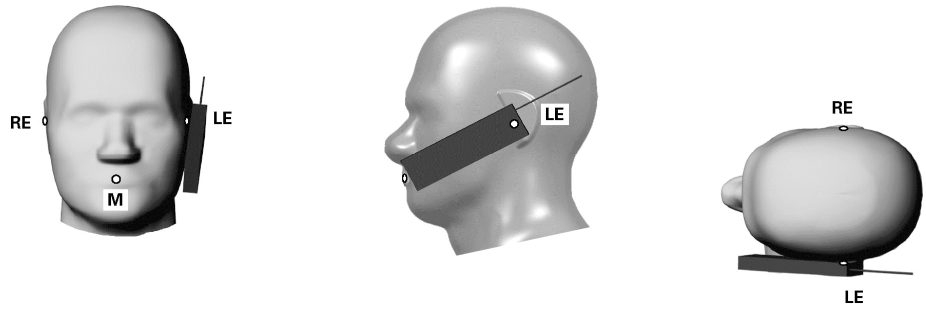



**Illustration for Cheek Position**

3. Tilted Position

(a) To position the device in the “cheek” position described above.

(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig-4.3).

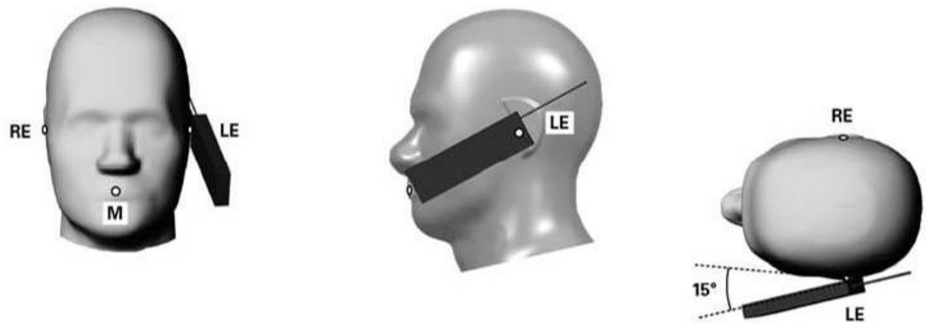



**Illustration for Tilted Position**

## 7.3. Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

| Test Date | Tissue Type | Frequency (MHz) | Measured Conductivity (σ) | Measured Permittivity ($\varepsilon_r$) | Target Conductivity (σ) | Target Permittivity ($\varepsilon_r$) | Conductivity Deviation (%) | Permittivity Deviation (%) |
|---|---|---|---|---|---|---|---|---|
| 2022-11-07 | H2450 | 2450 | 1.795 | 38.822 | 1.80 | 39.20 | -0.28 | -0.96 |
| 2022-11-07 | H2450 | 2402 | 1.744 | 39.018 | 1.76 | 39.29 | -0.80 | -0.69 |
| 2022-11-07 | H2450 | 2441 | 1.785 | 38.856 | 1.79 | 39.21 | -0.39 | -0.90 |
| 2022-11-07 | H2450 | 2480 | 1.825 | 38.719 | 1.83 | 39.15 | -0.44 | -1.10 |

**Note:**
The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.

## 7.4. System Validation

The SAR measurement system was validated according to procedures in KDB 865664 D01. The validation status in tabulated summary is as below.

| Test Date | Probe S/N | Calibration Point | Measured Conductivity (σ) | Measured Permittivity ($\varepsilon_r$) | Validation for CW | | | Validation for Modulation | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Sensitivity Range | Probe Linearity | Probe Isotropy | Modulation Type | Duty Factor | PAR |
| 2022-11-07 | 7506 | 2450 | 1.795 | 38.822 | Pass | Pass | Pass | N/A | N/A | N/A |

## 7.5. System Verification

The measuring result for system verification is tabulated as below.

| Test Date | Frequency (MHz) | 1W Target SAR-1g (W/kg) | Measured SAR-1g (W/kg) | Normalized to 1W SAR-1g (W/kg) | Deviation (%) | Dipole S/N | Probe S/N | DAE S/N |
|---|---|---|---|---|---|---|---|---|
| 2022-11-07 | 2450 | 51.80 | 23.60 | 51.20 | 23.76 | -1.16 | 0.68 | 1014 |

**Note:**
Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

# 8. Maximum Output Power

## 8.1. Measured Conducted Power Result

**<Bluetooth>**

| | | Left Earbud | | Right Earbud | | |
|---|---|---|---|---|---|---|
| Test mode | Frequency (MHz) | Peak Conducted Power (dBm) | Average Conducted Power (dBm) | Peak Conducted Power (dBm) | Average Conducted Power (dBm) | Power class |
| BLE 1Mbps | 2402 | 10.45 | 9.60 | 10.69 | 9.68 | 61 |
| | 2440 | 10.35 | 9.59 | 10.48 | 9.67 | 61 |
| | 2480 | 10.25 | 9.34 | 10.26 | 9.37 | 61 |
| BLE 2Mbps | 2402 | 10.52 | 9.60 | 10.63 | 9.68 | 61 |
| | 2440 | 10.41 | 9.59 | 10.46 | 9.638 | 61 |
| | 2480 | 10.23 | 9.34 | 10.23 | 9.36 | 61 |

| | | Left Earbud | | Right Earbud | | |
|---|---|---|---|---|---|---|
| Test mode | Frequency (MHz) | Peak Conducted Power (dBm) | Average Conducted Power (dBm) | Peak Conducted Power (dBm) | Average Conducted Power (dBm) | Power class |
| DH5 | 2402 | 10.53 | 9.60 | 10.68 | 9.72 | 61 |
| | 2441 | 10.19 | 9.57 | 10.4 | 9.68 | 61 |
| | 2480 | 10.12 | 9.32 | 10.27 | 9.36 | 61 |
| 3DH5 | 2402 | 10.51 | 7.50 | 10.65 | 7.79 | 61 |
| | 2441 | 10.33 | 7.48 | 10.39 | 7.79 | 61 |
| | 2480 | 10.25 | 7.29 | 10.25 | 7.49 | 61 |

All Rate have been tested, the Worst average power (Unit: dBm) is shown as below.

## 8.2. SAR Testing Results

### 8.2.1. SAR Test Reduction Considerations

**<KDB 447498 D01, General RF Exposure Guidance>**

Testing of other required channels within the operating mode of a frequency band is not required when the reported SAR for the mid-band or highest output power channel is:

(1) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz

(2) ≤ 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

### 8.2.2. SAR Results for Head Exposure Condition

**For Left earbud**

| Plot No. | Band | Mode | Test Position | Distance | Ch. | Max. Tune-up Power (dBm) | Measured Conducted Power (dBm) | Scaling Factor | Power Drift (dB) | Measured SAR-1g (W/kg) | Scaled SAR-1g (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Bluetooth | DH5 | Front face | 0 | 0 | 10.0 | 9.60 | 1.10 | -0.15 | 0.020 | 0.02 |
| 2 | Bluetooth | DH5 | Rear Face | 0 | 0 | 10.0 | 9.60 | 1.10 | 0.02 | 0.324 | **0.36** |
| 3 | Bluetooth | DH5 | Left Side | 0 | 0 | 10.0 | 9.60 | 1.10 | -0.05 | 0.102 | 0.11 |
| 4 | Bluetooth | DH5 | Right Side | 0 | 0 | 10.0 | 9.60 | 1.10 | -0.03 | 0.109 | 0.12 |
| 5 | Bluetooth | DH5 | Top Side | 0 | 0 | 10.0 | 9.60 | 1.10 | -0.03 | 0.060 | 0.07 |
| 6 | Bluetooth | DH5 | Bottom Side | 0 | 0 | 10.0 | 9.60 | 1.10 | -0.12 | 0.141 | 0.15 |
| 7 | Bluetooth | DH5 | Rear Face | 0 | 39 | 10.0 | 9.57 | 1.10 | 0.07 | 0.249 | 0.27 |
| 8 | Bluetooth | DH5 | Rear Face | 0 | 78 | 10.0 | 9.32 | 1.17 | 0.00 | 0.164 | 0.19 |

**For Right earbud**

| Plot No. | Band | Mode | Test Position | Distance | Ch. | Max. Tune-up Power (dBm) | Measured Conducted Power (dBm) | Scaling Factor | Power Drift (dB) | Measured SAR-1g (W/kg) | Scaled SAR-1g (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Bluetooth | DH5 | Front face | 0 | 0 | 10.0 | 9.72 | 1.07 | 0.03 | 0.022 | 0.02 |
| 2 | Bluetooth | DH5 | Rear Face | 0 | 0 | 10.0 | 9.72 | 1.07 | -0.08 | 0.369 | **0.39** |
| 3 | Bluetooth | DH5 | Left Side | 0 | 0 | 10.0 | 9.72 | 1.07 | 0.05 | 0.116 | 0.12 |
| 4 | Bluetooth | DH5 | Right Side | 0 | 0 | 10.0 | 9.72 | 1.07 | 0.02 | 0.124 | 0.13 |
| 5 | Bluetooth | DH5 | Top Side | 0 | 0 | 10.0 | 9.72 | 1.07 | 0.01 | 0.068 | 0.07 |
| 6 | Bluetooth | DH5 | Bottom Side | 0 | 0 | 10.0 | 9.72 | 1.07 | 0.06 | 0.161 | 0.17 |
| 7 | Bluetooth | DH5 | Rear Face | 0 | 39 | 10.0 | 9.68 | 1.08 | 0.14 | 0.260 | 0.28 |
| 8 | Bluetooth | DH5 | Rear Face | 0 | 78 | 10.0 | 9.36 | 1.16 | 0.11 | 0.181 | 0.21 |

### 8.2.3. SAR Measurement Variability

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

Since all the measured SAR are less than 0.8 W/kg, the repeated measurement is not required.

**Test Engineer**：Warren Xiong,

## Appendixes

**<u>All attachments are integral parts of this test report. This applies especially to the following appendix:</u>**

**Appendix A: SAR Plots of System Verification**

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

**Appendix B: SAR Plots of SAR Measurement**

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

**Appendix C: Calibration Certificate for probe and Dipole**

**Appendix D: Photographs of EUT and setup**

Test Laboratory: TÜV Rheinland (Shenzhen) Co., Ltd. Date: 2022/11/7

## System Check-D2450V2_H2450

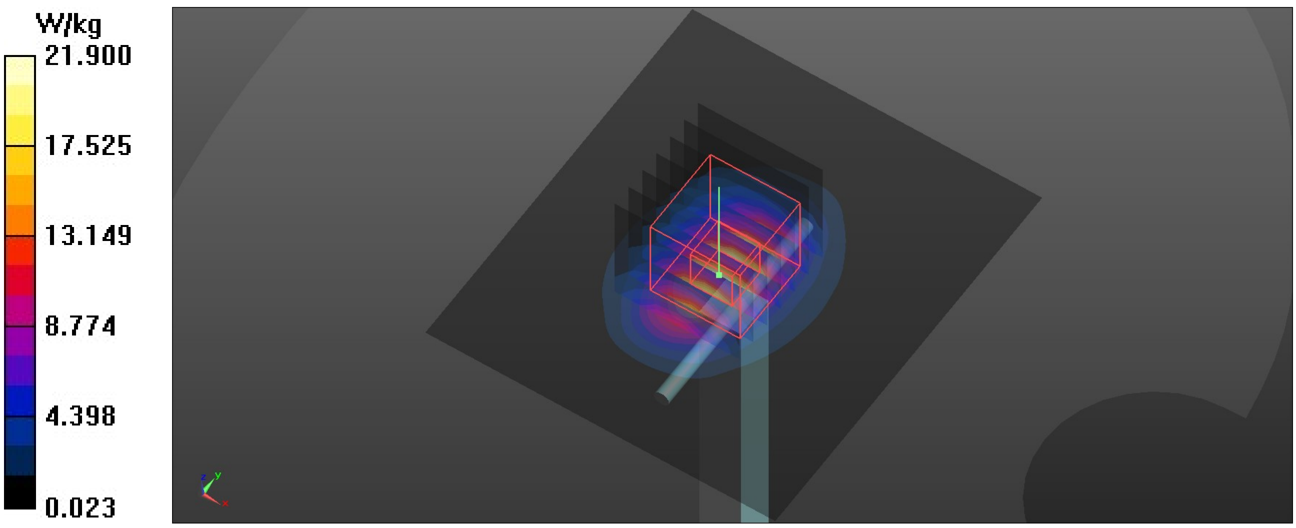
### DUT: Dipole 2450 MHz D2450V2 SN:1014

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: H2450 Medium parameters used: f = 2450 MHz; σ = 1.795 S/m; $\varepsilon_r$ = 38.822; ρ = 1000 $kg/m^3$

DASY5 Configuration:
- Probe: EX3DV4 - SN7506; ConvF(7.85, 7.85, 7.85) @ 2450 MHz; Calibrated: 2022/5/31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1557; Calibrated: 2022/1/20
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: 1961
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**Pin=250 mW/Area Scan (71x81x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 21.9 W/kg

**Pin=250 mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.2 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 26.6 W/kg
**SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.94 W/kg**
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 48.8%
Maximum value of SAR (measured) = 21.4 W/kg



# Test Results of left earbud

Test Laboratory: TÜV Rheinland (Shenzhen) Co., Ltd. Date: 2022/11/7

## P01 BT_DH5_Rear Face_0cm_Ch0_Left

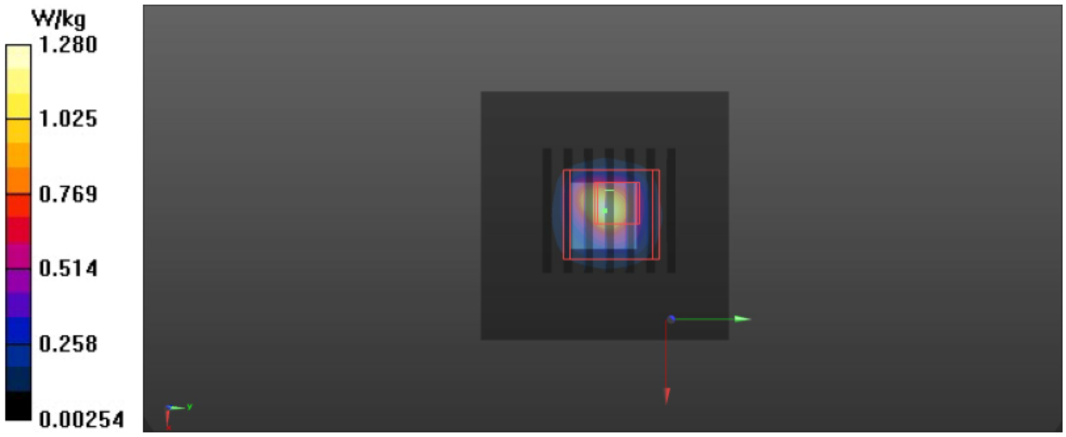
**DUT: EUT**

Communication System: BT; Frequency: 2402 MHz;Duty Cycle: 1:1
Medium: H2450 Medium parameters used: f = 2402 MHz; $\sigma$ = 1.744 S/m; $\varepsilon_r$ = 39.018; $\rho$ = 1000 kg/m$^3$

DASY5 Configuration:
- Probe: EX3DV4 - SN7506; ConvF(7.85, 7.85, 7.85) @ 2402 MHz; Calibrated: 2022/5/31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1557; Calibrated: 2022/1/20
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: 1961
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**- Area Scan (51x51x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.28 W/kg

**- Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.05 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.64 W/kg
**SAR(1 g) = 0.324 W/kg; SAR(10 g) = 0.117 W/kg**
Smallest distance from peaks to all points 3 dB below = 3 mm
Ratio of SAR at M2 to SAR at M1 = 18.1%
Maximum value of SAR (measured) = 1.08 W/kg



# Test Results of right earbud

Test Laboratory: TÜV Rheinland (Shenzhen) Co., Ltd. Date: 2022/11/7

## P02 BT_DH5_Rear Face_0cm_Ch0_Right

**DUT: EUT**

Communication System: BT; Frequency: 2402 MHz;Duty Cycle: 1:1
Medium: H2450 Medium parameters used: f = 2402 MHz; $\sigma$ = 1.744 S/m; $\varepsilon_r$ = 39.018; $\rho$ = 1000 $kg/m^3$

DASY5 Configuration:
- Probe: EX3DV4 - SN7506; ConvF(7.85, 7.85, 7.85) @ 2402 MHz; Calibrated: 2022/5/31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1557; Calibrated: 2022/1/20
- Phantom: SAM 1; Type: QD 000 P40 CB; Serial: 1961
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**- Area Scan (51x51x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.06 W/kg

**- Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.18 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.80 W/kg
**SAR(1 g) = 0.369 W/kg; SAR(10 g) = 0.141 W/kg**
Smallest distance from peaks to all points 3 dB below = 3 mm
Ratio of SAR at M2 to SAR at M1 = 20%
Maximum value of SAR (measured) = 1.14 W/kg