




TEST REPORT

Report No. : **CHTW24090032** Report verification: 

Project No...... : **SHT2407056601W**

FCC ID..... : **2BBCY3588S**

Applicant's name : **Lisheng Communications Co., Ltd.**

Address..... : **5#, ChongXiang St., Econ & Tech. Area, Quanzhou, Fujian, China.**

Test item description : **POC Two Way Radio / IP Two Way radio**

Trade Mark : **LISHENG**

Model/Type reference..... : **Q-3588S**

Listed Model(s) : **3288T**

Standard : **FCC 47 CFR Part2.1093**
IEEE Std C95.1, 1999 Edition
IEEE 1528: 2013

Date of receipt of test sample..... : **Aug. 14, 2024**

Date of testing..... : **Aug. 26, 2024- Aug. 28, 2024**

Date of issue..... : **Sep. 19, 2024**

Result..... : **PASS**

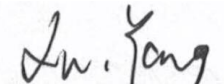
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Testing Laboratory Name : **Shenzhen Huatongwei International Inspection Co., Ltd.**

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The test report merely correspond to the test sample.

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1. Statement of Compliance

| Maximum Reported SAR (W/kg @1g) | | | | |
|--|-------|-----------|-------|-----------------|
| RF Exposure Conditions | WWAN | WLAN 2.4G | BT | Simultaneous TX |
| Front of face(Dist.= 25mm) | 0.381 | 0.007 | 0.008 | 0.333 |
| Body-Front (Dist.= 10mm) | 0.482 | 0.019 | 0.011 | 0.665 |
| Body-Rear(Dist.= 10mm) | 0.554 | 0.030 | 0.011 | 0.665 |
| Body- Rear(Dist.= 0mm) --With Belt clip | 0.622 | 0.042 | 0.012 | 0.665 |

Note:

1. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg@1g) specified in FCC 47 CFR part 2 (2.1093) and IEEE Std C95.1,
2. This device had been tested in accordance with the measurement methods and procedures specified in IEEE 1528 and FCC KDB publications.

2. Test Standards and Report version

2.1. Test Standards

The tests were performed according to following standards:

[FCC 47 Part 2.1093](#): Radiofrequency radiation exposure evaluation: portable devices.

[IEEE Std C95.1, 1999 Edition](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

[IEEE Std 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.

FCC published RF exposure KDB procedures:

[865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04](#): SAR Measurement Requirements for 100 MHz to 6 GHz

[865664 D02 RF Exposure Reporting v01r02](#): RF Exposure Compliance Reporting and Documentation Considerations

[447498 D01 General RF Exposure Guidance v06](#): RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES

[248227 D01 802.11 Wi-Fi SAR v02r02](#): SAR Measurement Procedures for 802.11 a/b/g Transmitters

[941225 D01 3G SAR Procedures v03r01](#): SAR Measurement Procedures for 3G Devices

[941225 D05 SAR for LTE Devices v02r05](#): SAR Evaluation Considerations for LTE Devices

[TCB workshop](#) April, 2019; Page 19, Tissue Simulating Liquids (TSL)

2.2. Report version

| Revision No. | Date of issue | Description |
|--------------|---------------|-------------|
| N/A | 2024-09-19 | Original |
| | | |
| | | |
| | | |
| | | |

3. Summary

3.1. Client Information

| | |
|---------------|---|
| Applicant: | Lisheng Communications Co., Ltd. |
| Address: | 5#, ChongXiang St., Econ & Tech. Area, Quanzhou, Fujian, China. |
| Manufacturer: | Lisheng Communications Co., Ltd. |
| Address: | 5#, ChongXiang St., Econ & Tech. Area, Quanzhou, Fujian, China. |

3.2. Product Description

| Main unit | |
|----------------------------|--|
| Name of EUT: | POC Two Way Radio / IP Two Way radio |
| Trade Mark: | LISHENG |
| Model No.: | Q-3588S |
| Listed Model(s): | 3288T |
| Power supply: | DC 3.7V from Battery |
| Hardware version: | P301_V2.0 |
| Software version: | V1.0 |
| Device Dimension: | Length x Width x Thickness (mm): 112 x 60 x32 |
| Antenna Dimension: | Length (mm): 51 |
| Device Category: | Portable |
| Product stage: | Production unit |
| RF Exposure Environment: | General Population/Uncontrolled |
| HTW test sample No.: | YPHT24070566002 |
| Support SIM card quantity: | <input checked="" type="checkbox"/> Single card <input type="checkbox"/> Double card |
| Ancillary unit | |
| Battery information: #1 | LI-ION BATTERY PACK Model: 3588-BAT DC 3.7V 3800mAh 14.06Wh |

Note:

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

3.3. RF Specification Description

| | | | | |
|--|---|---|--|--|
| GSM | | | | |
| Operation Band: | <input checked="" type="checkbox"/> GSM850 | <input checked="" type="checkbox"/> PCS1900 | | |
| Support type: | <input checked="" type="checkbox"/> GSM | <input checked="" type="checkbox"/> GPRS | <input checked="" type="checkbox"/> EGPRS | |
| Modulation type: | <input checked="" type="checkbox"/> GMSK | <input checked="" type="checkbox"/> 8PSK | | |
| Power Class: | <input checked="" type="checkbox"/> GSM850: Class 4 | | <input checked="" type="checkbox"/> PCS1900: Class 1 | |
| Device Class: | B | | | |
| GPRS Multi-Slot Class: | 12 | | | |
| EGPRS Multi-Slot Class: | 12 | | | |
| <i>Note:</i> <i>This device doesn't support DTM (Dual Transfer Mode).</i> | | | | |
| WCDMA | | | | |
| Operation Band: | <input checked="" type="checkbox"/> Band II | <input checked="" type="checkbox"/> Band IV | <input checked="" type="checkbox"/> Band V | |
| Support type: | <input checked="" type="checkbox"/> UMTS Rel. 99 (Voice & Data) | | <input checked="" type="checkbox"/> HSDPA | <input checked="" type="checkbox"/> HSUPA |
| Modulation type: | <input checked="" type="checkbox"/> QPSK | | | |
| Power Class: | Class 3 | | | |
| LTE | | | | |
| Operation Band: | <input checked="" type="checkbox"/> Band 2 | <input checked="" type="checkbox"/> Band 4 | <input checked="" type="checkbox"/> Band 5 | <input checked="" type="checkbox"/> Band 7 |
| | <input checked="" type="checkbox"/> Band 12 | <input checked="" type="checkbox"/> Band 17 | | |
| Support type: | <input checked="" type="checkbox"/> Single Carrier | <input type="checkbox"/> CA-UL | <input type="checkbox"/> CA-DL | <input type="checkbox"/> MIMO-UL |
| Modulation type: | <input checked="" type="checkbox"/> QPSK | <input checked="" type="checkbox"/> 16QAM | | |
| Power Class: | <input checked="" type="checkbox"/> Class 3 | <input type="checkbox"/> Class 2 | | |
| <i>Note:</i> <i>This device doesn't support SV-LTE (1xRTT-LTE).</i> | | | | |
| Wi-Fi 2.4G | | | | |
| Support type: | <input checked="" type="checkbox"/> 802.11b | <input checked="" type="checkbox"/> 802.11g | <input checked="" type="checkbox"/> 802.11n | <input type="checkbox"/> 802.11ax |
| Support bandwidth: | <input checked="" type="checkbox"/> 20MHz | <input checked="" type="checkbox"/> 40MHz | | |
| <i>Note:</i> <i>This device 2.4GHz Wi-Fi support hotspot operation</i> | | | | |
| Bluetooth | | | | |
| Support type: | <input checked="" type="checkbox"/> BR | <input checked="" type="checkbox"/> EDR | | |
| <i>Note:</i> <i>This device support Bluetooth Tethering.</i> | | | | |
| NFC | | | | |
| Radio function: | <input checked="" type="checkbox"/> NFC Reader | | | |
| | <input checked="" type="checkbox"/> NFC Tags-Passive devicese | | | |
| | <input checked="" type="checkbox"/> NFC Tags-Active devicese | | | |
| Operation frequency: | 13.56MHz | | | |

Note:

○ ☒: means that this feature is supported; ☐: means that this feature is not supported

3.4. Testing Laboratory Information

| | | |
|----------------------|---|----------------------|
| Laboratory Name | Shenzhen Huatongwei International Inspection Co., Ltd. | |
| Laboratory Location | Building 7, Baiwang Idea Factory, No.1051, Songbai Road, Yangguang Community, Xili Subdistrict, Nanshan District, Shenzhen, Guangdong, China | |
| Contact information: | Phone: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn | |
| Qualifications | Type | Accreditation Number |
| | FCC Registration Number | 762235 |
| | FCC Designation Number | CN1181 |

3.5. Environmental conditions

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

| | |
|---------------------|----------------|
| Ambient temperature | 18 °C to 25 °C |
| Ambient humidity | 30%RH to 70%RH |
| Air Pressure | 950-1050mbar |

4. Equipments Used during the Test

| Used | Test Equipment | Manufacturer | Equipment No. | Model No. | Serial No. | Cal. date (YY-MM-DD) | Due date (YY-MM-DD) |
|--------------------------------------|--------------------------------------|---------------|---------------|---------------|------------|--------------------------|--------------------------|
| ● | Data Acquisition Electronics DAEx | SPEAG | HTWE0313-05 | DAE4 | 1549 | 2024/04/16 | 2025/04/15 |
| ● | E-field Probe | SPEAG | HTWE0313-06 | EX3DV4 | 7494 | 2024/06/07 | 2025/06/06 |
| ● | Phantoms | SPEAG | HTWE0313-12 | ELI V8.0 | 2078 | N/A | N/A |
| ● | Head TSL | - | - | HBBL600-10000 | - | N/A | N/A |
| ● | Temperature & humidity | MIAO XIN | HTWE0319 | TH20R-EX | - | 2024/03/18 | 2025/03/17 |
| ● | Universal Radio Communication Tester | R&S | HTWE0323 | CMW500 | 137681 | 2024/03/14 | 2025/03/13 |
| Tissue-equivalent liquids Validation | | | | | | | |
| ● | Dielectric Assessment Kit | SPEAG | HTWE0315-02 | DAK-3.5 | 1267 | N/A | N/A |
| ● | Network analyzer | Keysight | HTWE0331 | E5071C | MY46733048 | 2023/08/18 2024/08/27 | 2024/08/17 2025/08/26 |
| ● | Thermometer | LKM | HTWE0317 | DTM3000 | 3693 | 2024/03/18 | 2025/03/17 |
| System Validation | | | | | | | |
| ● | System Validation Dipole | SPEAG | HTWE0314-03 | D750V3 | 1180 | 2023/12/07 | 2026/12/06 |
| ● | System Validation Dipole | SPEAG | HTWE0314-04 | D835V2 | 4d238 | 2023/12/08 | 2026/12/07 |
| ● | System Validation Dipole | SPEAG | HTWE0314-05 | D1750V2 | 1164 | 2023/12/08 | 2026/12/07 |
| ● | System Validation Dipole | SPEAG | HTWE0314-06 | D1900V2 | 5d226 | 2023/12/07 | 2026/12/06 |
| ● | System Validation Dipole | SPEAG | HTWE0314-07 | D2450V2 | 1009 | 2023/12/06 | 2026/12/05 |
| ● | System Validation Dipole | SPEAG | HTWE0314-08 | D2600V2 | 1150 | 2023/12/07 | 2026/12/06 |
| ● | Signal Generator | R&S | HTWE0276 | SMB100A | 114360 | 2024/08/22 | 2025/08/21 |
| ● | Power Viewer for Windows | R&S | | N/A | N/A | N/A | N/A |
| ● | Power sensor | R&S | HTWE0278 | NRP18A | 101010 | 2024/03/14 | 2025/03/13 |
| ● | Power sensor | R&S | HTWE0389 | NRP18A | 101386 | 2024/03/14 | 2025/03/13 |
| ● | Power Amplifier | BONN | HTWE0336 | BLWA 0160-2M | 1811887 | 2023/11/09 | 2024/11/08 |
| ● | Dual Directional Coupler | Mini-Circuits | HTWE0335 | ZHDC-10-62-S+ | F975001814 | 2023/11/09 | 2024/11/08 |
| ● | Attenuator | Mini-Circuits | HTWE0333 | VAT-3W2+ | 1819 | 2023/11/09 | 2024/11/08 |
| ● | Attenuator | Mini-Circuits | HTWE0334 | VAT-10W2+ | 1741 | 2023/11/09 | 2024/11/08 |

Note:

1. The Probe, Dipole and DAE calibration reference to the Appendix E and F.
2. Referring to KDB865664 D01, the dipole calibration interval can be extended to 3 years with justification. The dipole are also not physically damaged or repaired during the interval.

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

6. SAR Measurements System Configuration

6.1. SAR Measurement Set-up

The DASY5 system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).

A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

A unit to operate the optical surface detector which is connected to the EOC.

The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.

DASY5 software and SEMCAD data evaluation software.

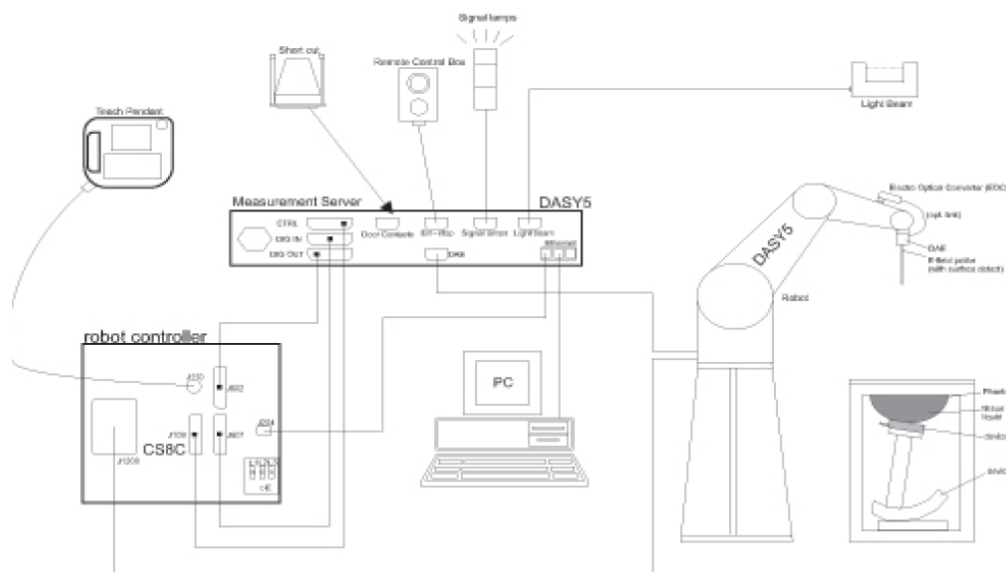
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

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



6.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

● Probe Specification

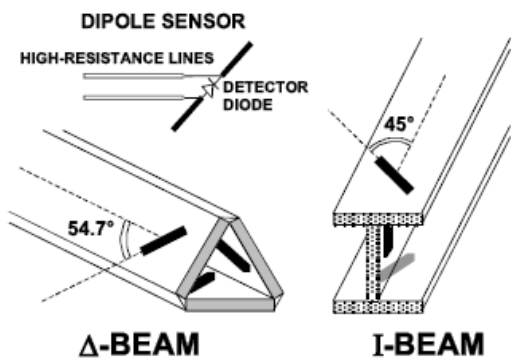
| | |
|---------------|--|
| Construction | Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| Calibration | ISO/IEC 17025 calibration service available. |
| Frequency | 4 MHz to 10 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz) |
| Directivity | ± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis) |
| Dynamic Range | 10 µW/g to > 100 W/kg; Linearity: ± 0.2 dB |
| Dimensions | Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm |
| Application | General dosimetry up to 6 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones |
| Compatibility | DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI |



◆ Isotropic E-Field Probe

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

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



6.3. Phantoms

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 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.



ELI4 Phantom

6.4. Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.

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



Device holder supplied by SPEAG

7. SAR Test Procedure

7.1. Scanning Procedure

Step 1: 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. Measure the local SAR at a test point within 8 mm of the phantom inner surface that is closest to the DUT. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in 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 Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Resolutions per FCC KDB Publication 865664 D01v04

| | ≤ 3 GHz | > 3 GHz |
|--|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 mm ± 1 mm | $\frac{1}{2} \cdot \delta \cdot \ln(2)$ 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: Δx _{Area} , Δy _{Area} | ≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm 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. | |

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Resolutions per FCC KDB Publication 865664 D01v04

| | | | | |
|--|---|---|---|---|
| Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$ | | | $\leq 2 \text{ GHz}: \leq 8 \text{ mm}$ $2 - 3 \text{ GHz}: \leq 5 \text{ mm}^*$ | $3 - 4 \text{ GHz}: \leq 5 \text{ mm}^*$ $4 - 6 \text{ GHz}: \leq 4 \text{ mm}^*$ |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{\text{Zoom}}(n)$ | | $\leq 5 \text{ mm}$ | $3 - 4 \text{ GHz}: \leq 4 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 3 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$ |
| | graded grid | $\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface | $\leq 4 \text{ mm}$ | $3 - 4 \text{ GHz}: \leq 3 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 2.5 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$ |
| | | $\Delta z_{\text{Zoom}}(n>1)$: between subsequent points | $\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1) \text{ mm}$ | |
| Minimum zoom scan volume | x, y, z | | $\geq 30 \text{ mm}$ | $3 - 4 \text{ GHz}: \geq 28 \text{ mm}$ $4 - 5 \text{ GHz}: \geq 25 \text{ mm}$ $5 - 6 \text{ GHz}: \geq 22 \text{ mm}$ |

Note: δ 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 $\leq 1.4 \text{ W/kg}$, $\leq 8 \text{ mm}$, $\leq 7 \text{ mm}$ and $\leq 5 \text{ mm}$ zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1. The SAR drift shall be kept within $\pm 5 \%$.

7.2. Data Storage and Evaluation

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors),s together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “.DA4”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

Data Evaluation

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

| | | |
|--------------------|--------------------------|----------------------|
| Probe parameters: | Sensitivity: | Normi, ai0, ai1, ai2 |
| | Conversion factor: | ConvFi |
| | Diode compression point: | Dcpi |
| Device parameters: | Frequency: | f |
| | 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 DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

| | |
|--------------------|---|
| Vi: | compensated signal of channel (i = x, y, z) |
| Ui: | input signal of channel (i = x, y, z) |
| cf: | crest factor of exciting field (DASY parameter) |
| dcp _i : | diode compression point (DASY parameter) |

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

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

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

| | |
|--------|--|
| Vi: | compensated signal of channel (i = x, y, z) |
| Normi: | sensor sensitivity of channel (i = x, y, z), [mV/(V/m)²] for E-field Probes |
| ConvF: | sensitivity enhancement in solution |
| aij: | sensor sensitivity factors for H-field probes |
| f: | carrier frequency [GHz] |
| Ei: | electric field strength of channel i in V/m |
| Hi: | magnetic field strength of channel i in A/m |

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

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

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

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

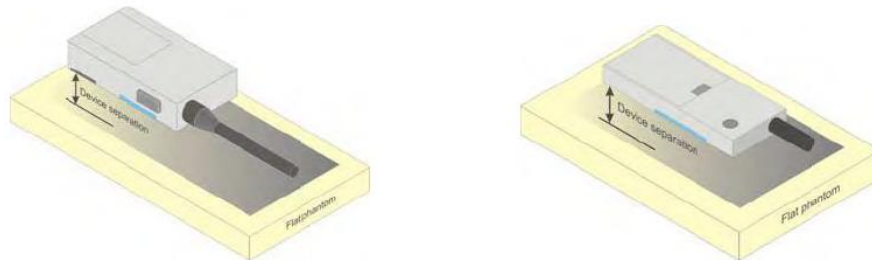
SAR: local specific absorption rate in W/kg
Etot: total field strength in V/m
 σ : conductivity in [mho/m] or [Siemens/m]
 ρ : equivalent tissue density in g/cm³

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

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

8.1. Front-of-face

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

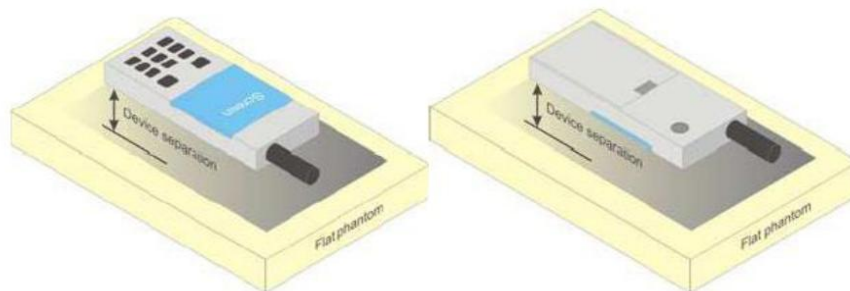


Test positions for Front-of-face devices

8.2. Body Position

Devices that support transmission while used with body-worn accessories must be tested for body-worn accessory SAR compliance, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics.

Devices that are designed to operate on the body of users using lanyards and straps or without requiring additional body-worn accessories must be tested for SAR compliance using a conservative minimum test separation distance $\leq 5\text{mm}$ to support compliance.



Picture 4 Test positions for body-worn devices

9. Dielectric Property Measurements & System Check

9.1. Tissue Dielectric Parameters

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3-4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

The dielectric constant (ϵ_r) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within $\pm 5\%$ of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for ϵ_r and σ may be relaxed to $\pm 10\%$. This is limited to frequencies $\leq 3\text{ GHz}$.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

| Tissue dielectric parameters for Head | | |
|---------------------------------------|--------------|----------------------|
| Target Frequency (MHz) | Head | |
| | ϵ_r | $\sigma(\text{S/m})$ |
| 750 | 41.9 | 0.89 |
| 835 | 41.5 | 0.90 |
| 1750 | 40.1 | 1.37 |
| 1800-2000 | 40.0 | 1.40 |
| 2450 | 39.2 | 1.80 |
| 2600 | 39.0 | 1.96 |

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Measurement Results:

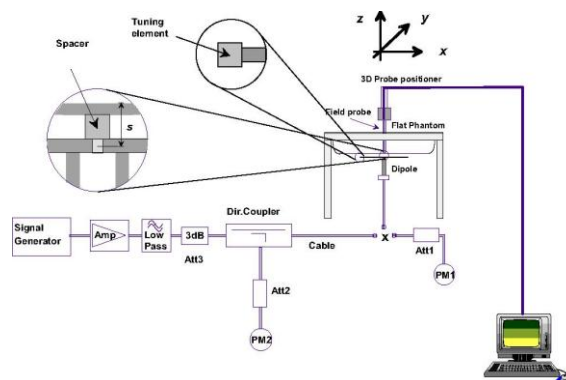
| Dielectric performance of Head tissue simulating liquid | | | | | | | | | |
|---|--------------|----------|----------------|----------|---------------------------|-----------------------|-------|--------------|-----------|
| Frequency (MHz) | ϵ_r | | σ (S/m) | | Delta (ϵ_r) | Delta (σ) | Limit | Temp (°C) | Date |
| | Target | Measured | Target | Measured | | | | | |
| 750 | 41.90 | 42.65 | 0.890 | 0.896 | 1.78% | 0.67% | ±5% | 22.4 | 2024/8/27 |
| 835 | 41.50 | 42.30 | 0.900 | 0.902 | 1.93% | 0.22% | ±5% | 22.4 | 2024/8/27 |
| 1750 | 40.10 | 40.26 | 1.370 | 1.364 | 0.41% | -0.44% | ±5% | 22.7 | 2024/8/26 |
| 1900 | 40.00 | 40.00 | 1.400 | 1.428 | 0.00% | 2.00% | ±5% | 22.7 | 2024/8/26 |
| 2450 | 39.20 | 39.23 | 1.800 | 1.754 | 0.07% | -2.56% | ±5% | 22.6 | 2024/8/28 |
| 2600 | 39.00 | 39.00 | 1.960 | 1.948 | 0.00% | -0.61% | ±5% | 22.6 | 2024/8/28 |

9.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ± 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- The results are normalized to 1 W input power.



System Performance Check Setup

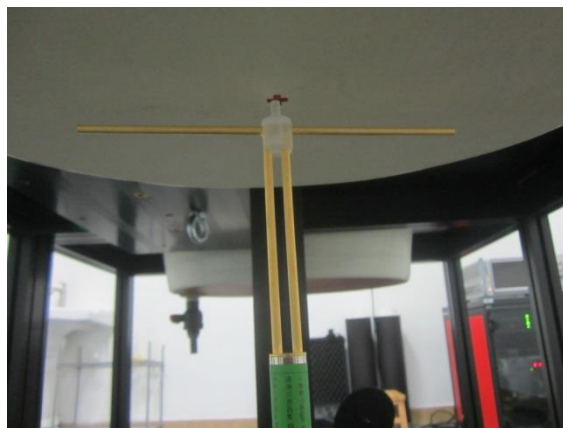


Photo of Dipole Setup

Measurement Results:

| Head | | | | | | | | | | | |
|--------------------|--------------|--------------------|-------------------|--------------|--------------------|-------------------|---------------|----------------|-------|--------------|-----------|
| Frequency (MHz) | 1g SAR | | | 10g SAR | | | Delta (1g) | Delta (10g) | Limit | Temp (°C) | Date |
| | Target 1W | Normalize to 1W | Measured 250mW | Target 1W | Normalize to 1W | Measured 250mW | | | | | |
| 750 | 8.32 | 8.84 | 2.21 | 5.48 | 5.92 | 1.48 | 6.25% | 8.03% | ±10% | 23.0 | 2024/8/27 |
| 835 | 9.53 | 9.72 | 2.43 | 6.13 | 6.48 | 1.62 | 1.99% | 5.71% | ±10% | 23.0 | 2024/8/27 |
| 1750 | 36.50 | 37.40 | 9.35 | 19.40 | 20.40 | 5.10 | 2.47% | 5.15% | ±10% | 23.3 | 2024/8/26 |
| 1900 | 40.80 | 42.80 | 10.70 | 21.10 | 22.48 | 5.62 | 4.90% | 6.54% | ±10% | 23.3 | 2024/8/26 |
| 2450 | 53.40 | 52.40 | 13.10 | 24.70 | 24.84 | 6.21 | -1.87% | 0.57% | ±10% | 23.1 | 2024/8/28 |
| 2600 | 56.40 | 55.60 | 13.90 | 25.30 | 25.40 | 6.35 | -1.42% | 0.40% | ±10% | 23.1 | 2024/8/28 |

Note:
The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within ±10% of the manufacturer calibrated dipole SAR target.

Plots of System Performance Check

Test Laboratory: Huatongwei International Inspection Co., Ltd., SAR Lab

Date: 8/27/2024

SystemPerformanceCheck-Head 750MHz

Communication System: UID 0, A-CW (0); Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.896 \text{ S/m}$; $\epsilon_r = 42.645$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

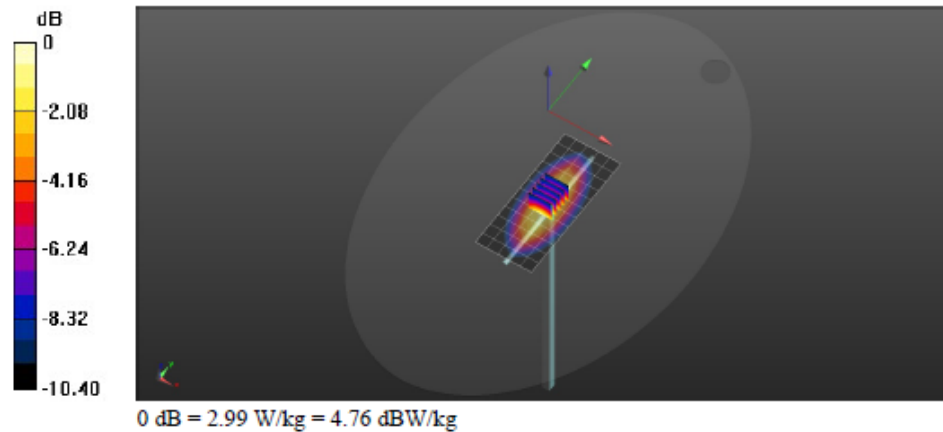
Ambient Temperature: 23.0°C; Liquid Temperature: 22.4°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(10.74, 10.74, 10.74) @ 750 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/16/2024
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=15mm, Pin=250mW/Area Scan (6x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.69 W/kg

Head/d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.25 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 3.54 W/kg
SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.48 W/kg
Maximum value of SAR (measured) = 2.99 W/kg



Test Laboratory: Huatongwei International Inspection Co., Ltd., SAR Lab

Date: 8/27/2024

SystemPerformanceCheck-Head 835MHz

Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.902 \text{ S/m}$; $\epsilon_r = 42.302$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Ambient Temperature: 23.0°C; Liquid Temperature: 22.4°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(10.38, 10.38, 10.38) @ 835 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/16/2024
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=15mm, Pin=250mW/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 3.35 W/kg

Head/d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

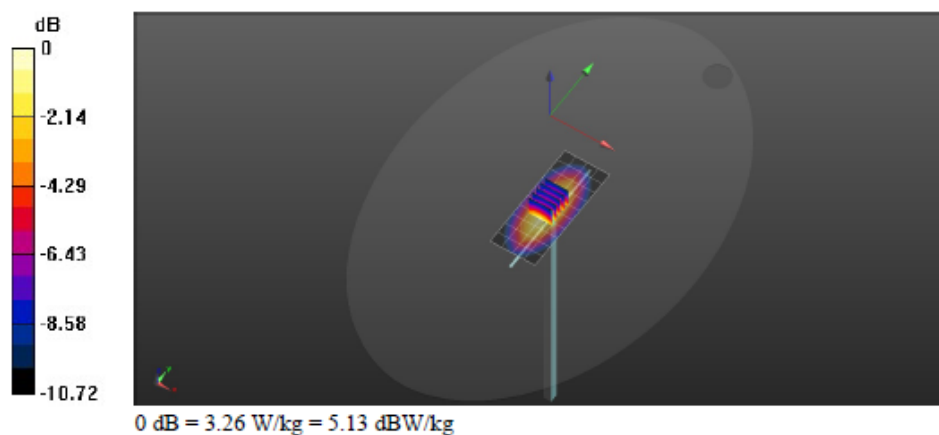
dy=8mm, dz=5mm

Reference Value = 61.84 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 3.78 W/kg

SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 3.26 W/kg



Test Laboratory: Huatongwei International Inspection Co., Ltd., SAR Lab

Date: 8/26/2024

SystemPerformanceCheck-Head 1750MHz

Communication System: UID 0, CW (0); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 40.264$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 23.3°C; Liquid Temperature: 22.7°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.94, 8.94, 8.94) @ 1750 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/16/2024
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 13.9 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

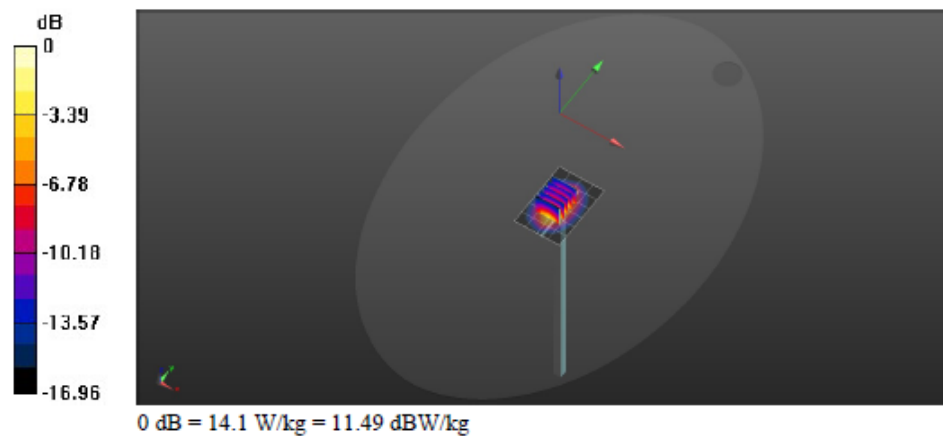
dy=8mm, dz=5mm

Reference Value = 103.9 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.35 W/kg; SAR(10 g) = 5.1 W/kg

Maximum value of SAR (measured) = 14.1 W/kg



Test Laboratory: Huatongwei International Inspection Co., Ltd., SAR Lab

Date: 8/26/2024

SystemPerformanceCheck-Head 1900MHz

Communication System: UID 0, CW (0); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.428$ S/m; $\epsilon_r = 39.999$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 23.3°C; Liquid Temperature: 22.7°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.6, 8.6, 8.6) @ 1900 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/16/2024
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 16.3 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

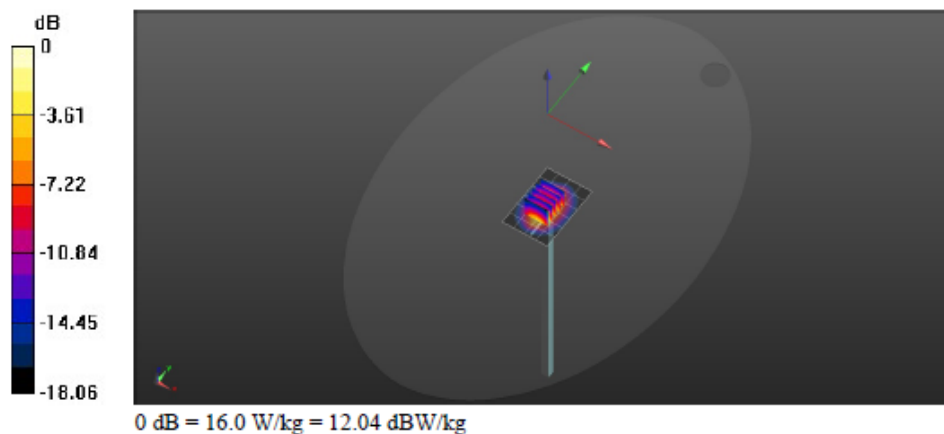
dy=8mm, dz=5mm

Reference Value = 109.8 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 19.6 W/kg

SAR(1 g) = 10.7 W/kg; SAR(10 g) = 5.62 W/kg

Maximum value of SAR (measured) = 16.0 W/kg



Test Laboratory: Huatongwei International Inspection Co., Ltd., SAR Lab

Date: 8/28/2024

SystemPerformanceCheck-Head 2450MHz

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2450$ MHz; $\sigma = 1.754$ S/m; $\epsilon_r = 39.228$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 23.1°C; Liquid Temperature: 22.6°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(8.13, 8.13, 8.13) @ 2450 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/16/2024
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (5x7x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 16.1 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

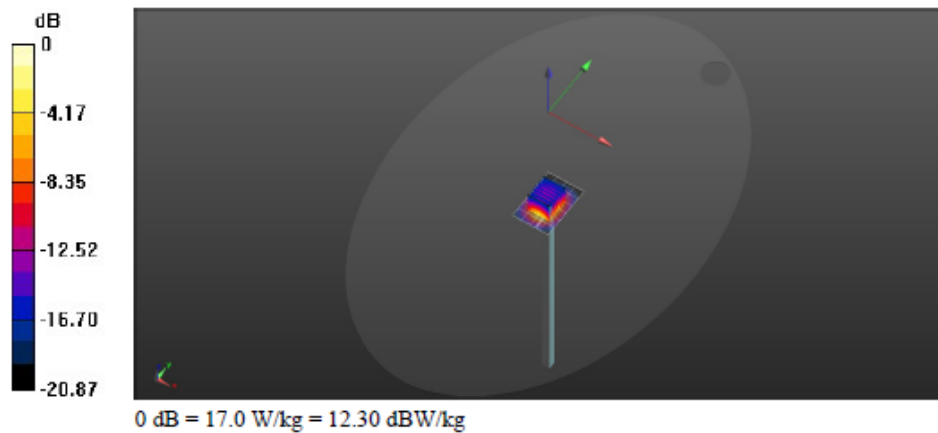
Reference Value = 96.56 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 26.4 W/kg

SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.21 W/kg

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 17.0 W/kg



Test Laboratory: Huatongwei International Inspection Co., Ltd., SAR Lab

Date: 8/28/2024

SystemPerformanceCheck-Head 2600MHz

Communication System: UID 0, CW (0); Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.948$ S/m; $\epsilon_r = 39$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Ambient Temperature: 23.1°C; Liquid Temperature: 22.6°C

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(7.93, 7.93, 7.93) @ 2600 MHz; Calibrated: 6/7/2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/16/2024
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Head/d=10mm,Pin=250mW/Area Scan (5x6x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 23.5 W/kg

Head/d=10mm,Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,

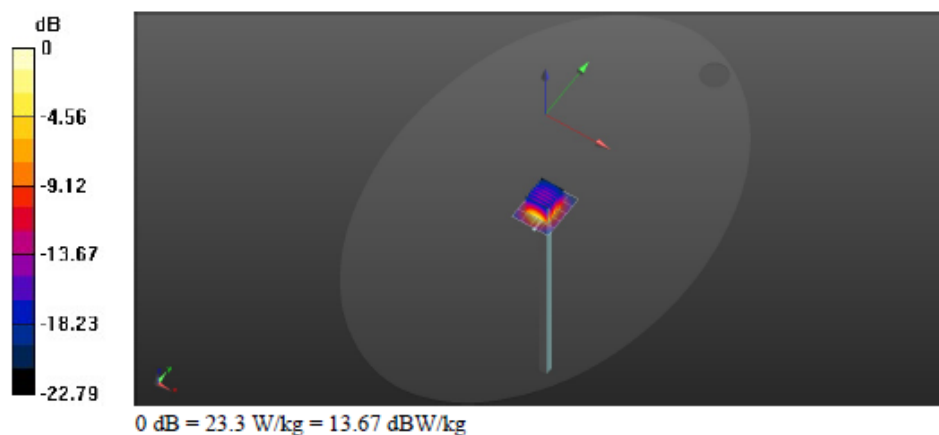
dy=5mm, dz=5mm

Reference Value = 113.8 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 29.6 W/kg

SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.35 W/kg

Maximum value of SAR (measured) = 23.3 W/kg



10. SAR Exposure Limits

SAR assessments have been made in line with the requirements of FCC 47 CFR § 2.1093.

| Type Exposure | Limit (W/kg) | |
|---|--|--|
| | General Population/ Uncontrolled Exposure Environment | Occupational/ Controlled Exposure Environment |
| Spatial Average SAR (whole body) | 0.08 | 0.4 |
| Spatial Peak SAR (1g cube tissue for head and trunk) | 1.6 | 8.0 |
| Spatial Peak SAR (10g for limb) | 4.0 | 20.0 |

Note:

1. *Population/Uncontrolled Environments: are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.*
2. *Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).*

11. Conducted Power Measurement Results and Tune-up

Please refer to Appendix Report

Note:

GSM

1. Per KDB 447498 D01, the maximum output power channel is used for SAR testing and further SAR test reduction.
2. Per KDB 941225 D01, considering the possibility of e.g. 3rd party VoIP operation for Head and Body-worn SAR test reduction for GSM and GPRS modes is determined by the source-base time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.
3. Per KDB941225 D01, for hotspot SAR test reduction for GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance, For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

WCDMA

1. The following tests were conducted according to the test requirements outlines in 3GPP TS34.121 specification.
2. The procedures in KDB 941225 D01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode to determine SAR test exclusion

A summary of the setting are illustrated below:

HSDPA Setup Configuration:

- a) The EUT was connected to base station RS CMU200 referred to the setup configuration
- b) The RF path losses were compensated into the measurements
- c) A call was established between EUT and base station with following setting:
 - i. Set Gain Factors (β_c and β_d) and parameters were set according to each specific sub-test in the following table, C10.1.4, Quoted from the TS 34.121
 - ii. Set RMC 12.2Kbps + HSDPA mode
 - iii. Set Cell Power=-86dBm
 - iv. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
 - v. Select HSDPA uplink parameters
 - vi. Set Delta ACK, Delta NACK and Delta CQI=8
 - vii. Set Ack-Nack repetition Factor to 3
 - viii. Set CQI Feedback Cycle (K) to 4ms
 - ix. Set CQI repetition factor to 2
 - x. Power ctrl mode= all up bits
- d) The transmitter maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

| Sub-test | β_c | β_d | β_d (SF) | β_c/β_d | β_{HS} (Note 1, Note 2) | CM (dB) (Note 3) | MPR (dB) (Note 3) |
|----------|-------------------|-------------------|-------------------|-------------------|-------------------------------------|---------------------|----------------------|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0.0 |
| 2 | 12/15 (Note 4) | 15/15 (Note 4) | 64 | 12/15 (Note 4) | 24/15 | 1.0 | 0.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 | 0.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 | 0.5 |

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{HS} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{HS}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

Setup Configuration

HSUPA Setup Configuration:

- a) The EUT was connected to base station RS CMU200 referred to the setup configuration
- b) The RF path losses were compensated into the measurements
- c) A call was established between EUT and base station with following setting:
- Call configs = 5.2b, 5.9b, 5.10b, and 5.13.2B with QPSK
 - Set Gain Factors (β_c and β_d) and parameters (AG index) were set according to each specific sub-test in the following table, C11.1.3, Quoted from the TS 34.121
 - Set Cell Power=-86dBm
 - Set channel type= 12.2Kbps + HSPA mode
 - Set UE Target power
 - Set Ctrl mode=Alternating bits
 - Set and observe the E-TFCI
 - Confirm that E-TFCI is equal the target E-TFCI of 75 for Sub-test 1, and other subtest's E-TFCI
- d) The transmitter maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

| Sub-test | β_c | β_d | β_d (SF) | β_c/β_d | β_{HS} (Note 1) | β_{ec} | β_{ed} (Note 5) (Note 6) | β_{ed} (SF) | β_{ed} (Codes) | CM (dB) (Note 2) | MPR (dB) (Note 2) | AG Index (Note 6) | E-TFCI |
|----------|----------------|----------------|----------------|-------------------|-----------------------|--------------|--|-------------------|----------------------|------------------|-------------------|-------------------|--------|
| 1 | 11/15 (Note 3) | 15/15 (Note 3) | 64 | 11/15 (Note 3) | 22/15 | 209/25 | 1309/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | β_{ed1} : 47/15 β_{ed2} : 47/15 | 4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 (Note 4) | 15/15 (Note 4) | 64 | 15/15 (Note 4) | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$.

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

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

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

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

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

LTE

General:

- CMW500 base station simulator was used to setup the connection with EUT; the frequency band, channel, bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
- Per KDB 941225 D05v02r03, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
- Per KDB 941225 D05v02r03, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RBoffsets at the upper edge, middle and lower edge of each required test channel.
- Per KDB 941225 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.

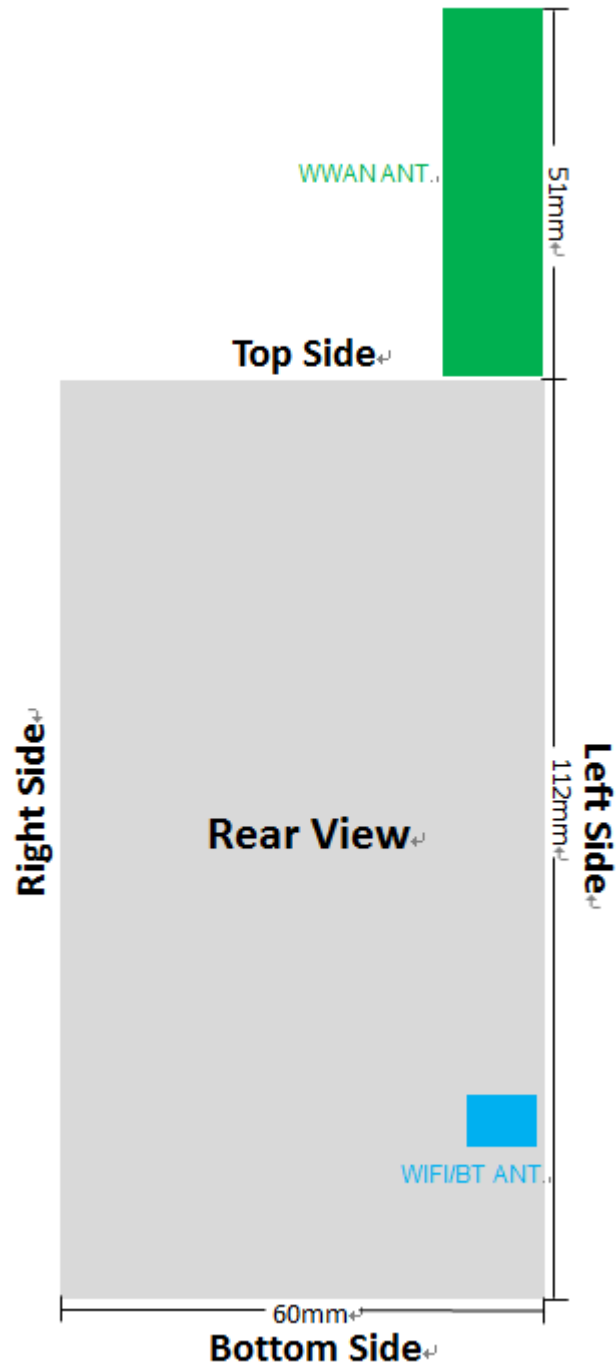
Wi-Fi

For 2.4GHz Wi-Fi SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were for SAR evaluation.

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

12. Antenna Location



13. Measured and Reported SAR Results

Measurement Results:

Please refer to Appendix Report

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as numeric thresholds in step b) below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B):

- 1) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)]\}$ mW, for 100 MHz to 1500 MHz
- 2) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$ mW, for > 1500 MHz and ≤ 6 GHz

c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):

- 1) For test separation distances > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by $[1 + \log(100/f(\text{MHz}))]$
- 2) For test separation distances ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$
- 3) SAR measurement procedures are not established below 100 MHz.

| Band/Mode | F(MHz) | Separation Distance (mm) | Calculation results (mW) | SAR test exclusion |
|-----------|--------|--|--------------------------|--------------------|
| NFC | 13.56 | Front of face(Dist.= 25mm) | 0.000003 | Yes |
| | | Body-Front (Dist.= 10mm) | 0.000003 | Yes |
| | | Body- Rear(Dist.= 0mm) --With Belt clip | 0.000003 | Yes |

Per KDB 447498 D01, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

The test exclusion threshold is ≤ 1107 , SAR testing is not required.

The field strength value of NFC transmission is 34.83dBuV/m (3m)

Measurement data plots:

Please refer to Appendix D

Note:

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN = Measured SAR * Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

KDB 447498 D01 General RF Exposure Guidance v06:

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:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 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
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 941225 D01 SAR test for 3G SAR Test Reduction Procedure:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

GSM Guidance

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Please refer to section 9. for GSM power verification.

SAR is not required for EDGE (8PSK) mode because the maximum output power and tune-up limit is $\leq 1/4$ dB higher than GPRS/EDGE (GMSK) or the adjusted SAR of the highest reported SAR of GPRS/EDGE (GMSK) is ≤ 1.2 W/kg.

W-CDMA Guidance

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC (Head) and other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC (Body-Worn Accessory) as the primary mode.

Per KDB 941225 D01 RMC12.2Kbps setting is used to evaluate SAR. If the maximum output power and Tune-up tolerance specified for production units in HSDPA/HSUPA is $\leq 1/4$ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC 12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA.

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM and 64-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the

highest channel bandwidth.

KDB 248227 D01 SAR meas for 802.11:

When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
 - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
 - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

14. Simultaneous Transmission analysis

| No. | Simultaneous Transmission Configurations | Front of face | Body-worn | Note |
|-----|---|---------------|-----------|------|
| 1 | GSM(voice) + Bluetooth (data)+NFC (data) | Yes | Yes | |
| 2 | GSM(voice) + WLAN (data) +NFC (data) | Yes | Yes | |
| 3 | WCDMA(voice) + Bluetooth (data) +NFC (data) | Yes | Yes | |
| 4 | WCDMA(voice) + WLAN (data) +NFC (data) | Yes | Yes | |
| 5 | GPRS (data) + Bluetooth (data) +NFC (data) | Yes | Yes | |
| 6 | GPRS (data) + WLAN (data) +NFC (data) | Yes | Yes | |
| 7 | WCDMA (data) + Bluetooth (data) +NFC (data) | Yes | Yes | |
| 8 | WCDMA (data) + WLAN (data) +NFC (data) | Yes | Yes | |
| 9 | LTE + Bluetooth (data) +NFC (data) | Yes | Yes | |
| 10 | LTE + WLAN (data) +NFC (data) | Yes | Yes | |

General note:

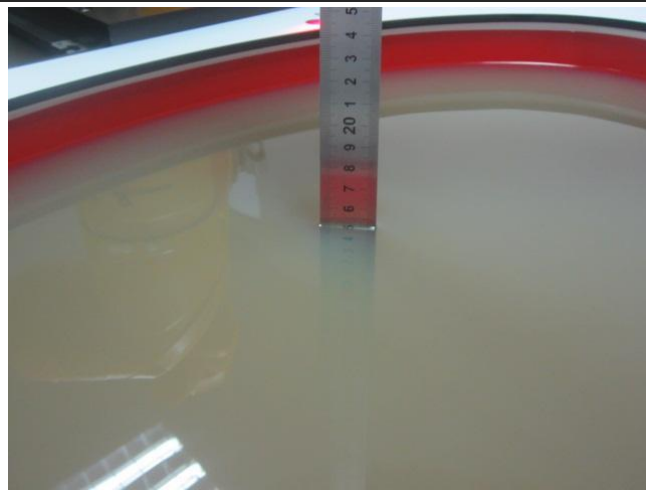
1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either GSM or WCDMA LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
3. The reported SAR summation is calculated based on the same configuration and test position
4. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below
 - a) $[(\text{max. Power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}/x] \text{W/kg}$ for test separation distances $\leq 50\text{mm}$; when $x=7.5$ for 1-g SAR, and $x=18.75$ for 10-g SAR.
 - b) When the minimum separation distance is $<5\text{mm}$, the distance is used 5mm to determine SAR test exclusion
 - c) 0.4 W/kg for 1-g SAR and 1.0W/kg for 10-g SAR, when the test separation distances is $>50\text{mm}$.

| NFC Max power | Exposure position | Front of face | Body-Front&Rear --Without Belt clip | Body- Rear --With Belt clip |
|------------------|----------------------|---------------|--|--------------------------------|
| | Test separation | 25mm | 10mm | 0mm |
| 0.000003mW | Estimated SAR (W/kg) | ≤ 0.001 | ≤ 0.001 | ≤ 0.001 |

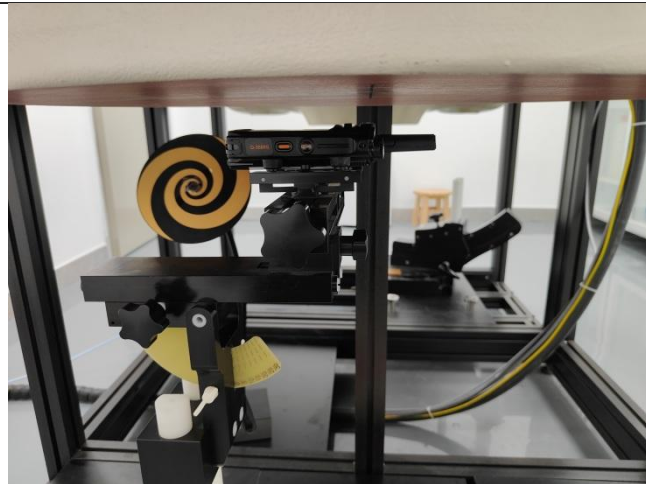
Simultaneous Transmission data:

Please refer to Appendix Report

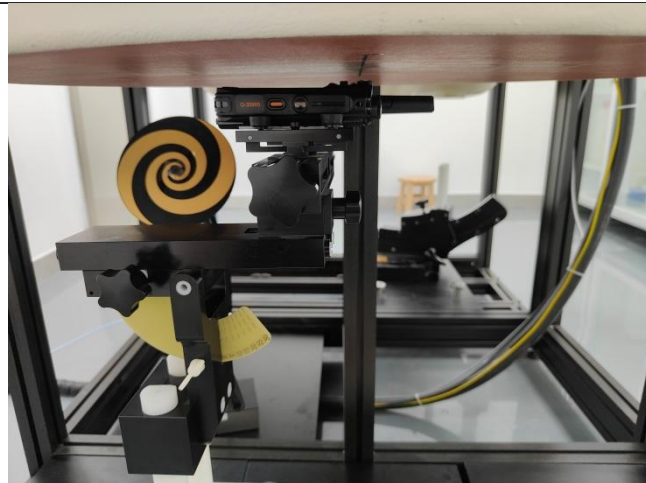
15. Test Setup Photos



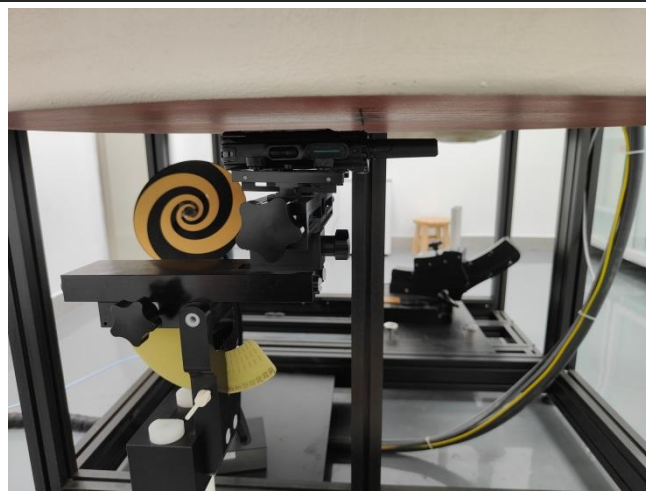
Liquid depth in the ELI phantom



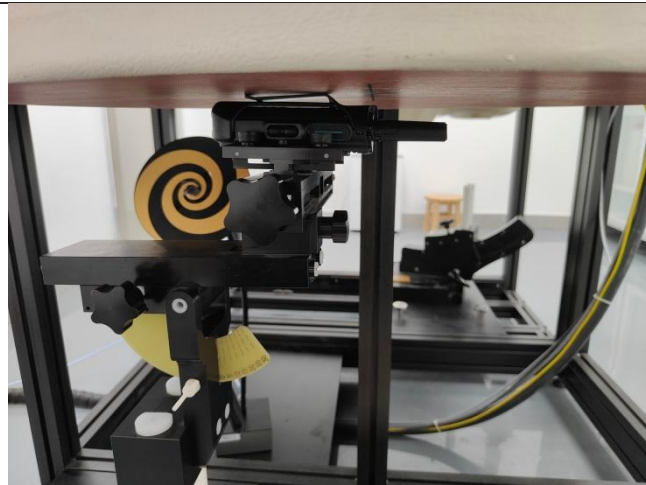
Front-of-face(25mm)



Body Front(10mm)



Body Rear(10mm)



Body Rear(0mm)- With Belt clip

16. External and Internal Photos of the EUT

Please reference to the report No.: CHTW24090001

-----End of Report-----