鑫宇环检测 Attestation of Global Compliance



# SAR Test Report

Report No.:AGC02931180801FH01

| | | |
|---|---|---|
| **FCC ID** | | POD-FRS |
| **PRODUCT DESIGNATION** | : | Analog Transceiver |
| **BRAND NAME** | : | TYT |
| **MODEL NAME** | : | TC-568 |
| **CLIENT** | : | TYT Electronics Co., Ltd. |
| **DATE OF ISSUE** | : | Oct. 12,2018 |
| **STANDARD(S)** | : | IEEE Std. 1528:2013<br>FCC 47CFR § 2.1093<br>IEEE/ANSI C95.1:2005 |
| **REPORT VERSION** | : | V1.0 |

Attestation of Global Compliance(Shenzhen) Co., Ltd.

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## Report Revise Record

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|---|---|---|---|---|
| V1.0 | / | Oct. 12,2018 | Valid | Initial Release |




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# TestReport

| | |
|---|---|
| Applicant Name | TYT Electronics Co., Ltd. |
| Applicant Address | Block 39-1, Optoelectronics-information industry base, Nan'an, Quanzhou, Fujian, China |
| Manufacturer Name | TYT Electronics Co., Ltd. |
| Manufacturer Address | Block 39-1, Optoelectronics-information industry base, Nan'an, Quanzhou, Fujian, China |
| Product Designation | Analog Transceiver |
| Brand Name | TYT |
| Model Name | TC-568 |
| Different Description | N/A |
| EUT Voltage | DC3.7 V by battery |
| Applicable Standard | IEEE Std. 1528:2013<br>FCC 47CFR § 2.1093<br>IEEE/ANSI C95.1:2005 |
| Test Date | Oct. 10,2018 |
| Report Template | AGCRT- US -PTT/SAR (2018-02-02) |

Note: The results of testing in this report apply to the product/system which was tested only.

Owen Xiao

Tested By

Qwen Xiao(Xiao Qi) Oct. 10,2018

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Forrest Lei(Lei Yonggang) Oct. 12,2018
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# 1. SUMMARY OF MAXIMUM SARVALUE

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

**Highest Report standalone SAR Summary (50% duty cycle)**

| Frequency Band | Type of signal | Highest Reported 1g-SAR(W/Kg) | |
|---|---|---|---|
| | | Face Up (with 25mm separation) | Back Touch |
| 462 | Analog | 0.207 | 0.795 |

This device is compliance with Specific Absorption Rate (SAR) for General population/Uncontrolled exposure Environment limits (1.6W/Kg) specified in 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1, and had been tested in accordance with measurement methods and procedures specified in IEEE 1528-2013 and the following specific FCC Test Procedures:

KDB447498 D01 General RF Exposure Guidance v06

KDB 865664 D01 SAR Measurement 100MHz to 6GHz v01r04

KDB 643646 D01 SAR Test for PTT Radios v01r03

# 2. GENERAL INFORMATION

## 2.1. EUT Description

| General Information | |
|---|---|
| Product Name | Analog Transceiver |
| Test Model | TC-568 |
| Hardware Version | A173201-BKEM2U-V1.2 |
| Software Version | V1.31 |
| Exposure Category: | General Population/Uncontrolled Environments |
| Device Category | PMR Portable Transceiver |
| Modulation Type | F3E |
| TX Frequency Range | 462.5500MHz -462.7250MHz |
| Rated Power | 2W (It was fixed by the manufacturer, any individual can't arbitrarily change it) |
| Max. Average Power | 32.87dBm |
| Channel Spacing | 12.5 KHz |
| Antenna Type | Inseparable |
| Antenna Gain | 1.5dBi |
| Body-Worn Accessories: | Belt Clip with headset |
| Face-Head Accessories: | None |
| Battery Type (s) Tested: | DC3.7V, 1200mAh (by battery) |

Note: The sample used for testing is end product.

| Product | Type | |
|---|---|---|
| | ☒ Production unit | ☐ Identical Prototype |




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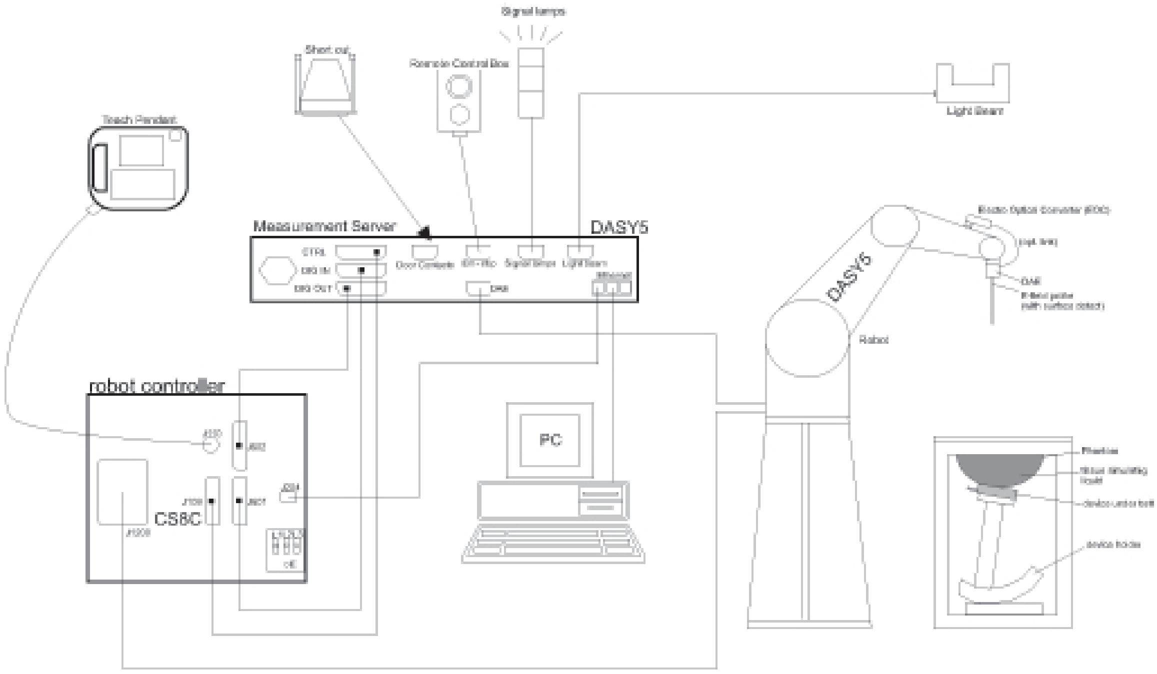
# 3. SAR MEASUREMENT SYSTEM

## 3.1. The DASY5system used for performing compliance tests consists of following items




- A standard high precision 6-axis robot with controller, teach pendant and software.
- Data acquisition electronics (DAE) which attached to the robot arm extension. The DAE consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server isaccomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock
- A dosimetric probe equipped with an optical surface detector system.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital Communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- A Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- Phantoms, device holders and other accessories according to the targeted measurement.

### 3.2. DASY5 E-Field Probe

The SAR measurement is conducted with the dosimetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. SPEAG conducts the probe calibration in compliance with international and national standards(e.g.IEEE1528, and relevant KDB files etc.)UnderISO17025.Thecalibration data are in Appendix D.

**Isotropic E-Field Probe Specification**

| | |
|---|---|
| **Model** | EX3DV4 |
| **Manufacture** | SPEAG |
| **frequency** | 0.15GHz-0.45 GHz<br>Linearity:±0.6%dB(K=2)(0.15GHz-0.45GHz) |
| **Dynamic Range** | 0.01W/Kg-100W/Kg<br>Linearity:±0.6%dB(K=2) |
| **Dimensions** | Overall length:337mm<br>Tip diameter:2.5mm<br>Typical distance from probe tip to dipole centers:1mm |
| **Application** | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 3 GHz with precision of better 30%. |

### 3.3. Data Acquisition Electronics description

The data acquisition electronics (DAE) consist if a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a control logic unit. Transmission to the measurement sever is accomplished through an optical downlink fir data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

DAE4

| | |
|---|---|
| **Input Impedance** | 200MOhm |
| **The Inputs** | Symmetrical and floating |
| **Common mode rejection** | above 80 dB |

### 3.4. Robot

The DASY system uses the high precision robots (DASY5:TX60) type from Stäubli SA (France).For the 6-axis controller system, the robot controller version from is used.
The XL robot series have many features that are important for our application:
- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallicconstruction shields against motor control fields)
- 6-axis controller

### 3.5. Light Beam Unit

The light beam switch allows automatic “tooling” of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned prob.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position. e, the same position will be reached with another aligned probe within 0

### 3.6. Device Holder

| | |
|---|---|
| The DASY device holder is designed to cope withdifferent positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).<br>Thus the device needs no repositioning when changingthe angles.<br>The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered. |  |

### 3.7. MeasurementServer

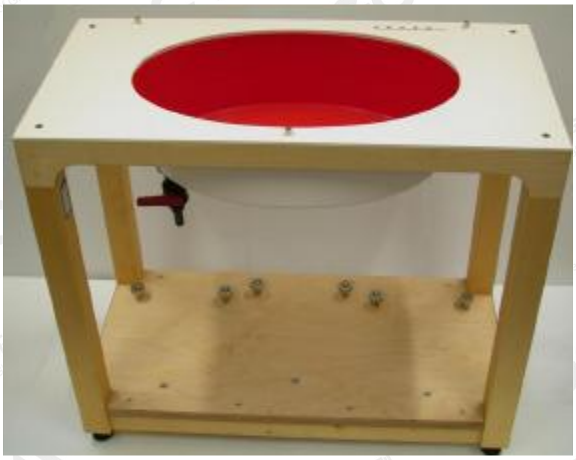
| | |
|---|---|
| The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chip-disk (DASY5: 128MB), RAM (DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital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

### 3.8. PHANTOM
### SAM Twin Phantom

| | |
|---|---|
| The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:<br>□ Left head<br>□ Right head<br>□ Flat phantom |  |

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

### ELI4 Phantom

| | |
|---|---|
| □ Flat phantom a fiberglass shell flat phantom with 2mm+/- 0.2 mm shell thickness. It has only one measurement area for Flat phantom |  |

# 4. SAR MEASUREMENT PROCEDURE

## 4.1. Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in 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 occupational/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 given mass density (ρ). The equation description is as below:

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

SAR is expressed in units of Watts per kilogram (W/Kg)
SAR can be obtained using either of the following equations:

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

$$SAR = c_h \left.\frac{dT}{dt}\right|_{t=0}$$

Where

SAR is the specific absorption rate in watts per kilogram;
E is the r.m.s. value of the electric field strength in the tissue in volts per meter;
σ is the conductivity of the tissue in siemensper metre;
ρ is the density of the tissue in kilograms per cubic metre;
$c_h$ is the heat capacity of the tissue in joules per kilogram and Kelvin;

$\frac{dT}{dt} | t = 0$is the initial time derivative of temperature in the tissue in kelvins per second

## 4.2. SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface is 2.7mm This distance cannot be smaller than the distance os 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 SATIMO 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 2db range is required in IEEE Standard 1528 and IEC62209 standards, whereby 3db is a requirement when compliance is assessed in accordance with the ARIB standard (Japan) If one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximum are detected, the number of Zoom Scan has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100MHz to 6GHz

| | ≤ 3 GHz | > 3 GHz |
|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 ± 1 mm | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |

Step 3: Zoom Scan

Zoom Scan are used to assess the peak spatial SAR value within a cubic average volume containing 1g abd 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 1g and 10g and displays these values next to the job's label.



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Zoom Scan Parameters extracted from KDB865664 D01 SAR Measurement 100MHz to 6GHz

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

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

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

## 5. TISSUE SIMULATING LIQUID

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 5.2

### 5.1. The composition of the tissue simulating liquid

| Ingredient (% Weight) / Frequency (MHz) | Water | Nacl | Sugar | HEC | Bactericide | DGBE | 1,2-Propanediol | Triton X-100 |
|---|---|---|---|---|---|---|---|---|
| 450 Head(100%) | 38.56 | 3.95 | 56.32 | 0.98 | 0.19 | 0.0 | 0.0 | 0.0 |
| 450 Body (100%) | 51.16 | 1.49 | 46.78 | 0.52 | 0.05 | 0.0 | 0.0 | 0.0 |

### 5.2. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE 1528have been incorporated in the following table. These head parameters are derived fromplanar layer models simulating the highest expected SAR for the dielectric properties andtissue thickness variations in a human head. Other head and body tissue parameters thathave not been specified in IEEE 1528 are derived from the tissue dielectric parameterscomputed from the 4-Cole-Cole equations described in Reference [12] and extrapolatedaccording to the head parameters specified in IEEE 1528.

| Target Frequency (MHz) | head | | body | |
|---|---|---|---|---|
| | εr | σ (S/m) | εr | σ (S/m) |
| 150 | 52.3 | 0.76 | 61.9 | 0.80 |
| 300 | 45.3 | 0.87 | 58.2 | 0.92 |
| **450** | **43.5** | **0.87** | **56.7** | **0.94** |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| 900 | 41.5 | 0.97 | 55.0 | 1.05 |
| 915 | 41.5 | 0.98 | 55.0 | 1.06 |
| 1450 | 40.5 | 1.20 | 54.0 | 1.30 |
| 1610 | 40.3 | 1.29 | 53.8 | 1.40 |
| 1800 – 2000 | 40.0 | 1.40 | 53.3 | 1.52 |
| 2450 | 39.2 | 1.80 | 52.7 | 1.95 |
| 3000 | 38.5 | 2.40 | 51.6 | 2.73 |

(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)




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### 5.3. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using DASY5 Dielectric Probe Kit and R&S Network Analyzer ZVL6.

| Tissue Stimulant Measurement for 450MHz | | | | |
|---|---|---|---|---|
| Fr. (MHz) | Dielectric Parameters (±5%) | | Tissue Temp [°C] | Test time |
| | Head | | | |
| | εr43.50(41.325 - 45.675) | δ[s/m]0.87(0.8265 - 0.9135) | | |
| 450.000 | 44.15 | 0.85 | 21.3 | Oct. 10,2018 |
| 462 | 43.69 | 0.87 | | |
| Fr. (MHz) | Dielectric Parameters (±5%) | | Tissue Temp [°C] | Test time |
| | Body | | | |
| | εr56.7(53.865 to 59.535) | δ[s/m] 0.94(0.893 to 0.987) | | |
| 450.000 | 58.43 | 0.91 | 21.5 | Oct. 10,2018 |
| 462 | 57.69 | 0.92 | | |




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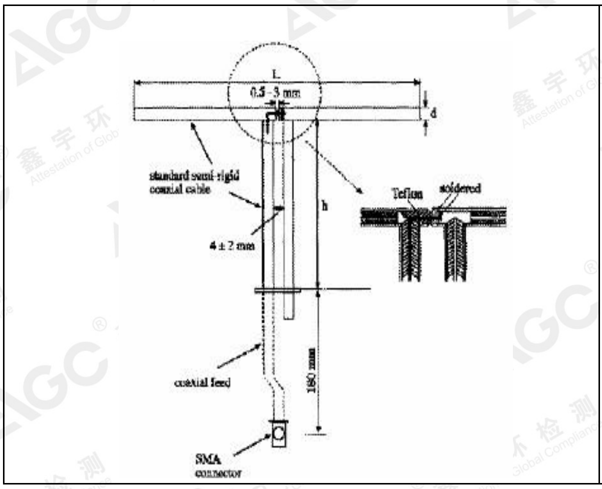
# 6. SAR SYSTEM CHECK PROCEDURE

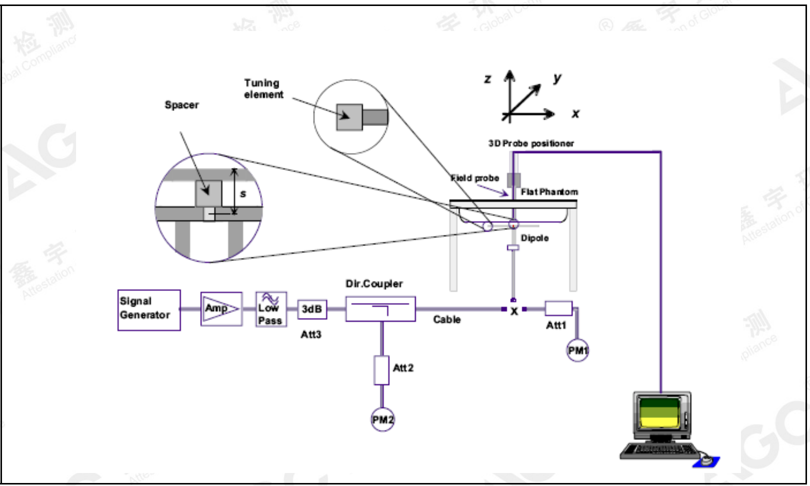
## 6.1. SAR System Check Procedures

SAR system check 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 remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

Each DASY system is equipped with one or more system check kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system check and system validation. System kit includes a dipole, and dipole device holder.

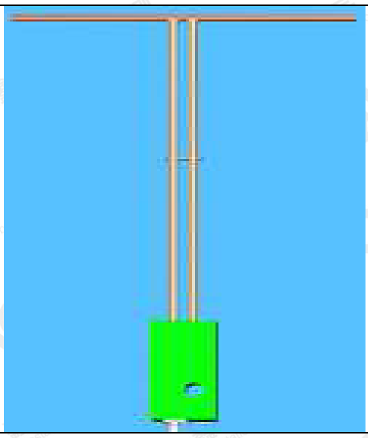
The system check verifies that the system operates within its specifications. It’s performed daily or before every SAR measurement. The system check uses normal SAR measurement in the flat section of the phantom with a matched dipole at a specified distance. The system check setup is shown as below.



## 6.2. SAR System Check

### 6.2.1.Dipoles

| | |
|---|---|
|  | The dipoles used is based on the IEEE-1528 standard, and is complied with mechanicaland electrical specifications in line with therequirements of IEEE. the table below provides details for the mechanical and electricalspecifications for the dipoles |

| Frequency | R/L (mm) | R/h (mm) | d (mm) |
|---|---|---|---|
| 450MHz | 290 | 166.7 | 6.35 |

### 6.2.2. System Check Result

| **System Performance Check at 450MHz** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Validation Kit:SN 46/11DIP 0G450-184** | | | | | | | | |
| Frequency [MHz] | Target Value(W/Kg) | | Reference Result (± 10%) | | Normalized to 1W(W/Kg) | | Tissue Temp. [°C] | Test time |
| | 1g | 10g | 1g | 10g | 1g | 10g | | |
| 450 head | 4.74 | 3.12 | 4.266-5.214 | 2.808-3.432 | 4.55 | 3.11 | 21.3 | Oct. 10,2018 |
| 450 body | 4.78 | 3.19 | 4.302-5.258 | 2.871-3.509 | 4.79 | 3.28 | 21.5 | Oct. 10,2018 |

Note:
(1) We use a CW signal of 18dBm for system check, and then all SAR value are normalized to 1W forward power. The result must be within ±10% of target value.

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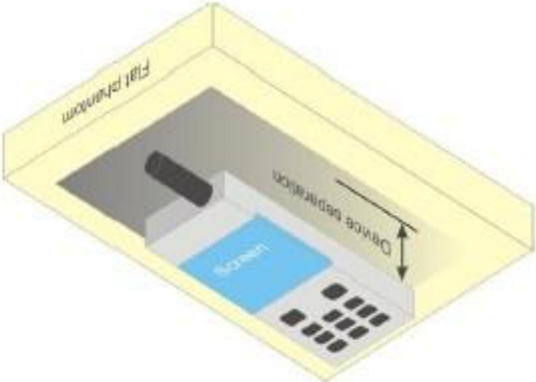
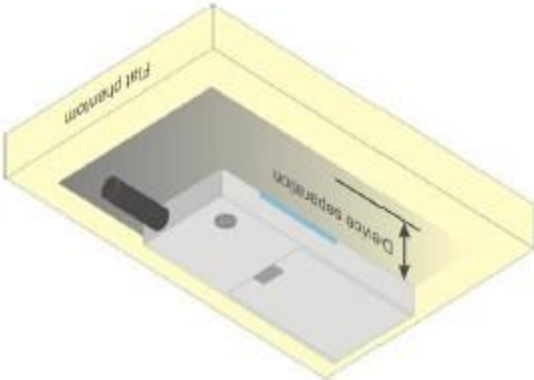
# 7. EUT TEST POSITION

This EUT was tested in **Front Face and Rear Face.**

## 7.1. Body Worn Position

(1) To position the EUT parallel to the phantom surface.
(2) To adjust the EUT parallel to the flat phantom.
(3) To adjust the distance between the EUT surface and the flat phantom to **25mm** while used in front of face, and body back touch with belt clip.



# 8. SAR EXPOSURE LIMITS

## Limits for General population/Uncontrolled exposure Environment

| Type Exposure Limits | general population/uncontrolled exposure limits (W/Kg) |
|---|---|
| Spatial Average SAR (whole body) | 1.6 |

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## 9. TEST FACILITY

| | |
|---|---|
| **Test Site** | Attestation of Global Compliance (Shenzhen) Co., Ltd |
| **Location** | 1-2F., Bldg.2, No.1-4, ChaxiSanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Shenzhen 518012 |
| **NVLAP Lab Code** | 600153-0 |
| **Designation Number** | CN5028 |
| **Test Firm Registration Number** | 682566 |
| **Description** | Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0 |




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# 10. TEST EQUIPMENT LIST

| Equipment description | Manufacturer/ Model | Identification No. | Current calibration date | Next calibration date |
|---|---|---|---|---|
| Stäubli Robot | Stäubli-TX60 | F13/5Q2UD1/A/01 | N/A | N/A |
| Robot Controller | Stäubli-CS8 | 139522 | N/A | N/A |
| E-Field Probe | Speag- EX3DV4 | SN:3953 | June 26,2018 | June 25,2019 |
| SAM Twin Phantom | Speag-SAM | 1790 | N/A | N/A |
| ELI4 Phantom | ELI V5.0 | 1210 | N/A | N/A |
| Device Holder | Speag-SD 000 H01 KA | SD 000 H01 KA | N/A | N/A |
| DAE4 | Speag-SD 000 D04 BM | 1398 | Feb. 08,2018 | Feb. 07,2019 |
| SAR Software | Speag-DASY5 | DASY52.8 | N/A | N/A |
| Liquid | SATIMO | - | N/A | N/A |
| Dipole | SATIMO SID450 | SN46/11 DIP 0G450-184 | Mar. 10,2017 | Mar. 09,2020 |
| Signal Generator | Agilent-E4438C | US41461365 | Mar. 01,2018 | Feb. 28,2019 |
| Vector Analyzer | Agilent / E4440A | US41421290 | Mar. 01,2018 | Feb. 28,2019 |
| Network Analyzer | Rhode & Schwarz ZVL6 | SN100132 | Mar. 01,2018 | Feb. 28,2019 |
| Attenuator | Warison/WATT-6SR 1211 | N/A | N/A | N/A |
| Amplifier | EM30180 | SN060552 | Mar. 01,2018 | Feb. 28,2019 |
| Directional Couple | Werlatone/ C5571-10 | SN99463 | Jun. 12,2018 | Jun. 11,2019 |
| Power Sensor | NRP-Z21 | 1137.6000.02 | Sep. 20,2018 | Sep. 19,2019 |
| Power Sensor | NRP-Z23 | US38261498 | Mar. 01,2018 | Feb. 28,2019 |
| Power Viewer | R&S | V2.3.1.0 | N/A | N/A |

Note: Per KDB 865664 Dipole SAR Validation, AGC Lab has adopted 3 years calibrationintervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:
1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement;
4. Impedance is within 5Ω of calibrated measurement.




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# 11. MEASUREMENT UNCERTAINTY

The component of uncertainly may generally be categorized according to the methods used to evaluate them. Theevaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation ofuncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation istermed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by anestimated standard deviation, termed standard uncertainty, which is determined by the positive square root of theestimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. Thisincludes calculating the standard deviation of the mean of a series of independent observations; using the method ofleast squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; orcarrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevantinformation available. These may include previous measurement data, experience, and knowledge of the behaviorand properties of relevant materials and instruments, manufacture's specification, data provided in calibration reportsand uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is eitherobtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution,rectangular or triangular distributions indicated in Table as follow.

| Uncertainty Distributions | Normal | Rectangular | Triangular | U-Shape |
|---|---|---|---|---|
| Multi-plying Factor(a) | 1/k(b) | $1/\sqrt{3}$ | $1/\sqrt{6}$ | $1/\sqrt{2}$ |

(a) Standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κis the coverage factor

**Table 13.1 Standard Uncertainty for Assumed Distribution (above table)**

The combined standard uncertainty of the measurement result represents the estimated standard deviation of theresult. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation usingthe usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root ofthe estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within whichthe measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by acoverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of ameasured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of thisdocument, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASYuncertainty Budget is shown in the following tables.

| DASY5 Uncertainty<br>Measurement uncertainty for 150 MHz to 3GHz averaged over 1 gram / 10 gram. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Uncertainty Component | Sec. | Tol (+- %) | Prob. Dist. | Div. | Ci (1g) | Ci (10g) | 1g Ui (+-%) | 10g Ui (+-%) | Vi |
| **Measurement System** | | | | | | | | | |
| Probe calibration | E.2.1 | 6.65 | N | 1 | 1 | 1 | 6.65 | 6.65 | ∞ |
| Axial Isotropy | E.2.2 | 0.25 | R | $\sqrt{3}$ | 1 | 1 | 0.14 | 0.14 | ∞ |
| Hemispherical Isotropy | E.2.2 | 1.3 | R | $\sqrt{3}$ | 1 | 1 | 0.75 | 0.75 | ∞ |
| Linearity | E.2.4 | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.17 | 0.17 | ∞ |
| Probe modulation | E.2.5 | 1.65 | R | $\sqrt{3}$ | 1 | 1 | 0.95 | 0.95 | ∞ |
| Detection limits | E.2.4 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| Boundary effect | E.2.3 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| Readout Electronics | E.2.6 | 0.2 | N | 1 | 1 | 1 | 0.20 | 0.20 | ∞ |
| Response Time | E.2.7 | 0.0 | R | $\sqrt{3}$ | 1 | 1 | 0.00 | 0.00 | ∞ |
| Integration Time | E.2.8 | 0.0 | R | $\sqrt{3}$ | 1 | 1 | 0.00 | 0.00 | ∞ |
| RF ambient Conditions-noise | E.6.1 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| RF ambient Conditions-reflections | E.6.1 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| Probe positioned mech. restrictions | E.6.2 | 0.7 | R | $\sqrt{3}$ | 1 | 1 | 0.40 | 0.40 | ∞ |
| Probe positioning with respect to phantom shell | E.6.3 | 6.5 | R | $\sqrt{3}$ | 1 | 1 | 3.75 | 3.75 | ∞ |
| Post-processing | E.5 | 3.8 | R | $\sqrt{3}$ | 1 | 1 | 2.19 | 2.19 | ∞ |
| **Test sample related** | | | | | | | | | |
| Device holder uncertainty | E.4.1 | 3.6 | N | 1 | 1 | 1 | 3.60 | 3.60 | M-1 |
| Test sample positioning | E.4.2 | 3.2 | N | 1 | 1 | 1 | 3.20 | 3.20 | M-1 |
| SAR scaling | E.6.5 | 0 | R | $\sqrt{3}$ | 1 | 1 | 0.00 | 0.00 | ∞ |
| Drift of output power(measured SAR drift) | E.2.9 | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.89 | 2.89 | ∞ |
| **Phantom and set-up** | | | | | | | | | |
| Phantom Uncertainty (Shape and thickness tolerances) | E.3.1 | 0.05 | R | $\sqrt{3}$ | 1 | 1 | 0.03 | 0.03 | ∞ |
| Algorithm for correcting SAR for deviations in permittivity and conductivity | E.3.2 | 1.9 | N | 1 | 1 | 0.84 | 1.90 | 1.60 | ∞ |
| Liquid conductivity (meas.) | E.3.3 | 5 | N | 1 | 0.78 | 0.71 | 3.90 | 3.55 | M-1 |
| Liquid permittivity (meas.) | E.3.3 | 5 | N | 1 | 0.23 | 0.26 | 1.15 | 1.30 | M |
| Liquid permittivity – temperature uncertainty | E.3.4 | 5 | R | $\sqrt{3}$ | 0.78 | 0.71 | 2.25 | 2.05 | ∞ |
| Liquid conductivity – temperature uncertainty | E.3.4 | 5 | R | $\sqrt{3}$ | 0.23 | 0.26 | 0.66 | 0.75 | ∞ |
| Combined Standard Uncertainty | | | RSS | | | | 10.65 | 10.39 | |
| Expanded Uncertainty (95% Confidence interval) | | | k | | | | 21.30 | 20.78 | |

| System validation for 150 MHz to 3GHz averaged over 1 gram / 10 gram. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Uncertainty Component | Sec. | Tol (+- %) | Prob. Dist. | Div. | Ci (1g) | Ci (10g) | 1g Ui (+-%) | 10g Ui (+-%) | Vi |
| **Measurement System** | | | | | | | | | |
| Probe calibration | E.2.1 | 6.65 | N | 1 | 1 | 1 | 6.65 | 6.65 | ∞ |
| Axial Isotropy | E.2.2 | 0.25 | R | $\sqrt{3}$ | 1 | 1 | 0.14 | 0.14 | ∞ |
| Hemispherical Isotropy | E.2.2 | 1.3 | R | $\sqrt{3}$ | 1 | 1 | 0.75 | 0.75 | |
| Linearity | E.2.4 | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.17 | 0.17 | ∞ |
| Probe modulation | E.2.5 | 1.65 | R | $\sqrt{3}$ | 1 | 1 | 0.95 | 0.95 | ∞ |
| Detection limits | E.2.4 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| Boundary effect | E.2.3 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| Readout Electronics | E.2.6 | 0.2 | N | 1 | 1 | 1 | 0.20 | 0.20 | ∞ |
| Response Time | E.2.7 | 0.0 | R | $\sqrt{3}$ | 1 | 1 | 0.00 | 0.00 | ∞ |
| Integration Time | E.2.8 | 0.0 | R | $\sqrt{3}$ | 1 | 1 | 0.00 | 0.00 | ∞ |
| RF ambient Conditions-noise | E.6.1 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| RF ambient Conditions-reflections | E.6.1 | 0.9 | R | $\sqrt{3}$ | 1 | 1 | 0.52 | 0.52 | ∞ |
| Probe positioned mech. restrictions | E.6.1 | 0.7 | R | $\sqrt{3}$ | 1 | 1 | 0.40 | 0.40 | ∞ |
| Probe positioning with respect to phantom shell | E.6.2 | 6.5 | R | $\sqrt{3}$ | 1 | 1 | 3.75 | 3.75 | ∞ |
| Post-processing | E.6.3 | 3.8 | R | $\sqrt{3}$ | 1 | 1 | 2.19 | 2.19 | ∞ |
| **System validation source(dipole)** | | | | | | | | | |
| Deviation of the experimental source from numerical source | E6.4 | 5.3 | N | 1 | 1 | 1 | 5.30 | 5.30 | ∞ |
| Source to liquid distance | 8,E.6.6 | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.58 | 0.58 | ∞ |
| Drift of output power(measured SAR drift) | 8,6.6.4 | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.89 | 2.89 | ∞ |
| **Phantom and set-up** | | | | | | | | | |
| Phantom Uncertainty (Shape and thickness tolerances) | E.3.1 | 0.05 | R | $\sqrt{3}$ | 1 | 1 | 0.03 | 0.03 | ∞ |
| Algorithm for correcting SAR for deviations in permittivity and conductivity | E.3.2 | 1.9 | N | 1 | 1 | 0.84 | 1.90 | 1.60 | ∞ |
| Liquid conductivity (meas.) | E.3.3 | 5 | N | 1 | 0.78 | 0.71 | 3.90 | 3.55 | M |
| Liquid permittivity (meas.) | E.3.3 | 5 | N | 1 | 0.23 | 0.26 | 1.15 | 1.30 | M |
| Liquid permittivity – temperature uncertainty | E.3.4 | 5 | R | $\sqrt{3}$ | 0.78 | 0.71 | 2.25 | 2.05 | ∞ |
| Liquid conductivity – temperature uncertainty | E.3.4 | 5 | R | $\sqrt{3}$ | 0.23 | 0.26 | 0.66 | 0.75 | ∞ |
| Combined Standard Uncertainty | | | RSS | | | | 10.90 | 10.635 | |
| Expanded Uncertainty (95% Confidence interval) | | | k | | | | 21.79 | 21.270 | |

| System check for 150 MHz to 3GHz averaged over 1 gram / 10 gram. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Uncertainty Component | Sec. | Tol (+- %) | Prob. Dist. | Div. | Ci (1g) | Ci (10g) | 1g Ui (+-%) | 10g Ui (+-%) | Vi |
| **Measurement System** | | | | | | | | | |
| Probe calibration drift | E.2.1.3 | 2.0 | N | 1 | 1 | 1 | 6.00 | 6.00 | ∞ |
| Axial Isotropy | E.2.2 | 0.25 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| Hemispherical Isotropy | E.2.2 | 1.3 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | |
| Linearity | E.2.4 | 0.3 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| Probe modulation | E.2.5 | 1.65 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| Detection limits | E.2.4 | 0.9 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| Boundary effect | E.2.3 | 0.9 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| Readout Electronics | E.2.6 | 0.2 | N | 1 | 0 | 0 | 0 | 0 | ∞ |
| Response Time | E.2.7 | 0 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| Integration Time | E.2.8 | 0 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| RF ambient Conditions-noise | E.6.1 | 0.9 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| RF ambient Conditions-reflections | E.6.1 | 0.9 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| Probe positioned mech. restrictions | E.6.2 | 0.7 | R | $\sqrt{3}$ | 1 | 1 | 0.40 | 0.40 | ∞ |
| Probe positioning with respect to phantom shell | E.6.3 | 6.5 | R | $\sqrt{3}$ | 1 | 1 | 3.75 | 3.75 | ∞ |
| Post-processing | E.5 | 3.8 | R | $\sqrt{3}$ | 0 | 0 | 0 | 0 | ∞ |
| **System check source(dipole)** | | | | | | | | | |
| Deviation of the experimental source from numerical source | E6.4 | 5.3 | N | 1 | 1 | 1 | 5.30 | 5.30 | ∞ |
| Source to liquid distance | 8,E.6.6 | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.58 | 0.58 | ∞ |
| Drift of output power(measured SAR drift) | 8,6.6.4 | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.89 | 2.89 | ∞ |
| **Phantom and set-up** | | | | | | | | | |
| Phantom Uncertainty (Shape and thickness tolerances) | E.3.1 | 0.05 | R | $\sqrt{3}$ | 1 | 1 | 0.03 | 0.03 | ∞ |
| Algorithm for correcting SAR for deviations in permittivity and conductivity | E.3.2 | 1.9 | N | 1 | 1 | 0.84 | 1.90 | 1.60 | ∞ |
| Liquid conductivity (meas.) | E.3.3 | 5 | N | 1 | 0.78 | 0.71 | 3.90 | 3.55 | M |
| Liquid permittivity (meas.) | E.3.3 | 5 | N | 1 | 0.23 | 0.26 | 1.15 | 1.30 | M |
| Liquid permittivity – temperature uncertainty | E.3.4 | 5 | R | $\sqrt{3}$ | 0.78 | 0.71 | 2.25 | 2.05 | ∞ |
| Liquid conductivity – temperature uncertainty | E.3.4 | 5 | R | $\sqrt{3}$ | 0.23 | 0.26 | 0.66 | 0.75 | ∞ |
| Combined Standard Uncertainty | | | RSS | | | | 8.11 | 7.86 | |
| Expanded Uncertainty (95% Confidence interval) | | | k | | | | 16.22 | 15.52 | |




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## 12.POWER MEASUREMENT

| Channel | Frequency (MHz) | Channel Separation | Avg. Power(dBm) |
|---|---|---|---|
| 1 | 462.5625 | 12.5KHz | 32.53 |
| 4 | 462.6375 | 12.5KHz | **32.87** |
| 7 | 462.7125 | 12.5KHz | 32.32 |
| 15 | 462.5500 | 12.5KHz | 32.46 |
| 18 | 462.6250 | 12.5KHz | 32.57 |
| 22 | 462.7250 | 12.5KHz | 32.39 |

# 13. TEST RESULTS

## 13.1. SAR Test Results Summary

### 13.1.1. Test position and configuration

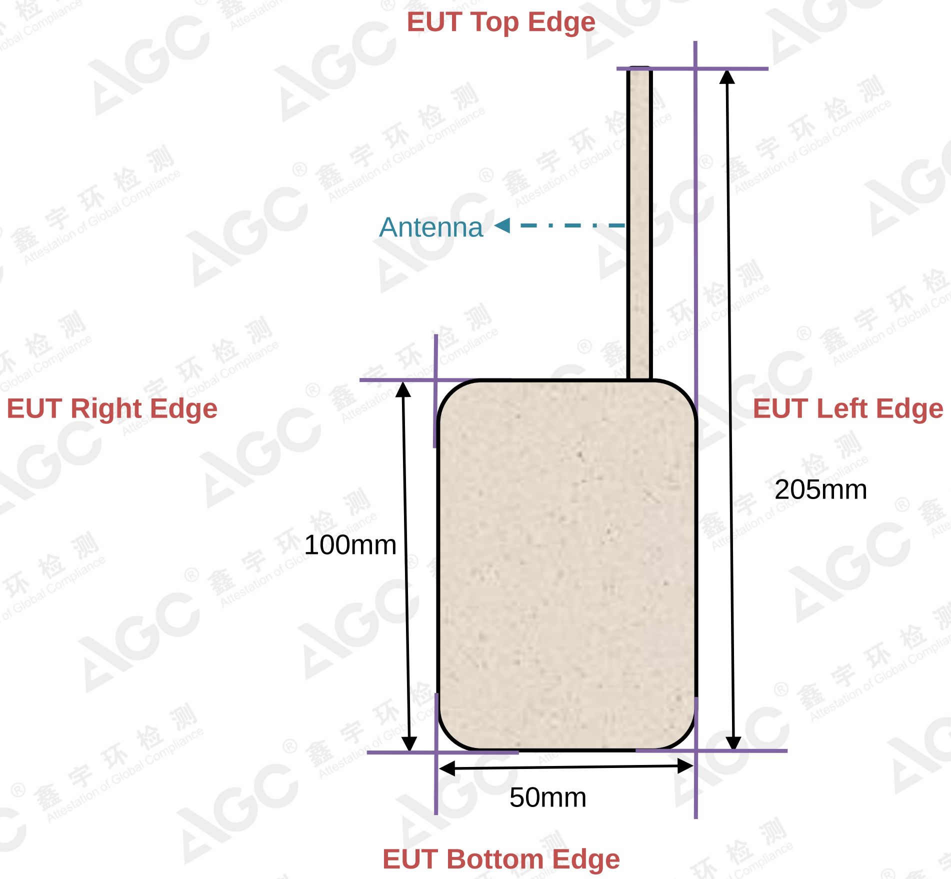
Face Up SAR was performed with the device configured in the positions according to KDB 643646 and Body SAR was performed with the device configurated with all accessories close to the Flat Phantom.

### 13.1.2. Operation Mode

- Set the EUT to maximum output power level and transmit on lower, middle and top channel with 100% duty cycle individually during SAR measurement.
- Per KDB 643646 D01, Passive body-worn and audio accessories generally do not apply to the head SAR of PTT radios. Head SAR is measured with the front surface of the radio positioned at 2.5 cm parallel to a flat phantom.
- Per KDB 643646 D01, Body SAR is measured with the radio placed in a body-worn accessory, positioned against a flat phantom, representative of the normal operating conditions expected by users and typically with a standard default audio accessory supplied with the radio.

  When testing antennas with the default battery: the same test measurement with head part.
- The EUT only contains the Testing antenna, Standard battery and default body-worn accessory specified by customer. The earphone is only for testing

### 13.1.3. Antenna Location:( back view )



### 13.1.4. SAR Test Results Summary

| SAR MEASUREMENT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth of Liquid (cm):>15 | | | | | Relative Humidity (%): 49.6 | | | | |
| Product: Analog Transceiver | | | | | | | | | |
| Test Mode: Hold to Face with 2.5 cm separation & body back touch with clip | | | | | | | | | |
| **Position** | **Freq. (MHz)** | **Separation (KHz)** | **Power Drift (<±0.2dB)** | **SAR 1g with 100% duty Cycle (W/kg)** | **SAR 1g with 50% duty cycle (W/Kg)** | **Max. Tune-up Power (dBm)** | **Meas. output Power (dBm)** | **Scaled SAR (W/Kg)** | **Limit W/kg** |
| Face Up | 462.6375 | 12.5 | -0.11 | 0.329 | 0.1645 | 32.87 | 32.87 | 0.169 | 1.6 |
| Back Touch | 462.6375 | 12.5 | -0.17 | 1.11 | 0.555 | 32.87 | 32.87 | 0.577 | 1.6 |
| Face Up | 462.6250 | 12.5 | -0.04 | 0.383 | 0.1915 | 32.87 | 32.57 | 0.207 | 1.6 |
| Back Touch | 462.6250 | 12.5 | -0.07 | 1.46 | 0.73 | 32.87 | 32.57 | 0.795 | 1.6 |

Note:

1、During the test, EUT power is 2W with 100% duty cycle;

2、$\text{Max\_ Scaled} = SAR\_meas * 10^{\frac{-Drift}{10}} * \frac{P\_\max}{P\_\text{int}} * DC$

P_ max = Maximum Power(W)
P_ int = Initial Power(W)
Drift = DASY drift results(dB)
SAR_ meas=Measured 10-g Avg.SAR
DC = Transmission mode duty cycle in % where applicable 50% duty cycle is applied for PTT operation.
For conservative results, the following are applied:
If P_ int > P_ max, then P_ max/P_ int =1. Drift = 1 for positive drift

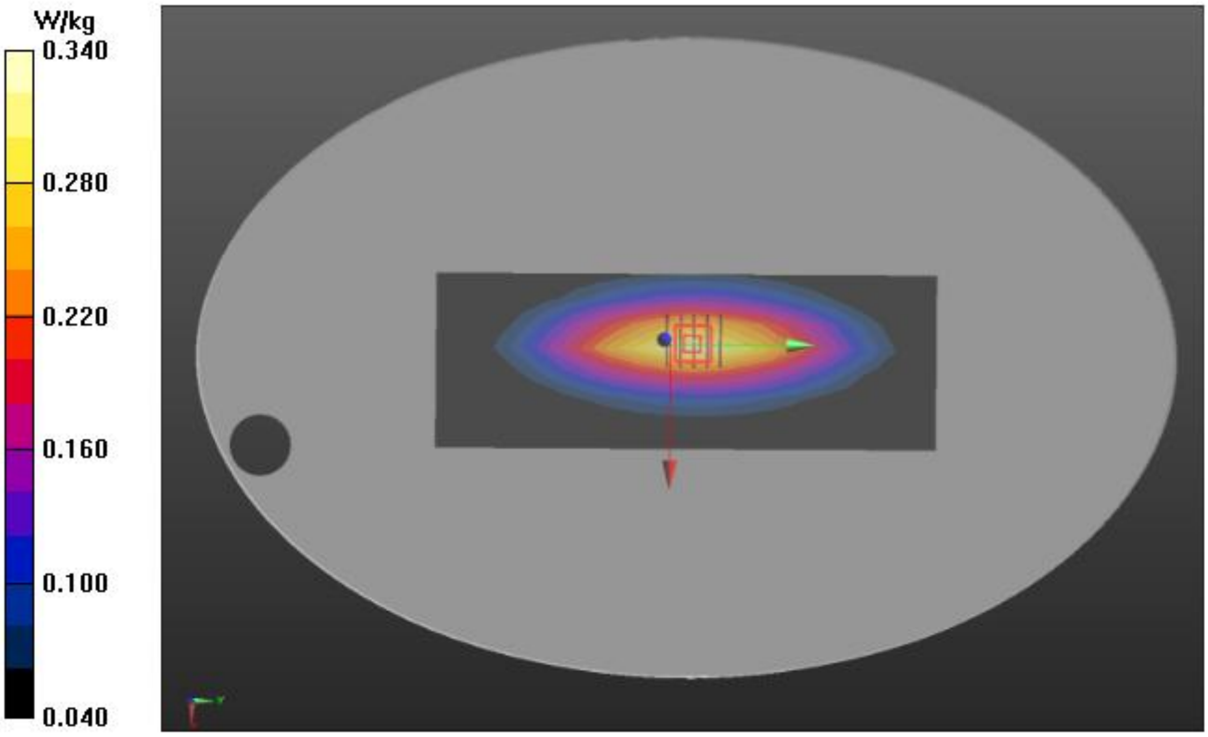
# APPENDIX A. SAR SYSTEM CHECK DATA

**Test Laboratory: AGC Lab** **Test date: Oct. 10,2018**
**System Check Head450MHz**
**DUT: Dipole 450 MHz Type: SID 450**
Communication System: CW; Communication System Band: CW; Duty Cycle: 1:1;
Frequency: 450MHz; Medium parameters used: f = 450MHz; σ= 0.85 mho/m; εr =44.15; ρ = 1000 kg/m³ ;
Phantom Type: Elliptical Phantom; Input Power=18dBm
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.3

DASY Configuration:
Probe: EX3DV4 – SN3953; ConvF(11.28, 11.28, 11.28); Calibrated: June 26,2018;
Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0,
Electronics: DAE4 SN1398; Calibrated: Feb. 08,2018
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1108
DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Configuration/System Check 450MHz Head/Area Scan (8x21x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.331 W/kg

**Configuration/System Check 450MHz Head/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.332 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.441 W/kg
**SAR(1 g) = 0.287 W/kg; SAR(10 g) = 0.196 W/kg**
Maximum value of SAR (measured) = 0.340 W/kg

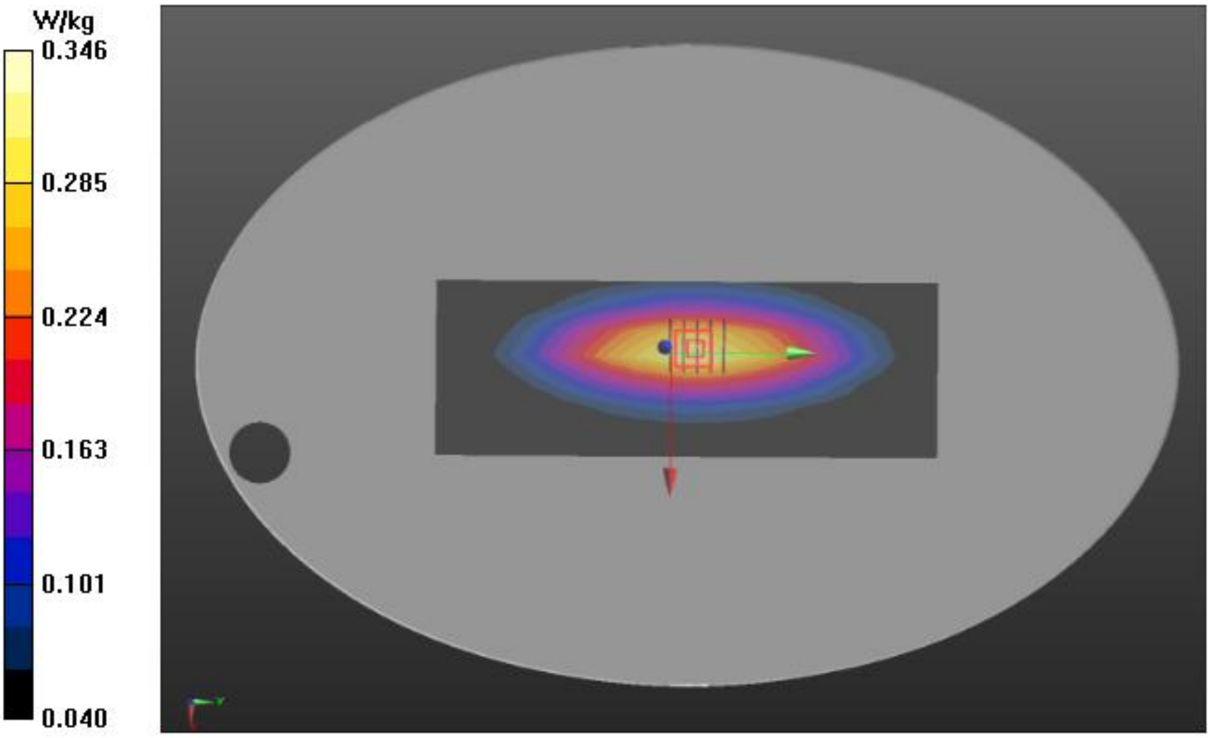


**Test Laboratory: AGC Lab** **Test date: Oct. 10,2018**
**System Check Body450MHz**
**DUT: Dipole 450 MHz Type: SID 450**
Communication System: CW; Communication System Band: CW; Duty Cycle: 1:1;
Frequency: 450MHz; Medium parameters used: f = 450MHz; σ= 0.91 mho/m; εr =58.43; ρ = 1000 kg/m³ ;
Phantom Type: Elliptical Phantom; Input Power=18dBm
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.5

DASY Configuration:
- Probe: EX3DV4 – SN3953; ConvF(11.51, 11.51, 11.51); Calibrated: June 26,2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0,
- Electronics: DAE4 SN1398; Calibrated: Feb. 08,2018
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1108
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Configuration/System Check 450MHz Body/Area Scan (8x21x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.341 W/kg

**Configuration/System Check 450MHz Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.251 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.471 W/kg
**SAR(1 g) = 0.302 W/kg; SAR(10 g) = 0.207 W/kg**
Maximum value of SAR (measured) = 0.346 W/kg



# APPENDIX B. SAR MEASUREMENT DATA

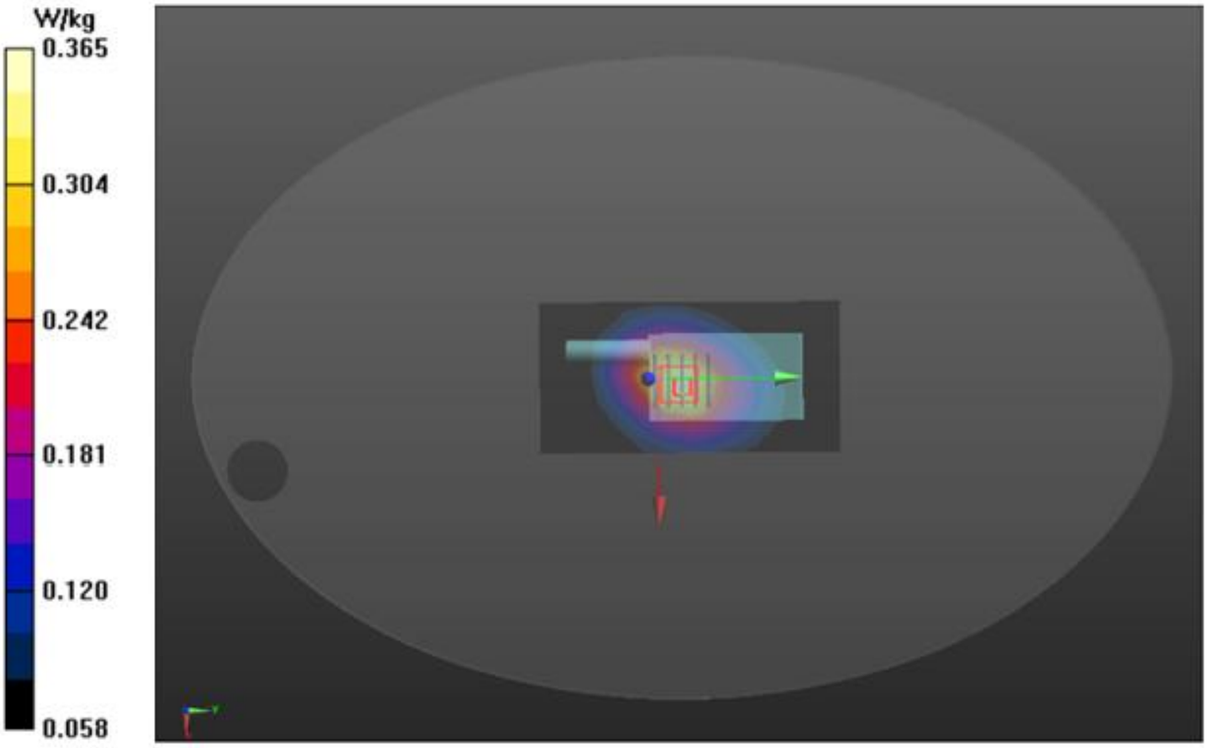
**Test Laboratory: AGC Lab** **Date: Oct. 10,2018**
**462Mid- face up 2.5cm (12.5 KHz)**
**DUT:Analog Transceiver;Type:TC-568**

Communication System: 450; Communication System Band: D450(450.0 MHz); Duty Cycle: 1:1;
Frequency:462.6375 MHz; Medium parameters used: f = 450MHz; σ= 0.87 mho/m; εr =43.69;ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.3

DASY Configuration:
- Probe: EX3DV4 – SN3953; ConvF(11.28, 11.28, 11.28); Calibrated: June 26,2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0,
- Electronics: DAE4 SN1398; Calibrated: Feb. 08,2018
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1108
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**FACE UP/MID/Area Scan (7x13x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.362 W/kg

**FACE UP /MID/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.940 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.426 W/kg
**SAR(1 g) = 0.329 W/kg; SAR(10 g) = 0.244 W/kg**
Maximum value of SAR (measured) = 0.365 W/kg







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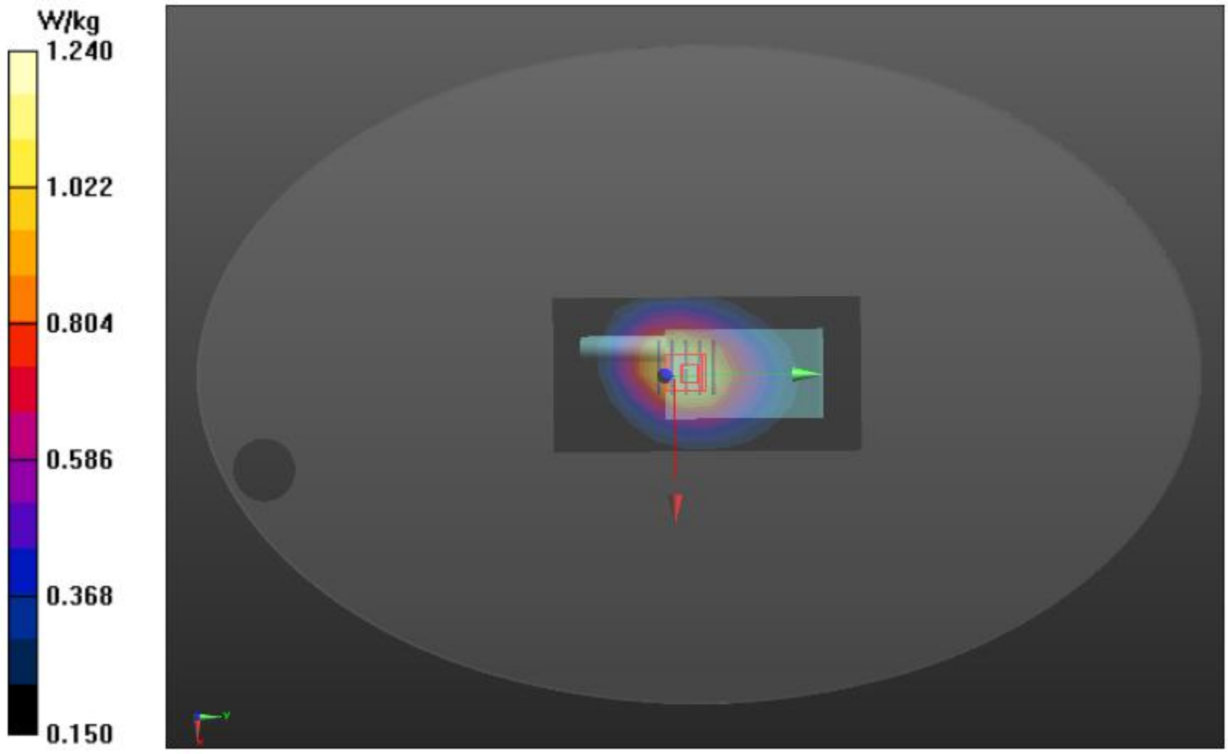
**Test Laboratory: AGC Lab** **Date: Oct. 10,2018**
**462 Mid -Body –Touch (12.5KHz)**
**DUT:Analog Transceiver; Type:TC-568**

Communication System: 450; Communication System Band: D450(450.0 MHz); DutyCycle: 1:1;
Frequency: 462.6375MHz; Medium parameters used: f = 450 MHz; σ= 0.92 mho/m; εr =57.69; ρ= 1000 kg/m ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.5

DASY Configuration:
Probe: EX3DV4 – SN3953; ConvF(11.51, 11.51, 11.51); Calibrated: June 26,2018;
Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0,
Electronics: DAE4 SN1398; Calibrated: Feb. 08,2018
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1108
DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**BODY/MID/Area Scan (7x13x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.30 W/kg

**BODY/MID/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 37.968 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 1.54 W/kg
**SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.782 W/kg**
Maximum value of SAR (measured) = 1.24 W/kg



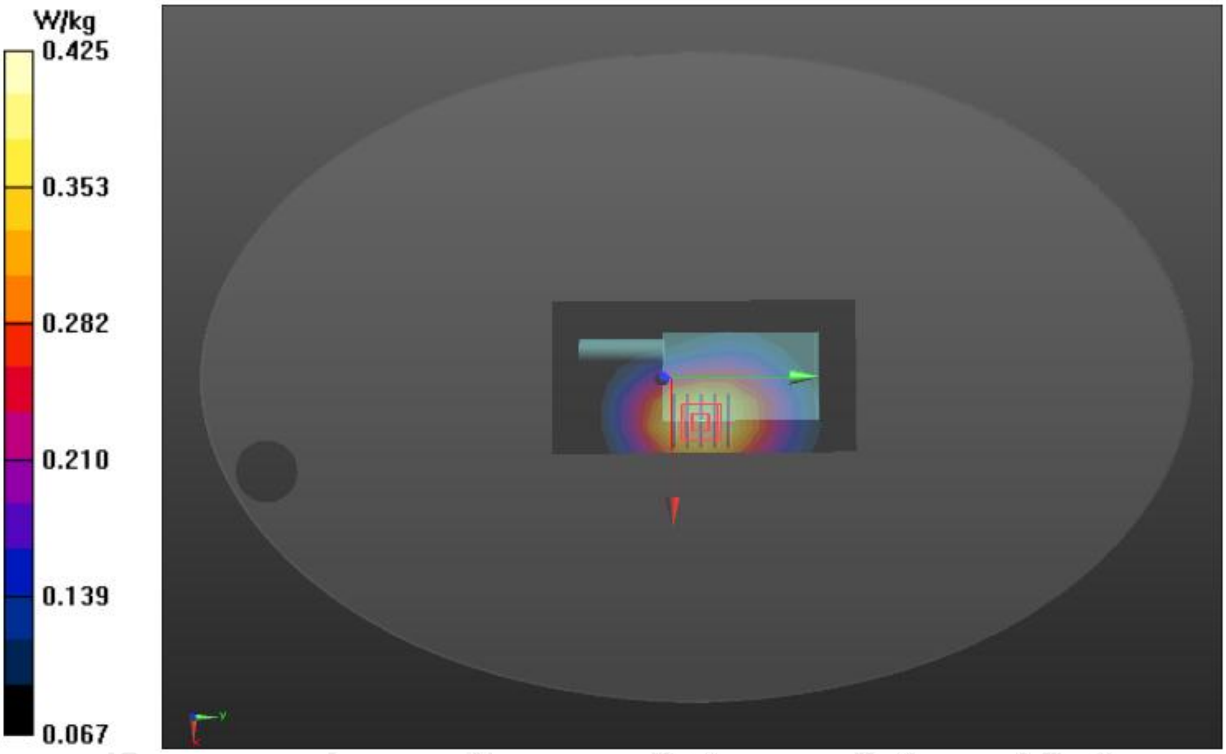
**Test Laboratory: AGC Lab** **Date: Oct. 10,2018**
**462Mid- face up 2.5cm (12.5 KHz)**
**DUT:Analog Transceiver;Type:TC-568**

Communication System: 450; Communication System Band: D450(450.0 MHz); Duty Cycle: 1:1;
Frequency: 462.6250 MHz; Medium parameters used: f = 450MHz; σ= 0.87 mho/m; εr =43.69;ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.3

DASY Configuration:
- Probe: EX3DV4 – SN3953; ConvF(11.28, 11.28, 11.28); Calibrated: June 26,2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0,
- Electronics: DAE4 SN1398; Calibrated: Feb. 08,2018
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1108
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**FACE UP/MID/Area Scan (7x13x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.439 W/kg

**FACE UP/MID/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.497 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.496 W/kg
**SAR(1 g) = 0.383 W/kg; SAR(10 g) = 0.284 W/kg**
Maximum value of SAR (measured) = 0.425 W/kg



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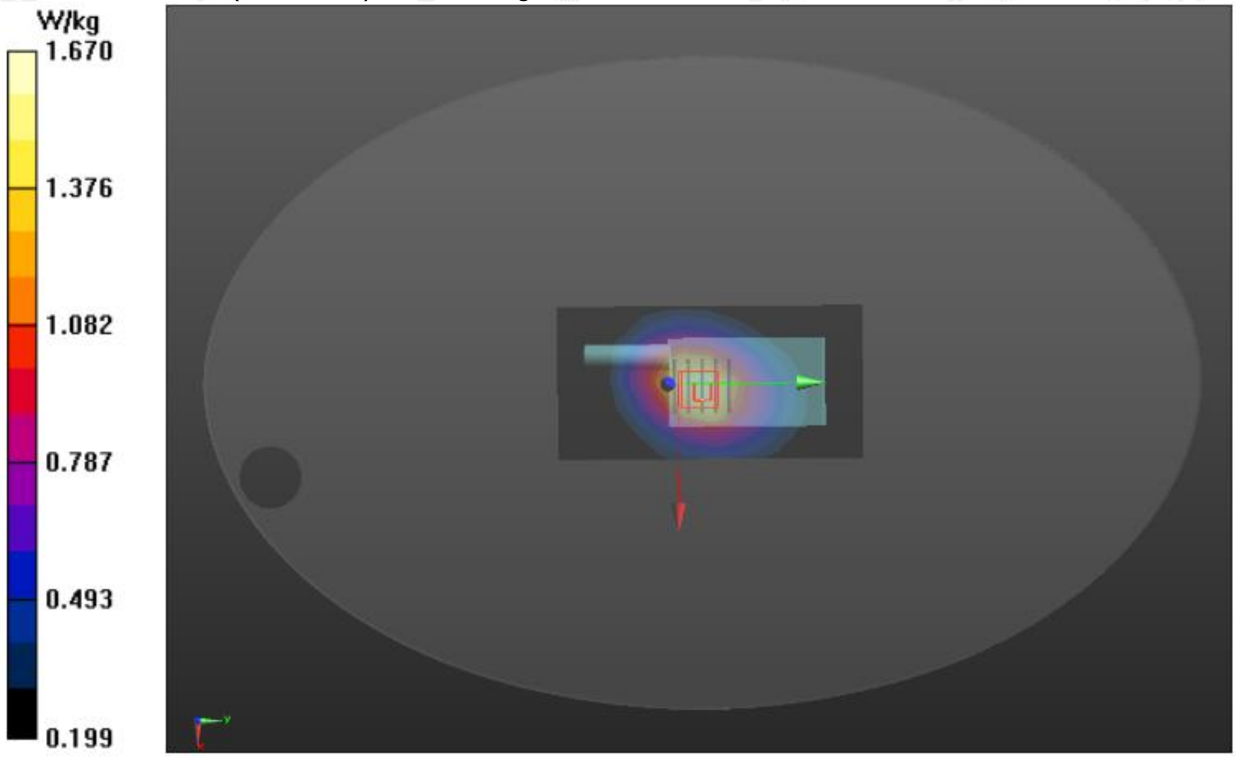
**Test Laboratory: AGC Lab** **Date: Oct. 10,2018**
**462 Mid -Body –Touch (12.5KHz)**
**DUT:Analog Transceiver; Type:TC-568**

Communication System: 450; Communication System Band: D450(450.0 MHz); DutyCycle: 1:1;
Frequency: 462.6250MHz; Medium parameters used: f = 450 MHz; σ= 0.92 mho/m; εr =57.69; ρ= 1000 kg/m ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.5

DASY Configuration:
Probe: EX3DV4 – SN3953; ConvF(11.51, 11.51, 11.51); Calibrated: June 26,2018;
Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0,
Electronics: DAE4 SN1398; Calibrated: Feb. 08,2018
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1108
DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**BODY/MID/Area Scan (7x13x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.62 W/kg

**BODY/MID/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 42.991 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.10 W/kg
**SAR(1 g) = 1.46 W/kg; SAR(10 g) = 1.01 W/kg**
Maximum value of SAR (measured) = 1.67 W/kg



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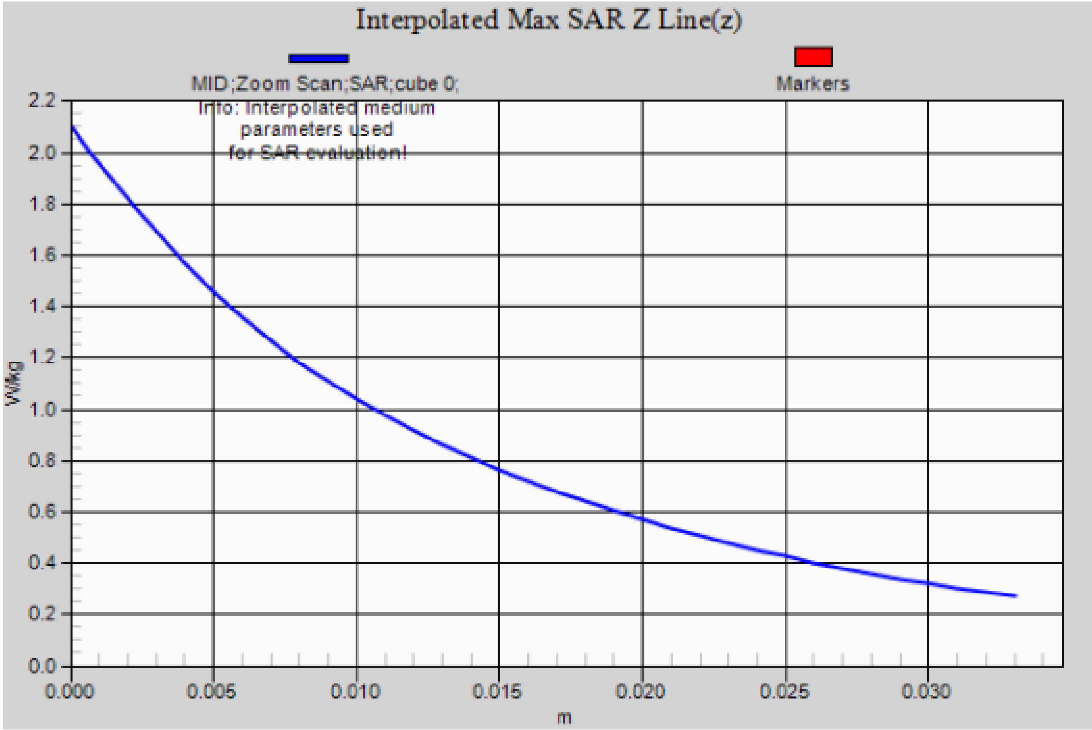

Interpolated Max SAR Z Line(z)
MID;Zoom Scan;SAR;cube 0;
Info: Interpolated medium parameters used for SAR evaluation!
Markers
W/kg
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

## APPENDIX C. TEST SETUP PHOTOGRAPHS

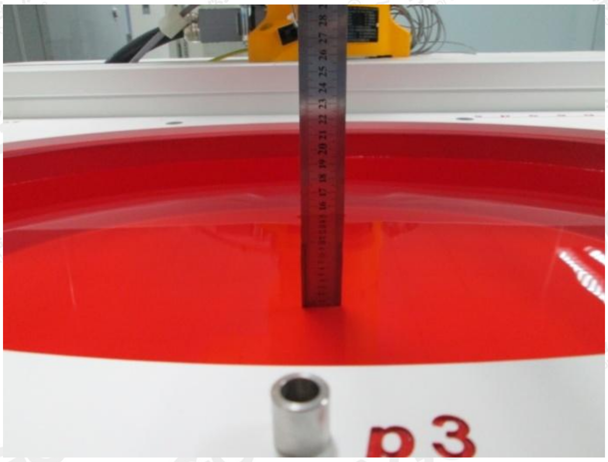
Face Up with 2.5 cm Separation Distance.


Body Back Touch with all accessories

Note : The headset is just for testing. This tested and electrically similar headsets may be used.

## DEPTH OF THE LIQUID IN THE PHANTOM—ZOOM IN

Note：The position used in the measurement were according to IEEE 1528-2013

| 450MHz Head | 450MHz Body |
|---|---|
|  |  |

## APPENDIX D. CALIBRATION DATA

Refer to Attached files.

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